3.3.1. Number of research papers published per teacher in the Journals notified on UGC care list during the last five years

3.3.1.1. Number of research papers in the Journals notified on UGC CARE list year wise during the last five years

HEI Input :

2022-23	2021-22	2020-21	2019-20	2018-19
25	24	24	17	18

DVV suggested Input :

2022-23	2021-22	2020-21	2019-20	2018-19
9	11	4	6	14

Query: Values have been updated excluding the research paper published beyond the assessment period has not been considered; Also the values have been updated excluding the journal without ISSN no. and the ISSN no. not found on UGC care list/ Scopus Indexed has not been considered as per NAAC SOP; HEI to provide the link landing to the research paper, link to the journal website.

RESPONSE: In response to the query regarding the research publications, we have updated the existing list of our research publications by excluding papers published beyond the assessment period and journals without ISSN numbers, as well as those not found on the UGC CARE list or indexed in Scopus, as per the NAAC SOP guidelines.

We have also ensured that all supporting documents are provided, including links to each research paper and corresponding journal websites. The year-wise revised number of publications is as follows:

1.	2022-23	: 22 publications
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- 2. 2021-22 : 13 publications
- 3. 2020-21 : 10 publications
- 4. 2019-20 : 14 publications

The updated document has been uploaded with all the required details.



3.3.1: Details of Research Articles Published

Details of Research Papers published by the faculty were given as per the institutional format given in NAAC SOP

DVV Suggested input

2022-23	2021-22	2020-21	2019-20	2018-19
9	11	4	6	14

Input claimed now with supporting documents

2022-23	2021-22	2020-21	2019-20	2018-19
22	13	10	14	14

*Red indicates the number of inputs changed from the DVV data and supporting documents are provided below



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CING	Title of paper	Name of the author/s	Dept of the teacher	Name of journal	Calendar Year of	ISSN number	Link to the rea Journal /Digi	Page No		
SINO					publication	number	Link to website of the Journal	Link to article / paper / abstract of the article	ls it listed in UGC Care list	1 050 110
1	Lipid nanoparticle formulation -US Patent	Ashwani Kumar Narayana	Chemistry	USPTO (United States Patent and Trademarks Office)	2022-23				Yes	12-13
2	Adaptive physio-anatomical modulations and ionomics of <i>Volkameria inermis</i> L. in response to NaCl.	Nair G. Sarath <i>,</i> Asseema Manzil Shackira and Jos T. Puthur	Botany	International Journal of Phytoremediat ion	2022-23	1549- 7879			Yes	14-16
3	Plant response to heavy metal Stress Toxicity: the role of Metabolomics and Other Omics tools.	K.S. Anjitha, Nair G. Sarath, P.P. Sameena, Edappayil Janeeshma, AM. Shackira and Jos T. Puthur.	Botany	Functional Plant Biology.	2022-23	1445- 4416			Yes	17-25
4	Adaptive physio-anatomical modulations and ionomics of Volkameria inermis L. in response to NaCl.	Nair G. Sarath, AM Shackira and Jos T. Puthur.	Botany	International Journal of Phytoremediat ion.	2022-23	1549- 7879			Yes	26-28
5	Binding energy analysis and molecular dynamic simulation studies of the designed orally active, non-toxic GABARAP modulators	Megha P Nambiar, N Ashwanikumar, Anakuthil Anoop, AR Biju	Chemistry	Journal of Biomolecular Structure and Dynamics	2022-23	1538- 0254			Yes	29-31



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6	Artificial intelligence in timber forensics employing DNA barcode database	Suma Arun Dev1 · Remya Unnikrishnan1,3 · P. S. Prathibha1 · K. Sijimol1 · V. B. Sreekumar1 · A. AzharAli2 , E. V. Anoop2 · Syam Viswanath1	Forestry	3 Biotech	2022-23	2190- 572X		Yes	32-33
7	The influence of lithium ion incorporation on the luminescence enhancement of Gd2O3:Pr3+ nanophosphors for lighting applications	K.K. Fairoosa, K. M. Nissamudeen	Physics	Optik	2022-23	0030- 4026		Yes	34-36
8	First Record of the Asian Sand Goby, <i>Favonigobius</i> <i>gymnauchen</i> (Bleeker, 1860) (Teleostei, Gobiidae) from Arabian Coast of India and Species Confirmation Through DNA Barcoding of COI Gene	Tmv Mumthaz , Kannookarathi Abdul, Ragunathan, Ghosh, Suresh, T, Vinayan	Zoology	Thalassas	2022-23	2366- 1674.		Yes	37-41
9	Molecular Characterization, genitalia based taxonomic differentiation and genetic make up analysis of Angonyx Krishna (insecta: Sphingidae)	N Bushra, RSM Shamsudheen	Zoology	Goya journal	2022-23	0017- 2715		Yes	42-44
10	First Record of Megaselia scalaris (Diptera: Phoridae) as a Parasitoid of Thyas coronata (Lepidoptera: Erebidae)	Ramya Rajan <i>,</i> RSM Shamsudeen	Zoology	Indian Journal of Entomology	2022-23	0974- 8172		Yes	45-55



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11	Potassium in plants: Growth regulation, signaling, and abiotic stress tolerance.	Riya Johnson, Kanchan Vishwakarma, Md. Shahadat Hossen,Vinod Kumar, Shackira A.M ., Jos T Puthur, Gholamreza Abdi, Mohammad Sarraf, Mirza Hasanuzzaman	Botany	Plant Physiology and Biochemistry. 172: 56-69. (07 January 2022)	2022-23	1873- 2690		Yes	56-58
12	Green Seed Photosynthesis: What is it? What do we know about it? Where to go?	A.M. Shackira, Nair G. Sarath, KP Raj Aswathi, P. Pardha-saradhi, Jos T. Puthur	Botany	Plant Physiology Reports.	2022-23	2662- 2548		Yes	59-61
13	Phycoremediation- A means for restoration of water contamination.	Shackira AM , Nair G. Sarath, Jos T Puthur	Botany	Environmental Sustainability. 1-14.	2022-23	2523- 8922		Yes	62-65
14	Phytostabilization of arsenic and associated physio- anatomical changes in <i>Acanthus ilicifolius</i> L.	Nair G. Sarath, Shackira AM , Hamed A. El-Serehy, Daniel Ingo Hefft, Jos T Puthur	Botany	Environmental Pollution. 298:118828. (11 January 2022)	2022-23	0269- 7491		Yes	66-70
15	Tree Diversity and Abundance of Western Ghats Striped Squirrels, Funambulus Tristriatus in Sacred Groves: Evidence from Kannur, Kerala,	P.V. Amina, P Sreeja , Manoj K	Botany	Applied Ecology and Environmental Sciences	2022-23	2328- 3920		Yes	71-73
16	Carbon dots derived from frankincense soot for ratiometric and colorimetric detection of lead (II)	Varsha Lisa John , Fasila P M , Chaithra K P and Vinod T P	Chemistry	Nanotechnology	2022-23	0957- 4484		Yes	74-76
17	Heavy metal contamination in water sources of Thaliparamba municipality, Kerala, India	T. P. Nafeesa Baby, V. Vineethkumar, K. P. Shimod, C. V. Vishnu, Sarayu Jayadevan	Chemistry	Radiation Protection and Environment	2022-23	0972- 0464		Yes	77-80



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18	Indole/oxazolone functionalized coumarins as pH-sensitive fluorescent kinase inhibitors	Aranhikkal Shamsiya, Rajeena Pathoor , D. Bahulayan	Chemistry	Tetrahedron Letters	2022-23	0040- 4039		Yes	81-84
19	Roost tree characteristics of <i>Pteropus medius</i> (Chiroptera: Pteropodidae) in the midland laterite hillocks of northern Kerala, India	Malik Fasil Madala , Christopher Guna, Anusree Pradeepan, Ayyoob K Chalil	Forestry	Journal of Asia-Pacific Biodiversity	2022-23	2287- 884X		Yes	85-88
20	Kerala Bird Atlas 2015–20: features, outcomes and implications of a citizen- science project	J. Praveen, Azhar Ali et al.	Forestry	Current Science	2022-23	0011- 3891		Yes	89-93
21	Diversity of Lepidoptera along Altitudinal Gradient in Shola Forest of Kerala, India	R.S.M. Shamsudeen and P. C. Pathania	Zoology	Rec. zool. Surv. India	2022-23	2581- 8686		Yes	94-96
22	High Fat-High Fructose Diet Elicits Hypogonadotropism Culminating in Autophagy - Mediated Defective Differentiation of Ovarian Follicles	Chalikkaran Thilakan Rejani; Ajit Kumar Navin; Thekkey Madathil Valappil Mumthaz ; Venugopal Bhuvarahamurthy	Zoology	Cells	2022-23	2073- 4409		Yes	97-99
23	An ethnobotanical study of medicinal plants traditionally used by the natives of Lakshadweep Islands, India- Journal of Traditional and Folk Practices	Ansarali, K.C and Abdussalam, A.K.	Botany	Journal of Traditional and Folk Practices	2021-22	2278- 5906		Yes	100-104



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24	Determination of use value and informant consensus factor on ethnobotanic knowledge about wild legumes used by natives of Wayanad District, Kerala	V Aswathi, & A K Abdussalam	Botany	Indian Journal of Traditional Knowledge	2021-22	0975- 1068		Yes	105-109
25	Healthcare management through mitigation of covid 19 pandemic with leafy vegetables- Annals of phytomedicine	Abdussalam, A.K. P K Prajith ,VP Jyothi, K P Prasanth, Asees, K. and Ratheesh Narayan, M.K.	Botany	Annals of Phytomedicine	2021-22	2393- 9885		Yes	110-113
26	Physiochemical characterization and thermal kinetics of lignin recovered from sustainable agrowaste for bioenergy applications (Publication by our M.Sc Student in a journal of JCR Impact factor of 8.1)	Gazliya Nazimudheen, Nimmi C. Sekhar,Anju Sunny, Aparna Kallingal, <u>Hasanath B</u>	Chemistry	International Journal of Hydrogen Energy	2021-22	0360- 3199		Yes	114-116
27	Detonation properties and impact sensitivities of trinitromethane derivatives of three-membered heterocyclic ring compounds	Rahana Ameen, Fasila P. M Anakuthil Anoop , Biju A. R	Chemistry	Journal of Molecular Graphics and Modelling	2021-22	1093- 3263		Yes	117-120
28	Evaluation of antiproliferative potential of manganese (II)- dafone complex	Reena, MP Nambiar, BK Babu, AR Biju	Chemistry	Indian Journal of Biochemistry & Biophysics	2021-22	0975- 0959		Yes	121-123
29	Theoretical investigation of energetic performance and impact sensitivities of nitro and trinitromethyl substituted ozonides of ethylene and cyclopentene	P.M. Fasila , Ameen Rahana , A.R. Biju	Chemistry	Computational and Theoretical Chemistry	2021-22	2211- 5249		Yes	125-132



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30	Theoretical studies of azete based high energy density materials with trinitromethane functional group	Rahana Ameen , P.M. Fasila,, A.R. Biju	Chemistry	Computational and Theoretical Chemistry	2021-22	2211- 5249		Yes	133-135
31	<i>Indotyphlops braminus</i> . The IUCN Red List of Threatened Species 2021: e. T172704A1370555	G Shea, Malik Fasil Madala et al.,	Forestry	The IUCN Red List of Threatened Species	2021-22	2307- 8235		Yes	136-144
32	<i>Varanus bengalensis</i> . The IUCN Red List of Threatened Species 2021: e. T164579A1058949	M Cota, Malik Fasil Madala et al.,	Forestry	The IUCN Red List of Threatened Species	2021-22	2307- 8235		Yes	145-152
33	Diversity of Pteridophyte Flora in Rajamala, Eravikulam National Park, Kerala, India	M. S. Arjun1*, Raju Antony2, A. Azhar Ali3, C. Abhirami1 and M. M. Sreejith4	Forestry	Asian Journal of Environment & Ecology	2021-22	2456- 690X		Yes	153-157
34	A review of <i>Gryllidae</i> (<i>Grylloidea</i>) with the description of one new species and four new distribution records from the Sindh Province, Pakistan	Sultana R, Sanam S, Kumar S, RSM Shamsudheen , Soomro F.	Zoology	Zookeys	2021-22	1313- 2970		Yes	158-162
35	Faunastic Studies on Smaller Moths (Insecta: Microlepidoptera) of Western Ghats, Kerala	RSM Shamsudeen	Zoology	RESEARCH REVIEW International Journal of Multidisciplina ry	2021-22	2455- 3085		Yes	163-165
36	An ethano botanical study of medicinal plants traditionally used by the natives of Lakhadweep islands India.	AK Abdussalam , K C Ansarali	Botany	International Journal of Creative Research Thoughts	2020-21	2320- 2882		Yes	166-168



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37	Analysis of <i>Morinda citrifolia</i> from different habitats of Kannur district	T.E. Arya, K.T. Chandra Mohanan, P. Sreeja	Botany	International Journal of All Research Education & Scientific Methods	2020-21	2455- 6211		Yes	169-170
38	Study of the epiphytic algae from pneumatophores of Avicennia officianalis L	Sreeja.P , Aswini.P.V and Chandramohanan. K.T	Botany	Journal of Emerging Technologies and Innovative Research	2020-21	2349- 5162		Yes	171-173
39	Phytochemical evaluation of <i>Amorphohalus smithsonianus</i> Sivad: a rare endemic species from western Ghats, Kerala, India	Raghavan Kavalan, A. K. Abdussalam and K. M. Gothandam	Botany	Annals of Phytomedicine : An International Journal	2020-21	2393- 9885		Yes	174-176
40	Naturally-occurring cholesterol analogues in lipid nanoparticles induce polymorphic shape and enhance intracellular delivery of mRNA	Siddharth Patel, <u>N.</u> <u>Ashwanikumar</u> , Ema Robinson, Yan Xia, Cosmin Mihai, Joseph P. Griffith III, Shangguo Hou, Adam A. Esposito, Tatiana Ketova, Kevin Welsher, John L. Joyal, Örn Almarsson & Gaurav Sahay	Chemistry	Nature Communicatio ns (Impact Factor 14.2)	2020-21	2041- 1723		Yes	177-179
41	Synthesis Characterization and Application of Copper Complexes with N-(4-pyridyl) isonicotinamide	Reena, Dr. Biju. A. R	Chemistry	IJRAR	2020-21	2348- 1269		Yes	180-183



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42	A critical evaluation of banking reforms in India in terms of e- banking	Shameel K	Commerce	Journal emerging technologies and innovative research	2020-21	2349- 5162		Yes	184-187
43	Attitude of Higher secondary student towards inclusion of enterpreneurship reducation in school curriculam with special reference Kannur district Kerala state.	Dr. G. Kanagavalli and Ramseena Azeez	Commerce	Journal emerging technologies and innovative research	2020-21	2349- 5162		Yes	188-191
44	Role of additional skill acquisition programme in life skill development of students with special reference to Tagore GHSS	Dr. G. Kanagavalli and Haseena K P	Commerce	Journal emerging technologies and innovative research	2020-21	2349- 5162		Yes	192-195
45	First record of the species Asota paliura (Swinhoe, 1893) (Lepidoptera: Erebidae: Aganinae) from India	Ramya Rajan and R.S.M. Shamsudeen	Zoology	Asian Journal of Conservation Biology	2020-21	2278- 7666		Yes	196-198
46	Cd ²⁺ influences metabolism and elemental distribution in roots of <i>Acanthus ilicifolius</i> L.	Shackira AM , Jos T Puthur.	Botany	International Journal of Phytoremediat ion 21(9):866- 877.	2019-20			Yes	199-201
47	Advances in intracellular delivery through supramolecular self-assembly of oligonucleotides and peptides	Jeonghwan Kim, Ashwanikumar Narayana , Siddharth Patel, Gaurav Sahay	Chemistry	Theranostics	2019-20	1838- 7640		Yes	202-204



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48	An efficient green diversity- oriented synthesis of Pyrimidinone and Indole appended macrocyclic peptidomimetics	Rajeena Pathoor , P Thasnim and D Bahulayan	Chemistry	Tetrahedron Letters	2019-20	0040- 4039		Yes	205-207
49	Clupeid fish hosts a Peniculus sp. (Pennellidae, Siphonostomatoida, Copepoda)–First report on new host and season dependent prevalence	Kattambally Rijin, TMV Mumthaz , Kappalli Sudha, Anilkumar Gopinathan	Zoology	Acta Oceanologica Sinica	2019-20	18691099 , 0253505 X		Yes	208-210
50	Copepod crustaceans parasitizing marine fish of the Cochin and Malabar coasts of India	R.M.V. Nikhila, O.K. Drisya, K. Rijin, T.M.V. Mumthaz , A.K. Helna, Viatcheslav N. Ivanenko, Sudha Kappalli	Zoology	Arthropoda Selecta	2019-20	0136006X		Yes	211-212
51	Electrochemical, computational and adsorption studies of leaf and floral extracts of <i>Pogostemon</i> <i>quadrifolius</i> (Benth.) as corrosion inhibitor for mild steel in hydrochloric acid	M. Jisha, N. H. Zeinul Hukuman, P. Leena, and A. K. Abdussalam	Chemistry	J. Mater. Environ. Sci.	2019-20	2028- 2508		Yes	213-214
52	GC-MS Analysis of bioactive components on the fruit extracts of <i>Artocarpus hirsutus</i> Lam.: a potential wild edible plant	Neha C. P. and Abdussalam A.K	Botany	. Int. J. Pharm. Sci & Res	2019-20	0975- 8232,		Yes	215-217
53	Cytotoxic and Antimitotic Properties of Morinda citrifolia L. and Simarouba glauca Dc.	Haripriya Baburaj and Tajo Abraham	Botany	INTERNATION AL JOURNAL OF RESEARCH ANDANALYTIC AL REVIEWS (IJRAR.ORG)	2019-20	2349- 5138		Yes	218-219



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54	Peptide decorated glycolipid nanomicelles for drug delivery across the blood–brain barrier (BBB)†	S. Meenu Vasudevan, N. Ashwanikumar, G. S. Vinod Kumar	Chemistry	Biomaterials Science	2019-20	2047- 4830		Yes	220-222
55	Studies on Methanolic Extract of <i>Lepidagathis keralensis</i> as Green Corrosion Inhibitor for Mild Steel in 1M HCl	Palakkal Leena, Zeinul Hukuman N. H, A. R. Biju , Mullapally Jisha	Chemistry	J. Electrochem. Sci. Technol.	2019-20	2233- 4110		Yes	223-225
56	Messenger RNA delivery for tissue engineering and regenerative medicine applications	Siddharth Patel, Avathamsa Athirasala, Paula P Menezes, N Ashwanikumar, Ting Zou, Gaurav Sahay, Luiz E Bertassoni	Chemistry	Tissue Engineering Part A	2019-20	1937- 3384		Yes	226-253
57	Peptide decorated glycolipid nanomicelles for drug delivery across the blood–brain barrier (BBB)	S Meenu Vasudevan, N Ashwanikumar, GS Vinod Kumar	Chemistry	Biomaterials science	2019-20	2373- 9878		Yes	254-255
58	Yield evaluation of oyster mushroom on dust waste of some common timber species	Minnu Tomy, C Sneha	Forestry	Mushroom Research	2019-20	0972- 4885		Yes	255-257
59	Prayers of Refugees	Abdul Samad K	English	Journal of Research in Humanities and Social Science	2019-20	2321- 9467		Yes	258-259

(12) United States Patent Patel et al.

(54) LIPID NANOPARTICLE FORMULATION

- (71) Applicants: Moderna TX, Inc., Cambridge, MA (US); Oregon State University, Corvallis, OR (US)
- (72) Inventors: Siddharth Patel, Corvallis, OR (US); Emily Robinson, Corvallis, OR (US); Anna Brown, Corvallis, OR (US); Orn Almarsson, Cambridge, MA (US); Kerry E. Benenato, Sudbury, MA (US); Staci Sabnis, Cambridge, MA (US); Gaurav Sahay, Portland, OR (US); Ashwani Kumar Narayana, Portland, OR (US)
- (73) Assignees: ModernaTX, Inc., Cambridge, MA (US); Oregon State University, Corvallis, OR (US)
- (*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 377 days.
- (21) Appl. No.: 16/493,814
- (22) PCT Filed: Mar. 15, 2018
- (86) PCT No.: PCT/US2018/022756
 § 371 (c)(1),
 (2) Date: Sep. 13, 2019
- (87) PCT Pub. No.: WO2018/170336PCT Pub. Date: Sep. 20, 2018

(65) Prior Publication Data

US 2020/0129445 A1 Apr. 30, 2020

Related U.S. Application Data

- (60) Provisional application No. 62/475,166, filed on Mar. 22, 2017, provisional application No. 62/471,949, filed on Mar. 15, 2017.
- (51) Int. Cl.

A61K 9/51	(2006.01)
A61K 31/7088	(2006.01)
A61K 45/06	(2006.01)
A61K 48/00	(2006.01)
C12N 15/113	(2010.01)

- (52) U.S. Cl.

(58) Field of Classification Search

CPC A61K 9/5123; A61K 9/5146; A61K 31/7088; A61K 45/06; A61K 48/0033; C12N 15/113; C12N 2320/32

(10) Patent No.: US 11,969,506 B2 (45) Date of Patent: Apr. 30, 2024

(56) References Cited

U.S. PATENT DOCUMENTS

3,324,182	A	6/1967	De et al.
3,872,171	A	3/1975	Cronin et al.
4,125,544	A	11/1978	Dygos
4,957,735	A	9/1990	Huang
5,807,861	A	9/1998	Klein et al.
6,143,276	A	11/2000	Unger
6,303,378	BI	10/2001	Bridenbaugh et al.
6,395,253	B2	5/2002	Levy et al.
6,652,886	B2	11/2003	Ahn et al.
6,696,038	BI	2/2004	Mahato et al.
7,268,120	B1	9/2007	Horton et al.
7,371,404	B2	5/2008	Panzner et al.
7,943,168	B2	5/2011	Schlesinger et al.
8,058,069	B2	11/2011	Yaworski et al.
8,158,601	B2	4/2012	Chen et al.
8,420,123	B2	4/2013	Troiano et al.
8,440,614	B2	5/2013	Castor
8,449,916	B1	5/2013	Bellaire et al.
8,450,298	B2	5/2013	Mahon et al.
8,460,696	B2	6/2013	Slobodkin et al.
8,460,709	B2	6/2013	Ausborn et al.
8,563,041	B2	10/2013	Grayson et al.
8,568,784	B2	10/2013	Lillard et al.
		(Con	tinued)

FOREIGN PATENT DOCUMENTS

AU	652831	B2	9/1994
CN	102068701	A	5/2011
	(Cont	inued)

OTHER PUBLICATIONS

Abdelwahed et al., "Freeze-drying of nanoparticles: Formulation, process and storage considerations," Advanced Drug Delivery Reviews 58 (2006) 1688-1713.

Akine et al., Development of Lipidoid-siRNA Formulations for Systemic Delivery to the Liver, Molecular Therapy, May 2009, vol. 17, No. 5, pp. 872-879.

Akinc et al., Targeted Delivery of RNAi Therapeutics With Endogenous and Exogenous Ligand-Based Mechanisms, Mol Ther. 2010 18(7):1357-1364.

Anderson, D.M. et al., Stability of mRNA/cationic lipid lipoplexes in human and rat cerebrospinal fluid: methods and evidence for nonviral mRNA gene delivery to the central nervous system. Hum Gene Ther. Feb. 10, 2003;14(3):191-202.

(Continued)

Primary Examiner - Robert S Cabral

(74) Attorney, Agent, or Firm - COOLEY LLP; Heidi A. Erlacher; Xixi Sun

(57) ABSTRACT

The disclosure features novel lipids and compositions involving the same. Nanoparticle compositions include an ionizable lipid, a phospholipid, a first sterol or a tocopherol, and optionally a second sterol different from the first sterol. Nanoparticle compositions further including therapeutic and/or prophylactics such as RNA are useful in the delivery of therapeutic and/or prophylactics to mammalian cells or organs to, for example, regulate polypeptide, protein, or gene expression.

13 Claims, 18 Drawing Sheets

therapeutic and/or prophylactics such as RNA are useful in the delivery of therapeutic and/or prophylactics to mammalian cells or organs to, for example, regulate polypeptide, protein, or gene expression.

Images (18)



Classifications

A61K9/5123 Organic compounds, e.g. fats, sugars
 View 9 more classifications
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 Health & Medical Sciences
 Life Sciences & Earth Sciences
 Q

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Inventor: Siddharth Patel, Emily ROBINSON, Anna Brown, Orn Almarsson, Kerry E. Benenato, Staci Sabnis, Gaurav Sahay, Ashwani Kumar NARAYANA

Current Assignee :

Oregon State University , ModernaTx Inc

Worldwide applications

2018 JP WO EP <u>US</u> CA AU 2023 JP

Application US16/493,814 events _o

2018-03-15	 Application filed by Oregon State University, ModernaTx Inc
2018-03-15	Priority to US16/493,814
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Adaptive physio-anatomical modulations and ionomics of *Volkameria inermis* L. in response to NaCl

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ABSTRACT

This study illustrates the salinity tolerance mechanisms in *Volkameria inermis* (a mangrove-associate), making it an ideal candidate for establishment in saline lands. The plant was exposed to 100, 200, 300, and 400 mM NaCl and the TI value indicates that the stress-imparting concentration was 400 mM. There was a decrease in biomass and tissue water, and a gradual increase in osmolytes like soluble sugars, proline, and free amino acids content was observed in plantlets with the increase in NaCl concentrations. Higher number of lignified cells in the vascular region of the plantlet's leaves treated with NaCl (400 mM) may influence the transport through the conducting tissues. SEM data reveals the presence of thick-walled xylem elements, an increased number of trichomes, and partially/fully closed stomata in the 400 mM NaCl-treated samples of *V. inermis*. In general, macro and micronutrient distribution tend to be affected in the NaCl-treated plantlets. However, Na content increased remarkably in plantlets treated with NaCl, and the highest accumulation was observed in roots (5.58-fold). *Volkameria inermis* can be a good option for phytodesalination in salt-affected areas since it is equipped with strong NaCl tolerance strategies and can be exploited for desalinization purpose of salt affected lands.

NOVELTY STATEMENT

The phytodesalination potential of *V. inermis* was proved with the aid of physiochemical and anatomical studies, which was not yet revealed. The present study elucidated the level of NaCl tolerance in *V. inermis* and the development of associated adaptive responses.

Introduction

The acceleration of climate change on a global scale has devastating effects on the ecosystem, and it is currently getting people's attention worldwide. Numerous environmental challenges, including harsh temperatures, drought, and flooding, affect the development and cultivation of crops. Among the different abiotic factors, soil salinity is a major issue affecting plant growth and metabolism, thus agriculture and food security. More than 424 million hectares of topsoil (0-30 cm) and 833 million hectares of subsoil (30-100 cm) have been eroded by salt, according to the data collected from 118 nations that account for 85% of the world's geographical area (FAO 2021). Inadequate agricultural practices, lack of precipitation, and irrigation with saline water contribute to soil salinization. In many countries, seawater intrusion into agricultural land due to changes in sea level results in a negative impact on food security (Khong et al. 2018). About 90% of our food is provided by thirty crop species, and the crop yield of these species is getting reduced drastically even under moderate salinity (EC 4-8 dS m^{-1}). According to Kromdijk and Long (2016), approximately 87% of food production must be increased to feed the increasing population

by 2050. However, it is estimated that an average of 2000 km^2 of irrigated land in about 75 countries is unremittingly degraded due to salinity (Reddy *et al.* 2017).

Salt-stressed plants showed lower nutrition uptake, reduced leaf dry weight and inadequate nitrogen transfer from roots to shoots, slow root development, deterioration of chlorophyll in leaves, and thereby reduced photosynthetic efficacy (Balusamy et al. 2022). Unbalancing the reactive oxygen species (ROS) in salt-stressed plants causes damage to the cell membrane, proteins, and nucleic acids. The ROS also functions as an activator of defense genes against higher salt stress, and it helps to regain normal homeostasis in plants (Sheikhalipour *et al.* 2021). The plants that could tolerate the salinity concentration in their habitats showed enhanced accumulation of osmolytes, H⁺-ATPase activity, antioxidants accumulation, and activation of secondary metabolites synthesis.

Volkameria inermis L. (synonym: Clerodendrum inerme (L.) Gaertn), a straggling evergreen shrub in the family of Lamiaceae that grows abundantly in the backwaters of low-lying areas and rocky coastal belts and is categorized as a mangrove associate as well as a halophyte. Mangrove

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KEYWORDS

lonomics; osmolytes; phytodesalination; xylem



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Plant response to heavy metal stress toxicity: the role of metabolomics and other omics tools

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ABSTRACT

Metabolomic investigations offers a significant foundation for improved comprehension of the adaptability of plants to reconfigure the key metabolic pathways and their response to changing climatic conditions. Their application to ecophysiology and ecotoxicology help to assess potential risks caused by the contaminants, their modes of action and the elucidation of metabolic pathways associated with stress responses. Heavy metal stress is one of the most significant environmental hazards affecting the physiological and biochemical processes in plants. Metabolomic tools have been widely utilised in the massive characterisation of the molecular structure of plants at various stages for understanding the diverse aspects of the cellular functioning underlying heavy metal stress-responsive mechanisms. This review emphasises on the recent progressions in metabolomics in plants subjected to heavy metal stresses. Also, it discusses the possibility of facilitating effective management strategies concerning metabolites for mitigating the negative impacts of heavy metal contaminants on the growth and productivity of plants.

Keywords: GC-MS, heavy metal stress, LC-MS, metabolic engineering, metabolomics, NMR spectroscopy, OMICS, stress tolerance.

Introduction

Metabolomics is a part of system biology encompassing a comprehensive study of the primary metabolites (PM) and secondary metabolites (SM) produced inside the cells. Certain metabolites are specially synthesised in plants due to the influence of environmental variables. Identifying and characterising metabolites is pertinent as it offers a potential tool to reveal the adaptive strategies operating in plants during biotic and abiotic stress conditions (Jańczak-Pieniążek *et al.* 2023). In response to external stimuli, plants produce PMs and SMs, which act as a chemical fingerprint of a particular phenotype (Cambiaghi *et al.* 2017). PMs such as proteins, amino acids, lipids, etc. are necessary for the growth and development of plants. In contrast, SMs (such as phenolics, terpenoids, alkaloids, etc.) are secondary in function; i.e. they aid the plants variously, including acting as agents of defence system (Hong *et al.* 2016; Carrera *et al.* 2021). Nearly 14 000 metabolites have been characterised in various plants grown in different environmental regimes (Alseekh *et al.* 2018).

Stress factors such as toxic metal ions affect the normal metabolism of plants by altering the activities of diverse enzymes, so as to cope with adverse conditions. Hence metabolomics has become a prominent branch in stress biology as it reflects the subtle changes in plant metabolism (Parida *et al.* 2018). Phytoremediation of contaminated water/soil/air with heavy metal (HM) tolerant plants is an eco-friendly and economical strategy. Generally, HMs interrupt plant metabolism by altering plasma membrane integrity, binding with proteins and changing their confirmation, changing the level of ATP or ADP, hindering the ionic balance or damaging the antioxidant machinery (Parida *et al.* 2018; Kaya *et al.* 2020; Qi *et al.* 2020). Photosynthetic inhibition in plants is one of the most common responses induced by HMs. Stressors negatively affect the photosynthetic apparatus and its functions, reducing chlorophyll synthesis and inhibiting Calvin cycle activities. Chlorophyll breakdown is hastened by HM poisoning because of an increase in chlorophyllase activity. Also, HMs replace the magnesium (Mg) ion in the porphyrin

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KEYWORDS lonomics; osmolytes; phytodesalination; xylem

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Artificial intelligence in timber forensics employing DNA barcode database

Suma Arun Dev¹ · Remya Unnikrishnan^{1,3} · P. S. Prathibha¹ · K. Sijimol¹ · V. B. Sreekumar¹ · <mark>A. AzharAli² ·</mark> E. V. Anoop² · Syam Viswanath¹

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Abstract

Extreme difficulties in species identification of illegally sourced wood with conventional tools have accelerated illicit logging activities, leading to the destruction of natural resources in India. In this regard, the study primarily focused on developing a DNA barcode database for 41 commercial timber tree species which are highly vulnerable to adulteration in south India. The developed DNA barcode database was validated using an integrated approach involving wood anatomical features of traded wood samples collected from south India. Traded wood samples were primarily identified using wood anatomical features using IAWA list of microscopic features for hardwood identification. Consortium of Barcode of Life (CBOL) recommended barcode gene regions (*rbcL, matK & psbA-trnH*) were employed for developing DNA barcode database. Secondly, we employed artificial intelligence (AI) analytical platform, Waikato Environment for Knowledge Analysis (WEKA) for analyzing DNA barcode sequence database which could append precision, speed, and accuracy for the entire identification process. Among the four classification algorithms implemented in the machine learning algorithm (WEKA), best performance was shown by SMO, which could clearly allocate individual samples to their respective sequence database of biological reference materials (BRM) with 100 % accuracy, indicating its efficiency in authenticating the traded timber species. Major advantage of AI is the ability to analyze huge data sets with more precision and also provides a large platform for rapid authentication of species, which subsequently reduces human labor and time.

Keywords DNA tools · Machine learning approaches · Illegal logging · Timber identification · Wood anatomy

Introduction

The substantial decline in biodiversity owing to overexploitation and extensive utilization of forest resources is a major threat to the entire ecosystem worldwide (Sikor and Tan 2011; Reboredo 2013; Souza and Prevedello 2020). In India, the forest policies prior to independence encouraged

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conversion of forests for agricultural activities and prioritized timber logging for revenue generation (Guha and Gadgil 1989; Joshi et al. 2011). This has intensified the destruction of forest cover at an alarming rate which led to the formulation of the Indian Forest Policy in 1952, focusing on better forest management (Joshi 1983; FAO 2015). Subsequently, the formulation of national forest policy (1986) targeting biodiversity conservation, a blanket ban on green felling by the Supreme Court of India (1995) along with various national level mass afforestation programs oriented toward conserving precious forest wealth from further deterioration in the country (Ghosh and Sinha 2016). These stringent policy regulations consequently affected the steady supply of timber from the government forest areas as well as widened the gap between the supply and demand of timber and its products for industrial uses (FSI 2011; Vanam 2019). Over the years, the gradual shift from production forestry to conservation forestry enhanced the country's dependency on wood import based on a liberalized policy, greatly



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The influence of lithium ion incorporation on the luminescence enhancement of Gd_2O_3 :Pr³⁺ nanophosphors for lighting applications

K.K. Fairoosa, K.M. Nissamudeen

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ARTICLE INFO

Keywords: Luminescence Nanophosphors Co-doping Annealing

ABSTRACT

In this study, nanosized Gd₂O₃: Pr³⁺ and Li⁺ co-doped Gd₂O₃: Pr³⁺ were synthesised by solution combustion method for analysing the structural, morphological and optical properties. X-ray diffraction patterns of as-prepared Gd₂O₃:Pr³⁺ indicated the existence of multiphase crystallites and it transformed to pure cubic phase upon annealing. Scanning Electron Microscopy (SEM) and Transmission Electron Microscopy (TEM) images confirmed that the particles are spherical. Upon 321 nm excitation, Gd₂O₃: Pr³⁺ phosphor exhibits characteristic emission bands at 613 nm, 529 nm and 439 nm. The photoluminescence emission intensity was found maximum for 2 wt% Pr³⁺ doped Gd₂O₃ powders. Li⁺ ions were co-doped into this Gd₂O₃:Pr³⁺ phosphor and were found to induce a considerable enhancement in PL emission intensity. Lithium co-doped samples crystallize in cubic structure. Raman spectra of the Li⁺ co-doped phosphors revealed characteristic A_g+ F_g mode of the cubic phase of Gd₂O₃:Pr³⁺. The new composition Gd₂O₃: Pr³⁺: Li⁺ with enhanced luminescence properties can be employed as a red light emitting phosphor for white light emitting diodes (WLEDs).

1. Introduction

Light-emitting diodes (LEDs) began a revolutionary change in the field of the lighting industry[1]. LEDs have been widely employed in display devices, electric vehicles, remote controls, decoration purposes, medical diagnosis and bio imaging[1–3]. Compared to a conventional incandescent lamps and fluorescent lamps, white LEDs (WLEDs) are more favourable owing to their low power consumption, outstanding efficiency, longer lifetime, and environmental friendliness[1]. Generally, three preferred methods are employed for fabricating WLEDs[4]. (1) By combining a yellow phosphor with a blue LED chip. (2) By the combination of a red-blue-green phosphor with near ultraviolet (n-UV) LED[1,5]. (3) By combining red, blue, and green three individual mono-chromatic LED chips[4]. The third approach has lots of disadvantages such as high cost, complicated electrics, temperature and current dependent colour shift etc. the first two fabrication methods using phosphors are employed to produce WLEDs commercially[4,6].

Phosphors, are luminescent material that provides light emission in the visible region when they are excited by electron beam, ultraviolet (UV), infrared and visible radiation[7]. The essential component that the phosphor consists of is the host matrix and an

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First Record of the Asian Sand Goby, *Favonigobius gymnauchen* (Bleeker, 1860) (Teleostei, Gobiidae) from Arabian Coast of India and Species Confirmation Through DNA Barcoding of COI Gene

Mumthaz TMV¹ • Abdul Jaleel K² • Raghunathan PP³ • Ghosh SM² • Vinayan T²

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Abstract

The Asian sand goby, *Favonigobius gymnauchen* (Bleeker 1860) (Teleostei, Gobiidae), is a gobiid fish native to estuarine and marine habitats of Western Pacific waters: Japan, Korean Peninsula, China, Southern Taiwan, Australia, Palau Island, Micronesia, Hong kong and Philippines. In the present study conducted in Jan-March 2021, *F. gymnauchen* were collected from Kavvayi backwater of Arabian Sea, Kerala, India. The genus and species identity of collected specimens were confirmed by morphological features and by the molecular analysis via. comparison of the mitochondrial COI genome. The molecular sequencing of mitochondrial COI genome yielded a 630 bp product on PCR amplification. The sequenced data were deposited in NCBI GenBank, with accession numbers MZ 505547.1 and OP 236548.1. The deposited COI gene fragments were perfectly matched with specific sequences of the species in NCBI GenBank. This is the first report of Asian sand goby, F. *gymnauchen* from the Arabian Sea coast of Kerala, India.

Keywords Asian sand goby · Favonigobius gymnauchen · Kavvayi backwater · Arabian Sea · COI genome

Introduction

Gobiidae is the largest marine fish family with valid 264 genera and 1966 species, inhabitant of marine and brackish water environments of most tropical and subtropical areas. They habitually accommodate in diverse and harsh habitats, including intertidal zones, coral reef, shallow coastal estuarine region with hard rocky bottom and also soft muddy or sandy bottom (Larson and Murdy 2001; Thacker 2012; Patzner et al. 2012; Nelson et al. 2016; Eschmeyer et al. 2017; Froese and Pauly 2022; Eschmeyer et al. 2022). They are the smallest fishes in the world with the maximum body size 50 mm and are distinct with wholly or partially fused pelvic fins into an adhesive disc and also have separate

spinous and rayed dorsal fins. Most species are cryptic bottom dwelling carnivores of small benthic invertebrates; others are planktivores. Some have symbiotic relationships with invertebrates and others remove ectoparasites from other fishes, thus play unique role in their ecosystem. Many are popular aquarium fishes. The detailed studies on the distribution, diversity, phylogenetic analysis and origin is still lacking from many of the Indo-Pacific areas, so the knowledge on the distribution of gobies along the world is highly disproportional (Kovacic and Patzner 2011). In Indian waters, only limited studies have been carried out on the gobiid diversity; and in Kerala also it has received little attention. It may be due to their small size with many cryptic species, low population and lack of economic value.

Favonigobius is the genera of sand gobies with 9 reported species are native to waters around the Indian and the western Pacific Ocean (Froese and Pauly 2020). Published information have shown that all the species are non-commercial, inhabit in tidal zones of shallow sandy inner reefs, estuaries, marine, brackish water as the demersal forms. As per IUCN Red List status all are not evaluated or least concerned (IUCN 2021). Details of distribution of different species of *Favonigobius* species are given in Table 1. *F. gymnauchen* (Bleeker 1860), Sharp-nosed sand goby or Asian sand goby

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Molecular characterization, genitalia-based taxonomic differentiation, and genetic makeup analysis of *Angonyx krishna* (Insecta: Sphingidae)

N Bushra^{1, 2}, RSM Shamsudheen¹

¹. Department of Zoology, Department of Zoology, Mananthavady Campus, Kannur University (PO) Edavaka, Wayanad, Kerala, 670645, India.

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ABSTRACT: One of the biggest challenges ever threatened by the earth mainly through human kind recognized to be biodiversity loss. Alarming reports regarding the rapid population diversity decline over the globe call for efforts to combat toward the potential drivers. In this regard here the current study has paid great efforts to analyze the chances of population diversity decline and elimination with special inference on the alteration in genomic characteristic features. The NucleoSpin® Tissue Kit was used for the genetic material extraction and all the statistical analysis was completed using the SPSS version 24.0.0. The current study reported the COI gene sequences of Angonyx krishna for the first time over the globe. The extremely reduced diversity of Angonyx krishna indicates the probable chance of getting the same towards disappearance in the future. According to the genetic makeup, the Angonyx papuana has been known to be depicted with a maximum range of differences. Based on the aforesaid elements, here the author has strictly focused on the conservational perspectives and developed a novel portable kit along with a glass vessel-based killing jar for the collection of moth specimens. Furthermore, the genitalia-based taxonomic differentiation of above said species for the first time over the globe with special inference molecular characterization has also been witnessed here. The significant contribution to science in an aforesaid way can also be noted as the most prominent direct output of the present research.

Keywords: Moth; Angonyx krishna; Genetic; Taxonomy; Western Ghats.

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FIRST RECORD OF *MEGASELIA SCALARIS* (DIPTERA: PHORIDAE) AS A PARASITOID OF *THYAS CORONATA* (LEPIDOPTERA: EREBIDAE)

RAMYA RAJAN^{1*} AND R S M SHAMSUDEEN¹

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ABSTRACT

Thyas coronota (Fabricius) (Lepidoptera: Erebidea) is one of the most significant fruit-piercing moths, particularly on citrus fruits, d as a result of feeding, it causes significant injury. The parasitoid, *Megaselia scalaris* was observed on the exterior surface of last instar larva of *T. coronata*. The fly laid egg on the exterior surface of the host larva, the incubation period was three to four days. The fly went through larval instars, each lasting three to four days, then pupated for seven to eight days. Adults liked for five to eight days. This study first time reports the parasitisation of dipteran scavenger fly *Megaselia scalaris* on the serious fruit piercing moth *Thyas coronota* from India.

Key words: *Thyas coronota*, *Megaselia scalaris*, humpbacked fly, Diptera, Lepidoptera, Erebidae, fruit piercing, parasitoid, Kerala, India, new record

Megaselia scalaris (Loew), known as the scuttle fly or humpbacked fly, is a widely dispersed insect with forensic significance (Disney 1994, Campobasso et al. 2004, Reibe and Madea ,2010). These flies have a broad range of biological and environmental niches that they can explore (Disney, 2008). It was also shown that this species parasitized and preyed upon a variety of arthropods (Costa et al., 2007; Koch et al., 2013).

According to field reports, this fly can parasivise a wide range of living arthropods, including species from the Orthoptera, Diptera, Lepidoptera, Coleoptera, Hymenoptera, Ixodida, and Araneae-some of which are essential for agriculture and the environment-as well as the orders Orthoptera, Diptera, Lepidoptera, and Coleoptera. Due to its remarkable ecological adaptability, M.scalaris has also gained a reputation as a laboratory pest for infesting invertebrate cultures. Adult Thyas coronata are well known fruit piercing moths belonging to the family Erebidae recognised as a serious pest of several synthetic and wild fruits. Their sclerotized proboscises are used to penetrate ripening fruit, and they macerate the fruit to extract the juice. Adults presumably preferred to consume slices of citrus, pineapple, banana, and papaya fruits, according to study on eating preferences and phototaxis in adults (Suthapradit et al. 2006). Adult posess two white bands on the black head, body brown to blackish, marked with black spots and red longitudinal streaks. The pupa is black-brown. The adult moth has rufous and fuscous forewings tinged with a black spot in the middle. The hind wings are bright yellow with a dark band at the

anterior and the posterior borders. Time required for egg to adult development is 40.35 ± 0.59 days (mean±SEM. As a result, citrus fruits suffer considerable harm. For the first time in India, the humpbacked fly *Megaselia scalaris* (Loew) (Diptera: Phoridae) was identified as a parasitoid of *Thyas coronata* and it is studied herein.

MATERIALS AND METHODS

The parasitoid flies were collected from the Banasura forest (75.93467811°N,11.67662398°E), Wayanad district of Kerala, India. The flies were identified as *Megaselia scalaris* through published literature (Deshmukh et al., 2021). During the time of survey five flies were seen to be attacking the larvae of *Thyas coronata*. Together with the larva the flies were collected and reared under laboratory conditions. The rearing of maggots was carried out as per methodology adopted by Deshmukh et al. (2021). The experiment was repeated to confirm the results. The adults emerged from the pupae of the reared maggots were transferred to containers which contained the 5th instar larva of *Thyas coronata*. The adult parasitoid flies were fed with 10% honey solution.

RESULTS AND DISCUSSION

Thyas Coronata (Fabricius, 1775) (Fig. 1,2)

Noctua coronata Fabricius, 1775, Syst. Ent.: 596. Noctua leonina Fabricius, 1775, Syst. Ent.: 596. Noctua ancilla Fabricius, 1794, Ent. Syst. III, 2: 17. Corycia magica Hübner, 1827, Zuträge



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Shivaji Hausrao Thube, R Thava Prakasa Pandian, C.T Jose, Bhavishya A, Santhosh Kumar Paichal, Omprakash Navik, Akash Prakash Nikoshe, Gagan Kumar Mahapatro

The Floral handling time behavior of Apis cerana indica F. in Sunflower (Helianthus annuus L.) ecosystem in Odisha (https://old.indianentomology.org/index.php/ije/article/view/1559)

🖀 DEEPAYAN PADHY, CHITTA RANJAN SATAPATHY, SHIMANTINI BORKATAKI

Study of the honeybee (Apis mellifera) and their role in oilseed rape agro- ecosystem in Bangladesh (https://old.indianentomology.org/index.php/ije/article/view/1186)

📽 Rabiul Islam

The Effects of Sub lethal doses of Epiel . Abamectin and Imidacloprid on the Biological Parameters ofTrialeurodesvaporariorum(Hem.:Aleyrodidae)inlaboratorycondition(https://old.indianentomology.org/index.php/ije/article/view/1219)

🖀 Ali Beheshti, Sohrab Imani, hadi Zohdi2, Siavash Tirgari, Mohammad Abdi Goodarzi

Research Articles

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(https://old.indianentomology.org/index.php/ije/article/view/1355)	£
😤 Nikhil R M, Anil Kumar S T, Subramanian S, Mahapatro G K	(http (http (http
INCIDENCE, MORPHOLOGICAL DESCRIPTION, DNA BARCODING AND PHYLOGENETIC ANALYSIS OF ARMYWORM, LEUCANIA ALBISTIGMA (LEPIDOPTERA: NOCTUIDAE) ON MAIZE FROM INDIA	thup in y
First record of Leucania albistigma from India	(http: YOU
(https://old.indianentomology.org/index.php/ije/article/view/1293)	ento:
Kalleshwara swamy C. M. Chikkanayakanahalli, C M KARTHIK, K J MEGHANA, G DURGA, G A MADHU, B RATNAKALA, A MEGHANA, P S PAVANI, S K ADARSHA, H B MALLIKARJUNA, P R SHASHANK	(IHI) LINK XOW
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(https://old.indianentomology.org/index.php/ije/article/view/1298)	99A9
📽 Girish Hadiya, S D Patel, R L Chavadhari, C. B. Damor	
EFFICACY OF PONGAMIA OIL SOAP AGAINST FRUIT AND SHOOT BORER IN OKRA (https://old.indianentomology.org/index.php/ije/article/view/1304)	
🖀 Anu Thomas	
INSECT GROWTH INHIBITORY ACTIVITY OF ANNONA SQUAMOSA L. AGAINST POLYPHAGOUS INSECT PEST, SPODOPTERA LITURA F. (https://old.indianentomology.org/index.php/ije/article/view/1313)	
🖀 Muthu R, R Vishnupriya , S Jeyarajan Nelson, D Uma, V P SanthanaKrishnan	
MORPHOMETRICS OF SPODOPTERA FRUGIPERDA (J.E. SMITH) ON DIFFERENT CEREAL HOST PLANTS (https://old.indianentomology.org/index.php/ije/article/view/1317)	
📽 Devanand Bankar, Dr. Vijay Bhamare	
Predatory performance of Microvelia douglasi Scott (Hemiptera: Veliidae) with reference to diel periodicity (https://old.indianentomology.org/index.php/ije/article/view/1320)	

📽 Subramanian Arivoli, Samuel Tennyson, Miriam Cecilia Vassou, Grace Marin

KIRAN DESHMUKH, Dr V. K. Bhamare

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WHITEFLY (Bemicia tabaci Genn.) FEEDING EFFECTS ON THE LEAF OF EGGPLANT (Solanum melongena L.) AND IT'S MANAGEMENT USING Citrus aurantium Christm PRODUCTS IN KEBBI STATE NIGERIA (https://old.indianentomology.org/index.php/ije/article/view/1494)

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🖀 M Sarika, R Nalini, T Venkatesan, K Suresh, M Ananthan, A Josephrajkumar

NOVEL ECO-FRIENDLY ANTIFEEDANT FOR SPODOPTERA FRUGIPERDA (J E SMITH), COLLOIDAL CHITIN, SYNTHESISED FROM MARINE WASTE AND THEIR STANDARDIZATION AND CHARACTERIZATION (https://old.indianentomology.org/index.php/ije/article/view/1238)

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(https://old.indiano	entomology.org/1r	ndex.php/ije/article/view/1032) 🐮 D. Raghavendra, Nira	anjan Singh, Ramesh KB,	Subhash Chander	
EFFECT OF DIFFE MYZUS PERSICAE	RENT SOWING E (SULZER) ON CUM), myzus persicae (S	DATES AND WEATHER PARAME IIN (CUMINUM CYMINUM L.) Sulzer) on cumin	TERS ON INCIDEN	CE OF APHID,	
(https://old.indiano	entomology.org/ir	ndex.php/ije/article/view/1045)			
			😤 MADAN MOHAN	KUMAWAT, Nisha	
Modulation of n (https://old.indiane	nate guarding b entomology.org/ir	ehavior in response to tem ndex.php/ije/article/view/1051) ừ Lankesh Ya	nperature in parth shwant Bhaisare, Desh D	nenium beetle Deepak Chaudhary	

Biology of Pieris brassicae (Linnaeus) on Cauliflower (https://old.indianentomology.org/index.php/ije/article/view/1060)

🖀 Deep Shikha, Ravinder Singh, Sanjeev Kumar

of

their

EFFECT OF JUVENILE HORMONE AGONIST ON THE ACCESSORY SEX GLANDS OF MALE SPODOPTERA MAURITIA BOISD. (https://old.indianentomology.org/index.php/ije/article/view/1120)	f
📽 Thanuja A Mathew Orapoozhyil House	(http
Detection and phylogenetic analysis of Wolbachia in onion thrips Wolbachia in onion thrips	
(https://old.indianentomology.org/index.php/ije/article/view/963)	ento (pp
📽 Pragati Randive, Pravin Khambalkar, Kiran Khandagale, Indira Bhangare, K Chandrashekhar, Major Singh, Suresh Gawande	LINK XOW
	(HTT
INCIDENCE OF SAPOTA SEED BORER, TRYMALITIS MARGARIAS (LEPIDOPTERA: TORTRICIDAE) AND	ENTC
ITS MANAGEMENT	SOCI
Incidence and management of sapota seed borer in Mudigere	99A9
(https://old.indianentomology.org/index.php/ije/article/view/1247)	

📽 Bharati Jambunatha Patil, Dr. Suchithra Kumari, MH

Population dynamics of the exotic whiteflies Rugose Spiralling Whitefly, Aleurodicus rugioperculatus Martin and Bondars nesting whitefly, Paraleyrodes bondari, Peracchi(Hemiptera: Aleyrodidae) on Coconut (https://old.indianentomology.org/index.php/ije/article/view/1248)

🖀 Logeshkumar , Nalini, Joseph Rajkumar, Chandramani P, Mini ML, Durai Singh R, Murugan M, Suresh K

A Nesting etiquacy of stingless bees (Tetragonula "iridipennis" sp. group) (https://old.indianentomology.org/index.php/ije/article/view/1250)

SAAI VIGNESH B BALAKRISHNAN

EVALUATION OF FEEDING PREFERENCE AND POTENTIAL OF PHYTOSEIID PREDATORY MITE NEOSEIULUS LONGISPINOSUS (EVANS) ON DIFFERENT STAGES OF TETRANYCHUS MACFARLANEI BAKER & PRITCHARD (https://old.indianentomology.org/index.php/ije/article/view/1261)

Nikita Negi, C. CHINNAMADE GOWDA, N. Srinivasa, N Sumithramma

POPULATION DYNAMICS OF HELICOVERPA ARMIGERA (HÜBNER) AND PARASITIZATION POTENTIAL OF CAMPOLETIS CHLORIDEAE UCHIDA IN CHICKPEA IN BUNDELKHAND REGION

PARASITIZATION POTENTIAL OF CAMPOLETIS CHLORIDEAE

(https://old.indianentomology.org/index.php/ije/article/view/1276)
📽 Saurabh Singh, Bhupendra Kumar Singh, Akhilesh Kumar Singh, Rakesh Pandey, Kartikey Singh, Happy Singh
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Maladar region in south India (https://old.indianentomology.org/index.php/ije/article/view/12/9)
SHIGINA K, Sabu Thomas -
GENUS ANOMOSTOMUS LAFERTÈ-SÉNECTÈRE 1853 (COLEOPTERA: CARABIDAE: HARPALINAE):
ADDITION OF A NEW SUBGENUS AND NEW SPECIES FROM SOUTH INDIA.
🐮 K NIJISHA, Sabu Thomas
Research Communications
ECOD HIDING REHAVIOUR BY CADERADA AFEINIS (JEDDON 1851) (EODMICIDAE: HVMENODTEDA)
FROM AN URBAN GARDEN. WEST BENGAL. INDIA.
(https://old.indianentomology.org/index.php/ije/article/view/1282)
📽 Priyanka Das, Dr. Sheela S.
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RONALD ROSS —MOSQUITO, MALARIA, AND MUCH MORE (https://old.indianentomology.org/index.php/ije/article/view/1562)
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Potassium in plants: Growth regulation, signaling, and environmental stress tolerance

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ARTICLE INFO

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ABSTRACT

Potassium (K) is an essential element for the growth and development of plants; however, its scarcity or excessive level leads to distortion of numerous functions in plants. It takes part in the control of various significant functions in plant advancement. Because of the importance index, K is regarded second after nitrogen for whole plant growth. Approximately, higher than 60 enzymes are reliant on K for activation within the plant system, in which K plays a vital function as a regulator. Potassium provides assistance in plants against abiotic stress conditions in the environment. With this background, the present paper reviews the physiological functions of K in plants like stomatal regulation, photosynthesis and water uptake. The article also focuses upon the uptake and transport mechanisms of K along with its role in detoxification of reactive oxygen species and in conferring tolerance to plants against abiotic stresses. It also highlights the research progress made in the direction of K mediated signaling cascades.

1. Introduction

Potassium (K) is a vital macronutrient and has significant roles in plants like osmoregulation, membrane potential regulation, cotransport of sugars, stress adaption and growth (Sanyal et al., 2020; Sardans and Peñuelas, 2021). Multiple types of transport occur for the transport of potassium ion (K⁺), but their regulation under low and high content in external medium remains generally uncertain. Researchers have recognized calcium (Ca²⁺) signaling route in its control (Assaha et al., 2017). K performs regulatory roles in diverse biochemical processes related to protein synthesis, carbohydrate metabolism and enzyme activation (Hasanuzzaman et al., 2018). Multiple physiological processes are based upon K⁺ like photosynthesis and stomatal control. It also provides abiotic stress lenience, and under salinity conditions, K⁺ sustains ion homeostasis and controls the osmotic balance (Assaha et al., 2017; Kumar et al., 2020). It controls stomatal opening under drought conditions and assist plants to acclimate under water stress conditions (Aksu and Altay, 2020; Pathak et al., 2020). Abiotic stress conditions like salt, drought, high and low temperature and chilling produces reactive oxygen species (ROS). Growing indications recommend that augmenting K^+ nutrition status of the plant can significantly accord to abiotic stress tolerance by reducing ROS level of the plants (Pandey and Mahiwal, 2020).

Potassium plays imperative function in upregulation of K^+ , which reduces ROS production in plants, declines the nicotinamide adenine dinucleotide phosphate (NADPH) oxidases activity, and maintains the photosynthetic electron transport activity that provides assistance in reducing the ROS level (Foyer, 2018). The scarcity of K reduces

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REVIEW ARTICLE



Green seed photosynthesis: What is it? What do we know about it? Where to go?

A. M. Shackira¹ · Nair G. Sarath² · K. P. Raj Aswathi² · P. Pardha-Saradhi³ · Jos T. Puthur²

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Abstract Chlorophyllous (chlorophyll-containing green) seeds can carry out photosynthesis, which partially meets the energy demand of the growing embryo embedded in them. However, as compared to the leaves, green seeds synthesize major biopolymers such as fatty acids, which are exploited as energy repositories rather than translocating to other sinks. Green seed photosynthesis is characterized with a large antenna size of Photosystem II (PSII), which enables the seeds to deal with low light saturation point and operate under a lower level of plastoquinone pool than in the leaves. In addition to the above features, the low chlorophyll (Chl) a/b ratio (1.51) also accounts for the reduced photosynthetic yield in green seeds as in the case of shade plants. The presence of chlorophylls, involved in the photosynthesis of seeds, ensures the maintenance of oxygen levels within the seeds and hence supports adequate cellular respiration in addition to providing the nutrients for the growing embryo. In this review, we provide an overview of the green seed photosynthesis, emphasizing the physiological role of the 'residual' chlorophyll in the seeds by highlighting the studies that have contributed towards the advancement of the green seed physiology.

Keywords Chlorophyll · Chloroembryos · Green seeds · Photochemistry · PSI · PSII · Rubisco

Introduction

According to Blankenship (2021), 'Photosynthesis is a process in which light energy is captured and stored by a living organism, and the stored energy is used to drive energy-requiring cellular processes'. In general, the term photosynthesis has been used for oxygenic photosynthesis by leaves and other green parts of higher plants, besides algae and phytoplankton using chlorophyll pigments. Algae and phytoplankton additionally use phycobilins for this purpose. In some higher plants, even seeds contain chlorophyll and are green in colour, indicating their capacity to carry out oxygenic photosynthesis. A wide range of plant species such as Pisum sativum (peas), Cicer arietinum (gram), Brassica oleracea (cabbage and more), Glycine max (soybean), Brassica napus (rapeseed), and Raphanus sativus (radish) possess green (chlorophyll-containing) seeds (Smolikova et al., 2017).

The different facets of photosynthesis by the green seeds of the above listed higher plants has rarely been studied. However, the presence of chlorophyll in the seeds of some plants has been studied by Kremnev and Strand (2014), and Allorent et al. (2015), who have provided some insights on the photochemistry of these green embryonic seeds. Further, the proplastids, present in the embryo, are converted into chloroplast during embryogenesis, accompanied by the formation of crucial multi-protein complexes of photosynthesis such as Photosystem II (PSII), Photosystem I (PSI), cytochrome (Cyt) $b_6 f$ complex, ATP synthase, as well as the light-harvesting antenna complexes.

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REVIEW



Phycoremediation: a means for restoration of water contamination

A. M. Shackira¹ · Nair G. Sarath² · Jos T. Puthur²

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Abstract

For the last few decades, environmental pollution has attained global attention as it resulted in the massive contamination of aquatic and terrestrial ecosystems. Aquatic ecosystems seem to be more prone to pollutants, as they act as a sink for pollutants, reaching through runaway water of the nearby area. Contaminants from water bodies can quickly enter the food chain through the primary producers of aquatic origin. This may lead to serious health hazards to humans and animals through biomagnification. In this scenario, it is essential to find a sustainable solution for the decontamination of the ground and surface water to maintain life on earth in a better way. Phycoremediation is an algal-based emerging technology applied to remove various pollutants in water. It is a low cost, eco-friendly and easily manageable remediation strategy. In this technique, algae are used as agents of remediation, and so far, a number of algae have been identified with high potential to detoxify various kinds of pollutants like nutrients, heavy metals, radionuclides, herbicides, pesticides, etc. Both micro and macroalgae are widely exploited to detoxify various contaminants from the water bodies. Algae are the sources of green energy, serve as a sink for CO_2 , and are also a rich resource of economically important components, making phycoremediation a promising technology. Even though the detailed mechanism behind the phycoremediation are proved to be operating in most of the species. This review analyzes the current status, various mechanisms, pros and cons and future promises of phycoremediation. The role of genetic engineering and also the nanoremediation strategies in phycoremediation are also discussed briefly.

Keywords Algae · Biosorption · Complexation · Detoxification · Phycoremediation

Introduction

The vast expansion of the industrial sectors and anthropogenic activities resulted in the increased disposal of various toxic wastes to the environment. The disposal of these toxic components affects our natural flora and fauna through the pollution of soil, water, and air, consequently inducing imbalances in the ecosystems (Giovanella et al. 2020). Management of these toxic pollutants in the ecosystem in a sustainable manner has bocome a new challenge. Conventionally different techniques are used to remediate these pollutants, but these are less effective, demand high costs of operation, and generally produce other by-products, which may cause adverse effects also (Chen et al. 2015). In this scenario, the biological method of remediation plays a crucial role and is getting greater attention nowadays because these methods of remediation are low in cost, have optimal removal efficiency, good performance at low concentrations and are environment friendly (Alegbeleye et al. 2017). The biological agents used in bioremediation include bacteria, archaea, fungi, algae, and higher plants (Azubuike et al. 2016; Giovanella et al. 2020).

In the recent past, the term 'phytoremediation' became quite familiar as higher plants were widely exploited for decontaminating various kinds of pollutants from soil. Different strategies are operating in higher plants to cope with contaminants such as phytoextraction, phytostabilization, phytoaccumulation, phytoexcretion, rhizofiltration and phytovolatilization (Shackira et al. 2021). Till date, a number of plants have been characterised for having the potential of decontamination and a number of higher plants have been transgenically modified for enhanced phytoremediation

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Phytostabilization of arsenic and associated physio-anatomical changes in *Acanthus ilicifolius* L^{*}

Nair G. Sarath^a, A.M. Shackira^b, Hamed A. El-Serehy^c, Daniel Ingo Hefft^d, Jos T. Puthur^a,

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ABSTRACT

The carcinogenic attribute of arsenic (As) has turned the world to focus more on the decontamination and declining the present level of As from the environment especially from the soil and water bodies. Phytoremediation has achieved a status of sustainable and eco-friendly approach of decontaminating pollutants, and in the present study, an attempt has been made to reveal the potential of As remediation by a halophyte plant, *Acanthus ilicifolius* L. Special attention has given to analyse the morphological, physiological and anatomical modulations in *A. ilicifolius* under As treatments were diminished as assessed from the reduction in leaf area, root length, dry matter accumulation, and tissue water status. However, the plants exhibited a comparatively higher tolerance index (44%) even when grown in the higher concentrations of As (90 µM). Arsenic treatment induced reduction in the photochemical activities as revealed by the pigment content, chlorophyll stability index (CSI) and Chlorophyll a fluorescence parameter. Interestingly, the thickness and diameter of the xylem walls in the leaf as well as root tissues of As treated samples increased upon increasing the As concentration. The adaptive strategies exhibited by *A. ilicifolius* towards varying concentrations of As is the result of coordinated responses of morpho-physiological and anatomical attributes, which make the plant a promising candidate for As remediation, especially in wetlands.

1. Introduction

The increased industrialization and other human activities have led to the deposition of toxic metals like As in nature. Arsenic (As), a redox metalloid, mutagen, teratogen, and class 1 carcinogen, causes severe pollution and impairments in the entire biosphere. It can jeopardize the existence of fauna and flora, even in minute concentrations (Cohen et al., 2019; ASTDR. 2019; Rahaman et al., 2021). Owing to the toxic and persistent nature, it is very difficult to eliminate this metal from the iontaminated sites and therefore, can create much menace to the environment (Parvez et al., 2020; Sarath and Purbur, 2020; Singh et al., 2021). Arsenic may occur in two forms as arsenate [As(V)] or arsenite As(III)] and can enter into the root cell by utilizing the phosphate ransporter or through silicic transporter or aquaporin channels (Xu (al., 2015; Wang et al., 2016). The NIP family of aquaporins has been

proven to have the capacity for the bidirectional transport of arsenate between the membranes (Bienert et al., 2008). Arsenic (III) is the most toxic form compared to As(V). According to the WHO guidelines, the maximum permissible level of As in water is 0.05 mg/L, which was later lowered to 0.010 mg/L. It was estimated that As contamination of groundwater has affected 500 million people across the world (Shaji et al., 2020). Exposure to this toxic metal in humans has resulted in hyperkeratosis, ulceration, cancers, and severe damages to internal organs (Sun et al., 2019).

POLLUTION

Arsenic is a non-essential element for the growth of plants and does not have any role in the metabolism, but it is generally absorbed from the soil by roots due to its chemical similarity to phosphate. If this metal once enters into the plant, it either gets stabilized in roots or may translocate to the shoot system and interfere with the biological process and cause retardation of growth due to unbalanced physiological

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Tree Diversity and Abundance of Western Ghats Striped Squirrels, *Funambulus Tristriatus* in Sacred Groves: Evidence from Kannur, Kerala

P.V. Amina[≜], P Sreeja, Manoj K

Applied Ecology and Environmental Sciences. **2022**, 10(10), 601-613. DOI: 10.12691/aees-10-10-2 Received September 01, 2022; Revised October 02, 2022; Accepted October 10, 2022

Abstract

The study was carried out to measure tree species diversity of six spatially heterogeneous Sacred Groves (SGs) to observe the abundance of IUCN Red List (LC) Western Ghats Striped squirrel, *Funambulus tristriatus*, Waterhouse (1837) inside these SGs. Shannon's and Simpson's Indices and IVI were used to examine the tree species diversity. The abundance of squirrels in all six SGs was also recorded through a two-month-long 48-kilometre transect walk survey. The floristic composition exhibited that *Memecylon randerianum* is the dominant species in Neeliyarkottam and Madayi kavu; *Myristica malabarica* is the dominant species in Poongottukavu, and *Carallia brachiata* is the predominant tree species in Iriverikavu. Thazhekavu is home to the mangrove species *Avicennia officinalis*. Chamakavu is a coastal SG with the highest density of *Syzygium caryophyllatum* and the highest IVI of *Gmelina arborea*. The study found that squirrels are significantly encountered in fruit-giving trees with a high canopy. Our descriptive statistical findings reveal that out of the total observed *F. tristriatus (n=106)*, about 42% of squirrels are encountered in *Memecylon randerianum*, *followed by*

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Heavy metal contamination in water sources of Thaliparamba municipality, Kerala, India

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Abstract The present study is an attempt to assess the heavy metal contamination in the water sources of Thaliparamaba Municipality, Kannur district, Kerala. The concentration of heavy metals, namely As, Cr, Fe, Mn, Cu, Zn, Ni, Cd, Hg, and Pb in water samples was measured using X-ray fluorescence spectroscopy. The physicochemical parameters, namely pH, electrical conductivity, and salinity of the water samples were also measured. The results indicate that the concentration of most of the heavy metals in water samples collected from the study area is much higher than the permissible limits. The anthropogenic activities may influence the enhanced level of heavy metal concentration in the study area. The results of these systematic investigations are presented and discussed in detail in the manuscript.

Keywords: Contamination, heavy metals, Kerala, water sources

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INTRODUCTION

Water is one of the basic needs of all living organisms. Groundwater is the major source of drinking water in both urban and rural areas.^[1] Human activities have created a huge decline in the availability of freshwater. As the demand for freshwater increased, the use of groundwater has also been increased. About 80% of fresh water in the environment is polluted due to the miss management of freshwater sources.^[2] One of the main reasons behind the degradation of the natural ecosystem is the release of contaminated wastewater to natural sources. Water pollution is the biggest environmental crisis faced by mankind globally. Anthropogenic activities are the major contributing source of water pollution in the environment. The use of fertilizers and pesticides in the agricultural

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fields, use of wide range of chemicals in industries and manufacturing factories, and other man-made activities have created a huge impact on polluting water bodies globally.

Among the various environmental pollutants, heavy metals pose severe impacts on drinking water as well as the aquatic ecosystem because of their toxicity, persistence, and bioaccumulation characteristics. Heavy metals are an important class of environmental pollutants which are toxic even at low concentration and diffused into the water column by both natural and anthropogenic processes.^[3-5] During natural processes such as weathering and erosion, landslides, volcanic eruption, flood, forest fires, decomposition and leaching, the metal get dispersed into

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Indole/oxazolone functionalized coumarins as pH-sensitive fluorescent kinase inhibitors

Aranhikkal Shamsiya, R<mark>ajeena Pathoor,</mark> D. Bahulayan 쏙 🖾

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Highlights

- Simple and green strategy for the construction of pH-sensitive fluorescent <u>kinase inhibitors</u>.
- Efficient use of scaffolding approach for smart property generation.
- Harvesting of dual properties like the potential for both imaging and therapy.
- Selective targeting of CDK2.

Abstract

A simple MCR-Click strategy for the construction of pH-sensitive fluorescent <u>kinase</u> <u>inhibitors</u> by scaffolding a coumarin core with an indole or oxazolone moiety is described. The fluorescent probes thus obtained showed click on fluorescence useful for imaging pHsensitive tumors, and inhibitor properties against cancer causing cyclin dependent kinase, CDK2. The optical and biological properties observed were rationalized based on DFT



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Original Article

Roost tree characteristics of *Pteropus medius* (Chiroptera: Pteropodidae) in the midland laterite hillocks of northern Kerala, India



Asia-Pacific Biodiversity

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ABSTRACT

The roost tree characteristics of Indian flying fox (*Pteropus medius*) were studied in the midland laterite hillocks of northern Kerala in peninsular India. A total of 170 trees belonging to 20 families, 32 genera, and 37 species were identified as roost trees from eleven roost sites located in Kannur and Kasargod districts of northern Kerala. Roost tree parameters such as habit, origin, diameter at breast height (DBH), tree height, bole height, crown length, crown spread, and crown closure were analyzed. Families Ana-cardiaceae and Lamiaceae represented more number of roost trees in the study area. The mean bat abundance per tree for the entire study area was found to be 54.35 ± 5.2 and it was highest for *Ficus religiosa* (peepal) followed by *Tetrameles nudiflora* (false hemp tree) and *Leucaena leucocephala* (subabul). Bats showed a preference for native trees and did not show any difference in the selection of evergreen and deciduous trees for roosting. The study also revealed that *P. medius* prefers large trees with greater height, diameter, crown length, and crown spread. As the midland laterite hillocks are under severe habitat degradation, the study recommends preserving large trees for better conservation of the remaining habitats of *P. medius* in the area.

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Introduction

The Indian flying fox or the great Indian fruit bat *Pteropus medius* Temminck, 1825 (formerly known as *Pteropus giganteus*) is one of the largest fruit bats in the world and belongs to the family Pteropodidae. This species is largely found in South Asia and widely distributed in India (Tsang 2020). Pteropodid bats are crucial for the survival of more than 114 plant species of the world (Mickleburgh et al. 1992). They play a vital role in the ecosystem functioning viz. pollination, seed dispersal, nutrient cycling, etc., and are animals of considerable economic importance (Godinez–Alvarez et al. 2002; Goveas et al. 2006). They are known to pollinate flowers of about 168 species of 100 genera and 41 families (Fleming et al. 2009). Being a social species, *P. medius* roosts in large colonies of hundreds to thousands of individuals on large trees in a variety of

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habitats viz. rural and urban areas, close to agricultural fields, ponds, and by the side of roads (Tsang 2020). Diurnal roost site selection is considered to be a vital component of bat ecology (Barclay and Kurta 2007). Bats spend half of their lifetime inside the roosts and the roost sites are used for activities like copulation, hibernation, maternal care, social interactions and to escape from adverse weather and predators (Kunz 1982; Altringham 1996; Kunz and Lumsden 2003). Their preferred roost trees comprise Ficus spp., Eucalyptus spp., Terminalia spp., Acacia spp., Casuarina spp., Delonix regia, Tamarindus indica, Mangifera indica, Artocarpus heterophyllus, Samanea saman (Chakravarthy and Yeshwanth 2008) Caesalpinia inermis, Eugenia jambolana, Alstonia scholaris, Polyalthiya longifolia (Ali 2010) Albizia lebbek, Peltophorum ferrugineum, Toona ciliata, Azadirachta indica, Terminalia catappa, Millingtonia hortensis, Cocos nucifera (Vendan and Kaleeswaran 2011) Albizia procera, Aegle marmelos, Bombax ceiba, Cedrela toona, Celtis australis, Cinnamomum camphora, Dalbergia sissoo, Dendrocalamus hamiltonii, Diospyros peregrine, Kigelia pinnata, Manilkara hexandra, Pterospermum acerifolium, Putranjiva roxburghii, Syzygium jambolanum and Taxodium mucronatum (Gulraiz et al. 2015). As the above studies represent various biogeographic zones, the tree species are also

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Kerala Bird Atlas 2015–20: features, outcomes and implications of a citizen-science project

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Kerala Bird Atlas 2015–20: features, outcomes and implications of a citizen-science project

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Citizen-science driven exercises (e.g. bird surveys) and online platforms (e.g. eBird) provide voluminous data on bird occurrence. However, the semi-structured nature of their data collection makes it difficult to compare bird distribution across space and time. Bird atlases are based on standardized surveys and describe the distribution of bird species over a predefined region and have fewer biases, and thus are better suited for use in research. The recently concluded Kerala Bird Atlas (henceforth KBA) is Asia's largest bird atlas in terms of geographical extent, sampling effort and species coverage. The entire state of Kerala was systematically surveyed twice a year during 2015-20 and over 0.3 million records of 380 species from 25,000 checklists were aggregated. The dataset was filtered and various metrics were estimated. A total of 915 cells were laid out for systematic surveys, of which 888 were surveyed in either or both the seasons - dry season (January-March) and wet season (July-September); 27 cells could not be surveyed in either of the seasons due to logistical constraints. However, this variation in sampling effort had a minimal effect on survey completeness. The slope of the species accumulation curve suggested nearcomplete species sampling in over 70% of the cells. After eliminating nocturnal and pelagic species, data from 361 species were analysed. Species count was higher in the dry season than in the wet season. Species richness (count) and evenness were higher in the northern and central districts than in the southern districts. High elevation regions of the southern Western Ghats were the largest contiguous areas lacking sufficient sampling. We found that most of the endemics were concentrated in the Western Ghats, but threatened species were as likely to occur along the coasts as in the Ghats. The KBA dataset is a valuable resource for testing various ecological hypotheses and suggesting science-backed conservation measures. KBA model could be replicated for similar atlases in other states or biogeographic regions of India.

Keywords: Bird atlas, birdwatching, citizen-science, Indian ornithology, Kerala, Western Ghats.

DATA on the distribution of species and the factors governing the same are prerequisites for effective and efficient conservation efforts¹. Such information is necessary to inform the selection of protected areas, to assess habitat associations and to predict the likely effects of future environmental changes². Historically, data on bird species distribution were sourced from field guides, ornithological field notes by experts, and museum collections. The increasing popularity of recreational birdwatching has made available fine-scale distribution data in the form of global and regional data repositories such as eBird³, Bird Count India (www.birdcount.in) and iNaturalist (www.inaturalist. org). eBird (http://ebird.org/) is the most widely used citizen-science platform that allows birdwatchers to share and manage their sightings on a globally accessible database⁴. Scientists have utilized eBird data to study the abundance and distribution of species in real-time, to prioritize conservation efforts and to test ecological hypotheses⁵⁻⁷. The data submission protocol in eBird is fairly simple and flexible. This leads to a large variation in efforts across checklists⁸, and the spatial precision is low for any fine-scale (<1 sq. km) analysis⁹. There can be many sampling biases in such datasets like spatial, taxonomic, or temporal. Spatial bias refers to uneven sampling efforts across a region. Taxonomic bias can include over- or under-representation of certain species in the dataset. Temporal bias occurs when records are collected in one season only, or more often at certain times of the year, or when species have very specific environmental triggers for activity periods¹⁰. Such biases in the dataset can have a profound influence on the inferences made¹¹. While the eBird platform is fairly new, globally available

since 2010, the concept of citizen-science is not. Amateur birdwatchers have contributed to ornithology since the 1950s via bird atlas projects. Bird atlas projects collect occurrence or breeding data and rely largely on groups of volunteers for data collection¹¹. A bird atlas describes the distribution of birds within a gridded framework over a predefined region based on systematic surveys¹². The first ever bird atlas was prepared for the birds of Britain and Ireland in 1952 (ref. 13) and over the years several national bird atlases and annual breeding bird atlases have been prepared across the world^{2,11,12}. Bird atlas data has multiple uses in the areas of conservation, ecological research and public outreach^{11,14}. National and regional bird atlases can help managers in protection, conservation and management of local breeding and migratory populations by providing an accurate assessment of species' abundance and distribution¹⁴.

Bird atlases can have similar biases as online citizenscience platforms, but these biases are small and can be

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Diversity of Lepidoptera along Altitudinal Gradient in Shola Forest of Kerala, India

R. S. M. Shamsudeen^{1*} and P. C. Pathania²

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Abstract

During the present studies, survey-cum-collection were undertaken for the three year in the Shola of Kerala part of Western Ghats. A total of 414 Lepidoptera species belonging to 24 families were recorded from the study area. Beside this, study deals with the species diversity patterns of Lepidoptera at varying altitudes in Shola (Chembra) forests of Kerala.

Keywords: Altitudinal Gradient, Lepidoptera, Shola, Species Diversity

Introduction

Shola of Kerala lies in the 34-biodiversity hotspots of the world (Myers, 2006), however its flora and fauna are the most threatened in the subcontinent only next to that of the Himalayas. The relief of the Western Ghats is not uniform throughout its entire length and it has several ascents and descents as it traverses from Cape Comorin to Kathiawar in Gujarat. The proliferation of the reliefdependent niches along the Western Ghats is also reflected in the kinds of vegetation types and Shola forests are one among them. Sholas being naturally fragmented forests are found as several small patches of varying shapes and sizes. The diversity of each of these minute Shola patches could drastically vary among themselves. To get a broader picture of the diversity of the Sholas it would be ideal to study several Shola patches together and estimate the diversity. During the tenure of threeyear studies in the Shola of Kerala part of Western Ghats a total of 414 lepidopteran species under 24 families were recorded from the study area. The present study deals with the species diversity patterns of Lepidoptera at varying altitudes in Shola (Chembra) forests of Kerala.

Materials and Methods

A part of the study was carried out in Chembra hills at Meppady. Meppady is located between 76° 4' and 76° 7'

East latitudes and 11° 31' and 11° 35' North longitudes. The altitude ranges between 1100 to 1800 m ASL. The forest type of Chembra hills ranges from tropical wet evergreen to montane subtropical forest, associated with vast areas of grassland. The Shola patches are seen from about 1500 m ASL extending up to 1800 m ASL. Sampling was carried out using stratified random sampling method to understand the diversity patterns of Lepidoptera along the altitude gradient Sampling across the strata was carried out in a cyclic order and within the strata at random.

Sampling Rhopalocera

Sampling of Rhopalocera was carried out using the line transect method (Pollard, 1977).

Sampling Heterocera

Sampling of Heterocera was carried out at each of the collection sites using battery-operated light traps specially fitted with switching devices to facilitate automatic operation at specified hours (Mathew & Rahamathulla, 1993). Sampling of Microheterocera was carried out during the night time with the help of an illuminated vertical white sheet (Shamsudeen *et al.*, 2005).

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Article



High Fat-High Fructose Diet Elicits Hypogonadotropism Culminating in Autophagy-Mediated Defective Differentiation of Ovarian Follicles

Chalikkaran Thilakan Rejani ¹, Ajit Kumar Navin ², <mark>Thekkey Madathil Valappil Mumtha</mark>z ³ and Venugopal Bhuvarahamurthy ¹,*

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Abstract: Pituitary gonadotropins directly govern ovarian functions, which are in turn regulated by the ovarian steroid hormones. The precise interplay of gonadotropins and steroid hormones is critical for follicle growth and differentiation. Furthermore, autophagy regulates ovarian follicle differentiation. However, how the high-fat-high fructose (HFD-HF) diet regulates gonadotropins and facilitates autophagy-mediated follicular differentiation in the ovary is obscure. We fed prepubertal rats (PND 25) an HFD-HF diet until PND 90. The results showed diminished adenohypophyseal GnRHR, PR, and aromatase expression, whereas AR, ER α , PRLR, and inhibin were augmented, resulting in gonadotropins decline. Interestingly, autophagy biomarkers, Beclin-1, ATG5, ATG12, LC3-II, and LAMP1 were reduced but SQSTM1/p62 was augmented in the ovaries of HFD-HF-fed rats, causing autolysosome to aggregation. The diet altered T, E2, P4, PRL, and their receptors status in the ovary, disturbed estrous cyclicity, and delayed vaginal opening. Ovarian histomorphology exhibited numerous cystic and atretic follicles, along with disturbed follicular maturation and ovulation. Moreover, the reduction of FSHR; steroidogenic proteins; receptor proteins AR, ER β , PR; and signaling proteins Wnt2 and β -catenin was also noticed in the ovary, whereas PRLR, inhibin, and pGSK3β were augmented. In conclusion, exposure to a prepubertal HFD-HF diet leads to hypogonadotropism and the autophagy-mediated defective differentiation of ovarian follicles, abating fertility in adult rats.

Keywords: autophagy; GnRHR; hypogonadotropism hypogonadism; folliculogenesis; steroidogenesis; infertility

1. Introduction

Nutritional status determines the attainment of reproductive potential in an individual. Children consume palatable calorie-dense foods during the key phase of development. The consumption of junk food during travel time, restaurants, home, and school in school-going adolescents contributes to poor growth outcomes [1]. National Health and Nutrition Examination Surveys (2003–2004, 2005–2006) report that the highest sources of energy for 2- to 18-year-olds were grain desserts, pizza, and soda, which are low in beneficial nutrients but high in solid fats and/or added sugars [2]. As per recent data, the consumption of saturated fat and sugar in children continues to exceed the recommended limit of fewer than 10% of total calories for anyone 2 years old or older, as boys and girls (age 1–18) obtain a range of about 11–12% of their total calories on average from saturated fat and a range of about 11–17% of their total calories on average from added sugar [3]. In developed countries, and developing countries as well, people highly rely on Western pattern diets, which include



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An ethnobotanical study of medicinal plants traditionally used by the natives of Lakshadweep Islands, India

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Abstract

Lakshadweep archipelago is a small group of islands in the Arabian Sea consisting of 36 inlands, only 10 islands are inhabited. The vegetation is typical Indo-Pacific atoll corol island flora. The present study is based on a survey among all inhabited islands to identify and document the area's ethnobotanical important and economic plants. Their ethnobotanical uses categorized the plants identified for the study. There are 70 different species of angiosperms found traditionally associated with island people. The people from the age group 40 and above are the stakeholders of the ethnic plant medicines. The traditional knowledge is circumscribed among the people of age group of 60 and above. Some exceptions were noticed among the people of age group 40-55 in some islands. It is noted that the men are dominating in the traditional healing practices than the women. It is noted that the men are dominating in the traditional healing practices than the women. It is noted that our owner to deal and use to ability with the younger generation. The study reveals that there is massive destruction of natural vegetation in the stands due to anthropogenic activities. Soil erosion is also very high in islands, which leads to the decline of coastal vegetation.

Keywords: Amindivi, Ethnomedicins, Laccadives, Traditional knowledge

1. Introduction

Lakshadoweg, India's smallest union territory, is an archipelage consisting of 36 islands with 32 km² and located between 8°-12° 13' North latitude and 71°-74° 00' East longitude, 220 to 440 km away from the coastal city of Kochi, Kerala, India (Fig.1). This uni-district union territory comprises of 17 atolls, 3 reefs, 6 submerged banks and 10 inhabited islands. The Lakshadoweg comprises the most extensive coral reef and atoll system in the Indian Ocean and the largest atoll system in the world (Anonymous, 2012). The vegetation is typical of Indo-Pacific atoll coral island flore. There is no declared forest in Lakshadoweg, but 80% of its landmass is covered by green vegetation, mainly with cocount trees (Rao and Ellis, 1995). As per the 2011 census, the inhabited islands had a total population of 64,429 and population density is 2013 person per km²



Fig. 1. Location of study area (Source: www.lakabadweep.nic.in)

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Since its establishment in 2013, the Journal of Traditional and Folk Practices has been at the forefront of scholarly research and discussion on the intersection of traditional knowledge and modern science. As a biannual, peer-reviewed, and UGC-approved publication, our journal is dedicated to the dissemination of original research and comprehensive review articles that advance the understanding of traditional and folk practices across a range of scientific disciplines.

We are committed to exploring and documenting the profound impact of traditional knowledge on contemporary health, nutrition, and medicine. Our journal provides a rigorous platform for examining the contributions of traditional systems to modern scientific and medical fields, offering valuable insights into the preservation and application of cultural practices.

Through our diverse range of topics and research areas, we aim to bridge the gap between ancient wisdom and modern innovation, fostering a deeper appreciation and understanding of traditional practices and their relevance in today's scientific landscape.



Scope of the Journal:

- **Traditional Knowledge Related to Food and Medicine:** This section encompasses research on traditional dietary practices and medicinal systems, analyzing their historical development, efficacy, and impact on contemporary health paradigms.
- **Classical and Oral Health Traditions:** We publish detailed studies and reviews on classical and oral health traditions, including their methodologies, theoretical frameworks, and

practical applications in modern healthcare.

- Healing Arts of Tribal Communities: This area focuses on the healing practices of indigenous and tribal communities, highlighting their unique approaches to health and wellness and their integration with broader medical systems.
- **Traditional Food Recipes:** Our journal features research on traditional food recipes, exploring seasonal, geographical, and cultural variations and their significance in preserving culinary heritage.
- Ethnomedicine and Related Disciplines: We provide a platform for studies in ethnomedicine, ethnobiology, ethnobotany, ethnopharmacology, ethnozoology, and ethnoveterinary science, emphasizing the role of traditional knowledge in these fields and its contributions to modern scientific understanding.
- **Drug and Nutraceutical Development:** This section covers advancements in the development of pharmaceuticals and nutraceuticals derived from traditional knowledge, including research on new drug formulations and health supplements.
- **Protection of Traditional Knowledge:** We address issues related to the protection and preservation of traditional knowledge, including intellectual property rights and strategies for safeguarding cultural heritage.
- Ayurveda, Siddha, Unani, and Sowa Rigpa: Our journal publishes articles on various traditional medical systems such as Ayurveda, Siddha, Unani, and Sowa Rigpa, detailing their theoretical foundations, clinical applications, and contributions to integrative health practices.
- Vrikshayurveda and Bioprospecting: We feature research on Vrikshayurveda (the science of plant care) and bioprospecting of medicinal plants, examining their relevance in both traditional and contemporary contexts.
- **Product Development through Biotechnology:** This section highlights the application of biotechnological methods to develop products based on traditional knowledge, showcasing innovations that bridge traditional practices and modern science.

Our mission is to foster rigorous academic research and provide a forum for scholarly exchange on the multifaceted dimensions of traditional and folk practices. We invite researchers, practitioners, and academics to contribute to the advancement of knowledge in these vital areas.

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Indian Journal of Traditional Knowledge Vol 20(1), January 2021, pp



Determination of use value and informant consensus factor on ethnobotanic knowledge about wild legumes used by natives of Wayanad district, Kerala

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Received 27 September 2019; revised 24 June 2020

The present work is aimed to document the traditional knowledge about the various usages of leguminous plants (Fabaceae), by tribals of Wayanad district and its nearer places such as Vanimel and Vilangad villages of Kozhikkode district, Kerala. Ethnobotanical surveys/ interviews/ discossions were carried out in few randomly selected tribal hamlets for the data collection. Among these visits the plants used by tribal communities Paniya and Kattunaikka were focused for documentation. This study reports the data of 80 plants from the family Fabaceae. This report also observed that the tribal communities were deeply depending on various wild legumes for making infrastructures, agricultural utilities, making food fuel/ timber/manure and they solve their health issues to a large extent also by using some wild legume species. Among the eighty species, fifty were used in various medicinal preparations and thirty species were used for dietary needs in combination or alone. At the same time major group of plants are unable to demarcate between food and medicine. Use Value analysis shows that the tree legume species Tamarindusindica is relatively more important with 64 use reports (UV 0.98). Analysis of Informant consensusfactor reveals that the homogeneity of knowledge is more for the plants with medicinal properties (F_{ic} 0.97); whereas maximum heterogeneity (F_{ic} 0.92) was found about agricultural utilities of plants. According to the results of DMR analysis Dalbergialatifolia ranked first, so that this species is getting more exploited, because it is highly preferable for all five categories studied under DMR analysis. Moreover the present documentation of ethnic knowledge about wild legumes is an attempt to serve as indigenous information for future sustainable utilization and conservation

Keywords: DMR, Ethnic knowledge, Fabaceae, Informant consensus factor, Traditional uses Use Value, Wayanad IPC Code: Int. Cl.⁷: A61K35/78, A61P1/10, A61P11/00, A61P11/10, A61P11/12, A61P11/14.

Forest dwellers are dealing with huge amount of traditional knowledge and ethnic diversity. Wild edible plants are important in the livelihood strategies of tribal populations¹. Various forms of wild edible food reserves play a crucial role in suppressing their hunger as well as supplementing their nutritional needs. The relationship between humans, plant and animal has been since time immemorial and of course, the legumes are been cultivated and used for food for centuries all over the world². Ancient men had discovered natural products to satisfy his needs, including relief from his personal ailments as well as of his fellow domestic animals³.

Legumes are consumed primarily as seed foods; but pods, leaves and roots or tubers of various species are also eaten⁴. The nitrogen fixing ability of many legumes provides an important source of biological nitrogen in agriculture and natural ecosystem, benefitting sustainable agricultural productivity, and

*Corresponding author

providing essential ecosystem services⁵. So that legumes used prominently in crop rotations and in the mixed cropping commonly practiced in Indian agriculture². Studies done by Nair and Volga *et al.* reveals several timber yielding tree legumes^{6,7}, found in and around the study area. Apart from all these wellknown uses many legumes possess local household utilities those were also focused in this study.

Wayanad has the highest percentage of tribals in Kerala and it forms 17.1% of the total population of the district⁸. The ethnic diversity of the district is very impressive as evidenced by ten different tribal groups⁹, in which five of them were major and large communities such as *Kurichya*, *Kuruma*, *Adiya*, *Paniya* and *Kattunaikka*¹⁰. Two among the major five, *Paniya* and *Kattunaikka* were focused in this present study (Fig. 1). All the tribal communities are homogenous ethnic groups with a specific sense of identity based on common language and culture¹¹.

Documentation of indigenous knowledge through ethnobotanical studies is important for the

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Focus and Scope

"Traditional knowledge" is employed to mean knowledge, innovations and practices of indigenous and local communities embodying traditional life-styles; the wisdom developed over many generations of holistic traditional scientific utilization of the lands, natural resources, and environment. It is generally passed down by word of mouth, from generation to generation and is, for the most part, undocumented. Traditional knowledge is valid and necessary, and awaits its currently relevant wider application for human benefit. National Institute of Science Communication and Policy Research (erstwhile NISCAIR), CSIR felt a need to document the recent developments and the information bygone in this area in the form of an interdisciplinary periodical.

The Indian Journal of Traditional Knowledge will carry original research papers, review articles, short communications, etc. concerned with the observation and experimental investigation of the biological activities of the materials from plants, animals and minerals, used in the traditional health-care systems such as Ayurveda, Siddha, Yoga, Unani, Naturopathy, Homoeopathy, Folk-remedies, etc. As validation of indigenous claims it will cover Ethno-biology, Ethno-medicine, Ethno-pharmacology, Ethno-pharmacognosy & Clinical Studies on efficacy.

Besides, the journal will also welcome interdisciplinary papers on traditional uses (non-medicinal) of Indian raw materials of plant, animal and mineral origin and development of appropriate technologies for community benefit with specific interest to the rural areas.

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As the premier institution of publishing primary scientific journals in various disciplines of science and technology in India, CSIR-NIScPR strongly reiterates its policy of discouraging plagiarism of all kinds. All efforts are made to detect and frustrate attempts at plagiarism through editorial screening and rigorous peer review in respect of communications received for publication in the CSIR-NIScPR publications. Cooperation of the scientific community is sought in our efforts to frustrate all attempts at plagiarism.

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Special Issue1 (COVID-19)

Healthcare management through mitigation of COVID-19 pandemic with leafy vegetables

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Abstract

Article history Received 5 May 2021 Revised 21 June 2021 Accepted 22 June 2021 Published Online 30 June 2021 COVID-19 pandemic becomes one of the leading challenges across the world. To fight against the virus, compulsory maintenance of nutritional status is very important. Age, sex, health status, medications and lifestyles are the important factors affecting individuals regarding their nutritional status. Due to the COVID-19 pandemic, the nutritional status of individuals is destabilized. To survive the current situation, a sustainable nutritional dietary should be maintained for strengthening the immune system. One of the most important ways to maintain the immune system is to supplement enough vitamin C. A spectrum of viruses that belongs to the coronavirus in humans usually causes the common cold, which is recently severe acute

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Volume 46, Issue 6, 22 January 2021, Pages 4798-4807

Physiochemical characterization and thermal kinetics of lignin recovered from sustainable agrowaste for bioenergy applications

Gazliya Nazimudheen ^a, Nimmi C. Sekhar ^a, Anju Sunny ^a, Aparna Kallingal ^a $\stackrel{ ext{M}}{ imes}$, H<mark>asanath</mark> B ^b

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- Extracted lignin showed characteristics of herbaceous lignin.
- Morphological analysis showed high <u>surface area</u>, hollow spherical structures.



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Detonation properties and impact sensitivities of trinitromethane derivatives of three-membered heterocyclic ring compounds

Rahana Ameen ^{a c}, <mark>Fasila P. M ^c,</mark> Anakuthil Anoop ^b 🖾, Biju A. R ^c 📯 🖾

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Highlights

- Quantum mechanical studies of new three-membered <u>heterocyclic</u> compounds as HEDMs.
- Promising trinitromethane derivatives of high <u>energy density</u> materials.
- Calculation of impact sensitivity of high <u>energy density</u> materials.

Abstract

We have carried out the design and theoretical investigation of a series of trinitromethane derivatives of three-membered <u>heterocyclic</u> ring compounds – <u>aziridine</u>, 1H-azirine, diaziridine, 1H-diazirine, triaziridine, 1H-triazirene, <u>oxaziridine</u>, oxadiaziridine, dioxaziridine, <u>oxirane</u>, and dioxirane – in search for new high <u>energy density</u> materials



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Evaluation of antiproliferative potential of manganese (II)-dafone complex

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Cytotoxicity is the quality of being toxic to cells. *In vitro* toxicity is the scientific analysis of the effect of toxic chemical substances on cultured bacteria or mammalian cells. In our work Manganese–4,5-Diazafluoren-9-one complex was prepared and its cytotoxicity was studied by standard MTT Assay in Cervical carcinoma cells HeLa. The result was compared with the normal fibroblast cell to check its influence on normal cells. On comparing the results, the complex is found to be more toxic to cervical carcinoma cells than the normal fibroblast cells. The photocatalytic activity of the complex was studied on the basis of the decomposition reaction of methylene blue dye in presence of the complex. The compound $[Mn(C_{11}H_6N_2O)_2(NCS)_2]$ was synthesised and characterised by various spectroscopic methods and the structure was confirmed by single– crystal XRD analysis. The molecular structure of the complex was optimized using density functional theory (DFT) at the B3LYP/6–311 G (d,p) level. The smallest HOMO–LUMO energy gap (0.66 eV) indicates the soft acid nature of the complex.

Keywords: Crystal structure, Cytotoxicity, DFT studies, 4,5-Diazafluoren-9-one, Photocatalyst

Cancer, also called malignancy, is an abnormal growth of cells. There are five types of cancer known as carcinoma, lymphoma, melanoma, sarcoma, and leukemia. Carcinoma is the most commonly diagnosed cancer, originate in the skin, lungs, breasts, pancreas, and other organs and glands. In cervical carcinoma lowermost part of the uterus (cervix) was affected. It is the fourth most common cancer in women. According to WHO, in 2018, approximately 5,70,000 women were diagnosed with cervical cancer worldwide and about 3,11,000 women died from the disease.

Dafone is a bidentate ligand similar to 1,10phenanthroline and bipyridine. It is a derivative of 1,10-phenanthroline, having an exocyclic keto group^{1,2}, which make it suitable for further derivatisation, to yield multinuclear metal complexes having interesting catalytic and biological properties³. Metal coordination complexes have been widely studied for their anticancer activities⁴⁻⁹. Earlier platinum– based complexes like cisplatin and carboplatin were used for the treatment of various cancers. In spite of their effectiveness, they lack selectivity for tumour tissues, which leads to severe side effects like neurotoxicity and ototoxicity. Moreover, some tumor cell lines are now growing resistant to cisplatin. So researchers are trying to synthesize new compounds that are selectively toxic to tumor cells^{10,11} and cause no harm to normal cells. Titanium complex titanocene dichloride was clinically approved for its higher cytotoxicity in renal cell carcinoma¹² and human ovarian cancer¹³. Recent studies support the cytotoxicity of phenanthroline derivative against various cell lines including cisplatin- resistant cell lines^{14,15}. A cisplatin analogue cis-Pt(dafone)Cl₂ shows considerable cytotoxicity against HeLa and Hacat cell lines¹⁶. Silver complexes have been reported to have anticancer activity. Silver carboxylate dimers possess anticancer activity against human carcinoma cells¹⁷ and silver phosphine complexes are active against cisplatin- resistant cell lines¹⁸. Several Cu (II) chelates have been reported to exhibit enhanced antiproliferative activity^{19,20}. On analysing these results we decided to find out the cytotoxic character of the title complex.

A photocatalyst is a material that absorbs light to bring it to a higher energy level and provides such energy to a reacting substance to make a chemical reaction occur. Environmental pollution gets more and

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Abbreviations: dafone, 4,5diazafluoren-9-one; DFT, density functional theory; FMO, Frontier Molecular Orbitals; LC_{50} , Lethel concentration⁵⁰

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Theoretical investigation of energetic performance and impact sensitivities of nitro and trinitromethyl substituted ozonides of ethylene and cyclopentene

<mark>P.M. Fasila ª</mark>, Ameen Rahana ^{a b}, A.R. Biju ^a 📯 🖾

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Highlights

- Quantum mechanical studies ozonides of ethylene and <u>cyclopentene</u> as <u>HEDMs</u>.
- Promising trinitromethane derivatives of ozonides as high energy density materials.
- Calculation of impact sensitivity of high energy density materials.

Abstract

A series of novel energetic compounds were designed by introducing groups such as — NO_2 , and $-C(NO_2)_3$ to the ethylene <u>ozonide</u> (trioxolane) and cyclopentene <u>ozonide</u> (6,7,8-trioxabicyclo[3,2,1]octane) skeletons and their detonation properties and impact sensitivity were investigated using <u>DFT</u> - <u>B3LYP</u> method with aug-cc-pVDZ as basis set.



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Computational and Theoretical Chemistry

Volume 1203, September 2021, 113346

Theoretical studies of azete based high energy density materials with trinitromethane functional group

Rahana Ameen ^{a b}, <mark>P.M. Fasila</mark> ^b, A.R. Biju ^b $\stackrel{>}{\sim}$ 🖾

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Highlights

- Quantum mechanical studies of <u>azete</u> based heterocyclic compounds as HEDMs.
- Promising trinitromethane derivatives of high <u>energy density</u> materials.
- Calculation of impact sensitivity of high <u>energy density</u> materials.

Abstract

A series of azete based high <u>energy density</u> molecules, with trinitromethane functional group, were designed and theoretically investigated. The structure optimization, frequency calculations and bond dissociation energies of these compounds were studied using the Gaussian 09 set of programs by the DFT - B3LYP functional (aug-cc-pVDZ).The calculated values of the heat of formation and detonation properties, of these sixty five

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Indotyphlops braminus, Brahminy Blindsnake

Assessment by: Shea, G. et al.



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Taxonomy

Kingdom	Phylum	Class	Order	Family
Animalia	Chordata	Reptilia	Squamata	Typhlopidae

Scientific Name: Indotyphlops braminus (Daudin, 1803)

Synonym(s):

- Argyrophis truncatus Gray, 1845
- Eryx braminus Daudin, 1803
- Glauconia braueri Sternfeld, 1910
- Indotyphlops fletcheri (Wall, 1919)
- Onychocephalus capensis Smith, 1846
- Ophthalmidium tenue Hallowell, 1861
- Ophthalmidium tenue Hallowell, 1861
- Ramphotyphlops braminus (Daudin, 1803)
- Tortrix russeli Merrem, 1820
- Typhlina braminus (Daudin, 1803)
- Typhlops russeli Schlegel, 1839
- Typhlops accedens Jan & Sordelli, 1864
- Typhlops accedens Jan, 1864
- Typhlops braminus (Daudin, 1803)
- Typhlops braminus var. pallidus Wall, 1909
- Typhlops braminus var. arenicola Annandale, 1906
- Typhlops inconspicuus Jan, 1863
- Typhlops khoratensis Taylor, 1962
- Typhlops limbricki Annandale, 1906
- Typhlops pseudosaurus Dryden and Taylor, 1969
- Typhlops pseudosaurus Dryden & Taylor, 1969
- Typhlops russeli (Merrem, 1820)

Common Name(s):

- English: Brahminy Blindsnake, Bootlace Snake, Flowerpot Snake
- روەزلا ءانا ىعفا Arabic:

Taxonomic Source(s):

Uetz, P., Freed, P. and Hošek, J. (eds). 2018. The Reptile Database. Available at: http://www.reptiledatabase.org. (Accessed: 06 February 2018).

Taxonomic Notes:

The species has also been recently placed in the typhlopid genera *Typhlops* and *Typhlina* (see Wallach 2009 for a complete synonymy). Following Wallach (2009), *Typhlops khoratensis* is considered a junior synonym of *Indotyphlops braminus*. *Typhlops fletcheri* has widely been treated as a junior synonym of *Indotyphlops braminus*, but examination of the holotype suggests that it is likely to represent a distinct species (A. Wynn pers. comm. to P. Uetz, in Uetz 2019). It is treated as valid (as *I. fletcheri*) without comment by Hedges *et al.* (2014), but as it has not been formally resurrected this account follows Pyron and Wallach (2014) in retaining it within *I. braminus* pending further taxonomic research.

Assessment Information

Red List Category & Criteria:	Least Concern <u>ver 3.1</u>		
Year Published:	2021		
Date Assessed:	August 10, 2018		

Justification:

This species is listed as Least Concern. It has a wide distribution in its native range and has also been introduced to many countries through human agencies. It is relatively abundant, inhabits a wide range of habitats and can thrive in modified areas. It is not affected by any significant threats and is present in numerous protected areas.

Geographic Range

Range Description:

This snake is native to tropical Asia (possibly southern India), but is invasive in many parts of the world and is now known from approximately 84 countries worldwide (Wallach 2009). This cosmopolitan distribution includes Old World tropical and subtropical regions, with encroachment into the Northern Hemisphere of the New World and adjacent temperate areas (Wallach 2009). It is found at a wide range of elevations. It is not present in Sri Lanka.

It has been accidentally introduced to many of the warmer parts of the world, this species has the widest distribution of any terrestrial snake. Although it is thought to have probably originated from India or Southeast Asia, the Brahminy blind snake is now found in parts of Africa, Australia, North, Central and South America, southern and eastern Asia from the Arabian Peninsula to Japan, and on numerous islands of the Atlantic, Indian and Pacific Oceans. It is thought that it may eventually establish itself in the majority of the world's tropical and subtropical areas (Ota *et al.* 1991, Wallach 1999, Halliday and Adler 2002, Zug *et al.* 2001, Lever 2003, Pauwels *et al.* 2004, Hellyer and Aspinall 2005, O'Shea 2007).

Country Occurrence:

Native, Extant (resident): Bhutan; India

Extant & Introduced (resident): Afghanistan; American Samoa; Anguilla; Aruba; Australia; Bahamas; Bangladesh; Barbados; Belize; Benin; Brunei Darussalam; Burkina Faso; Cambodia; Cameroon; Cayman Islands; Central African Republic; China; Comoros; Congo; Côte d'Ivoire; Egypt; El Salvador; Equatorial Guinea; Fiji; Gabon; Guatemala; India (Andaman Is., Laccadive Is., Nicobar Is.); Indonesia; Iran, Islamic Republic of; Iraq; Japan (Nansei-shoto, Ogasawara-shoto); Kenya; Kuwait; Lao People's Democratic Republic; Macao; Madagascar; Malaysia; Marshall Islands; Mauritania; Mexico; Micronesia, Federated States of ; Mozambique; Myanmar; Nepal; New Zealand; Nigeria; Oman; Pakistan; Palau; Papua New Guinea; Philippines; Saint Barthélemy; Saint Martin (French part); Saudi Arabia; Senegal; Singapore; Sint Maarten (Dutch part); Solomon Islands; Somalia; South Africa; Spain (Canary Is.); Taiwan, Province of China; Tanzania, United Republic of; Thailand; Timor-Leste; Togo; Turks and Caicos Islands; United Arab Emirates; United States (Alabama, Arizona, California, Florida, Georgia, Hawaiian Is., Louisiana, Massachusetts, Minnesota, North Carolina, Ohio, Texas, Virginia); Vanuatu; Viet Nam; Yemen

Distribution Map



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Population

This species is native to Southeast Asia and considered to be the most successful disperser in the snake world and the most probable dispersal mechanism is in the root balls of ornamental or food plants transported by humans (Crombie and Pregill 1999). The species is very common in India (Daniel 2002), and it is likely to be locally very abundant where it occurs in much of its global range.

Current Population Trend: Increasing

Habitat and Ecology (see Appendix for additional information)

This fossorial species is a human commensal and found in and around human habitation, also in gardens, loose soil, refuse heaps, decaying logs and trees, gutters and drain ditches, and under leaf litter, heaps of stones and piled up bricks, flower pots. Naturally occurs in all types of habitat from seashore dunes to tropical rainforest, frequently in disturbed areas and secondary growth, most commonly in moist soils (Broadley and Wallach 2009). This is the world's only known unisexual (all-female) and smallest snake species (Wallach 2009). It has a wide elevational tolerance, and in India it occurs from sea level to 3,500 m elevation. It feeds on ants and termites (Wallach 2009). It is parthenogenetic and lays 2-8 eggs (Daniel 2002, Whitaker and Captain 2004).

Systems: Terrestrial

Use and Trade (see Appendix for additional information)

This species is not used or traded.

Threats

There are no threats to this species.

Conservation Actions (see Appendix for additional information)

No conservation measures are required. It is present in numerous protected areas.

Credits

Assessor(s):	Shea, G., Stuart, B.L., Chan-Ard, T., Wogan, G., Srinivasulu, C., Srinivasulu, B., Vijayakumar, S.P., Ramesh, M., Ganesan, S.R., <mark>Madala,</mark> M., Sreekar, R., Shankar, G., Allison, A., Hamilton, A., Tallowin, O., Beraduccii, J., Howell, K., Msuya, C.A., Ngalason, W., Parker, F., O'Shea, M. & Iskandar, D.	
Reviewer(s):	Cox, N.A. & Bowles, P.	
Contributor(s):	Hedges, S.B.	
Facilitator(s) and Compiler(s):	Cox, N.A.	

Bibliography

Allam, A.A., Daza, J.D. and Abo-Eleneen, R.E. 2016. Histology of the skin of three limbless Squamates dwelling in mesic and arid environments. *The Anatomical Record* 299(7): 979-989.

Broadley, D.G. and Wallach, V. 2009. A review of the eastern and southern African blind-snakes (Serpentes: Typhlopidae), excluding *Letheobia* Cope, with the description of two new genera and a new species. *Zootaxa* 2255: 1-100.

Crombie, R.I. and Pregill, G.K. 1999. A checklist of the herpetofauna of the Palau Islands (Republic of Belau), Oceania. *Herpetological Monographs* 13: 29-80.

Daniel, J.C. 2002. *The Book of Indian Reptiles and Amphibians*. Oxford University Press / Bombay Natural History Society, Oxford.

Das, I. and Wallach, V. 1998. Scolecophidian arboreality revisited. *Herpetological Review* 29 (1): 15.

Egan, D. 2007. *Snakes of Arabia: A field guide to the snakes of the Arabian Peninsula and its shores.* Motivate Publishing, Dubai.

Halliday, T. and Adler, K. 2002. *The New Encyclopedia of Reptile and Amphibians*. Oxford University Press, Oxford.

Hedges, S.B., Marion, A.B., Lipp, K.M., Marin, J. and Vidal, N. 2014. A taxonomic framework for typhlopid snakes from the Caribbean and other regions (Reptilia, Squamata). *Caribbean Herpetology* 49: 1-61.

Hellyer, P. and Aspinall, S. 2005. *The Emirates: A Natural History*. Trident Press Limited, United Arab Emirates.

Henderson, R.W. and Powell, R. 2009. *Natural History of West Indian Reptiles and Amphibians*. University Press of Florida, Gainesville, Florida, USA.

IUCN. 2021. The IUCN Red List of Threatened Species. Version 2021-3. Available at: <u>www.iucnredlist.org</u>. (Accessed: 09 December 2021).

Lemos-Espinal, J.A. and Smith, G.R. 2015. Amphibians and reptiles of the state of Hidalgo, Mexico. *Check List: Journal of Biodiversity Data* 11(3): 1642.

Lever, C. 2003. Naturalized Reptiles and Amphibians of the World. Oxford University Press, Oxford.

Marais, J. 2004. A Complete Guide to the Snakes of Southern Africa. Struik, Cape Town.

Mizuno, T. and Kojima, Y. 2015. A blindsnake that decapitates its termite prey. *Journal of Zoology* 297(3): 220-224.

O'Shea, M. 2007. Boas and Pythons of the World. New Holland, London.

Ota, H., Hikida, T., Matsui, M., Mori, A. and Wynn, A.H. 1991. Morphological variation, karyotype, and reproduction of the parthenogenetic blind snake, *Ramphotyphlops braminus*, from the insular region of East Asia and Saipan. *Amphibia-Reptilia* 12(2): 181-193.

Pauwels, O.S.G., Wallach, V., Biteau, J.-P., Chimsunchart, C., Yoga, J.-A. and O'Heix, B.-C. 2004. First record of *Ramphotyphlops braminus* (Serpentes: Typhlopidae) from Gabon, western central Africa. *Hamadryad* 29(1): 138-139.

Powell, R. and Henderson, R.W. 2012. Island lists of West Indian amphibians and reptiles. *Bulletin of the Florida Museum of Natural History* 51(2): 85-166.

Pyron, R.A. and Wallach, V. 2014. Systematics of the blindsnakes (Serpentes: Scolecophidia: Typhlopoidea) based on molecular and morphological evidence. *Zootaxa* 3829 (1): 001-081.

Qing, N., Xiao, Z., Watkins-Colwell, G.J., Hou, M., Lu, W.H., Lazell, J. and Sun, Z.W. 2015. Additions to the reptile and amphibian fauna of Nan Ao Island: A Chinese treasure trove of biogeographic patterns. *Bulletin of the Peabody Museum of Natural History* 56(1): 107-124.

Torki, F. 2017. A new species of blind snake, Xerotyphlops, from Iran. Herpetological Bulletin 140: 1-5.

Uetz, P., Freed, P. and Hošek, J. (eds). 2018. The Reptile Database. Available at: <u>http://www.reptile-database.org</u>. (Accessed: 06 February 2018).

van der Kooij, J. 2001. The herpetofauna of the Sultanate of Oman: Part 4: The terrestrial snakes. *Podarcis* 2(2): 54-64.

Vijayakumar, S.P. 2005. Status and Distribution of Amphibians and Reptiles of the Nicobar Islands, India. Final Report, Rufford Foundation, UK.

Wallach, V. 1999. Geographic distribution: Ramphotyphlops braminus. Herpetological Review 30(4): 236.

Wallach, V. 2009. *Ramphotyphlops braminus* (Daudin): a synopsis of morphology, taxonomy, nomenclature and distribution (Serpentes: Typhlopidae). *Hamadryad* 34: 34-61.

Whitaker, R. 1978. Common Indian snakes: A field guide. MacMillan India Limited, Chennai.

Whitaker, R. and Captain, A. 2004. Snakes of India. The Field Guide. Draco Books, India.

Zug, G.R., Vitt, L.J. and Caldwell, J.P. 2001. *Herpetology: An Introductory Biology of Amphibians and Reptiles. Edition 2*. Academic Press, San Diego.

Citation

Shea, G., Stuart, B.L., Chan-Ard, T., Wogan, G., Srinivasulu, C., Srinivasulu, B., Vijayakumar, S.P., Ramesh, M., Ganesan, S.R., Madala, M., Sreekar, R., Shankar, G., Allison, A., Hamilton, A., Tallowin, O., Beraduccii, J., Howell, K., Msuya, C.A., Ngalason, W., Parker, F., O'Shea, M. & Iskandar, D. 2021. *Indotyphlops braminus*. *The IUCN Red List of Threatened Species* 2021: e.T172704A1370555. https://dx.doi.org/10.2305/IUCN.UK.2021-3.RLTS.T172704A1370555.en

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For <u>Supplementary Material</u>, and for <u>Images and External Links to Additional Information</u>, please see the Red List website.

Appendix

Habitats

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Habitat	Season	Suitability	Major Importance?
1. Forest -> 1.5. Forest - Subtropical/Tropical Dry	Resident	Suitable	Yes
1. Forest -> 1.6. Forest - Subtropical/Tropical Moist Lowland	Resident	Suitable	Yes
1. Forest -> 1.7. Forest - Subtropical/Tropical Mangrove Vegetation Above High Tide Level	Resident	Suitable	Yes
1. Forest -> 1.8. Forest - Subtropical/Tropical Swamp	Resident	Suitable	Yes
1. Forest -> 1.9. Forest - Subtropical/Tropical Moist Montane	Resident	Suitable	Yes
3. Shrubland -> 3.5. Shrubland - Subtropical/Tropical Dry	Resident	Suitable	Yes
3. Shrubland -> 3.6. Shrubland - Subtropical/Tropical Moist	Resident	Suitable	-
3. Shrubland -> 3.7. Shrubland - Subtropical/Tropical High Altitude	Resident	Suitable	Yes
5. Wetlands (inland) -> 5.1. Wetlands (inland) - Permanent Rivers/Streams/Creeks (includes waterfalls)	Resident	Marginal	-
14. Artificial/Terrestrial -> 14.1. Artificial/Terrestrial - Arable Land	Resident	Suitable	Yes
14. Artificial/Terrestrial -> 14.2. Artificial/Terrestrial - Pastureland	Resident	Suitable	Yes
14. Artificial/Terrestrial -> 14.3. Artificial/Terrestrial - Plantations	Resident	Suitable	Yes
14. Artificial/Terrestrial -> 14.4. Artificial/Terrestrial - Rural Gardens	Resident	Suitable	Yes
14. Artificial/Terrestrial -> 14.5. Artificial/Terrestrial - Urban Areas	Resident	Suitable	Yes
14. Artificial/Terrestrial -> 14.6. Artificial/Terrestrial - Subtropical/Tropical Heavily Degraded Former Forest	Resident	Suitable	Yes

Conservation Actions in Place

(http://www.iucnredlist.org/technical-documents/classification-schemes)

Conservation Action in Place	
In-place research and monitoring	
Action Recovery Plan: Unknown	
Systematic monitoring scheme: Unknown	
In-place land/water protection	
Percentage of population protected by PAs: 40	
Area based regional management plan: Unknown	

Conservation	Action	in	Place

Occurs in at least one protected area: Yes

Invasive species control or prevention: Unknown

In-place species management

Harvest management plan: Unknown

Successfully reintroduced or introduced benignly: Unknown

Subject to ex-situ conservation: Unknown

In-place education

Subject to recent education and awareness programmes: Unknown

Included in international legislation: Unknown

Subject to any international management / trade controls: Unknown

Additional Data Fields

Distribution
Continuing decline in area of occupancy (AOO): No
Extreme fluctuations in area of occupancy (AOO): No
Continuing decline in extent of occurrence (EOO): No
Extreme fluctuations in extent of occurrence (EOO): No
Continuing decline in number of locations: No
Extreme fluctuations in the number of locations: No
Lower elevation limit (m): 0
Upper elevation limit (m): 3,500
Population
Population severely fragmented: No

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Varanus bengalensis, Bengal Monitor Lizard

Assessment by: Cota, M. et al.



View on www.iucnredlist.org

Short citation: Cota, M. *et al.* 2021. *Varanus bengalensis*. *The IUCN Red List of Threatened Species* 2021: e.T164579A1058949. <u>https://dx.doi.org/10.2305/IUCN.UK.2021-2.RLTS.T164579A1058949.en</u> [see full citation at end]

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Taxonomy

Kingdom	Phylum	Class	Order	Family
Animalia	Chordata	Reptilia	Squamata	Varanidae

Scientific Name: Varanus bengalensis (Daudin, 1802)

Synonym(s):

- Monitor gemmatus Guérin-Méneville, 1829
- Tupinambis bengalensis Daudin, 1802
- Tupinambis cepedianus Daudin, 1802
- Varanus irrawadicus Yang & Li, 1987
- Varanus nebulosus (Gray, 1831)
- Varanus punctatus Merrem, 1820
- Varanus vietnamensis Yang & Liu, 1994

Common Name(s):

- English: Bengal Monitor Lizard, Clouded Monitor, Common Indian Monitor
- Chinese: 孟加拉巨蜥

Taxonomic Source(s):

Uetz, P., Freed, P. and Hošek, J. (eds). 2021. The Reptile Database. Available at: http://www.reptiledatabase.org. (Accessed: 1 June 2021).

Taxonomic Notes:

Varanus irrawadicus Yang & Li, 1987 and *V. vietnamensis* Yang & Liu, 1994 were previously described as nominal species, but both were synonymized with *V. bengalensis* by Böhme and Ziegler (1997). The same authors raised *V. bengalensis nebulosus* (Gray, 1831) to full species status based on a *V. b. bengalensis* specimen obtained from a market in Phuket (exhibiting characters within the range of *V. b. nebulosus*), which was thought to prove sympatry between the two forms, together with differences in hemipenial structure. It is widely accepted that this specimen instead represents a geographic race of *V. bengalensis*, based on a very detailed study of geographic variation in *V. bengalensis* across its range (Auffenberg 1994). The Phuket locality is also considered doubtful, as this is an extensively-visited area where no *nebulosus*-morph monitors have otherwise been recorded, and the specimen recorded in the market may have been collected further north (D. Bennett pers. comm. 2017). Consequently *V. nebulosus* is treated here as a junior synonym of *V. bengalensis*.

Assessment Information

Red List Category & Criteria:	Near Threatened A2d <u>ver 3.1</u>		
Year Published:	2021		
Date Assessed:	June 8, 2018		

Justification:

The species is heavily hunted in a variety of habitats across South Asia and continental Southeast Asia. Extreme local declines have been reported within 30 years (estimated to correspond to three

generations) for most of Southeast Asia outside Malaysia. If the Southeast Asian *Varanus nebulosus* is revalidated as a full species, it will consequently likely warrant a Vulnerable or Near Threatened listing, although Southeast Asian populations of *V. bengalensis* - as presently understood - rather reflect a geographically restricted distribution. More data on rates of any decline in India are needed, the main part of the global range. It is strongly suspected that local population declines of em style="">V. bengalensis will increase across the species' global range, and the species appears to be close to qualifying for a threatened category, and is therefore assessed Near Threatened.

Previously Published Red List Assessments

2010 – Least Concern (LC) https://dx.doi.org/10.2305/IUCN.UK.2010-4.RLTS.T164579A5909661.en

Geographic Range

Range Description:

This is a wide ranging monitor lizard found in Afghanistan, Pakistan, Bangladesh, Nepal, India, Sri Lanka, southern China (Daudin 1802, Zhao and Adler 1993), Myanmar, Viet Nam (Nguyen et al. 2009, Das 2010), Lao PDR (Duckworth et al. 1999), southeastern Iran, and as far as Java and the Anambas Islands in Indonesia. In Lao PDR, it has been reported from Nakai Plateau and is considered to have been locally extirpated in recent years in one area of Phou Louey NBCA (Stuart 1998c, Duckworth et al. 1999). In China, it is only known from the Wanding Valley, in Yunnan Province (Zhao and Adler 1993). It has an upper elevation limit of 2,150 m asl (though has been reported up to 2,600 m asl. in Afghanistan - Clark 1990). Varanus bengalensis nebulosus is present in Myanmar, Lao PDR, Thailand, Cambodia, Malaysia, Singapore, Indonesia, Viet Nam, and various islands in the South China Sea between Peninsular Malaysia and Sumatra and Borneo (Gray 1831, Nguyen et al. 2009, Das 2010, Grismer 2011, Chan-ard et al. 2015). In Viet Nam, it has been recorded from the provinces of Quang Tri (Dak Rong, Dong Tam Ve, Huong Hoa), Thua Thien-Hue (A Luoi, Loc Hai), Da Nang (Son Tra), Quang Nam (Nam Giang, Tay Giang), Kon Tum (Kon Plong, Bo Y), Gia Lai (K Bang), Dak Lak (Chu Yang Sin, Dak Phoi, Yok Don), Lam Dong (Lang Bian Plateau), Binh Phuoc (Nghia Trung), Dong Nai (Cat Tien), Ba Ria–Vung Tau (Con Dao) and Kien Giang (Phu Quoc) (Nguyen et al. 2009). In Indonesia, it has been recorded from Java and its occurrence on Sumatra has been suggested (Gray 1831, De Lisle 1996, Smith 1935, Das 2010). Although there are some old specimens purportedly from Sumatra, no recent records seem to exist from the mainland (e.g. Auffenberg 1994), but it has been recorded on at least three islands in the Riau Archipelago close to the coast of Sumatra (E. Arida pers. comm. 2019, Arida et al. 2015). Javan records are from the west and east, but the only recent records are photographs of a dead and a live animal from Baluran National Park and from Meru Betiri National Park (Auliya and Koch 2020), both taken in East Java two or three years ago (E. Arida pers. comm. 2019). Captive animals have been seen in West Java (D.T. Iskandar pers. comm. 2019).

In Malaysia, it is known from the states of Perlis (Wang Kelian), Kedah (Ulu Muda, Pulau Langkawi), Terengganu (Jertih, Hutan Lipur Sekayu, Tasik Kenyir, Perhentian Besar, Gunung Tebu), Perak (Batang Padang and Beruas, Selangor (Kepong), Negeri Sembilan (Pasoh), Endau-Rompin (Kampung Relau, Johor (Gunung Panti, Pulau Aur), Penang (Pulau Jerejak) and Pahang (Pulau Tioman, Krau Wildlife Reserve), and the foot of Gunung Lawit in Sungai Padang and Batang Padang (Cantor 1847, Boulenger 1903, Hendrickson 1966, Dring 1979, Sharma *et al.* 2001, Grismer *et al.* 2001, Norsham and Ong 2001, Daicus and Hashim 2004, Norsham *et al.* 2005, Ibrahim *et al.* 2006, Chan *et al.* 2009, 2010, Grismer 2011,

Nurulhuda *et al.* 2014, Sumarli *et al.* 2015). In Thailand, it is present in forested areas throughout the country, although rare in the northeast (Chan-ard *et al.* 2015). In Cambodia, it has been found in the northern Cardamom Mountains (Daltry and Chheang 2000, Swan and Daltry 2002). In Lao PDR, the species is sometimes referred as *V. nebulosus*, which has been reported from Nakai Plateau and considered as locally extirpated in recent years in one area of Phou Louey NBCA (Stuart 1998c, Duckworth *et al.* 1999). It ranges up to 350 m asl (Grismer 2011). The species is naturally absent from the Chao Phraya River Central Flood Plain in Thailand, a historically swampy area unsuitable for this typically dry forest species. It may be absent from naturally swampy areas in the Mekong Delta, but there are too few records for Myanmar to clarify its occurrence in this area (G. Wogan pers. comm. 2017). In China this species is distributed in Ruili River watershed in western Yunnan (Yang and Li 1987, as *Varanus irrawadicus*). The highest elevational record is 3,000 m asl (Singh *et al.* 2020).

Country Occurrence:

Native, Extant (resident): Afghanistan; Bangladesh; Cambodia; China (Yunnan); India (Assam, Gujarat, Himachal Pradesh, Jammu-Kashmir, Kerala, Madhya Pradesh, Tamil Nadu); Indonesia (Jawa); Iran, Islamic Republic of; Lao People's Democratic Republic; Malaysia; Myanmar; Nepal; Pakistan; Sri Lanka; Thailand; Viet Nam

Native, Possibly Extant (resident): Indonesia (Sumatera)

Distribution Map



Legend

EXTANT (RESIDENT)

Compiled by: IUCN, University of Tel Aviv 2019





Population

There is limited recent information on the population status of this species. Most available information on the population status reported here dates from 9–30 years ago, prior to evidence of decline in much of Southeast Asia. It is unclear whether comparable declines have taken place elsewhere, but as this species is widely exploited this is considered likely. In some agricultural areas, this species has been found to be common (Auffenberg 1989). Density estimates varied greatly between different habitats in northern India and Pakistan, from an average of two individuals per km² recorded on the edge of a seasonally flooded evaporation basin in Rajasthan to just under 40 individuals on average per km² in marsh habitat in Pakistan (Auffenberg 1994). Various techniques were used to derive these estimates, so that the numbers are not directly comparable (Auffenberg 1994). Densities were also found to be relatively high in agricultural habitats, from around 14 to 30 individuals per km² (Auffenberg 1994). In the more arid parts of its range it probably occurs at reasonably low densities. Although present on Java, the species is very common in southern Thailand, in areas where the predominantly Muslim population does not hunt the animal for food (M. Cota pers. comm. 2017).

In areas where the species is eaten by humans or traded for other purposes, populations are likely to be in decline. This includes most of Myanmar (though it appears to be very common in the southern Thananthari area, and the Myeik Archipelago - Kyi Soe Lwin pers. comm. 2017), much of southern Thailand; in much of northern and northeastern Thailand it is now very rare (following declines from around 30–15 years ago) and may not decline much further (M. Cota pers. comm. 2017). It is heavily hunted in Cambodia, and the population is estimated to have declined by around 30% over 20 years (T. Neang pers. comm. 2017). It is commonly seen in markets in Laos, but no information is available on rates of decline (S. Phimmachak pers. comm. 2017), although rates of decline are likely to be comparable (B. Stuart pers. comm. 2017). The species is now very rare in mainland Viet Nam as a result of hunting pressure, and it is confined largely to national parks (S. Nguyen pers. comm. 2017); there is however no information on rates of decline. It remains common in this country only in Can Dao National Park (S. Nguyen pers. comm. 2017). The species remains common in Malaysia (L. Grismer pers. comm. 2017). In China, it is a rare species. (D.Q. Rao pers. comm. 2018).

Current Population Trend: Decreasing

Habitat and Ecology (see Appendix for additional information)

This diurnal and largely terrestrial species inhabits forests and forests edges, as well as plantations (Das 2010), including oil palm, and agricultural areas (Auffenberg 1994). It has been recorded from a variety of habitats, both arid and moist, and from scrubland to forests, at moderate to high elevations (Auffenberg 1994, Pianka 2004), although it is absent from swampy areas. It feeds on insects, spiders, snails, crabs, frogs, small mammals, birds, lizards and snakes; also known to scavenge (Das 2010). Clutches comprise 8–32 eggs, with 1–2 clutches laid per year (Auliya and Koch in press), which may be laid in termitaria (Das 2010); hatchlings measure 94 mm (Das 2010). The average age at reproduction may be 11 years, as the species has an age at maturity of three and maximum longevity of 20 years (M. Cota pers. comm. 2017).

Systems: Terrestrial, Freshwater (=Inland waters)

Use and Trade

This species is harvested for a number of uses: the skins are commercially valuable, the meat is eaten, and the fat is used in traditional medicine (Papenfuss *et al.* 2010). In India there is an illegal trade in hemipenes of the Bengal and Yellow Monitors (termed "hatha jodi"), which are marketed as plant roots with magical powers (D'Cruze *et al.* 2018; Sharma *et al.* 2019). It is hunted for food and sold to traders in Lao PDR, Viet Nam and Thailand (Baird 1993, Stuart 1998b, 1998e, 1998d, Duckworth *et al.* 1999), and it has been estimated that a single village in Dong Khanthung PNBCA annually harvested 100 individuals for consumption and sale to Lao army soldiers and Lao traders (Stuart 1998e, Duckworth *et al.* 1999). International trade is prohibited, however, this species appears to be in regional trade between Lao PDR, Viet Nam and China (S. Phimmachak pers. comm. 2017), and trade from China appears to have declined or ceased since the 1990s (D.Q. Rao pers. comm. 2019).

Threats (see Appendix for additional information)

The greatest threat to this species is hunting, as it is hunted commercially for its skin (domestically), and its meat is commonly eaten; the fat is also used in traditional medicine (Papenfuss *et al.* 2010), and in India the hatha jodi trade represents an additional impact. Although hunting for local use has historically been a subsistence-level activity in India, the recent emergence of festivals in which thousands gather to hunt animals (e.g. in West Bengal - Rajpoot *et al.* 2018) can be expected to have serious impacts on local subpopulations. The Bengal Monitor has been declining "for several decades" in India, attributed to harvesting for the illegal skin trade (Traffic Post 2013), and Rajpoot et al. (2018) suggest that Indian Monitor species (including the Bengal Monitor) "could go extinct very soon" without protection, although do not specify the evidence for this expectation.

In Iran, it is killed by people who mistakenly consider it to be dangerous; it is not hunted for food or skins in that country (Papenfuss *et al.* 2010). The species is very rare in most of Thailand and in Viet Nam outside protected areas (M. Cota and S. Nguyen pers. comm. 2017), where long-established infrastructure has made subpopulations vulnerable to exploitation, and it is very easily hunted with dogs (B. Stuart pers. comm. 2017). Recent declines in Cambodia and Viet Nam are linked to the opening up of these areas as they develop (B. Stuart pers. comm. 2017). In southern Thailand and presumably in Malaysia it has some cultural protection as a result of Islamic prohibitions on eating reptiles, but it is undergoing widespread declines in Southeast Asia save perhaps in Thailand and Viet Nam where densities have been very low for decades. Habitat loss and increase of the human population in India conflicts arise that pose another severe threat (Sharma *et al.* 2018), and this is presumably also the case elsewhere.

Conservation Actions (see Appendix for additional information)

This species occurs in many protected areas across its extensive range and it is protected in a number of countries by national legislation because it is currently listed on Appendix I of CITES which prohibits legal export. While there are reports of some cross-border illegal trade - including the hatha jodi trade from India - this listing is likely to be effective in limiting exploitation for the international leather industry (M. Cota pers. comm. 2017). Nevertheless, penalties for violating the Indian Wildlife Protection Act are not required to be strict, local hunting in rural areas is rarely reported (M. Auliya pers. comm. 2020), and skins of Appendix I listed monitor skins have been sold openly in the Philippines as recently as March 2020 (TNN 2020). Further research into the harvest levels of this species is needed. The establishment and management of new protected areas where it is illegal to hunt this species should be carried out to





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Diversity of Pteridophyte Flora in Rajamala, Eravikulam National Park, Kerala, India

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Authors' contributions

This work was carried out in collaboration among all authors. Author MSA designed the study, conducted the fieldwork, prepared the herbaria of collected specimens and wrote the first draft of the manuscript. Author RA identified the species and edited the first draft of the manuscript. Author AAA assisted in fieldwork and the preparation of herbaria. Author CA managed the literature searches and the analyses of the study. Author MMS assisted in literature searches and field exploration. All authors read and approved the final manuscript.

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Short Research Article

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ABSTRACT

Aims: To enumerate the fern diversity in the disturbed landscapes of Rajamala part of Eravikulam National Park, Western Ghats

Study Design: Purposive sampling method was adopted in the study area and habitats suitable for ferns were surveyed.

Place and Duration of Study: The study area is Rajamala, a tourist impacted site inside Eravikulam National Park in Kerala, India. Intensive field explorations were carried out in this area during February 2018- April 2019, to document the ferns and fern-allies.

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Methodology: A preliminary study was conducted in February 2018 to identify the probable habitats of ferns for further detailed study. Purposive sampling was done in the study area considering the most suitable habitats in both shola ecosystems and grassland ecosystems of the area. Materials for herbaria were processed using standard methods. The collected plants were identified with the help of standard field guides and flora. The potential medicinally important ferns were also listed out. **Results:** 54 species of pteridophytes including fern and fern allies belonging to sixteen different families were found from the Rajamala region of Eravikulam National Park. Aspleniaceae was the most common family with 11 species followed by Polypodiaceae. The majority of the Pteridophytes found in the region are showing terrestrial habit. Eleven species found in the study site are medicinally important.

Conclusion: Despite the high tourism pressure in the study area, pteridophyte species richness is higher in the Rajamala region of Western Ghats. The suitable habitat with ideal substrate conditions and year-long moisture availability in the substrates could be the reason for a higher number of pteridophyte species in this area.

Keywords: Ferns; fern allies; grassland; shola forests; southern western ghats.

1. INTRODUCTION

India is one of the top ten plant-diverse countries in the world. The world flora consists of about 12000 species of pteridophytes [1], and among them, more than 1200 species of pteridophytes including both fern and fern- allies have been reported from India [2,3]. Pteridophytes are considered to be important because of their evolutionary significance. They are a notable ancient group of species with a significant number of relict and endemic ones [4]. Pteridophytes are considered as an intermediate between the higher vascular plants (gymnosperms and angiosperms) and lower nonvascular plants because of their specialized vascular system. Their life cycle is also remarked by the independent alternation of the generation of sporophyte and gametophyte. Pteridophytes are generally categorized into Ferns and Fern Allies, which are not scientifically very distinct [5]. Ferns are considered an advanced group that originated later during the Carboniferous period (325 million years back) and marked by a welldeveloped plant body (sporophyte-spore-bearing generation) with rhizome, roots, large leaves but no flowers and fruits. The fern allies had originated and established in the Silurian (395 million years back) and were characterized by having small (microphyllous) leaves each with a single vein on the stele. The spores arranged are also different in both ferns and fern allies, sporangia are superficial (on the lower surface of the leaf) or marginal in ferns, whereas in fern allies they are generally produced in terminal strobili (sorus) at branch tips [6].

The potential use of Pteridophytes especially the edible and medicinal properties are explored by

many workers in India. They reported much information about the various ethnobotanical utility and medicinal properties of the pteridophytes [7,8,9,10,11,12]. Sixty Pteridophytes used by the tribals of the Western Ghats which have medicinal importance are reported during an ethnobotanical study [8]. Other than the economic uses, many Pteridophytes were cultivated indoors of the houses or outdoors due to their attractive beautiful fronds. The medicinally important properties of the Pteridophytes were reported by workers [12]. Several species of many ornamentally potential ferns were also reported in India [13,14,15,16,17,18] with twenty ornamental pteridophytes from Nilgiris [19].

Pteridophytes are a wide-range group that fills every possible ecological niche but the diversity is maximum in the high temperature and rainfall conditions of tropics. The ongoing shrinkage of the tropical biome is a matter of concern as many pteridophyte species are yet to be discovered from the diverse and dense forests of this area [20]. According to the threat assessment of pteridophytes of India, roughly 43 percent of the total pteridophytes seen in India are threatened [21]. The Western Ghats is a region of a richly diverse collection of wild flora and fauna and the Kerala part of it is further rich in plant diversity due to its climatic condition with about 3000 mm rainfall throughout the year. Recently 283 species of fern and fern allies were described from Kerala [6]. Kerala provides an ideal condition for the growth and development of fern and fern allies. There are also many endemic ferns including the tree fern, Cyathea nilgirensis that have distribution in this part of Western Ghats [22].

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RESEARCH ARTICLE



A review of Gryllidae (Grylloidea) with the description of one new species and four new distribution records from the Sindh Province, Pakistan

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Abstract

Seventeen species of the family Gryllidae were reviewed and a *Modicogryllus sindhensis* is described herein as new. Four species, namely *Acheta hispanicus* Rambur, 1838, *Gryllus septentrionalis* F. Walker, 1869, *Callog-ryllus saeedi* Saeed, 2000, and *Miogryllus itaquiensis* Orsini & Zefa, 2017 are recorded as new country and state records. Differences between similar species and a taxonomic key to the species of Sindh are provided.

Keywords

Acheta, Callogryllus, Miogryllus, Modicogryllus, new distribution record, review, taxonomic key

Introduction

Crickets are representative of superfamily Grylloidea with six (four families: Myrmecophilidae, Gryllotalpidae, Mogoplistidae and Gryllidae) Baissogryllidae Gorochov, 1985, Gryllidae Laicharting, 1781, Mogoplistidae Costa, 1855, Phalangopsidae Blanchard, 1845, Protogryllidae Zeuner, 1937 and Trigonidiidae Saussure, 1874 (Cigliano

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Faunastic Studies on Smaller Moths (Insecta: Microlepidoptera) of Western Ghats, Kerala

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ABSTRACT

ARTICLE DETAILS

Article History

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Keywords Microlepidoptera, Gelechiidae, Tineidae, Oecophoridae, Kerala

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1. Introduction

As the name suggests, Microlepidoptera includes all of the very small forms where the wingspan varies from 5-20 mm. More than one quarter of the world's 16,5000 named Lepidoptera species is Microlepidoptera indicating the significance of this group constituting a substantial share of the planet's biodiversity (Robinson *et al.*, 1994). The moths have traditionally been divided into two groups; the Macroheterocera and Microheterocera, or small moths. The latter, while not a natural group, is generally accepted as comprising the primitive (non-ditrysian) Lepidoptera, the diverse superfamilies Tineoidea, Gracillarioidea, Immoidea and Pterophoridea, and a few other small superfamilies.

2. Materials and Methods

Intensive survey of Microlepidoptera has been made in Kerala part of Western Ghats *viz.*, Silent Valley, Mannarkkad, Mukkali, Muthanga, Sultan Bathery, Amarambalam, Meenmutty, Vellimuttam, Nilambur, Peechi, Vazhani, Sholayar, Thekeddy, Rajamalai, Ranni, Thenmala, Arienkavu, Rosemala, Kattlapara, Achenkovil, Neyyar and Peppara (Fig. 1). The study was undertaken as apart of All India Coordinated project of Taxonomy for smaller moths for a period of four years.

Usually, collection of Lepidoptera is done using light traps, which was found to be unsatisfactory for Microlepidoptera due to trampling of small moths by larger insects. Moreover, Microlepidoptera generally flutter around the lamp and tend to remain on the outer surface of the trap rather than falling inside the collecting chamber. Based on these observations, we found that the best method of collecting Microlepidoptera was to attract them at night to an illuminated vertical white sheet. The sheet measuring 70cm x 55cm touches the ground where it can be anchored with stones. The light source we used was an 18-watt CFL (Compact Fluorescent Lamp) powered by a 12-watt car battery. Microlepidoptera, which rest over the white sheet, were collected in a separate vial, to avoid trampling by other insects. The only disrupt is that we have to stay for the

In a study on the Microlepidoptera fauna of Kerala, 77 species of insects mostly belonging to Gelechiidae, Tineidae and Oecophoridae were recorded. The fauna was rich and diverse and contained several new reports to the state and south India. Other than light trap, a new method was followed for Microlepidoptera collection, which is helpful in taxonomic studies. An inventory of 77 species is given with new records; an endeavor for the first time to the state.

insects collection for 3-4 hrs. However, it shows advent effect that we can study more on its behavioral aspects while resting. The most appropriate collecting period is usually after sunset for about 3 to 4 hrs although sporadic occurrence of moths may be observed throughout the night. Insects collected, were freeze in a chiller rather than killing using a chemical like benzene or chloroform. Use of a killing agent, usually decolorizes or render the specimens to become stiff. Freezing the specimens for about 12 to 14 hrs was found to give best results. The greatest advantage of collecting moths using the above method is that larger insects do not damage the moths, and the specimens remain intact with the colour and body markings unaffected, which is helpful in taxonomic studies (Shamsudeen et al., 2005). The methodology discussed by workers such as Mikkola (1986) as well as Landry and Landry (1994) were followed for the pinning, stretching and preservation of specimens. The standard techniques given by Zimmerman (1978) and Robinson (1976) have been followed for wings and genitalia respectively. With regard to systematic arrangement of families Heppner classification for Lepidoptera (1998) were followed.

3. Results and Discussion

Altogether 77 species of microlepidoptera belonging to 18 families have been collected during the survey Appendix I. Of the various groups recorded, Geleichiidae (17 species) and Tineidae (16 species) contained maximum number of taxa. The other groups recorded were Oecophoridae (9 species); Comopterigidae (7 species); Lecithoceridae and Tortricidae (5 species); Psychidae (4 species); Blastobasidae (3 species); Immidae (2 species) and Adelidae, Ethimidae, Glyphipterigidae, Plutellidae, Yponomeutidae, Attevidae, Lyonetiidae, Helionidae and Pterophoridae (1 species).

In examination of moth recorded from various regions indicate that about 80% of all species of smaller moths recorded belonged to Tineoidea and Gelechoidea. In the former most of the species collected (10-20%) were from disturbed forest patches whereas in the latter 40-60% were

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An ethnobotanical study of medicinal plants traditionally used by the natives of Lakshadweep Islands, India

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Abstract

Lakshadweep archipelago is a small group of islands in the Arabian Sea consisting of 36 islands; only 10 islands are inhabited. The vegetation is typical Indo-Pacific atoll coral island flora. The present study is based on a survey among all inhabited islands to identify and document the area's ethnobotanical important and economic plants. Their ethnobotanical uses categorized the plants identified for the study. There are 70 different species of angiosperms found traditionally associated with island people. The people from the age group 40 and above are the stakeholders of the ethnic plant medicines. The traditional knowledge is circumscribed among the people of age group of 60 and above. Some exceptions were noticed among the people of age group 40-55 in some islands. It is noticed that the men are dominating in the traditional healing practices than the women. It is noted that the young generation of the islanders has very negligible knowledge of traditional healing practices. Most of the conventional practitioners are no more to share the ability with the younger generation. The study reveals that there is massive destruction of natural vegetation in the islands due to anthropogenic activities. Soil erosion is also very high in islands, which leads to the decline of coastal vegetation.

Keywords: Amindivi, Ethnomedicine, Laccadives, Traditional Knowledge

1. Introduction

Lakshadweep, India's smallest union territory, is an archipelago consisting of 36 islands with 32 km² and located between 8°-12° 13' North latitude and 71°-74° 00' East longitude, 220 to 440 km away from the coastal city of Kochi, Kerala, India (Fig. 1). This uni-district union territory comprises of 17 atolls, 3 reefs, 6 submerged banks and 10 inhabited islands. The Lakshadweep comprises the most extensive coral reef and atoll system in the Indian Ocean and the largest atoll system in the world (Anonymous, 2012). The vegetation is typical of Indo-Pacific atoll coral island flora. There is no declared forest in Lakshadweep, but 80% of its landmass is covered by green vegetation, mainly with coconut trees (Rao and Ellis, 1995). As per the 2011 census, the inhabited islands had a total population of 64,429 and population density is 2013 person per km² (Anonymous, 2011). 'Lakshadweep' earlier known as 'Laccadives and Amini Islands' has more than 93% of Muslims' indigenous

population. A dialect of Malayalam called '*Jessry*' is spoken in all the islands except Minicoy, where people talk '*Mahal*', written in '*Divehi*' script. The main occupation of the people is fishing and coconut cultivation. The entire ethnic population of Lakshadweep is classified as Scheduled Tribes because of socio-economic backwardness and geographical isolation (Mannadiar, 1977).



Fig. 1. Location of study area (Source: www.lakshadweep.nic.in)

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Analysis of *Morinda citrifolia L*. from Different Habitats of Kannur District, Kerala, India

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ABSTRACT

Morinda citrifolia L. is a medicinally significant small evergreen tree belongs to the family Rubiaceae. Samples from ecotype scollected from selected places of Kannur district of Kerala were compared for their morphological, anatomical and phytochemical parameters. The morphological features of leaves, fruits and seeds were studied with 13 characters. The anatomical studies of the leaf and petiole were also done. The soil was analysed for pH, T.S.S EC, Organic Carbon, Phosphorus, Potassium, Manganese, Sulfur, Iron, Zinc, Copper and Boron. GCMS analysis was also done. The present studies shown variations in response to various environmental conditions and in plant profile based on different habitats. Collection of plants for medicinal purposes without knowing the precise nature of habitats may leads to negative effects. So the ecotype and habitat studyof this plant isverycritical. The present attempt is to study such profiles of *Morinda citrifolia* L. Nowadays various developmental activities leading to serious soil and air pollutioncauses the degradation of natural habitats. Water stress and soil nutrient variation also creates stress for the plant.

Key words- Ecotype, GCMS, phenolics, proline, stomatal index.

INTRODUCTION

*Morinda citrifolia*L. known as Indian Noni or Indian mulberry on Indian subcontinent, mengkudu in Malaysia ;nhau in South east Asia, painkiller bush in the Caribbean or cheese fruit in Australia[7],[10], [13], [3]. Morinda is a small evergreen tree belongs to the family Rubiaceae. The name Morinda is derived from latin words *Morus* means Mulberry and *indicus* means Indian referring similarity of fruit to mulberry, *Morusindica*. The genus is represented by more than 80 species [6]. The plant is a native from South Asian Asia to Australia and now has a pantropical distribution.

Noni have antibacterial, antifungal, analgesic, hypotensive, anti-inflammatory and immune enhancing effects[6], [13], [5]. Noni has analgesic, anti-inflammatory, ant hypersensitive, immune enhancing, anticancer, antibacterial, antiviral, antifungal, antituberculous, antiprotozoal, antioxidant, anti-stress and sedative properties and also effective in cough, nausea, colic, enlarged spleen, joint disorders such as gout and arthritis, senility, poor digestion, arthrosclerosis and drug addiction. Noni also has cancer preventive effect [9]. Different phytochemical constituents have been found in the leaves, stem, flowers, and fruits of the Noni plant. The fruit has detoxifier that removes toxins from body. It has more than 150 nutraceuticals in Noni fruits. The major compounds found in Noni plant involve scopoletin, octoanoic acid, potassium, vitamin C, terpenoids, alkaloids, anthraquinones, b-sitosterol, carotene, vitamin A etc. *M. citrifolia* tolerates a wide range of soil and environmental conditions, with great ability to survive in harsh environments. The present study is a preliminaryeffort to screen the morphological, anatomical, phytochemical characters of *M. citrifolia* growing in four entirely different habitats.

MATERIALS AND METHODS

For the present study four different areas were selected from Kannur district of Kerala which are having different habitat texture. Edakkepuram and Mottammal of Kannapuram village panchayath, Payyambalam of Kannur corporationand Payynnur of Payyanur Municipality were selected for the present study. The altitudes of these areas are 9m, 2m, 2m and 13m respectively. Plants and soil samples were collected from these identified areas. The study areas were cited as Site1-Edakkepuram, Site 2-Mottammal, Site 3-Payyambalam and Site 4-Payynnur. Among these Site - 1 is an area located near a water body, Site- 2 is a dry water stressed area, Site - 3 is a saline prone coastal area and Site- 4 is characterized by latarite

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STUDY OF THE EPIPHYTIC ALGAE FROM PNEUMATOPHORES OF AVICENNIA OFFICINALIS L

¹Sreeja.P, ²Aswini.P.V and ³Chandramohanan. K.T

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ABSTRACT

Kerala supports many wetlands of International and National importance. These supports rich mangroves along the coastal zones . Kannur district of Kerala support about 14 speciesof true mangroves ,of which Avicennia officinalis was of maximum occurrence. Avicennia officinalis has a wide geographical distribution with wide numbers found in inter tidal estuaries along many of the worlds tropical and warm temperate coasts. Members of Avicennia have pneumatophores, that project above the mud to facilitate gas exchange for the submerged primary root. The exposed part contain large number of small openings, exposed in air. The water inundated portion and freely exposed portion support rich amount of algae. The present study was carried out in the Kunjimangalam and Valapattanam wetlands of Kannur districts of Kerala during the period of November to March 2019. Quadrant of size 25x25cm² where sampled at different locations of the selected two sites mentioned above randomly. The pneumatophores of Avicennia have been found to support a rich flora of algae and other micro organisms. 15 species of algae belongs to various classes isolated The biomass of algae on pneumatophores were entirely different in the two sites. The comparison of pneumatophore density at the two sites indicate that, Kunchimangalam region have favorable condition for the abundant growth of pneumatophore, supports high density of algae while compared to the most polluted Valapatanam site. This study signifies the role of mangroves in supporting rich biodiversity and the presence of algae also help to add the carbon sequestering power of mangroves.

INDEX TERMS – Mangrove, Pneumatophore.

1. INTRODUCTION

Wetland system directly or indirectly support thousands of people providing goods and services to them. However urbanization, development activities and mushrooming of residential complexes have fragmented the continuity of the wetland and destroyed its vegetation. Though there were no quantitative estimate on the rate of destruction of wetland in Kerala, the qualitative degradation of ecosystem is more or less, well understood. The major issue facing the wetlands are mainly related to pollution, eutrophication, encroachment, reclamation, mining and biodiversity loss. Algae are diverse water plants that can vary in size, colour, and shape. The unique wetland ecosystem of Kerala include marshy and water logged areas ,vast areas associated with back waters , lakes and the *Myristica* swamps in the western Ghats . Kerala contain a few wetlands of International or National importance. The wetlands of Kerala especially those in Kannur District support rich diversity of Mangroves. Radhakrishnan, et al (2006) reported the presence of about 172 birds, 110 fishes, 13 mammals and several invertebrates from the mangroves of Kannur district, Chemballikund wetland in the Kunhimangalam Grama panchayat characterized by large stretch of mangrove.

Of the reported 14 species, *Avicennia* was abundant and significant. Avicennia has a wide geographical distribution with wide numbers found in inter tidal estuaries along many of the worlds tropical and warm temperate coasts. Members of *Avicennia* have pneumatophores (respiratory roots), that project above the mud to facilitate gas exchange for the submerged primary root. The exposed part contain large number of

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Phytochemical evaluation of *Amorphophallus smithsonianus* Sivad.: A rare endemic species from Western Ghats, Kerala, India

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Amorphophallus smithsonianus Sivad. Phytochemical Antioxidant Antibacterial DPPH Radical scavenging

Abstract

Amorphophallus smithsonianaus Sivad., a rare endemic species of the family Araceae from Western Ghats, Kerala, India has been evaluated for its phytochemicals, antioxidant potential and antibacterial properties. Morphological description of the species is also provided. For phytochemical screening, tuber was extracted in hexane, methanol and water. Preliminary phytochemical analysis revealed the presence of secondary metabolites such as reducing sugar, phenols, tannins, flavonoids, phytotannins, terpenoids, saponins, fats, oils, *etc.*, in different extracts of the tuber. Out of three extracts, methanolic extracts of *A. smithsonianus* exhibited more phytochemicals. The tuber extracts exhibited antioxidant potential through DPPH radical scavenging assay and nitric oxide radical scavenging assay. The tuber extract of *A. smithsonianus* different extracts showed antibacterial property against the selected five pathogenic bacterial strains. The study suggests that the tuber of *A. smithsonianus* has good potential as a natural source of antioxidant.

1. Introduction

The genus *Amorphophallus smithsonianus* Sivad. is a member of the family Araceae, a natural group of monocotyledons with approximately 120 genera and 3800 species (Cusimano *et al.*, 2011). The genus *Amorphophallus* with 200 species is the most diverse in the family with respect to its vegetative and reproductive characters such as habit, leaf morphology, inflorescence and most other characters that have been studied (Van der Ham *et al.*, 2005). The species has been grouped together mainly on the basis of the distinctive inflorescences (Grayum, 1984). *Amorphophallus* is the second largest genera of the family Araceae in India (Jaleel *et al.*, 2011). The genus *Amorphophallus* Blume *ex* Decne. is distributed in tropical Africa, Madagascar, India, Continental South East Asia, Malesia and North East Australia (Mayo *et al.*, 1997).

The genus *Amorphophallus* exhibits lot of variation in vegetative as well as reproductive characters. The morphological similarity in the leaves of many species makes identification of the species with vegetative specimens difficult or impossible as the plant can be seen only either during vegetative stage or during flowering stage. Most of the time, the corms remain under the soil and it became impossible to identify and collect the plants. The plants

Corresponding author: Dr. A. K. Abdussalam Assistant Professor, Department of Post Graduate Studies and Research in Botany, Sir Syed College, Karimbam P.O., Taliparamba-670142, Kannur, Kerala, India E-mail: salamkoduvally@gmail.com Tel.: +91-9847654285

Copyright © 2020 Ukaaz Publications. All rights reserved. Email: ukaaz@yahoo.com; Website: www.ukaazpublications.com flower usually before leaves come out, so collection of both inflorescence and leaves together is impossible in the genus. The flowering period is very short, once the vegetative period over, the plant loses their leaves leaving an underground corm which makes the detection and collection of the plant very difficult. Many species of *Amorphophallus* are endemic to particular area. In India, the genus is represented by 20 species (Jaleel *et al.*, 2011), with the addition of a new species *A. shyamsalilianum* (Gadpayale, 2017) from Maharashtra. The number of species in the genus increased to 21 in the country. All the wild relatives of *Amorphophallus* except *A. paeoniifolius* are rare and are sparsely distributed (Jaleel *et al.*, 2011). *A. smithsonianus* is a rare member of the aroid family, with limited population, strictly endemic to Agastyamalai hill ranges of Western Ghats, Thiruvanathapuram District, Kerala, India.

Species of the genus *Amorphophallus* are known to have a long history of use in tropical and subtropical Asia as a source of food, fodder and as traditional medicines for centuries and is a major ingredient in several herbal preparations (Hetterschied and Ittenback, 1996). *A. paeoniifolius* var. *campanulatus*, widely known as elephant foot yam is cultivated and used as vegetable. The tuberous corms of *Amorphophallus* are reported to be used for treatment of piles, cysts, and tumors (Ravikumar and Ved, 2004), cure for snake bite by tribals in some villages of Rajasthan, India (Jain *et al.*, 2005; Kavitha *et al.*, 2011), acute rheumatism, boils, abdominal tumors, enlargement of spleen and asthma (Yusuf *et al.*, 1994). Tubers also serve as tonic, detoxifying agent, appetizer, gastro protective ability, antioxidative, antidiarrheal and anti-inflammatory activity (Singh and Wadhwa, 2014).

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Naturally-occurring cholesterol analogues in lipid nanoparticles induce polymorphic shape and enhance intracellular delivery of mRNA

OPEN

Siddharth Patel¹, N. Ashwanikumar¹) Ema Robinson¹, Yan Xia², Cosmin Mihai², Joseph P. Griffith III³, Shangguo Hou ³, Adam A. Esposito², Tatiana Ketova², Kevin Welsher ³, John L. Joyal², Örn Almarsson² & Gaurav Sahay^{1,4*}

Endosomal sequestration of lipid-based nanoparticles (LNPs) remains a formidable barrier to delivery. Herein, structure-activity analysis of cholesterol analogues reveals that incorporation of C-24 alkyl phytosterols into LNPs (eLNPs) enhances gene transfection and the length of alkyl tail, flexibility of sterol ring and polarity due to -OH group is required to maintain high transfection. Cryo-TEM displays a polyhedral shape for eLNPs compared to spherical LNPs, while x-ray scattering shows little disparity in internal structure. eLNPs exhibit higher cellular uptake and retention, potentially leading to a steady release from the endosomes over time. 3D single-particle tracking shows enhanced intracellular diffusivity of eLNPs relative to LNPs, suggesting eLNP traffic to productive pathways for escape. Our findings show the importance of cholesterol in subcellular transport of LNPs carrying mRNA and emphasize the need for greater insights into surface composition and structural properties of nanoparticles, and their subcellular interactions which enable designs to improve endosomal escape.

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ENVIRONMENTAL COMMUNICATION-A

Synthesis Characterisation and Application of Copper Complexes with N-(4-pyridyl) isonicotinamide.

Reena¹, Dr. Biju.A.R²

¹Assistant Professor in Chemistry, PRNSS College, Mattanur; ²Assistant Professor in Chemistry, Sir Syed College, Taliparamba;

Abstract : Two complexes of copper with N-(4-pyridyl-) Isonicotinamide was prepared by solvent based synthesis method. Their structure were identified by various spectrioscopic method. Their antimicrobial and catalytic activities are verified.

Key word - Isonicotinamide, Antimicrobial properties, MIC analysis, Photocatalyst.

I. INTRODUCTION

Nicotinic acid and its derivatives are excelent biological chelating ligands which posses N, S, and O donor atoms that can coordinate with metal atoms to form coordination complexes. Metal complexes of these ligands show many important biological activities such as antibacterial, antifungal, antiviral, antitumor, anti-inflammatory etc. and are also found to be pharmacologically and physiologically active. Many such metal complexes of nicotinic acid and its derivatives have supramolecular association i.e. 3D framework structure via hydrogen or covalent bonds. Pyridine derivatives possess a diverse array of bioactivities as well as playing crucial roles for physiological functions¹⁻⁴. They have been extensively used as ligands in the formation of coordination compounds as medicinal agent⁵. Isonicotinamide is a versatile reagent in crystal engineering for the synthesis of binary crystals with hydrogen bond donor groups (carboxylic acid, phenol)⁶ and coordination compounds with silver salts (AgBF₄, AgPF₆, AgO₃-SCF₃)⁷. In the present work we prepare two binuclear complexes of copper. Application of the complexes were also studied.

II. EXPERIMENTAL

A. Synthesis of N-(4-Pyridyl)Isonicotinamide

1.4028g/6.8mmol DCC (NN'-Dicyclohexyl Carbodiimide) and 0.8248g/6.7mmol 4-Pyridine carboxylic acid are added to 30ml of ethyl acetate and stirred for 30minutes. The mixture was added gradually to cold solution of 0.6306g/6.7mmol 4-Aminopyridine in 30ml of ethyl acetate and stirred for 24hours at room temperature. Resultant solution was filtered and kept in cold condition. White crystals of N-(4-Pyridyl)Isonicotinamide abbreviated as **4-pina** was started to separate within three days. Crystals are purified by washing with methanol.

B. Synthesis of [Cu₂ (4-pina) (Py)₄ (ClO₄)₄ (H₂O)₂] 4Py 6H₂O

0.1000gm/0.5mmol of 4-pina was dissolved in 10ml of methanol. 0.3164ml/4mmol of pyridine was dissolved in it. 0.370gm/1mmol CuClO₄ was dissolved in minimum amount of methanol. Ligand solution was added slowly to CuClO₄ solution which is kept undisturbed. Dark blue crystals were formed slowly.

C. Synthesis of [Cu₂ (4-pina) (Bpy)₂ (ClO₄)₄ (H₂O)₂] 2Bpy 6H₂O

0.1000 gm/0.5 mmol 4-pina was dissolved in 10ml of methanol. 0.3124 gm/2 mmol bipyridine was dissolved in it. 0.370 gm/1 mmol CuClO₄ was dissolved in minimum amount of methanol. Ligand solution was added slowly to CuClO₄ solution which is kept undisturbed. Light blue crystals were formed slowly.

Characterisation of the complexes was done by various spectroscopic analysis. Its antimicrobial and catalytic properties are studied.

III. RESULTS AND DISCUSSION

A. General properties

General properties include Physical and analytical data, molar conductivity value, and the solubility. The color and other physical properties are listed in table 1, the elemental analysis results are given in table. 2 and molar conductivity value were given in table 3. Elemental analysis and molar conductivity value indicates the stochiometry of the complexes. The complexes are highly soluble in DMSO and DMF and slightly soluble in methanol.

Ligand/ Complex	Color	Mol.Wt	M.P(°C)	Yield (%)
Ligand – 4-pina	White crystals	199	280°C	20
[Cu ₂ (4-pina) (Py) ₄ (ClO ₄) ₄ (H ₂ O) ₂] 4Py 6H ₂ O	yellow	1498.88	220°C	65.30
[Cu ₂ (4-pina) (Bpy) ₂ (ClO ₄) ₄ (H ₂ O) ₂] 2Bpy 6H ₂ O	yellow	1491.892	250°C	68.26

Table.1. Physical and analytical data of the ligand and complexes

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A critical evaluation on banking reforms in India in terms of e-banking

Shameel K

Assistant Professor, PG Department of Commerce, Sir Syed College, Taliparambau, Kannur.

Abstract

Banking sector has always been relying on Information Technology to process and deliver its services to the relevant stakeholders. The contemporary banking sector in India is fiercely competitive than ever before, making it extremely important for every players to achieve and maintain its competitive edge. For this, most banks have taken steps to improve their banking systems by seizing the growing opportunities of information technology. The most recent two developments in banking sector include the internet banking (e-banking) and mobile banking (m-banking). With the development of e-banking, majority of the Indian banks have developed online banking and mobile banking platforms for its customers to get most of their regular banking services. Though various researches have been conducted in the field of online and mobile banking, it is imperative to investigate how these banking developments have contributed to the economic growth and reforms in India. This paper will critically evaluate the banking developments in terms of e-banking adoption in recent years, and to investigate its future perspectives in terms of security issues associated with e-banking services.

Key words: E-banking, ATMs, M-banking, Banking Reforms, online banking in India, Mobile banking.

Introduction

Internet and mobile technologies have great potential for tremendously changing the banks and the banking industry. The opportunities which the e-banking and m-banking technologies offer to the banking sector have in turn transformed the way banks do their businesses. Rapid advances in information technology provided banking sector with numerous advances such as ATM, Tele-banking, internet banking, and mobile banking and so on. Almost all banks in India are now reaping the advantages of Core Banking Solutions (CBS) linked to internet and mobile banking, which in turn facilitated anywhere banking, NEFT (National Electronic Funds Transfer) RTGS (Real-Time Gross-Settlement) and many other advanced banking services.



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Attitude of Higher Secondary Students towards Inclusion of Entrepreneurship Education In School Curriculum With Special Reference To Kannur Districts Of Kerala State.

(**Dr. G. Kanagavalli**, Assistant professor, Department of Commerce, Alagappa University, Karaikudi. **Ramseena Azeez**, Assistant Professor, P.G Department of Commerce, Sir Syed College, Taliparamba, Kannur & Research Scholar, Department of Commerce, Alagappa University, Karaikudi.)

Abstract

Entrepreneurship is a creative process in which resources are organised and used in a venture that satisfies both personal needs or wants and the needs and wants of others. Youth of a country is regarded as the most vibrant and talented source of human resource. A transition is therefore inevitable during that age which determines their career. The introduction of entrepreneurship in universities and colleges and also higher secondary schools are much needed in our country than ever before. In Kerala, entrepreneurship education is already included in the syllabus of graduate students. This further contributed to more young entrepreneurs. As an extension Government of Kerala is about to set forth the inclusion of entrepreneurship education in school curriculum. The state Government had offered a number of incentives to college students wanting to set up business enterprises. From the study it is revealed that students are very eager towards inclusion of entrepreneurship education in school curriculum is chool curriculum as they think this will be a better way for rethinking about traditional career options. The study titled "A study on attitude of higher secondary students towards inclusion of entrepreneurship in curriculum", identifies the attitudes of students who are in a dilemma regarding their career.

Key words: Entrepreneurship, Entrepreneur, Student Entrepreneurship.

1. INTRODUCTION

Entrepreneurship refers to the process of creating a new enterprise and bearing any of its risks, with the view of making profit. The term entrepreneurship is derived from the French word 'Entreprendre' which means 'to undertake', 'to pursue opportunities' or ' to fulfil needs and wants through innovation and starring business'. The word first appeared in French dictionary in 1723. So entrepreneurship is as old as human history. According to Robert.D.Hisrich and Michael P.Peter "entrepreneurship is the process of creating something new with value by devoting the necessary time and effort, assuming the accompanying financial, psychic and social risks and receiving the resulting rewards of monetary and personal satisfaction and independence."



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Role of Additional Skill Acquisition Programme (ASAP) in Life skill development of students with special reference to Tagore GHSS Skill Development Centre, Taliparamba, Kannur District, Kerala

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Abstract

Skills help to attain the goals of individuals. Life skills promote the mental and social wellbeing. It is necessary to acquire skills in the modern world to survive in the competitive world. ASAP is a skill development progarmme initiated by the Govt. Kerala to reduce unemployment among the youth by providing specialized training to higher secondary and graduate level students.. The study aims to identify the role of Additional Skill Acquisition Programme in promoting the life skills of students enrolled for the programme. Sampling method is to be used for the study. 80 samples were selected and questionnaire is used for collection of primary data. The study focuses on the important life skills that are acquired by the students to identify the most imbibing skills and least acquired skills and to give suggestions based on that.

The present study will throw light on the area of role performing by the ASAP course in the life skill development of the students. Also it analyses the relation between attitude of the trainers towards the students and satisfaction level of the students on the courses.

Key words: Additional skill acquisition progamme, Skill Development, Life skills.

Introduction

Skills that help the human beings to promote mental and social wellbeing is life skills. Life skills help the students to compete for stability, wellness and success in life. Additional Skill Acquisition Programme (ASAP) is an initiative by the Government of Kerala to impart skill training to students of higher secondary and graduate level. Under ASAP, training is given to the areas such as Information Technology. Communication, industry and service sector along with imparting training in life skills, soft skills and analytical skill. It is a joint effort of General Education Department, Higher education Department and Labor & local self-governments departments of Kerala. There are 121-skill development centre's and 82 skill courses are providing under the programme. All the courses consider the skills for meeting career opportunities. The students enrolling for the course has to undergo 300 hours of training, of which 180 hours of soft and life skill sessions. Through continuous and systematic monitoring, the SDE's (Skill developments Executives) or mentors ensure acquisition of skills by the students. Here quality monitoring is a routine process and feedback is collected from students to identify the progress.

Objectives Of the study

- 1. To identify the life skills acquired from training programmes provided by ASAP
- 2. To analyze the impact of Additional Skill Acquisition Programme on life skill development of students.



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Short Communication

First record of the species *Asota paliura* (Swinhoe, 1893) (Lepidoptera: Erebidae: Aganinae) from India

Ramya Rajan^{1*}, R.S.M. Shamsudeen^{1,2}

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(Received: May 15, 2020; Revised: August 10, 2020; Accepted: September 13, 2020)

ABSTRACT

Asota paliura (Swinhoe, 1893) is reported as new record for Indian moth fauna from Kerala. This study was carried out to study the diversity of moth fauna of Malabar region of kerala. During this study we have identified the species *A. Paliura*, which is reporting first time from India. The taxonomical analysis of *A. Paliura* was done based on both morphological and genetic cytochrome oxidase I (COI) data. Male and Female genitalia of the species are illustrated. Geographic distributions of this species in Kerala are also provided.

Key words: Asota paliura, new record, Kerala, genitalia, barcoding

INTRODUCTION

The genus Asota belongs to the subfamily Aganinae of the Family Erebidae. The genus comprises of 51 species in worldwide (Zwier, 2008; Bayarsaikhan et al., 2016). Eight Asota species have been reported so far from India. Genus Asota are large in size and colourful in nature. Forewing yellow, brown and dark brown, with spot, wedge and elongated patch; hindwing yellow, orange, and white, with spot and bands. The species belonging to this genus possess distinguishable characters like - small oval orange yellow patch of scent scales anterior to the center of the hindwing sub costal on the upper side and the antennae fasciculate in males but antennae is ciliated in females (Holloway, 1982). The vein 5 of forewing emerges from the lower angle of cell or marginally above from it. The 6thveins unfold from the top angle or lower than it. Hind wing occupy vein 5 from just above lower angle of cells. Vein 6 and 7 emanate from the upper angle.

The species *Asota paliura* was reported from China and Thailand by Gunther *et al.*, in 1893.There is no report that points the presence of this species in India till date. This discovery thus represents a new record from India.

MATERIALS AND METHODS

This study was done from some of the selective places of Malabar region of Kerala. Sampling was carried out from the collection sites using battery operated light traps specially fitted with switching device to facilitate automatic operation at specified hours (Mathew and Rahamathulla, 1995; Mathew *et al*, 2018). The timer was set such that the UV tube in the traps will be switched on at 6.30 pm and off at 10.30 pm, ensuring that the trap will be operated for a constant period of 4 hours thereby facilitating uniform sampling, each time the trap will be operated. For this, a sheet measuring 70cm \times 55cm was fixed in such a way that the bottom

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anchored with stones. An 18-watt CFL (Compact Fluorescent Lamp) powered by a 12 watt car battery was used as the light source. The moths which rest over the white sheet was collected and freezed in a chiller for about 12 to 14 hours. (Shamsudeen et al., 2005). The dead specimens were set; wings were spread and kept in the oven (set at 45°c) for drying. They were processed as per standard techniques. The dried specimen was labeled and stored in collection boxes. Permanent slides of wings were prepared for studying the wing venation. The method given by Lindquist (1956), Common (1970), Zimmerman (1978), and Landry and Landry (1994) were followed for the preparation of permanent slides of fore and hind wings. The methodology given by Robinson (1976) has been followed for the study of external male and female genitalia. The genital photographs were taken with the help of OLYMPUS SZ61Stereomicroscope attached with Magnus MIPS 10MP camera.

The sequencing of the mitochondrial gene, Cytochrome C Oxidase subunit 1 (COI), was carried out. DNA was isolated from the legs. Electrophoresed the DNA in 1% Agarose and visualized under UV light.COI region was PCR amplified with specific primers and amplicon was checked for appropriate size by agarose gel visualization. Amplicon was gel purified using commercial column based purification kit (Invitrogen, USA) and Sequencing was performed with forward and reverse primers in ABI 3730 XL cycle Sequencer. Forward and reverse sequences were assembled and contig was generated after trimming the low quality bases. Sequence analysis was performed using online tool BLAST of National Center for Biotechnology Information database and based on maximum identity score E value top most sequences was utilized for multiple sequence alignment (Clustal W2) and dendrogram was constructed. Further analysis was done using MEGA 7.The sequences were submitted to National Center for Biotechnology for Genbank Accessions.



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Cd²⁺ influences metabolism and elemental distribution in roots of *Acanthus ilicifolius* L.

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ABSTRACT

Effect of cadmium (Cd) on the primary metabolic activities and elemental distribution in roots was explored in *Acanthus ilicifolius* L, a halophyte with phytostabilization potential. The rate of photosynthesis decreased in the $CdCl_2$ treated plants and this reduction was mainly attributed to the reduction of leaf area, photosynthetic pigments, impaired gaseous exchange caused by the stomatal closure and tissue water status. However, respiration rate was significantly higher in the $CdCl_2$ treated plants which aid the plant with additional energy required for the metabolic activities. Distribution of essential elements in the roots exhibited significant differences from that of control, which indicate the nutritional adaptation developed by *A. ilicifolius* under the influence of toxic metal ions. Thus, Cd toxicity is neutralized through the resource allocation from the growth process to processes that increase the fitness of the plant to encounter adverse environmental condition. In addition, the absorbed Cd is retained in the cortical cells of root thereby preventing the upward movement to shoot thereby making the plant a potential candidate for phytostabilization of Cd.

KEYWORDS

Acanthus ilicifolius; cadmium; chlorophyll; osmotic potential; photosynthesis; phytostabilization

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Introduction

Environmental pollution with toxic heavy metals like cadmium (Cd), lead (Pb), zinc (Zn), mercury (Hg), etc. invites great deal of attention nowadays because of the fact that our principal natural resources like air and water are getting more and more contaminated (Liphadzi et al. 2005). Pollution of water bodies turns out to be very serious since it leads ultimately to the contamination of groundwater resources and is much more difficult to decontaminate these water bodies as chemical treatment may turn the water unfit for living organisms. Wetlands act as a major sink and source for heavy metal pollution since the polluted leachate from the land carrying several toxic ions reaches to this ecosystem (Weis and Weis 2004). Due to the peculiar edaphic features of wetland sediments, these toxic metal ions get deposited over there and finally reach to the water bodies causing a threat to the living system through the food chain.

Remediation of polluted wetlands is a difficult task since this ecosystem is biodiversity-rich, consisting of several endangered and threatened species. Owing to the fact that the physical or chemical removal of contaminants may harm the wetlands ecosystems, a green, environmentally friendly and low-cost technique namely phytoremediation has been accepted worldwide. Out of the several phytoremediation techniques, phytostabilization (immobilization) represent a prime one since it is used for the remediation of soil, sediment, sludge. This technique uses certain plant species to immobilize contaminants present in the soil and ground-water through absorption and accumulation by roots, adsorption onto roots or precipitation within the root zone of plants (rhizosphere) (USEPA 2000). This process reduces the mobility of contaminants in sediments thereby preventing the migration of metal ions to groundwater and thus reduces the movement of metal into the food chain. Numerous studies were carried out to study the ecophysiology of the wetlands with special emphasis to heavy metal pollution (Kadouche *et al.* 2012; Demim *et al.* 2013a; 2013b; 2014; Song *et al.* 2017).

In this scenario, several researchers have focused their studies on identifying potential halophyte candidates for remediating the polluted wetlands, *i.e.*, *Phragmites australis* (Weis and Weis 2004), *Atriplex halimus* (Nedjimi and Daoud 2009), *Kandelia obovata* (Liu *et al.* 2014), *Avicennia marina* (MacFarlane *et al.* 2003; Chaudhuri *et al.* 2014), etc. Recently, our group has reported a new potential halophyte, *Acanthus ilicifolius* for phytostabilizing Cd and Zn (Shackira and Puthur 2017, Shackira *et al.* 2017). It is a major halophyte abundantly distributed in the wetlands throughout the world and despite its abundance, only few works have been carried out in this context. Elucidation of the adaptive responses exhibited by *A. ilicifolius* towards Cd detoxification will shed light towards how halophytes are

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Review



Advances in intracellular delivery through supramolecular self-assembly of oligonucleotides and peptides

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Abstract

Cells utilize natural supramolecular assemblies to maintain homeostasis and biological functions. Naturally inspired modular assembly of biomaterials are now being exploited for understanding or manipulating cell biology for treatment, diagnosis, and detection of diseases. Supramolecular biomaterials, in particular peptides and oligonucleotides, can be precisely tuned to have diverse structural, mechanical, physicochemical and biological properties. These merits of oligonucleotides and peptides as building blocks have given rise to the evolution of numerous nucleic acid- and peptide-based self-assembling nanomaterials for various medical applications, including drug delivery, tissue engineering, regenerative medicine, and immunotherapy. In this review, we provide an extensive overview of the intracellular delivery approaches using supramolecular self-assembly of DNA, RNA, and peptides. Furthermore, we discuss the current challenges related to subcellular delivery and provide future perspectives of the application of supramolecular biomaterials for intracellular delivery in theranostics.

Key words: Self-assembly, Intracellular delivery, Oligonucleotide, Peptide

1. Introduction

Nature relies on the supramolecular assembly of nucleic acids, proteins, lipids to maintain cellular homeostasis and functions [1]. Supramolecular assembly is spontaneous organization of molecules to a unique structure via noncovalent interactions, such as hydrogen bonding, hydrophobic, electrostatic interactions, van der Waals forces, and π-π stacking [2]. The simplicity through which complex structures can be built using fundamental molecules confers elegant architectures within the cells. These biological supramolecular assemblies are involved in a variety functions in living organisms, such as compartmentalization of environments, transport and of molecules, and interactions release and with communications of cells extracellular compartments [3]. Cellular membrane, which is a

supramolecular organization of phospholipids, separates the cell interior from the extracellular compartments. Actin filaments, an assembly of actin protein essential in all eukarvotic cells, are present in cytoplasm and perform various functions; their assembly and disassembly, responding to intra- and extracellular stimuli, are involved in various cellular activities including cytokinesis, endocytosis and maintaining mechanical exocytosis, stability, providing shape and motility to cells, and so on. In the past decades, supramolecular assembly of actin monomer was of high interest. The changes in pH, presence of ATP and divalent cations, and salt concentrations result in the nucleation of actin and the formation of filament [4,5].

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An efficient green diversity oriented synthesis of pyrimidinone and indole appended macrocyclic peptidomimetics

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ABSTRACT

A concise protocol for the synthesis of pyrimidinone/indole functionalized hybrid peptide macrocycles with varying ring size is described. The precursors of the macrocycles were obtained from the post reaction modification of multicomponent reaction products and were cyclized via copper (I) catalyzed [3 + 2] azide-alkyne cycloaddition. The macrocycles showed excellent inhibitory property towards CDK2 protein which is responsible for a variety of cancers and were also showed excellent cytotoxicity against human breast cancer cell line MCF-7.

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Diversity oriented synthesis (DOS) is a problem solving technique for the development of drug-like molecules in minimum number of synthetic steps [1]. One of the methods to increase the drug-likeness of DOS libraries is the introduction of privileged scaffolds in lead molecules, where the privileged scaffolds play a major role in enhancing their biological activity [2]. Macrocycles are one of such interesting privileged scaffolds in medicinal chemistry due to their enormous potential as enzyme inhibitors [3]. Macrocycles usually have a rigid backbone structure capable to pre-organize for establishing an effective binding with therapeutic targets [4]. Macrocycles are widely distributed in nature and typical examples of such bioactive natural macrocycles include macrolides, ansamysins, bryostatins, epothilones, rapamycin, rifampicin, vancomycin and buruli toxins etc. [5]. However, the difficulties associated with their isolation and identification are the major challenges that restrict the use of natural macrocycles in drug discovery programmes. Hence the focus is now on their synthetic versions [6]. Synthetic macrocycles are relatively easy to access due to the availability of efficient macrocyclization tools such as various cross coupling reactions [7], ring closing metathesis [8], alkylations [9], macrolactonizations [10], macrolactamizations

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[11], multicomponent reactions (MCRs) [12,13], click chemistry etc. [14–16]. Among the various synthetic macrocycles, hybrid peptide macrocycles are particularly useful for a broad spectrum of therapeutic applications [17].

Hybrid peptide macrocycles are cyclic peptidomimetics in which their ring structure consists of a small peptide motif and one or more heterocyclic subunits such as oxazoles, oxazolines, isoxazolines, thiazoles, indoles, pyrimidine etc. as privileged subunits [18–21]. Despite the enormous potential of such hybrid peptide macrocycles in drug discovery, these class of molecules are underexploited and there remains enormous possibilities for the development of cost effective therapeutic agents based on them. In this context, herein we report the synthesis and cytotoxicity evaluation of a new series of hybrid peptide macrocycles functionalized with pyrimidinone or indole moieties as heterocyclic privileged subunits, based on a "Click with MCR" strategy as shown in Fig. 1 [22].

The indole alkyne **1a** was obtained from a base catalyzed reaction between propargyl bromide and 3-acetylindole as shown in Scheme 1. The alkyne functionalized 5-acetyl pyrimidinones were synthesized by following a Biginelli type cyclocondenzation of propargylated aromatic aldehyde, acetyl acetone and urea as shown in Scheme 1 [23]. The components were mixed in equimolar quantities and the reaction mixture was kept at 80 °C in an oil bath for 1 h. After 1 h, the viscous mass obtained was cooled to room temperature and the solid product obtained was stirred with water to obtain the alkynyl pyrimidinones **1b-d** in pure form [24].





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Clupeid fish hosts a *Peniculus* sp. (Pennellidae, Siphonostomatoida, Copepoda)—First report on new host and season dependent prevalence

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Abstract

Pennellid copepod *Peniculus fistula fistula* (Nordmann, 1832) (Synonym: *Peniculus fistula* Nordmann, 1832, Aphia ID: 745880), a worldwide distributed species, has been recovered from at least 19 teleost families. The present paper reports for the first time from the Malabar coast (South India), not only the existence of a new host family, Clupeidae, hosting this parasitic copepod species (*P. fistula fistula*) but also their season dependent hosting. A total of 123 marine fish species, belonging to 77 genera and 38 families surveyed along the Malabar coast, only the clupeid, *Anadontostoma chacunda* (Hamilton, 1822) was shown to be infected by this copepod species; all the recovered (copepod) parasites were invariably found attached at the mid portion of the caudal fin lobes and lying parallel to the host body, indicating the strict site-specific parasitisation. There is a discrete seasonality in the prevalence (*P*<0.05) as the sign of infection was noticed during the period from September to May with relatively high prevalence during winter months (November-January). During the monsoon months (June-August), the host fish was found completely free from *Peniculus* infection. Interestingly, all the 229 recovered specimes (*P. fistula fistula*) were gravid females having paired uniserrate egg sacs with the length more than its own body length.

Key words: clupeid fish, Peniculus fistula fistula, host specificity, seasonality, prevalence

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1 Introduction

Copepods are known to be one of the most recognized crustaceans that parasitize on fishes. More than 2 000 species of copepods are known to infect the marine and the freshwater fishes. They are found all over the external body surface of the host as well as in more sheltered microhabitats (Arnal and Morand, 2001; Nagasawa, 2015; Youssef et al., 2016; Abdel-Gaber et al., 2017). These parasitic copepods draw considerable attention of researchers worldwide, on account of their economical, ecological and evolutionary impacts (Bunkley-Williams and Williams, 2009). Pennellidae, one of the major families of parasitic copepods, comprises 140 species belonging to 20 genera and most of them appears to be mesoparasites of marine fishes and aquatic mammals (Boxshall and Halsey, 2004; Ho et al., 2007; Uyeno and Nagasawa, 2010; Ismail et al., 2013; Moon and Choi, 2014). Among them (Pennellidae) Peniculus forms the largest of all genera, comprising 14 valid species (Maran et al., 2012). Their members are highly transformed ectoparasites which generally prefer to infect the body surface and fin rays of actinopterygian fishes (Ismail et al., 2013; Moon and Choi, 2014). The fishes, Terapon jarbua (Terapontidae) and Daysciaena albida (Sciaenidae) from

Indian waters host P. teraponi and P. sciaenae respectively (Gnanamuthu, 1951). Peniculus ostraciontis was found to parasitize the fins of rock fish, Sebastes schlegeli (Sebastidae) along the Korean coast, humpback turretfish, Ostacion gibbosum (Ostraciidae) and Lactophrys sp. (Ostraciidae) along the Japan coast (Choi et al., 1996). Peniculus truncatus infects the dorsal fin of Korean rock fishes such as Sebastes schledge and S. oblongus (Maran et al., 2012). Peniculus minuticaudaeis shown to infect four species of Monocanthid fishes Stephanolepis cirrhifer, Thamnaconus modestus, Aluterus monoceros and Paramonocanthus japonicas and a Chaetodontid fish Roa modesta from Japan (Alexander, 1983; Okawachi et al., 2012). Peniculus fistula fistula von Nordmann, 1832 (Synonym-Peniculus fistula von Nordmann, 1832) which appears as more or less widely distributed parasitic copepod being recovered from at least 19 teleost families (Vidjak et al., 2008; Bunkley-Williams and Williams, 2009). However, surveying through the literature, not even a single report showing the instance of clupeid fish being parasitized by any species of Peniculus. It is at this context, the present paper reports for the first time from the Malabar coast (South India), not only the existence of a new host family, Clupeidae, host-

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Copepod crustaceans parasitizing marine fish of the Kerala coast, India

Веслоногие ракообразные, паразитирующие на рыбе прибрежья штата Керала, Индия

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KEY WORDS: parasitic copepod, Siphonostomatoida, Cyclopoida, fish, Kerala, India.

КЛЮЧЕВЫЕ СЛОВА: паразитические веслоногие ракообразные, сифоностоматоиды, циклопоиды, рыбы, Керала, Индия.

ABSTRACT: Copepods parasitizing marine fish were collected along the Cochin and Malabar coasts (Kerala, India) of the Indian Ocean from July 2013 through February 2019. One hundred species of copepods from 31 genera in eight families, were found living on 85 species fish represented 65 genera in 34 families. Copepods of the order Siphonostomatoida were the dominant parasites; they belonged to five families (Caligidae, Lernaeopodidae, Lernanthropidae, Pennellidae, and Pseudocycnidae), of which Caligidae and Lernanthropidae were the most diverse, comprising 29 species each (in eight and five genera, respectively). The genera Caligus and Lernanthropus, with 20 and 21 species, respectively, are the most diverse genera of siphonostomatoid copepods. All 26 species in nine genera of the poecilostome cyclopoids belong to the families Bomolochidae, Chondracanthidae and Ergasilidae. The great diversity of parasitic copepods living on fish suggests a need for a more thorough integrative study of the diversity, host specificity and ecology of these copepods, not only from fish along the Kerala coasts, but also along the other coasts of India.

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РЕЗЮМЕ: Копеподы, паразитирующие на морской рыбе, собирали в Индийском океане вдоль побережья Малабар и Кочин (штат Керала, Индия) с июля 2013 г. по февраль 2019 г. Выявлено сто видов копепод, относящихся к 31 роду восьми семейств, обитающих на 85 видах рыб, относящихся к 65 родами 34 семейств. Копеподы отряда Siphonostomatoida — преобладающие паразиты, относящиеся к пяти семействам: Caligidae, Lernaeopodidae, Lernanthropidae, Pennellidae и Pseudocycnidae. Ceмейства Caligidae и Lernanthropidae — наиболее разнообразные семейства, каждое из которых включает 29 видов и относящихся к восьми и пяти родам, соответственно. Роды Caligus и Lernanthropus, насчитывающие 20 и 21 видов — самые разнообразные рода сифоностоматоидных копепод. Все 26 видов девяти родов поецилостомовых циклопоид относятся к семействам Bomolochidae, Chondracanthidae и Ergasilidae. Большое разнообразие копепод, паразитирующих на рыбах, указывает на необходимость проведение тщательного комплексного исследования разнообразия, специфичности к хозяевам и экологии копепод не только вдоль побережья Кералы, но и у берегов других районов Индии.

Introduction

Marine fish host a great diversity of parasitic invertebrates, among which copepods are significant [Tripathi, 1960, 1962a,b; Silas, Ummerkutty, 1967; Kabata, 1985; Pillai, 1985]. However, a comprehensive account of this crustacean group along the coasts of India is still in its infancy despite the important initial work on parasitic copepods carried out before the mid-1980s. The first records of copepods parasitizing fish in Indi-

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Electrochemical, computational and adsorption studies of leaf and floral extracts of *Pogostemon quadrifolius* (Benth.) as corrosion inhibitor for mild steel in hydrochloric acid

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Keywords

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- ✓ Adsorption.

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Abstract

Pogostemon quadrifolius methanolic leaf extracts (POML) and floral extracts (POMF) have been investigated as corrosion inhibitors for mild steel in 1M hydrochloric acid.Corrosion rates were studied at 303K, 313K and 323K by weight loss method at varying inhibitor concentrations. Electrochemical impedance spectroscopy and potentiodynamic polarization techniques were used to study corrosion rate at 303 K in various inhibitor concentrations. Scanning electron microscopy (SEM), Fourier transform infrared spectroscopy (FT-IR) and adsorption studies were used to study the surface morphology and mechanism of corrosion inhibition. EIS data and weight loss data shows maximum inhibition efficiency 95.79 % & 96.5% respectively at 300 ppm inhibitor concentration at 303K for floral extracts and 85 % and 90.5 % for leaf extracts. Moreover floral extracts were found to be more efficient corrosion inhibitor than leaf extracts.To identify the contribution of major components in the inhibition potential of the extracts, computational calculations corresponding to (Z)-ethylidene-4, 6-dimethoxycoumaran-3one (EDC) and Geranyl vinyl ether (GVE) were carried out. Quantum chemical parameters well explain the effect of structural peculiarities on electron donating ability of EDC and GVE. The surface interaction of both floral and leaf extracts on mild steel was obeying Langmuir adsorption isotherm at all temperatures.

1. Introduction

Corrosion of metals is, though unavoidable, but a controllable process. The National Institute of Standards and Technology has estimated that the annual cost of corrosion in the US was in the range of \$9 billion to \$ 90 billion [1]. In most of the industrialized nations the cost of corrosion has been identified upto 3 -5% of the gross national product [2]. Metals and their alloys which are exposed to adverse conditions during various stages can accelerate degradation. In order to prevent corrosion, methods like water displacing products (oil or grease), water absorption products (silica gel) and dehumidification were employed previously, but they became insignificant due to high material cost for application and removal and high labour [3]. In acidic media, especially in oil and gas industries, the use of inhibitor was found to be the best approach for protecting metals against corrosion. The general corrosion rate may be extremely high and increase exponentially with increasing temperature and acid concentrations, in the absence of corrosion inhibitors [4].

Corrosion inhibitors execute inhibition by protecting the surface of metals either by merging with them or by reacting with the impurities in the environment which may cause pollution [5]. Corrosion inhibitors act in many ways; it may restrict the rate of the cathodic or anodic process by blocking the active sites on the metal surface or

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GC-MS ANALYSIS OF BIOACTIVE COMPONENTS ON THE FRUIT EXTRACTS OF *ARTOCARPUS HIRSUTUS* LAM.: A POTENTIAL WILD EDIBLE PLANT

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Keywords:

Artocarpus hirsutus, GC-MS, Bioactive compounds, NIST

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ABSTRACT: Wild fruits play a significant role in human nutrition, especially as sources of carbohydrates, proteins, vitamins, minerals, dietary fibers, and enormous medicinal potential. Local people in different parts of the country have learned to live on many wild edible fruits available around their localities. *Artocarpus hirsutus* Lam. is an important wild edible fruit plant belongs to the family Moraceae and is commonly known as Wild Jackfruit, Ayani, Aanjili, *etc.* The present study was to trace out the variations in the profile of bioactive compounds from petroleum ether and chloroform extracts of *Artocarpus hirsutus* (GC-MS). The identification of the bioactive components of the extracts was established by GC retention indices, by comparing their mass spectra with National Institute of Standards and Technology (NIST) data center. According to GC-MS spectral data, in petroleum ether extract five major compounds were identified. And in chloroform extract, seven major compounds were detected.

INTRODUCTION: Artocarpus hirsutus belongs to the family Moraceae, and this comprises 50 varieties of species. They are deciduous and evergreen tall tree grows up to 75 meters in height in southern regions of India. It is known by a variety of names such as Aani, Aini, Aini-maram, Anjili, and Anhili. Artocarpus hirsutus is an endemic tree species of the southern Western Ghats of peninsular India and Maharashtra Sahyadris, popularly known as wild jack tree in the Malabar Coast¹. According to Ahmedulla and Nair among the species in Artocarpus, A. hirsutus is the only endemic species. This tree is considered as the "keystone species"¹¹.

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The plant image is shown in **Fig. 1**. Many wild plants serve as alternatives to staple foods during period of food deficit and are valuable supplements for a nutritionally balanced diet ¹⁴. Wild fruits are generally used as raw or processed, which help to compensate for the day-to-day requirement of calories. Wild fruits play a significant role in human nutrition, especially as sources of carbohydrates, proteins, vitamins, minerals, dietary fiber and enormous medicinal potential ¹⁵.

Many wild plants, used by rural and tribal populations and contributing significantly to their livelihood and food security have escaped recognition and scientific inquiry ⁷. Plants are vital for the remedies as well as existence for human disease because they contain components of therapeutic value ⁵. Plants are a rich source of secondary metabolites with remarkable biological activities. The secondary metabolites are a significant source with a variety of structural arrangements and properties ¹⁰.

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Cytotoxic and Antimitotic Properties of Morinda citrifolia L. and Simarouba glauca Dc.

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*Abstract:*Medicinal plants have provided therapeutic agents for thousands of years and continue being a great source of novel pharmaceutical products. Cytotoxicity studies are useful initial step in determining the potential toxicity of a test substance, including plant extracts or biologically active compounds isolated from the plant. In the present study, the cytological effects of leaf extracts of nature's wonder herbs, *Morinda citrifolia* L. (Noni) and *Simaroubaglauca* Dc, (Lakshmitaru)were evaluated. The antimitotic activity of the test plant extract (crude, 1:1, 1:2 & 1:4 concentrations) was done by using *Alliumcepa* root tip meristematic cells and were scanned under microscope with 100 x magnifications.

The results revealed that the high amount of mito-depressive effect was shown in root tips treated with *S. glauca* leaf extract when compared to *M. citrifolia*. Mitotic index decreases along with an increase in concentration and duration of treatment. The percentage of abnormality was almost similar; however, metaphasic aberrations were more frequently occur in onion root tips treated with *M. citrifolia* and anaphase aberrations were predominant in root tips treated with *S. glauca* leaf extract. Chromosome stickiness, bridges, laggards, clumping, scattered metaphase, diagonal metaphase and anaphase, mis-orientation of chromosomes, nuclear lesions and unequal cytokinesis are the major cytotoxic effects observed. Results revealed that selected plants are promising source of antimitotic/anticancerous drug which can arrest the proliferation of cancer cells.

Index terms: Morinda citrifolia, Simarouba glauca, Mitoclastic, Cytotoxicity.

I. INTRODUCTION

Plant extracts is widely used for finding new and novel chemotherapeutics to treat cancer as well as viral and microbial infection. Plants and herbals as natural products were reported to have anti-cancer properties and even play an important role in the efficacy of chemotherapy [1].Cytotoxicity studies are useful, initial step in determining the potential toxicity of a test substance, so that it can serve as a gateway for the development of novel anticancer drugs. *Allium cepa* root tip meristems have been widely used for the evaluation of cytotoxicity, antimitotic activity and genotoxicity, where the roots grow in direct contact with the substance of interest enabling possible damage to the DNA of eukaryotes to be predicted. The genetic categories of different parameters analysed by this test system, includes mainly chromosomal aberration and mitotic index (MI). Chromosomal aberration is characterized by change in their total number of chromosome or in chromosome structure which occur as a result of exposure of chemical treatment to evaluate the different structural abnormalities. The cytotoxic level of test can be determined based on the increase or decrease in the level of mitotic index (MI). The cytotoxic level can be determined by the decreased rate of mitotic index [2] [3] [4]. Several investigators have used MI as an end point for the evaluation of genotoxicity of different chemical treatments. In the present study, extract of*Morinda citrifolia* L. (Noni) and *Simaroubaglauca* Dc. (Lakshmitaru) is analysed, for its cytotoxic as well as the antimitotic effects in *A. cepa* root meristem.

M. citrifolia is a medicinal plant belongs to the family Rubiaceae is of South Asian origin, with traditional medicinal uses and most commonly known by the name "*Noni*" or the "*The Indian mulberry*" [5]. Noni is noted for its extremely wide range of environmental tolerances. The Polynesians utilized the whole noni plant in various combinations for herbal remedies [6] [7]. Noni also reported to possess hepato-protective [8], anticancer [9], immunomodulatory [10], anti-inflammatory [11] and wide spectrum of biological activity [12] and safe herbal drug [13].S. glauca popularly known as "Lakshmitaru" is a medium sized evergreen tree belongs to the family Simaroubaceae. The trees are polygamodoccious and because of its many benefits and uses this nature's wonder herb is also called as the "Tree of paradise". All parts of the plant are used in herbal medicine. An infusion of leaves or bark is considered as astringent, digestive, antihelminthic and emmenagogue. The chloroform soluble extract of *S. glauca* exhibited significant cytotoxicity against several human cancer cell lines [14].

Allelopathic treatments for cancer like chemotherapy, radiotherapy and surgery provide only partial and transient relief and also it may induce toxic effects on the body. In addition to that, the above treatments and synthetic anti cancerous drugs are costly and i.e.; beyond the reach of general public. Hence alternative herbal remedies that are commonly available, comparatively economical are to be explored. So, the purpose of the present study is to investigate the cytotoxic effects of plant extracts of *M.citrifolia* and*S. glauca* on mitotic stages of cell cycle and to determine its potential to induce chromosomal aberration in root meristem cell of *A. cepa* L. In addition to that the cytotoxic properties of these plant extracts which may very useful to establish a standard natural drug for feature and further research for various purpose.

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Peptide decorated glycolipid nanomicelles for drug delivery across the blood-brain barrier (BBB)⁺

S. Meenu Vasudevan,^{a,b} N. Ashwanikumar^c and G. S. Vinod Kumar 🕑 *^a

This interdisciplinary research highlights the engineering of glycolipid nanomicelles with surface modification using a BBB crossing peptide for *in vivo* drug delivery especially for glioma therapy. We demonstrated an eco-friendly, green synthesis of a nanomicelle followed by felicitous characterization which substantiates the merits of the drug delivery system.

Despite the significant advances in the field of nano drug delivery systems (DDSs), the treatment of central nervous system (CNS) diseases like glioma, Parkinson's disease, Alzheimer's disease, epilepsy, stroke, brain trauma, *etc.* is limited due to the inefficiency of the cargo to cross the blood-brain barrier (BBB).^{1,2} The tight endothelial cell monolayer associated with pericytes and astrocytes in the BBB restricts the transport of 98–100% of the drug molecules to the brain.³ In the case of glioma, the BBB was found to be intact during the first stage which allows us to design a nanocarrier by exploiting the principle of active transport using targeting ligands on the surface of the nanocarrier. The DDS can be designed by engineering an apt amphiphilic polymeric nanocarrier surface-modified with a targeting ligand to breach the BBB.

Polymeric nanomicelles are regarded as promising carriers for small molecule hydrophobic drugs because of their good stability and biocompatibility *in vitro* and *in vivo*.⁴ Tailor-made amphiphilic polymers when exposed to an aqueous environment spontaneously form self-assembled nanomicelles having a core-shell architecture which serve as ideal hosts for hydrophobic drugs. Many natural and synthetic polymers have been used for the preparation of amphiphilic polymeric micelles. Chitosan is one of the major biocompatible polymers with a glycosamine backbone and used as a hydrophilic part of the amphiphilic system.⁵ A major drawback of naive chitosan is its aqueous solubility and its tendency to precipitate at physiological pH.⁶ Glycol chitosan (GC) is a commercially available water-soluble, biocompatible and biodegradable derivative of chitosan,⁵ which is used as a drug delivery scaffold in the present work.^{7,8} To impart suitable amphiphilicity to GC, we have conjugated it to a biocompatible aliphatic long-chain fatty acid namely stearic acid (SA). The amine functionality of GC was selected as the binding site to retain the intact ethylene glycol moiety which is essential for the aqueous solubility of GC. The synthesized stearoyl-*g*-glycol chitosan (SAGC) was used for surface modification with an apt targeting ligand.

Site-specific delivery of polymeric nanomicelles can be achieved by the use of suitable receptor targeting ligands. Over the years, several receptors like integrin, folate, transferrin, etc. have been employed by researchers for targeting nanomicelles.9 Unfortunately, the abundance of these receptors in the majority of tissues limited the brain-specific delivery and necessitated the development of highly specific brain targeting ligands. In addition to this, the BBB acts as a major hurdle for the aforementioned targeting ligands. To solve these problems, specific brain targeting short peptide sequences have been developed by the use of the in vivo phage display technique.¹⁰ One such peptide (TGN peptide-TGNYKALHPHNG) was identified by Li et al. using a filamentous M13-phage with the aid of a random 12 mer peptide library displayed on the capsid surface of this phage having BBB targeting ability.^{11,12} AS TGN peptide demonstrated superior brain targeting efficacy, we have used this peptide as the targeting moiety and conjugated it to our glycopolymer (SAGC) to produce a hybrid, peptide decorated nanomicelle named "TSAGC". The development of nanomicelles of TSAGC, encapsulation of a model hydrophobic drug (Curcumin), and their efficacy in crossing the BBB for brain delivery were demonstrated in the present work by various physicochemical and biological analyses. As most of the drugs used in brain diseases are hydrophobic, we

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Studies on Methanolic Extract of *Lepidagathis keralensis* as Green Corrosion Inhibitor for Mild Steel in 1M HCl

Palakkal Leena^{1,2*}, Zeinul Hukuman N. H.¹, A. R. Biju¹, and Mullapally Jisha¹

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ABSTRACT

The methanolic extracts of the leaves and stem of the plant *Lepidagathis keralensis* were evaluated for anticorrosion behavior against mild steel in 1M HCl. Corrosion inhibition studies were done by gravimetric method, electrochemical impedance spectroscopy and potentiodynamic polarization methods. Surface morphology of mild steel in the presence and absence of inhibitors were studied using SEM analysis. UV-Vis studies were also done to evaluate the mechanism of inhibition. Both the extracts showed good inhibition efficiency which increased with increase in concentration of the inhibitor and decreased with increase in temperature. The mechanism of inhibition was explained by adsorption which obeyed Langmuir adsorption isotherm. Thermodynamic calculations revealed a combination of both physisorption and chemisorption of the inhibitor on the surface of mild steel. The extracts behaved as mixed type inhibitors as determined by polarization studies. Quantum chemical studies on Phenoxyethene, one of the major components in the leaf extract of the plant was also carried out to support the experimental results.

Keywords : Lepidagathis keralensis, Corrosion Inhibition, Mild Steel, EIS, DFT

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1. Introduction

Mild steel is one of the most frequently used metal in industries as it is easily available and possesses good mechanical properties. Corrosion of this metal in aggressive environment especially in presence of hydrochloric acid is a major problem faced in industrial process. Hydrochloric acid is commonly used in industries for acid pickling of steel, for cleaning of scales, for rust removal and for the cleaning of oil refinery equipments [1-3]. In order to minimize the loss of metals by corrosion, inhibitors are commonly employed. Organic compounds possessing S, N and O as heteroatoms act as good corrosion inhibitors. These compounds form a protective hydrophobic layer around the metal surface by adsorption of heteroatoms on the surface of the metal and thus prevent the attack by corrosive agents [4,5]. Though there are

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many such synthetic compounds available, most of them are expensive and toxic to environment and human beings. A good inhibitor should not only be efficient but also be non toxic and cheaply available. Thus there is an increasing attention towards the use of green or eco friendly inhibitors. Numerous plant extracts have shown to be highly efficient corrosion inhibitors both in acidic and alkaline medium. This is generally believed to be due to the presence of various metabolites synthesized naturally by the plants. These compounds which contains various hetero atoms and double bonds aids in the adsorption of these substances on the surface of metals [6-10].

Lepidagathis keralensis (Family: Acanthaceae) is an endemic plant of Kerala found widely distributed in lateritic hills near seacoast. It is a rigid prostrate under shrub with woody rootstock [11]. The plant possesses several medicinal properties. It is used as a preventive medicine for digestive disorders. Whole plant decoction is recommended for kidney stone. It is a blood purifier and increases blood. The plant is also used to treat bronchial asthma in children [12, 13]. Preliminary analysis of the plant in our lab has

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SPECIAL FOCUS: RNA THERAPEUTICS FOR TISSUE ENGINEERING*

Messenger RNA Delivery for Tissue Engineering and Regenerative Medicine Applications

Siddharth Patel, MEng^{1,**}, Avathamsa Athirasala, MSE^{2,**}, Paula P. Menezes, MS^{2,3,**}, N. Ashwanikumar, PhD¹, Ting Zou, MS^{2,4}, Gaurav Sahay, PhD^{1,5}, and Luiz E. Bertassoni, DDS, PhD^{2,5,6}

The ability to control cellular processes and precisely direct cellular reprogramming has revolutionized regenerative medicine. Recent advances in *in vitro* transcribed (IVT) mRNA technology with chemical modifications have led to development of methods that control spatiotemporal gene expression. Additionally, there is a current thrust toward the development of safe, integration-free approaches to gene therapy for translational purposes. In this review, we describe strategies of synthetic IVT mRNA modifications and nonviral technologies for intracellular delivery. We provide insights into the current tissue engineering approaches that use a hydrogel scaffold with genetic material. Furthermore, we discuss the transformative potential of novel mRNA formulations that when embedded in hydrogels can trigger controlled genetic manipulation to regenerate tissues and organs *in vitro* and *in vivo*. The role of mRNA delivery in vascularization, cytoprotection, and Cas9mediated xenotransplantation is additionally highlighted. Harmonizing mRNA delivery vehicle interactions with polymeric scaffolds can be used to present genetic cues that lead to precise command over cellular reprogramming, differentiation, and secretome activity of stem cells–an ultimate goal for tissue engineering.

Keywords: mRNA delivery, gene therapy, cell reprogramming, tissue engineering, lipid nanoparticles, hydrogels

Introduction

THE MULTIDISCIPLINARY FIELD of tissue engineering and regenerative medicine combines technologies derived from chemistry, material sciences, stem cell biology, and increasingly more frequently, genetic engineering; all with the ultimate goal of developing functional and clinically useful biological tissue substitutes. In recent years, substantial strides have been made in regenerative medicine through the application of strategies that seek to utilize the therapeutic capacity of stem cells and their inherent regenerative capacity upon tissue injury.¹ In addition to their ability to differentiate into multiple cell lineages in response to signaling factors,² the stem cell secretome, which comprises a broad array of cytokines, chemokines, and growth factors,³ has been increasingly acknowledged for its role in repair and regeneration, making

stem cells uniquely suitable for regenerative applications. Harnessing these functions by directing stem cell fate, function, and phenotype, and controlling their natural signaling pathways, can further extend our control over the inherent regenerative capabilities of these systems. In this review, we describe recent examples of how both endogenous and exogenous cell behavior can be engineered for regenerative purposes by the use of nucleic acid therapeutics to either trigger (DNA, messenger RNA) or suppress (small interfering RNA, micro RNA [miRNA], small hairpin RNA [shRNA], antisense oligonucleotides, genome editing) the expression of specific genes and transcription factors, with particular attention to the potential and current use of messenger RNA (mRNA) on various regenerative applications.

mRNA has recently garnered much attention for its potential for gene transfer applications.⁴ This turn of events

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^{*}This article is part of a special focus issue on RNA Therapeutics for Tissue Engineering.

DNA	RNA
Slow and long-lasting expression	Rapid and transient expression
Risk of genomic integration	No risk of genomic integration
Needs to reach the nucleus for effective transfection	Needs to reach the cytoplasm for effective transfection
Difficulty in traversing nuclear barrier results in lower efficiency	Does not need to cross nuclear membrane since translation machinery is found in the cytoplasm
Difficult to transfect nondividing cells	Can transfect nondividing cells
Consists of promotor region, initiator, coding region,	Consists of 5' cap, 3' and 5' UTRs, coding region, Poly(A) tail
Delivery based on viral and nonviral methods	Delivery mostly based on nonviral methods

TABLE 1. CHARACTERISTICS OF DNA AND MRNA

followed improvements in mRNA synthesis and stability,
which have allowed its use in a broad range of applications
sumassing the notantial of DNA based anniactions. DNA
surpassing the potential of DNA-based applications. DNA,
utilizing viral (lentivirus, adenovirus, adenoassociated virus,
etc.) and nonviral delivery approaches (physical and che-
mical methods) has been widely employed in tissue engi
inical incurous), has been widely employed in tissue engi-
neering since the past two decades." However, its clinical
translation has been hindered due to low efficiency, ^{10,11} risk
of insertional mutagenesis, $12-14$ as well as unpredictable and
slow expression kinetics (Table 1) Moreover despite the high
off and y of viral vectors, the inherent extetovicity and im
encacy of viral vectors, the innerent cytotoxicity and im-
munogenicity of viral vectors cause further hurdles for suc-
cessful clinical application of DNA-based gene delivery.
Another limitation of viral vectors is their inability to package
larger nucleic acids. Therementia delivery of mDNA on the
larger nucleic actus. Therapeutic derivery of mixinA, on the
other hand, possesses virtually no risk of genomic integra-
tion. ¹⁵ Since mRNA does not require nuclear entry (a sig-
nificant barrier to successful gene transfer using DNA) and
needs only to reach the translational machinery in the cytosol
for expression of its protein modulat it has demonstrated a
for expression of its protein product, it has demonstrated a
higher transfection efficiency than DNA-based gene deliv-
ery ^{10,16,17} and can transfect nondividing cells ^{10,11} (Table 1).
mRNA transfection is characterized by rapid, transient, and
predictable protein expression kinetics allowing greater tem-
poral regulation over protein production (Table 1) As a
por regulation over protein production (radie 1). As a
consequence, mkinA, annost exclusively exploiting nonviral
delivery techniques, has been employed in cancer immuno-
therapy, ^{16–21} vaccine development, ^{22–20} protein replacement
therapy, ^{27–29} cellular reprogramming, ^{2,16,30–32} and genome
engineering, ^{33,34} While still in its infancy, mRNA applica-
tions in tissue engineering present significant potential where
tions in ussue engineering present significant potential, where
traditional DNA-based therapies have failed due to innerent
cellular limitations. Especially, the temporal control over
expression of key signaling molecules or transcription factors
can be used to direct cellular reprogramming and stem cell
fate reminiscent of physiological conditions. It is likely that
different RNA molecules including mRNA siRNA shRNA
an he delivered in a controlled fashion that explositents tique
can be derivered in a controlled fashion that of the state tissue
regeneration but have the capacity to "switch off" due their
transient nature, thus preventing any off-target effects. In this
scenario, considering that there is limited literature ^{55,50} spe-
cifically related to this subject, the present review will sum-
marize the recent advances on the mRNA application in tissue
engineering, emphasizing findings that contribute to the better
understanding of the molecular mechanisms underlying the
regenerating abilities of stem cells and thus potentially im-
nacting the field of regenerative medicine

In Vitro Transcribed mRNA

Despite the advent of mRNA delivery in the 1970 s by polycations³⁷ and liposomes,³⁸ the instability (average half-life of 7 h)³⁹ and innate immunogenicity^{40–45} of mRNA had rendered it unsuitable for therapeutic applications. Significant advances in decoding of mRNA biology have now allowed us to upgrade methods of *in vitro*-transcribed (IVT) mRNA synthesis by incorporating various chemical modifications to improve IVT mRNA pharmacokinetics and pharmacology.

mRNA serves as a template for protein synthesis and is made up of four ribonucleoside bases: adenosine, guanosine, cytidine, and uridine, linked through a phosphate group. With an average size of approximately 2000 bases, this single-stranded molecule can be subdivided into five domains - the 7-methylguanosine cap (m7G) at the 5' end, 5' untranslated region (5' UTR), coding sequence known as the open reading frame, 3' untranslated region (3' UTR), and 3' poly(A) tail consisting of 50–250 adenosine residues (Fig. 1).⁴⁶ Modifications to the 5' cap, poly(A) tail, and 5' and 3' UTRs have been explored for modulation of IVT mRNA immunogenicity and stability.⁴⁷

The 5' cap and the poly(A) tail are critical in the protection of the transcript. Apart from playing a role in regulation of nuclear export of mRNA, the 5' 7-methylguanylate cap protects against degradation by exonucleases and facilitates the initiation of translation through the binding of eukaryotic initiation factor 4E.48 Common in vitro transcription techniques can result in significant fraction of the caps being introduced in reverse orientation, preventing binding of translation factors.⁴⁹ In response to this phenomenon, mRNA is now synthesized with antireverse cap analogs, which have greatly enhanced translational efficiency.^{50,51} Efficient mRNA capping is an active area of investigation and novel capping analogs have been reported that further enhance the efficiency of mRNA translation (Fig. 2). The poly(A) tail aids in nuclear export of mRNA, promotes translation through interactions with translation initiation factors, and regulates mRNA stability and half-life by preventing degradation by nucleases.⁴⁶ In IVT mRNA, it is elongated either through enzymatic polyadenylation using recombinant poly(A)polymerase or by directly encoding for the poly(A) nucleotides within the DNA template. It has been reported that a poly(A) tail of about 120 nucleotides is necessary for optimal inhibition of mRNA degradation.⁵²

The 5' and 3' UTRs present additional avenues for modifications. The two regions play a role in mRNA



FIG. 1. Native mRNA structure. The key structural domains of mRNA are the 5' cap (also known as the 7-methylguanosine cap), the 5' and 3' UTRs, the coding sequence and the poly(A) tail. Reproduced with permission from³⁵ Copyright Springer Nature Publishing Group 2017. UTR, untranslated region. Color images available online at www .liebertpub.com/tea

translation and stability through the interaction of 5' UTR with translation machinery and the 3' UTR serving as a binding site for microRNA (miRNA) and mRNA decay-promoting proteins.⁵³ A frequent approach for increasing the half-life of IVT mRNA is selecting UTR domains from human mRNAs with higher stability (e.g., human α and β -globin) and incorporating them into the 3' UTR of IVT mRNA.⁵²

The mammalian immune system is well adapted for detecting and eliminating exogenous RNA, recognizing it as a viral or viroid challenge. RNA is identified through pattern recognition receptors (PRRs), Toll-like receptors (TLRs), and nucleotide-binding oligomerization domain-like receptors (NLRs), possessed by immune cells such as macrophages and dendritic cells.^{40,41,44,45} Binding of these receptors triggers an inflammatory cascade, which results in RNA degradation, representing an important consideration for potential application in regenerative medicine. Nonimmune cells also detect exogenous RNA through PRRs, such as the retinoic acid-inducible gene 1 (RIG-1) receptor family to induce in-nate immune responses.^{42,43} Several chemical base modifications have been examined to restrict immune activation by IVT-mRNA.^{54–56} This process involves the substitution of a base (e.g., uridine) with the equivalent modified base (e.g., 5-methyluracil) in the entire sequence (Fig. 3). The base modifications that have been explored include, but are not limited to, 5-methylcytosine, pseudouracil, and 5-methoxyuracil.^{16,57,58} Moreover, the altered versions of ribose sugar moiety have also been reported with methyl and fluoro substitutions at the C-2 position (Fig. 3). Since base modification is a naturally occurring posttranscriptional event in eukaryotes, these chemical modifications do not inhibit the endogenous ribosomal IVT mRNA translation,^{59,60} and have represented important improvements on

the half-life and stability of mRNA for intracellular delivery and their potential use to stimulate the regenerative capacity of stem cells *in vitro* and *in vivo*. It should be noted that the efficacy of the enhancements conferred by chemical modulation of IVT mRNA seems to depend on the type and method of modification, cell type, and cell differentiation state. Moreover, it is believed that there is still much to be discovered concerning mRNA interactions with the myriad extracellular and intracellular proteins and the full breadth of possible modulations in mRNA engineering is yet to be realized. All of these aspects represent important areas of future study that remain to be explored.

mRNA delivery

The chemical modification of IVT mRNA has greatly improved its efficacy, and despite the wide variety of both membrane disruption-mediated and carrier-mediated delivery strategies, both using physical and chemical methods, intraceullar mRNA delivery remains a challenge. It is known that exposure to serum and intracellular nucleases, in addition to immune cells, reduces the half-life of mRNA.^{40,42,61–64} Moreover, the high-molecular-weight and negative charge density of mRNA prevents it from effectively entering cells, due to steric inhibition to diffusion and electrostatic repulsion from the anionic cell membrane. Various delivery technologies have been utilized to overcome one or more of these barriers for intracelullar delivery. Originally developed for DNA, siRNA, and miRNA delivery, these technologies are now being explored for mRNA delivery. In this study, we will selectively highlight physical and chemical methods that have been reported to circumnavent these barriers. We encourage the reader to refer



FIG. 2. Structures of standard capping (m^7 GpppG) and ARCA. In case of ARCA analogs unidirectional transcription ensures translational efficacy. The different capping R groups were reported in the literature at the 3' carbon of ribose in m^7 G, which includes (1–3) [with methoxy substitution⁵⁰] and (4–6) [recently reported with azide functionality for bioor-thogonal binding⁴⁷]. ARCA, anti-reverse capping analogs. Color images available online at www.liebertpub.com/tea



FIG. 3. Structural features of different sugar and base modifications to enhance translational efficacy of mRNA with reduced immunogenicity. Color images available online at www.liebertpub.com/tea

to a recent review on the topic 65 for more in-depth details of the described methods.

Physical methods. Physical modes of gene transfer have been developed to achieve direct transfection of cells in vitro and ex vivo. Electroporation is the most popular of these methods demonstrating high efficiency in direct delivery of mRNA into the cytosol.^{27,66–69} This is achieved through the application of electrical pulses to cells to permeabilize the cell membrane for the entry of mRNA. In vivo electroporation of mRNA encoding the neurogenic factor, Myt11 was recently used to drive the transformation of neural stem cells into proliferative progenitors.¹⁷ Another technique used for cytosolic mRNA delivery utilizes a "gene gun", wherein heavy metal particles (e.g., gold) surface coated with mRNA are propelled at high velocities into the cell using pressurized gas.^{70,71} Microinjection, yet another physical method, makes use of a microneedle to inject mRNA into individual cells.^{68,69} The low throughput of this technique makes it extremely labor intensive and hence, has only seen sporadic use.⁶⁸ Sonoporation, using ultrasound along with microbubbles, has also been used to deliver mRNA to dendritic cells ex vivo.²¹

Collectively, these techniques have been used primarily for application in cancer immunotherapy,^{21,66} and to a lesser extent in protein replacement therapy,^{27,71} cellular reprogramming,^{72,73} and gene editing,^{68,69} where the latter two have special relevance for the field of tissue engineering. These methods deliver mRNA directly to the cytosol, avoiding the need for endosomal escape and immune activation. The efficacy of physical methods at mRNA transfection is clearly demonstrated by their popularity in *ex vivo* applications, such as cancer immunotherapy,^{66,67,74} gene editing,^{57,68,75,76} and tissue regeneration.^{17,27,66} However, these methods remain expensive, invasive (for instance, extraction of blood), and require extensive optimization.⁷⁷

Chemical methods. The limitations of physical methods have lead to the development of chemical methods for delivery of nucleic acids. Today, chemical techniques, with their high versatility, low cost, and ease of use, have been broadly evaluated for in vitro, ex vivo, and in vivo delivery of nucleic acids. Furthermore, the true advantage lies in their potency to deliver nucleic acids in vivo. Parenteral delivery of nucleic acids is faced with additional challenges such as degradation of nucleic acids by immune cells^{40,45} and serum nucleases,^{63,64} and the need for cellular uptake and endosome escape to achieve successful transfection.^{78,79} These problems have been addressed using nanoparticles made up of cationic molecules such as polycations, cationic or ionizable lipids, and lipid-like molecules (Fig. 4). These cationic molecules bind electrostatically to the anionic phosphates on the mRNA backbone leading to efficient packaging of mRNA into nanoparticles. Evasion of immune recognition is accomplished by shielding the nanoparticles using inert materials, such as polyethylene glycol (PEG).⁸ Cellular uptake is achieved through endocytosis following receptor-mediated, electrostatic or hydrophobic binding of nanoparticles to the cell surface followed by internalization.⁸¹ Extensive effort has been put into utilizing ligands (such as transferrin, folic acid, RGD peptide, etc.) toward cell surface receptors to increase specificity and efficiency.^{78,81} A major consideration in design of nanocarriers is their ability to induce endosome escape. Two mechanisms are accepted as potential hypotheses for endosome escape of nanoparticle–proton sponge effect⁸² and membrane destabilization.⁸³ Additional amplification of transfection can be attained through the use of endosomal escape agents, such as chloroquine,⁸⁴ guanabenz,⁸⁵ endosomal escape peptides (such as melittin, muramyl dipeptide, etc.),^{84,86} and leukotriene inhibitors (e.g., MK571, Pranlukast, Zafirlukast).⁸⁶ The flexibility in nanoparticle design and size of mRNA, low cost, ease of scale-up, limited toxicity, and low immunogenicity has made chemical modes the preferred choice for mRNA delivery. Selected examples are provided below.

Polycations. Polycations utilize electrostatic interactions to encapsulate nucleic acids ensuring serum stability. The cationic charge of the nanoparticles thus formed also assists in internalization of these polyplexes (complex of polycation and nucleic acid) into cells. One of the first polymers to be investigated for nucleic acid delivery was Poly-L-lysine (PLL)^{87,88} (Fig. 4A). While PLL was proficient at encapsulating nucleotides, it was unable to induce endosomal escape due to its poor buffering capacity resulting in low efficiency of gene transfer. A new polymer, polyethylenimine (PEI) (Fig. 4A), was later developed to have a high charge density and superior buffering capacity leading to higher efficacy. PEI remains the most explored polymeric delivery material for nucleic acid delivery.^{84,89} PEI grafted to graphene oxide was recently used to complex and deliver mRNA encoding Oct4, Sox2, c-Myc and Klf4 (Yamanaka factors) for generation of "footprint-free" (gene integrationfree) induced pluripotent stem cells (iPSCs) from somatic cells.⁹⁰ Polyaspartate (poly-Asp) (Fig. 4A) is another broadly investigated polycation for nucleotide delivery. Variations of polyaspartate such as poly-Asp(DET), poly-Asp(TET), poly-Asp(TEP), poly-Asp(PEH) have been successfully used for mRNA delivery.^{91,92} To further add to the versatility and utility of these polymers, block copolymers of PLL, PEI, and poly-Asp with PEG have been developed to form "nanomicelles" for enhanced *in vivo* delivery.⁹³⁻⁹⁵ PEGpolyAsp(DET) and PEG-polyAsp(TET) nanomicelles carrying cartilage anabolic transcription factor, runt-related transcription factor 1 (RUNX1) mRNA have shown promising results in treatment of animal models of osteroarthiritis.⁹⁶ Poly beta amino esters (PBAEs),^{97,98} and polypeptoids^{92,99} are other class of polycations, which have evolved in design to improve efficacy and reduce toxicity.

Lipoplexes and lipid nanoparticles. Lipoplexes exploit the mechanism of electrostatic complexation to package nucleic into nanoparticles using cationic lipids (e.g., 1,2-di-O-octadecenyl-3-trimethylammonium propane (DOTMA), N-[1-(2,3-Dioleoyloxy)propyl]-N,N,N-trimethylammonium chloride (DOTAP), (Fig. 4B) and/or an accessory neutral lipid (such as 1,2-Distearoyl-sn-glycero-3-phosphocholine (DSPC), 1,2-Dioleoyl-sn-glycero-3-phosphoethanolamine (DOPE) (Fig. 4B). Notable cationic lipoplex formulations explored for *in vitro*, *ex vivo*, and *in vivo* delivery of mRNA include DOTAP:DOPE, Lipofectamine, TransIT, Mega-Fectin, and Stemfect.^{28,89} iPSCs have been successfully generated from fibroblasts and subsequently, differentiated



into terminally differentiated myogenic cells using synthetic, IVT mRNA transfected through Lipofectamine and TransIT cationic lipid delivery systems.¹⁶ Further optimization of formulations containing cationic lipids led to the development of highly modular lipid-based nanocarriers known as lipid nanoparticles (LNPs). Most commonly, LNPs are composed of combinations of a cationic lipid, a structural lipid, cholesterol, and PEG-lipid, mixed together in precise ratios. The presence of 'helper' lipids (structural lipids, PEG-lipids, and cholesterol) confers stability as well as protection from opsonization and nonspecific uptake by mononuclear phagocyte system resulting in improved circulation half-life and efficacy.^{100,101} Another method employed calcium phosphate to assist in packaging of mRNA within lipid-based carriers.¹⁰² At the cellular level, LNPs are trafficked through the endolysosomal pathway with endosomal escape taking place through membrane destabilization initiated by electrostatic interactions between cationic lipids of the LNPs and anionic lipids of the endosomal membrane. Although, the use of cationic lipids in lipoplexes and LNPs offers high transfection in vitro, their toxicity and immunogenicity has led to setbacks for in vivo translation. 103-105

Over the years, better understanding of the necessities in the delivery process has allowed the development of potent synthetic lipids leading to higher efficacy and lower toxicity.¹⁰⁶ The greatest advancements for *in vivo* delivery of nucleic acids have come in the form of ionizable lipids (e.g., C12–200, TT3, DLin-MC3-DMA, OF-2, Fig. 4B) as replacements for cationic lipids in LNPs. LNPs with ionizable lipids have experienced the most success among nanoparticle gene delivery systems, showing positive results in clinical trials for RNA therapeutics.¹⁰⁷ Patisiran, an LNP containing siRNA against transthyretin, successfully completed phase 3 clinical trials, making it the first to reach this stage. Several LNP formulations are currently being tested for mRNA delivery in various preclinical and clinical studies, including infectious disease vaccinations and cancer immunotherapy.^{24,108–110}

These chemical methods have evolved to enhance *in vitro* and *in vivo* transfer of mRNA by effectively complexing it to prevent degradation and facilitate intracellular delivery by triggering endocytosis-mediated cellular entry and endosomal escape. Thus, nanoparticle-based mRNA delivery would enable highly efficient, transient *in situ* manipulation of cells and tissues. Furthermore, they can be designed to target specific cell types *in situ* or in a multicell coculture. The highly modular nature of nanoparticles enables various strategies for use of mRNA in tissue engineering, cellular reprogramming, and regenerative medicine.

Hydrogel Scaffolds in Tissue Engineering and mRNA Delivery

A noteworthy aspect that requires special attention regarding the use of mRNA for tissue engineering is that, different from many RNAi strategies where nucleic acids are used for downregulation of intracellular mechanisms, mRNA in tissue engineering is primarily intended to promote tissue formation or certain aspects of cellular response, such as differentiation, reprogramming, and protein secretion (Fig. 5). Given the 3D architectural complexity of tissues in the body, such an mRNA-guided response, ideally needs to be controlled in three dimensions and in a sitespecific manner, thus giving rise to 3D multitypic tissues with spatially defined functions and organization, such as

FIG. 5. Schematic showing modes of applications of mRNA delivery in tissue engineering. mRNA in lipid nanoparticles can be encapsulated in hydrogels and other biomaterials (both with cells or without) to spatially and temporally regulate gene transfer. Another potential route of application is in vivo, either systemically or through direct injection at the site of regeneration or repair. These methods can be utilized to induce pluripotency in reprogrammed somatic cells, direct differentiation, or stimulate therapeutic function through secretion of chemokines and cytokines (secretome) for regenerative applications. Color images available online at www .liebertpub.com/tea



those in the body. Therefore, local and sustained delivery of mRNA is a challenge that becomes particularly relevant for tissue engineering strategies. Effectively, this means that much of the optimization that has been performed in the field of mRNA complexation,65 and bolus intravascular mRNA delivery using nanoparticles,^{79,111} become a stepping stone for future developments on controllable biomaterial "depots" that are compatible with such delivery vehicles. Moreover, in addition to being compatible with these nanodelivery vehicles, such biomaterials need to be compatible with the cells that are being used for new tissue formation. Importantly, the far majority of tissue engineering strategies in the past decade have used cell-laden biomaterials that attempt to replicate the native microenvironment that cells are exposed to in the body,¹¹² which makes these challenges especially more complicated.

For the most part, challenges associated with design and fabrication of complex tissues in the laboratory, a field that has emerged under the broad definition of "biomanufacturing", ¹¹³ have used various types of scaffold materials. These have generally been based either on solid slow degrading or nondegrading systems (i.e., bioceramics, metallic implants, etc.), or on biodegradable polymeric materials, out of which hydrogels have been the ones with far greater attention in tissue engineering. Given the inherent compatibility of hydrogel scaffolds with mRNA nanoparticles, lipoplexes and polyplexes, this review will cover primarily aspects that relate to polymer hydrogels. The reader is encouraged to refer to recent comprehensive reviews on other materials for nonviral intracellular delivery of mRNA in recent publication.¹¹⁴

By definition, hydrogels are three-dimensional networks of polymers that exhibit the ability to swell and retain large amounts of water within their structure. We have recently published a comprehensive review of their recent use in tissue engineering for various applications, and the reader is encouraged to refer to this publication for details.¹¹² Natural hydrogels are engineered based on naturally occurring proteins (e.g., collagen, gelatin, and fibrin), and polysaccharides (e.g., alginate chitosan, hyaluronic acid, dextran), whereas synthetic hydrogels are made from synthetic polymers, such as poly (acrylic acid), PEG, poly (vinyl alcohol), polyacrylamide, and other polypeptides.¹¹⁵ Much of the excitement surrounding polymer hydrogels in tissue engineering stem from their ability to be tailored for specific applications, which can be achieved by carefully tuning their biodegradability, physical and mechanical properties, injectability, and microstructure. This can be achieved either by controlling their polymer to water ratio, or their degree of polymerization upon gelation.^{112,113} Additionally, hydrogels can be engineered to be responsive to specific stimuli, such as enzymatic activity,^{116,117} pH,^{118,119} temperature,^{120–122} light,^{123–125} and electricity.^{126,127} These different components of customization render hydrogels with improved pharmacokinetic and pharmacodynamic properties, and add to their inherent capacity for overcoming problems such as off-target nucleic acid accumulation.¹²⁷ For these reasons hydrogels represent highly desirable materials.

Similar to other aspects of genetic manipulation discussed above, DNA and RNAi delivery using hydrogels have dominated the field for quite some time,¹²⁸ and the use of mRNA for regeneration has only recently began to received closer attention. This has been primarily previewed by a sharp increase in industry investments in and around mRNA-based therapy, which jumped from nearly nothing in 2011 to close to \$2 billion in 2016.¹²⁹ Of note, like in all other nucleic acidbased therapies, mRNA is a large polyanion that does not readily cross nonpolar cellular and tissue barriers. Therefore, the potential interactions occurring between the mRNA delivery vehicles with hydrogels is a point that requires careful attention. In addition to their composition, crosslinking density and delivery method (injectability, *in situ* polymerization, etc.), which are challenges that are somewhat common to other drug delivery strategies, the electrostatic interactions between hydrogels and mRNA nanoparticles is a factor that needs to be carefully considered.

Given the polyanionic character of mRNA, and cationic property of most nanoparticles used for their delivery, hydrogels that are electrostatically inert have been proposed as improved materials for mRNA-based tissue engineering, these include primarily PEG-based hydrogels and dextran, which have received more attention.¹³⁰ Cationic hydrogels, however, such as gels composed of PEI, chitosan, polyamidoamine, PBAEs, and poly L-lysine, have been shown to confer advantages to nucleic acid delivery, including mRNA.¹²⁸ This is not only because cationic polymers have the ability to self assemble into hydrogels themselves,^{122,131} but also because their positive charge distribution enables sustained release of sequestered nucleic acid cargo due to the net negative charge of mRNA and other nucleic acid nanoparticles.

An important disadvantage of these materials for tissue engineering, however, is that cationic polymers have been known to activate apoptotic signaling pathways¹³² and to induce formation of nanopores on the cell membrane,^{133,134} which can lead to cytotoxic effects despite the enhanced transfection outcomes. Moreover, hydrogels derived from these polymers, by themselves, lack cell adhesive ligands (RGD, MMP) that are known to regulate important mechanisms of cell response and differentiation. Therefore, future work should seek to design and develop less cytotoxic cationic hydrogels that are compatible with cell loading, existing biofabrication methods, while still offering favorable electrostatic interactions with polyplexes, lipoplexes, and naked nucleic acids. Current research has paid particular attention to the development and modification of PEI with various additives to improve their cytotoxicity, 135,136 although modification of PEI and other cationic hydrogels for improved mRNA delivery, specifically, has remained relatively stagnant in recent years. Lastly, while cationic polymers have been linked to a more sustained delivery of genetic cargo, negatively charged nanoparticles or mRNA complexes may be more readily repelled in anionic hydrogels,¹²⁸ which is likely to enhance their immediate delivery in areas where fast release is desired, such as for rapid vascularization of engineered tissues or wound healing.

Despite being an area of certain interest in future, relatively few hydrogels have been evaluated as biomaterials for mRNA delivery. The far majority of the work performed using hydrogels has been on RNAi strategies, and the reader is encouraged to refer to a recent review on the use of hydrogels for RNAi therapies.¹²⁸ Of relevance, it has been demonstrated that nucleic acid delivery in 2D and 3D hydrogels can activate sharply different signaling pathways, although the targets may be similar.¹³⁷ Krebs *et al.* compared the ability of the released nucleic acid to knockdown the expression of GFP in cells that constitutively express this protein among three different types of cell-laden hydrogel scaffolds: calcium crosslinked alginate, photocrosslinked alginate, and collagen. The results showed that alginate hydrogels resulted in rapid release of nucleic acid cargo over 1 week, whereas collagen had more prolonged and controlled release over a period of 2 weeks, where the differences were postulated to result from the electrostatic interactions between the gel matrix and the RNA cargo. Cell-laden PEI/dextran hydrogels that had complete degradation over 17 days demonstrated 80% efficiency in GFP expression knockdown when siRNA was released from the hydrogel matrix.¹³⁰ A subsequent report utilizing siRNA for osteogenic differentiation in cell-laden PEG hydrogels utilized a thiol-acrylate reaction for in situ hydrogel gelation, showing a marked increase of cell differentiation upon release of RNA-interfering molecules in a sustained and controlled manner over the course of 3-6 weeks.¹³⁸ Spatially controlled release of nucleic acid in hydrogels was also shown in methacrylated dextran hydrogels loaded with RNA/PEI polyplexes using a syringe pump, demonstrating that localized and site-specific cell response can be achieved through the controlled gradient formation of the hydrogel scaffold. Recent preliminary experiments from our group using gelatin methacryloyl hydrogels photopolymerized using a visible LED light and loaded with dental stem cells (stem cells from apical papilla-SCAP) showed effective intracellular delivery of mRNA for expression of luciferase and GFP, where the mRNA release was directly proportional to the hydrogel concentration, or crosslinking density over a period of 48 h (Fig. 6). An important observation that requires attention is that multiple groups have reported that directly adapting DNA or siRNA methods for mRNA delivery can be ineffective,¹³⁹ which encourages future studies on the specific use of hydrogels for mRNA delivery in tissue engineering.

In summary, the vast number of tools available for the development and tuning of hydrogel scaffolds that has been

generated in the past two decades in the field of tissue engineering will be important to develop improved methods for mRNA delivery. Although the field of genetic manipulation for tissue engineering has been largely skewed toward the use of DNA delivery and RNAi in recent years, there is growing evidence of the ability of mRNA to address important challenges in regenerative medicine. The ideal combination of scaffold-guided cell response with specific mRNA delivery vehicles remains to be determined. Nanoparticle/scaffold composite materials may possess more favorable properties for tissue engineering than a single system by itself, and this is certainly an area that deserves to be explored for future regenerative applications.

mRNA Applications in Tissue Engineering

mRNA delivery for iPSC reprogramming

The ability to derive pluripotent stem cells from somatic cells through the induction of the Yamanaka reprogramming factors (*Oct 4, SOX 2, KLF 4* and c-Myc)^{140,141} has uncovered an autologous source of stem cells for regenerative medicine, without the ethical issues associated with human embryonic stem cells, or the logistics challenges associated with primary mesenchymal stem cell (MSC) isolation. Cell reprogramming was originally achieved through viral transduction and integration of these reprogramming factors into the genome of host cells. This approach, however, precludes their use for therapeutic applications. Since continuous ectopic expression of these reprogramming factors is both unnecessary^{142,143} and undesirable,^{144,145} transient transfec-tion strategies involving plasmid vectors,^{146,147} adenovirus,¹⁴⁸ DNA transposons,^{149–151} or excisable lentiviral vectors,¹⁵² have been employed to induce pluripotency, which have considerably reduced the risk of genomic modification or insertational mutagenesis. However, a consequent reduction in transfection efficiency and levels of expression has been observed using these methods, highlighting an area where mRNA transfection might be of interest. Although, the Sendai virus, which is a nonintegrating vector, provided a high



FIG. 6. Schematic representation of mRNA delivery of luciferase-encoding mRNA LNP encapsulated in cell-laden photocrosslinked GelMA hydrogel. (A) LNPs have restricted access to cells in the pores of the gel, which (B) upon enzymatic degradation of MMP sequence facilitates diffusion of mRNA through the gel matrix reaching more cells and (C) enhancing luciferase expression after 48 h. Around 5% GelMA has greater porosity than 10% GelMA, leading to approximately twice as much mRNA-driven luciferase expression of stem cells from the dental apical papilla (SCAP). GelMA, gelatin methacryloyl; LNP, lipid nanoparticle. Color images available online at www.liebertpub.com/tea

MRNA IN TISSUE ENGINEERING AND REGENERATIVE MEDICINE

degree of transfection and cytosolic expression, it required elaborate treatment steps to expunge the virus from the cells.^{152–156} Other studies have used recombinant proteins, modified to enhance cell penetration,^{157–159} or nanoparticles¹⁶⁰ to deliver reprogramming transcription factors into cells. Again, the cost of production and purification of recombinant proteins does not justify the low expression and pluripotency induction obtained by these methods. Therefore, mRNA intracellular delivery for somatic cell reprogramming has been an emerging area of interest in the tissue engineering community, since, in principle, it should enable more straightforward protein translation and reprogramming efficiency.

Synthetic mRNA was first used by Warren *et al.* to direct reprogramming by inducing transgene expression of *Oct4, SOX2, KLF4, c-Myc*, and *Lin-28* in fibroblasts. Phosphatase treatment of mRNA and substitution of ribonucleoside bases, 5-methylcytidine and pseudouridine for cytidine and uridine, respectively, enabled relatively high doses of transfection without generating host immune response and cytotoxicity, and cells transfected with modified mRNA showed high dose-dependent transgene expression.¹⁶ The

use of feeder cells and supplementation of medium with the interferon inhibitor B18R further diminished toxic effects of the transfection process. The protocol required periodic, multiple transfections for sustained expression of reprogramming factors over the 2-week duration necessary to induce pluripotency owing to the transient nature of mRNA translation kinetics and degradation, with transgene expression peaking at 24 h.¹⁶¹ While the time and laborintensive nature of this method may be considered a disadvantage-and can be remedied through the use of scaffoldmediated mRNA/nanoparticle release kinetics, as discussed above-the process also renders flexibility in the stoichiometric combination and temporal expression of the tran-scription factors,¹⁶² which is expedient. In fact, a doseramping regimen developed to adjust mRNA dose to cell proliferation rates resulted in a significant reduction in apoptosis caused by stress during standard reprogramming protocols.¹⁶³ A subsequent publication by Warren *et al.* also described the use of a variant of Oct4 with a myoD transactivation domain that facilitated more efficient and faster induction of pluripotency (Fig. 7), in addition to other



FIG. 7. iPSC colonies derived from fibroblasts reprogrammed with mRNA cocktail containing modified MyoD and subsequent directed differentiation, reproduced from¹⁶¹ with permission. (A–D) Immunostaining of pluripotent colonies showing expression of nuclear and cell-surface markers. Immunofluorescence images revealing expression of (E) neuroectoderm markers, (F) endodermal marker Sox17, and (G) α -actinin immunostaining of cardiomyocytes derived by directed differentiation of the same iPSC clone. (Scale bars: 100 µm). iPSC, induced pluripotent stem cell. Color images available online at www.liebertpub.com/tea



improvements to culture conditions, such as 5% O₂, addition of valproic acid to medium,¹⁶¹ and a more recent study that incorporated two more reprogramming factors (Lin28 and Nanog), in addition to the Oct4 variant, saw additional improvement in reprogramming under hypoxic conditions.¹⁶⁴ Other combinations of reprogramming factor with unmodified mRNA, and in the absence of interferon inhibitors, have also since been employed to induce pluripotency in fibroblasts¹⁶⁵ and the iPSCs obtained in this manner could successfully be differentiated to multiple lineages,^{16,32} but mRNA reprogramming has yet to be applied to other cell types and different media conditions. A recent comparative study conducted on the efficacy of mRNA reprogramming showed highest efficiency among nonintegrating reprogramming methods with epigenetics, homogeneity, and pluripotency markers comparable to lenti-derived iPSCs, although successful mRNA reprogramming could not be achieved in blood cells.166

As the field of tissue engineering becomes more reliant on the use of reprogrammed cells for cell therapy and regeneration, improvements in the methods of cell reprogramming through nucleic acid delivery are likely to become more relevant. Although both the reprogramming efficiency and mRNA delivery still need to be significantly improved for ultimate clinical use, the efforts expended on phase I/II clinical trials using naked, chemically modified, or protaminecomplexed mRNA show great promise for the use of mRNAguided reprogramming in future regenerative efforts.^{99,167,168}

mRNA-directed cell differentiation

Stem cell differentiation occurs during development of an organism to produce new specialized cells, and also

in adults to replace cells that are lost.¹⁶⁹ Increased understanding of the specific signaling mechanisms that control stem cell fate and lineage commitment through highthroughput DNA and proteomic analyses of the changes in gene expression during self renewal and differentiation of stem cells has enabled directed differentiation of stem cells, particularly in the absence of tissue-specific cues.¹⁷⁰ Extracellular cytokine and growth factor-defined protocols for differentiation are largely inefficient and present a high degree of variability. For many years now, both viral^{171,172} and nonviral ¹⁷³ gene delivery methods have been used for transfer of lineage-specifying transcription factors to direct differentiation of stem cells to desired lineages in a controlled manner. Again, these methods entail varying levels of genomic integration, risk of immunogenic response, and possibly tumorogenesis, thus limiting their translational appeal. The aforementioned progress in reprogramming fibroblasts to pluripotent states through synthetic modified mRNA-derived transgene expression of transcription factors suggests that this strategy may be feasibly applied to direct differentiation in stem cells. Following this line of thinking, a proof of concept study achieved terminal myogenic differentiation of mRNA iPSCs to myoblasts by subsequent transfection with modified mRNA encoding MyoD (Fig. 8)¹⁶ in time scales comparable to other transfection methods.¹⁷⁴ Two other studies have reported transdifferentiation of fibroblasts to myoblasts by mRNA-driven exogenous expression of MyoD1 in murine and human models opening up the possibility of other phenotypic conversions using this method.^{164,175} In summary, current research suggests that transgene expression of lineage-specific transcription factors to direct differentiation in stem cells or promoting transdifferentiation of somatic cells through ectopic expression of

FIG. 8. (**A**) Microscopy images showing keratinocytes transfected with unmodified mRNA (No Mods) (**B**) 5-methyl-cytosine modified (5mC) (**C**) Pseudouridine modified (Psi) (**D**) 5mC + Psi modified-RNA encoding GFP. (**E**) Immunostaining for the muscle-specific proteins, myogenin (*green*) and myosin heavy chain (MyHC - *red*), in murine C3H/10T1/2 cell cultures with (**F**) mRNA encoding MYOD. Reproduced from³² with permission. Color images available online at www.liebertpub.com/tea



molecular switches, eliminates heterogeneity caused by defined media formulations, allowing reproducibility of differentiation protocols for regenerative applications with quantitative control over expression levels.

mRNA delivery to control stem cell secretome

In addition to their multipotent differentiation potential, the regenerative capacity of stem cells is attributed to their robust paracrine response to tissue injury. In particular, the MSC secretome has been found to be pivotal in modulating immune/inflammatory response, regulating angiogenesis, and maintaining a cytoprotective effect on local cells through both soluble factors and horizontal gene transfer by extracellular microvesicles and exosomes, in response to stress-derived signaling.³ High-throughput analyses using Liquid Chromatography with Tandem Mass Spectrometry Detection (LC-MS/MS), antibody arrays and bioinformatics have identified over 200 proteins as part of the MSC secretome.¹⁷⁶ While preconditioning and molecular stimulation protocols have been developed to stimulate the secretory function of stem cells for therapeutic applications, genetic manipulation through overexpression of selected genes such as Akt, and its target genes IGF-1, VEGF, GATA-4 and SDF-1 produced a sustained secretory response.177-181 Other studies have identified regulators of the stem cell secretome, such as calcium/calmodulin-dependent protein kinase kinase-1 (CAMKK1)¹⁸² and the activated form of HIF1 α ,¹⁸³ overexpression of which resulted in stimulation of the secretory function in MSCs through the Akt/PI3K pathway. There is also evidence for the involvement of PI3K, ERK1/2, p38 MAPK, and JAK/STAT signaling cascades in the regulation of stem cell secretory actions.¹⁸⁴⁻¹⁸⁶ While controlled genetic manipulation of the stem cell secretory function would require a deeper mechanistic understanding of the specific function of each of these transcription factors and the response they generate, currently, overexpression of individual growth factors, such as VEGF, PDGF-BB, BDNF, with well-characterized roles in angiogenesis and neuroprotection in transplanted stem cells have found use in recovery and regeneration of tissues, particularly for cardiovascular and neuroregenerative applications.¹⁸⁷⁻¹⁸⁹ These strategies, in addition to the concerns associated with traditional gene transfer methods, may warrant undesirable side effects as a result of prolonged expression of paracrine factors,^{190,191} which can be avoided by mRNA-driven therapeutics.

VEGF-A, one of the crucial factors in angiogenic signaling, was stably and transiently expressed at physiologically relevant doses in multipotent human embryonic stem cell-derived heart progenitors using chemically modified mRNA encoding *VEGF-A*, and stable accumulation of secreted protein occurred for upto 3 days after transfection. While local administration of modified *VEGF* mRNA after myocardial infarct showed promise in preventing scar formation and engendering regenerative effects through targeted, localized signaling,³¹ both secretory therapeutic functions as well as vasculogenic lineage specification to an endothelial phenotype was achieved in *VEGF*engineered progenitor cells *in vitro* and *in vivo*¹⁹² evidencing complete functional potency of the translated protein. Based on these studies, in 2017 major pharmaceutical companies (i.e., AstraZeneca-Moderna) announced a phase I clinical trial using mRNA *VEGF-A* formulations to investigate the angiogenesis in cardiometabolic disease patients. The outcome expected by this study consists in the formation of more blood vessels and enhanced blood supply providing a unique regenerative treatment option for cardiac patients.¹¹⁰ Cotransfection of multiple signaling factors of P-selectin glycoprotein ligand-1, Sialyl-Lewis^x, and Interleukin-10 in MSCs was successfully performed, which provoked an immunomodulatory response *in vitro*¹⁹³ and *in vivo*¹⁹⁴ as yet another example of enhanced and targeted therapeutic function of mRNA-engineered stem cells.

Another interesting application has been proposed for stem cells in regenerative medicine involving the use of microvesicles and exosomes shed by these stem cells as vehicles of genetic material, following their intrinsic func-tion of transporting proteins beyond cell membranes.^{195,196} Their innate stability against enzymatic degradation, long half-life, and membrane penetrability add to their appeal and can potentiate cell-free, tissue-specific gene modification strategies for regenerative applications.¹⁹⁷ Microvesicles can be modified to be enriched with specific proteins for transfer to target cells by genetic engineering of host stem cells for overexpression of these proteins, as a therapeutic or regenerative strategy that surpasses delivery and protein stability limitations faced by other drug or nucleic acid delivery methods.^{198,199} In this perspective, microvesicles derived from stem cells/precursors, may activate the cell organization capillary-like structures and trigger angiogenesis through horizontal transfer of mRNA or protein delivery that may contribute to tissue regeneration.^{200,201} However, more extensive biological characterization of microvesicles will need to be performed before they can be adopted for translational purposes in regenerative medicine.

mRNA applications for cytoprotection and angiogenesis

In regenerative processes, proteins act as important signaling molecules to control cell response on regeneration of damaged tissue. However, proteins have a low stability when delivered *in vivo* and may denaturate if directly submitted to the blood stream. To overcome these limitations, mRNAs can be delivered to site-specific locations, then internalized by cells, and activate the cell translation process to produce the target proteins required for tissue repair.³⁶

Huang *et al.*, demonstrated the effectiveness of modified *IGF-1* mRNA delivered intramyocardially during myocardial infarction in impeding hypoxia-induced apoptosis by supplementing cell-secreted and cell-associated IGF-1.¹⁹⁹ Cells induced to express IGF-1 transiently increases phosphorylation of Akt and ERK, as well as activation of HIF1 α , which are known transcription factors for signaling. Margariti *et al.* described the mechanism of derivation of endothelial and stem cells from a single source of partially reprogrammed fibroblasts (4 days of induction of OSKM factors). Treatment of these cells with VEGF before use for regeneration, showed efficient derivation of endothelial cells, which when seeded on decellularized vessel scaffolds showed high reendothelialization potential.²⁰² This method, which according to the authors, can be accomplished through either DNA or mRNA delivery, offers a nontumorogenic source of personalized cell therapy for treatment of ischemic tissues as well as engineered tissues, and can be applied for the derivation of other cell types that are not easily procurable.^{203–205}

Cas mRNA delivery for xenotransplantation

Xenotransplanted organs or cells have become increasingly popular as therapeutic solutions to overcome shortages in allotransplants. Recent examples of decellularized xenotransplanted organs have contributed to the development of newer strategies of regenerative medicine.^{206–209} The development of molecular tools, such as zinc finger nucleases, transcription activator-like effector nucleases, and CRISPR-Cas systems, has gone a long way toward achieving suppression of immunogenic responses and prevention of infection transfer thus providing longterm protection to xenografts against rejection mechanisms of the recipient organism.

In addition to the inherent ease of handling and efficiency of CRISPR/Cas systems, the development of chimeric single-guide RNAs (sgRNA) for targeted editing^{210,211} has further improved the specificity and efficiency²¹² of this approach and has been widely used for gene editing in cells that can be more effectively used for regenerative approaches, $^{213-215}$ as well as in creation of transgenic ani-mals with desired knockout genes^{216,217} for mechanistic studies. Moreover, CRISPR/Cas systems involving sgRNA can target multiple genomic loci enabling creation of multitransgenic organisms.²¹⁸ For example, Zhou et al., demonstrated the multiplexable nature of the CRISPR/ Cas9 mRNA system by targeting one exon of five genes (B2m, Il2rg, Prf1, Prkdc, and Rag1) in mice zygotes and successfully achieved various immunodeficient strains of mice with different combinations of knockout genes with upto quintuple deletions of all five genes, which could be transmitted through the germline to offsprings.²¹⁹ The incorporation of these methods in creating multimodified transgenic pigs for xenotransplantation with knockout of xenoantigens, such as GGTA1, CMAH, and B4GalNT2 and integration of human protective genes (CD46, CD55, CD59), has created a safe, ethically viable, and potentially unlimited source of cells and organs for xenotransplantation,²²⁰ which may form the next stage of implanatable regenerative strategies with more efficient translational outcomes. While transgenic animals are typically created through somatic cell nuclear transfer, the procedure is inefficient and prone to causing phenotypic abnormalities in the animals.²²¹ However, the use of RNA-guided nucleases and Cas nuclease mRNA enables circumvention of multiple steps wherein the two components could be directly injected into the cytoplasm of zygotes,²²² mitigating the low efficiencies and technical challenges associated with somatic cell nuclear transfer has been used to create knockout animals in various species.^{222–225} The advantage of Cas mRNA-mediated gene silencing methods is in the transient nature of expression of the nuclease, enabling efficient on-target genome editing, while curtailing offtarget editing due to extended nuclease exposure.^{226,227} However, contradictory results were obtained by Petersen et al. when cytoplasmic injection of CRISPR/Cas9 DNA

vectors targeting $\alpha 1,3$ -galactosyltransferase (*GGTA-1*), a major gene responsible for hyperacute rejection in pig-toprimate xenotransplants, resulted in higher efficiency of knockout and lower mosaicism in porcine cells²²⁸ than when nonviral delivery of Cas9 mRNA was used.²¹³ Similarly, high degree of mosaicism was reported by Liang *et al.* in human tripronuclear zygotes using the CRISPR/ Cas9 system suggesting that a further examination of delivery methods, nuclease concentrations, and intracellular mechanisms will be required to enhance fidelity and efficiency of these tools for successful clinical adaptation.

Challenges and Perspectives

The field of tissue engineering has evolved dramatically since its inception in the late 90 s. Current methods of biofabrication for direct engineering of tissues and organs have represented important strides toward clinical application. Similarly, the developments of advanced in vitro tools for drug discovery and disease models, such as integrated organs-on-a-chip,^{229,230} and organoid engineering,^{231,232} have drastically changed the landscape of research on regenerative medicine. The development of improved methods of genetic manipulation of stem cells for regenerative applications certainly represents another facet of the next generation of tissue engineering methods. Borrowing tools from basic biology and metabolomics,^{233,234} pro-teomics,²³⁵ and material sciences/materiomics,²³⁶ we en-vision that the generation of libraries^{111,114} of polymers will enable the expedited determination of the ideal combinations of nanoparticle carriers, RNA cargos, and hydrogel scaffolds for controlled cell response. Existing microarray technologies may be of interest in the development of these databases of materials and biological systems to better determine how they interact with one another for ultimate use.

Another area that is likely to receive increasing attention is the integration of genetic modifiers, such as mRNA, RNAi, and DNA, in controllable materials for biomanufacturing. As we hinted above, the complexity of native tissues in the body gives rise to the need for biofabrication methods that can precisely control the position, size, and morphology of each individual component making up complex tissues and organs. Therefore, it is unlikely that this is a situation where a single nanoparticle/mRNA will be able to allow for regeneration/engineering of an entire complex tissue or organ. Most likely the combination of multiple nucleic acids and cell-laden hydrogels engineered through biofabrication methods will bring us one step closer to the controlled formation of functional tissues and organs. In this regard, manufacturing tools such as 3D bioprinting,^{237,238} hydrogel microfabrication,^{112,239} and microfluidics²⁴⁰ will become increasingly important, especially when utilized with the right cells and scaffold materials. Moreover, the ability of controlling the genetic composition of individual cells in vitro and in vivo will illuminate the range of possibilities that remain poorly explored, including in situ reprogramming of stem cells after cell-laden hydrogel implantation, in situ genetic manipulation of delivered cells as a means of immunomodulation, controlled genetic vaccines, and other areas that are still in their infancy.

Conclusions

A new generation of synthetic nucleic acids is finding favor for gene modification in a wide variety of applications by enabling controlled transgene expression without risk of insertational mutagenesis or genome modification. Innovative approaches for in vitro transcription and modifications to mRNA chemistry, as well as delivery mechanisms have curtailed immunogenicity and improved transfection efficiencies. Additional endeavors to study and optimize scaffold-carrier interactions can add an additional level of spatiotemporal control over transgene expression while allowing integration of mRNA-mediated gene transfer with tissue engineering strategies to precisely modulate cell behavior and function for regenerative applications. Furthermore, the ability to induce pluripotency in somatic cells through mRNA reprogramming has afforded an increasing source of multipotent cells, and the same technology can be feasibly applied to efficiently induce differentiation to desired lineages in a reproducible manner, or to stimulate stem cell secretory functions. The prospect of integration of biofabrication techniques with optimized scaffold carrier interactions and release kinetics for delivery of multiple gene modifiers could represent an important addition to the expanding field of tissue engineering.

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Disclosure Statement

The authors declare no conflicts of interest.

References

- 1. Bianco, P., and Robey, P.G. Stem cells in tissue engineering. Nature **414**, 118, 2001.
- Bernal, J.A. RNA-based tools for nuclear reprogramming and lineage-conversion: towards clinical applications. J Cardiovasc Transl Res 6, 956, 2013.
- Bollini, S., Gentili, C., Tasso, R., and Cancedda, R. The regenerative role of the fetal and adult stem cell secretome. J Clin Med 2, 302, 2013.
- 4. Weissman, D., and Kariko, K. mRNA: fulfilling the promise of gene therapy. Mol Ther **23**, 1416, 2015.
- Bonadio, J., Smiley, E., Patil, P., and Goldstein, S. Localized, direct plasmid gene delivery in vivo: prolonged therapy results in reproducible tissue regeneration. Nat Med 5, 753, 1999.
- Edwards, P.C., Ruggiero, S., Fantasia, J., *et al.* Sonic hedgehog gene-enhanced tissue engineering for bone regeneration. Gene Ther **12**, 75, 2005.

- Jang, J.H., Rives, C.B., and Shea, L.D. Plasmid delivery in vivo from porous tissue-engineering scaffolds: transgene expression and cellular transfection. Mol Ther 12, 475, 2005.
- Huang, Y.C., Simmons, C., Kaigler, D., Rice, K.G., and Mooney, D.J. Bone regeneration in a rat cranial defect with delivery of PEI-condensed plasmid DNA encoding for bone morphogenetic protein-4 (BMP-4). Gene Ther 12, 418, 2005.
- Laporte, L.D., Yang, Y., Zelivyanskaya, M.L., Cummings, B.J., Anderson, A.J., and Shea, L.D. Plasmid releasing multiple channel bridges for transgene expression after spinal cord injury. Mol Ther **17**, 318, 2009.
- Zou, S., Scarfo, K., Nantz, M.H., and Hecker, J.G. Lipidmediated delivery of RNA is more efficient than delivery of DNA in non-dividing cells. Int J Pharm 389, 232, 2010.
- Matsui, A., Uchida, S., Ishii, T., Itaka, K., and Kataoka, K. Messenger RNA-based therapeutics for the treatment of apoptosis-associated diseases. Sci Rep 5, 15810, 2015.
- Donsante, A., Miller, D.G., Li, Y., *et al.* AAV vector integration sites in mouse hepatocellular carcinoma. Science (New York, NY) **317**, 477, 2007.
- Wang, P.-R., Xu, M., Toffanin, S., Li, Y., Llovet, J.M., and Russell, D.W. Induction of hepatocellular carcinoma by in vivo gene targeting. Proc Natl Acad Sci USA 109, 11264, 2012.
- 14. Russell, D.W., and Grompe, M. Adeno-associated virus finds its disease. Nat Genet **47**, 1104, 2015.
- Sahin, U., Kariko, K., and Tureci, O. mRNA-based therapeutics — developing a new class of drugs. Nat Rev Drug Discov 13, 759, 2014.
- 16. Warren, L., Manos, P.D., Ahfeldt, T., *et al.* Highly efficient reprogramming to pluripotency and directed differentiation of human cells with synthetic modified mRNA. Cell Stem Cell **7**, 618, 2010.
- 17. Bugeon, S., de Chevigny, A., Boutin, C., *et al.* Direct and efficient transfection of mouse neural stem cells and mature neurons by —in vivo mRNA electroporation. Development **144**, 3968, 2017.
- Phua, K.K., Boczkowski, D., Dannull, J., Pruitt, S., Leong, K.W., and Nair, S.K. Whole blood cells loaded with messenger RNA as an anti-tumor vaccine. Adv Healthc Mater 3, 837, 2014.
- McNamara, M.A., Nair, S.K., and Holl, E.K. RNA-Based vaccines in Cancer Immunotherapy. J Immunol Res 9, 2015, 2015.
- Oberli, M.A., Reichmuth, A.M., Dorkin, J.R., *et al.* Lipid nanoparticle assisted mRNA delivery for potent cancer immunotherapy. Nano Lett **17**, 1326, 2017.
- Dewitte, H., Stock, E., Vanderperren, K., De Smedt, S., Breckpot, K., and Lentacker, I. Ultrasound triggered mRNA delivery to dendritic cells-towards an in vivo cancer vaccination strategy. J Acoustical Soc Am 141, 4011, 2017.
- 22. Deering, R.P., Kommareddy, S., Ulmer, J.B., Brito, L.A., and Geall, A.J. Nucleic acid vaccines: prospects for nonviral delivery of mRNA vaccines. Expert Opin Drug Deliv **11**, 885, 2014.
- 23. Midoux, P., and Pichon, C. Lipid-based mRNA vaccine delivery systems. Expert Rev Vaccines 14, 221, 2015.
- 24. Richner, J.M., Himansu, S., Dowd, K.A., *et al.* Modified mRNA vaccines protect against Zika virus infection. Cell **168**, 1114, 2017.

- 25. Pardi, N., Hogan, M.J., Pelc, R.S., *et al.* Zika virus protection by a single low-dose nucleoside-modified mRNA vaccination. Nature **543**, 248, 2017.
- Alberer, M., Gnad-Vogt, U., Hong, H.S., *et al.* Safety and immunogenicity of a mRNA rabies vaccine in healthy adults: an open-label, non-randomised, prospective, firstin-human phase 1 clinical trial. Lancet (London, England) **390**, 2017, 1511.
- 27. Creusot, R.J., Chang, P., Healey, D.G., Tcherepanova, I.Y., Nicolette, C.A., and Fathman, C.G. A short pulse of IL-4 delivered by DCs electroporated with modified mRNA can both prevent and treat autoimmune diabetes in NOD mice. Mol Ther **18**, 2112, 2010.
- Kormann, M.S.D., Hasenpusch, G., Aneja, M.K., *et al.* Expression of therapeutic proteins after delivery of chemically modified mRNA in mice. Nat Biotechnol 29, 154, 2011.
- Kariko, K., Muramatsu, H., Keller, J.M., and Weissman, D. Increased erythropoiesis in mice injected with submicrogram quantities of pseudouridine-containing mRNA encoding erythropoietin. Mol Ther **20**, 948, 2012.
- Rosa, A., and Brivanlou, A.H. Synthetic mRNAs: powerful tools for reprogramming and differentiation of human cells. Cell Stem Cell 7, 549, 2010.
- Zangi, L., Lui, K.O., von Gise, A., *et al.* Modified mRNA directs the fate of heart progenitor cells and induces vascular regeneration after myocardial infarction. Nat Biotechnol **31**, 898, 2013.
- 32. Sridhar, A., Ohlemacher, S.K., Langer, K.B., and Meyer, J.S. Robust differentiation of mRNA-reprogrammed human induced pluripotent stem cells toward a retinal lineage. Stem Cells Transl Med 5, 417, 2016.
- Yin, H., Song, C.Q., Dorkin, J.R., *et al.* Therapeutic genome editing by combined viral and non-viral delivery of CRISPR system components in vivo. Nat Biotechnol 34, 328, 2016.
- 34. Miller, J.B., Zhang, S., Kos, P., *et al.* Non-viral CRISPR/ Cas gene editing in vitro and in vivo enabled by synthetic nanoparticle co-delivery of Cas9 mRNA and sgRNA. Angew Chem Int Ed Engl **56**, 1059, 2017.
- 35. Hajj, K.A., and Whitehead, K.A. Tools for translation: non-viral materials for therapeutic mRNA delivery. Nat Rev Mater **2**, 17056, 2017.
- Kwon, H., Kim, M., Seo, Y., *et al.* Emergence of synthetic mRNA: in vitro synthesis of mRNA and its applications in regenerative medicine. Biomaterials **156**, 172, 2018.
- Koch, G. Interaction of poliovirus-specific RNAs with HeLa cells and *E.coli*. Curr Top Microbiol Immunol 62, 89, 1973.
- Dimitriadis, G.J.. Translation of rabbit globin mRNA introduced by liposomes into mouse lymphocytes. Nature 274, 923, 1978.
- 39. Sharova, L.V., Sharov, A.A., Nedorezov, T., Piao, Y., Shaik, N., and Ko, M.S. Database for mRNA half-life of 19 977 genes obtained by DNA microarray analysis of pluripotent and differentiating mouse embryonic stem cells. DNA Res 16, 45, 2009.
- Heil, F., Hemmi, H., Hochrein, H., *et al.* Species-specific recognition of single-stranded RNA via toll-like receptor 7 and 8. Science (New York, NY) **303**, 1526, 2004.
- Diebold, S.S., Kaisho, T., Hemmi, H., Akira, S., and Reis e Sousa, C. Innate antiviral responses by means of TLR7mediated recognition of single-stranded RNA. Science (New York, NY) **303**, 1529, 2004.

- 42. Hornung, V., Ellegast, J., Kim, S., *et al.* 5'-Triphosphate RNA is the ligand for RIG-I. Science (NewYork, NY) **314**, 994, 2006.
- 43. Loo, Y.M., and Gale, M., Jr. Immune signaling by RIG-Ilike receptors. Immunity **34**, 680, 2011.
- 44. Vegna, S., Gregoire, D., Moreau, M., *et al.* NOD1 participates in the innate immune response triggered by hepatitis C virus polymerase. J Virol **90**, 6022, 2016.
- Sabbah, A., Chang, T.H., Harnack, R., *et al.* Activation of innate immune antiviral responses by Nod2. Nat Immunol 10, 1073, 2009.
- 46. Jalkanen, A.L., Coleman, S.J., and Wilusz, J. Determinants and implications of mRNA poly(A) tail size-does this protein make my tail look big? Semin Cell Dev Biol **34**, 24, 2014.
- 47. Mamot, A., Sikorski, P.J., Warminski, M., Kowalska, J., and Jemielity, J. Azido-functionalized 5' cap analogues for the preparation of translationally active mRNAs suitable for fluorescent labeling in living cells. Angew Chem Int Ed Engl 56, 15628, 2017.
- 48. Ramanathan, A., Robb, G.B., and Chan, S.-H. mRNA capping: biological functions and applications. Nucleic Acids Res **44**, 7511, 2016.
- 49. Pasquinelli, A.E., Dahlberg, J.E., and Lund, E. Reverse 5' caps in RNAs made in vitro by phage RNA polymerases. RNA **1**, 957, 1995.
- Jemielity, J., Fowler, T., Zuberek, J., *et al.* Novel "antireverse" cap analogs with superior translational properties. RNA 9, 1108, 2003.
- 51. Grudzien-Nogalska, E., Stepinski, J., Jemielity, J., *et al.* Synthesis of anti-reverse cap analogs (ARCAs) and their applications in mRNA translation and stability. Methods Enzymol **431**, 203, 2007.
- 52. Holtkamp, S., Kreiter, S., Selmi, A., *et al.* Modification of antigen-encoding RNA increases stability, translational efficacy, and T-cell stimulatory capacity of dendritic cells. Blood **108**, 4009, 2006.
- Barrett, L.W., Fletcher, S., and Wilton, S.D. Regulation of eukaryotic gene expression by the untranslated gene regions and other non-coding elements. Cell Mol Life Sci 69, 3613, 2012.
- Kariko, K., Muramatsu, H., Welsh, F.A., *et al.* Incorporation of pseudouridine into mRNA yields superior nonimmunogenic vector with increased translational capacity and biological stability. Mol Ther **16**, 1833, 2008.
- 55. Kariko, K., Buckstein, M., Ni, H., and Weissman, D. Suppression of RNA recognition by Toll-like receptors: the impact of nucleoside modification and the evolutionary origin of RNA. Immunity **23**, 165, 2005.
- Uchida, S., Kataoka, K., and Itaka, K. Screening of mRNA chemical modification to maximize protein expression with reduced immunogenicity. Pharmaceutics 7, 137, 2015.
- 57. Svitkin, Y.V., Cheng, Y.M., Chakraborty, T., Presnyak, V., John, M., and Sonenberg, N. N1-methyl-pseudouridine in mRNA enhances translation through eIF2α-dependent and independent mechanisms by increasing ribosome density. Nucleic Acids Res 45, 6023, 2017.
- Li, B., Luo, X., and Dong, Y. Effects of chemically modified messenger RNA on protein expression. Bioconjug Chem 27, 849, 2016.
- Lewis, C.J., Pan, T., and Kalsotra, A. RNA modifications and structures cooperate to guide RNA-protein interactions. Nat Rev Mol Cell Biol 18, 202, 2017.

MRNA IN TISSUE ENGINEERING AND REGENERATIVE MEDICINE

- 60. Zhao, B.S., Roundtree, I.A., and He, C. Posttranscriptional gene regulation by mRNA modifications. Nat Rev Mol Cell Biol **18**, 31, 2017.
- 61. Garneau, N.L., Wilusz, J., and Wilusz, C.J. The highways and byways of mRNA decay. Nat Rev Mol Cell Biol **8**, 113, 2007.
- 62. Houseley, J., and Tollervey, D. The many pathways of RNA degradation. Cell **136**, 763, 2009.
- 63. Reddi, K.K., and Holland, J.F. Elevated serum ribonuclease in patients with pancreatic cancer. Proc Natl Acad Sci U S A **73**, 2308, 1976.
- 64. Eder, P.S., DeVine, R.J., Dagle, J.M., and Walder, J.A. Substrate specificity and kinetics of degradation of antisense oligonucleotides by a 3' exonuclease in plasma. Antisense Res Dev 1, 141, 1991.
- Stewart, M.P., Sharei, A., Ding, X., Sahay, G., Langer, R., and Jensen, K.F. In vitro and ex vivo strategies for intracellular delivery. Nature 538, 183, 2016.
- 66. Van Driessche, A., Ponsaerts, P., Van Bockstaele, D.R., Van Tendeloo, V.F., and Berneman, Z.N. Messenger RNA electroporation: an efficient tool in immunotherapy and stem cell research. Folia Histochem Cytobiol 43, 213, 2005.
- 67. Van Tendeloo, V.F., Ponsaerts, P., Lardon, F., *et al.* Highly efficient gene delivery by mRNA electroporation in human hematopoietic cells: superiority to lipofection and passive pulsing of mRNA and to electroporation of plasmid cDNA for tumor antigen loading of dendritic cells. Blood **98**, 49, 2001.
- Chen, S., Lee, B., Lee, A.Y., Modzelewski, A.J., and He, L. Highly efficient mouse genome editing by CRISPR ribonucleoprotein electroporation of zygotes. J Biol Chem 291, 14457, 2016.
- 69. Ma, H., Marti-Gutierrez, N., Park, S.-W., *et al.* Correction of a pathogenic gene mutation in human embryos. Nature **548**, 413, 2017.
- Qiu, P., Ziegelhoffer, P., Sun, J., and Yang, N.S. Gene gun delivery of mRNA in situ results in efficient transgene expression and genetic immunization. Gene Ther 3, 262, 1996.
- Sohn, R.L., Murray, M.T., Schwarz, K., *et al.* In-vivo particle mediated delivery of mRNA to mammalian tissues: ballistic and biologic effects. Wound Repair Regen 9, 287, 2001.
- 72. Rizk, A., and Rabie, B.M. Electroporation for transfection and differentiation of dental pulp stem cells. BioRes Open Access **2**, 155, 2013.
- Wiehe, M., Ponsaerts, J., Rojewski, P., *et al.* mRNAmediated gene delivery into human progenitor cells promotes highly efficient protein expression. J Cell Mol Med 11, 521, 2007.
- 74. Gerer, K.F., Hoyer, S., Dorrie, J., and Schaft, N. Electroporation of mRNA as universal technology platform to transfect a variety of primary cells with antigens and functional proteins. Methods Mol Biol (Clifton, NJ) 1499, 165, 2017.
- 75. Dever, D.P., Bak, R.O., Reinisch, A., *et al.* CRISPR/Cas9 beta-globin gene targeting in human haematopoietic stem cells. Nature **539**, 384, 2016.
- 76. Wang, W., Kutny, P.M., Byers, S.L., *et al.* Delivery of Cas9 protein into mouse zygotes through a series of electro-poration dramatically increases the efficiency of model creation. J Genet Genomics **43**, 319, 2016.

- 77. Alsaggar, M., and Liu, D. Chapter One–Physical methods for gene transfer. In: Huang, L., Liu, D., and Wagner, E., eds. Advances in Genetics. Cambridge: Academic Press, 2015, p.1
- Dowdy, S.F. Overcoming cellular barriers for RNA therapeutics. Nat Biotechnol 35, 222, 2017.
- 79. Stewart, M.P., Lorenz, A., Dahlman, J., and Sahay, G. Challenges in carrier-mediated intracellular delivery: moving beyond endosomal barriers. Wiley Interdiscip Rev Nanomater Nanobiotechnol 8, 465, 2016.
- 80. Barenholz, Y. Doxil(R)-the first FDA-approved nanodrug: lessons learned. J Control Release **160**, 117, 2012.
- Sahay, G., Alakhova, D.Y., and Kabanov, A.V. Endocytosis of nanomedicines. J Control Release 145, 182, 2010.
- Boussif, O., Lezoualc'h, F., Zanta, M.A., *et al.* A versatile vector for gene and oligonucleotide transfer into cells in culture and in vivo: polyethylenimine. Proc Natl Acad Sci U S A **92**, 7297, 1995.
- 83. Hafez, I.M., Maurer, N., and Cullis, P.R. On the mechanism whereby cationic lipids promote intracellular delivery of polynucleic acids. Gene Ther **8**, 1188, 2001.
- Bettinger, T., Carlisle, R.C., Read, M.L., Ogris, M., and Seymour, L.W. Peptide-mediated RNA delivery: a novel approach for enhanced transfection of primary and postmitotic cells. Nucleic Acids Res 29, 3882, 2001.
- Osborn, M.F., Alterman, J.F., Nikan, M., *et al.* Guanabenz (Wytensin) selectively enhances uptake and efficacy of hydrophobically modified siRNAs. Nucleic Acids Res 43, 8664, 2015.
- Patel, S., Ashwanikumar, N., Robinson, E., *et al.* Boosting intracellular delivery of lipid nanoparticle-encapsulated mRNA. Nano Lett **17**, 5711, 2017.
- 87. Wagner, E., Plank, C., Zatloukal, K., Cotten, M., and Birnstiel, M.L. Influenza virus hemagglutinin HA-2Nterminal fusogenic peptides augment gene transfer by transferrin-polylysine-DNA complexes: toward a synthetic virus-like gene-transfer vehicle. Proc Natl Acad Sci U S A **89**, 7934, 1992.
- Jeong, J.H., and Park, T.G. Poly(L-lysine)-g-poly(D,Llactic-co-glycolic acid) micelles for low cytotoxic biodegradable gene delivery carriers. J Control Release 82, 159, 2002.
- Islam, M.A., Reesor, E.K.G., Xu, Y., Zope, H.R., Zetter, B.R., and Shi, J. Biomaterials for mRNA delivery. Biomater Sci 3, 1519, 2015.
- 90. Choi, H.Y., Lee, T.J., Yang, G.M., *et al.* Efficient mRNA delivery with graphene oxide-polyethylenimine for generation of footprint-free human induced pluripotent stem cells. J Control Release 235, 222, 2016.
- 91. Li, J., Wang, W., He, Y., *et al.* Structurally programmed assembly of translation initiation nanoplex for superior mRNA delivery. ACS Nano **11**, 2531, 2017.
- Uchida, H., Itaka, K., Nomoto, T., *et al.* Modulated protonation of side chain aminoethylene repeats in N-substituted polyaspartamides promotes mRNA transfection. J Am Chem Soc 136, 12396, 2014.
- 93. Chen, Q., Qi, R., Chen, X., *et al.* A targeted and stable polymeric nanoformulation enhances systemic delivery of mRNA to tumors. Mol Ther **25**, 92, 2017.
- 94. Uchida, S., Kinoh, H., Ishii, T., *et al.* Systemic delivery of messenger RNA for the treatment of pancreatic cancer using polyplex nanomicelles with a cholesterol moiety. Biomaterials **82**, 221, 2016.

- 95. Debus, H., Baumhof, P., Probst, J., and Kissel, T. Delivery of messenger RNA using poly(ethylene imine)poly(ethylene glycol)-copolymer blends for polyplex formation: biophysical characterization and in vitro transfection properties. J Control Release 148, 334, 2010.
- 96. Aini, H., Itaka, K., Fujisawa, A., *et al.* Messenger RNA delivery of a cartilage-anabolic transcription factor as a disease-modifying strategy for osteoarthritis treatment. Sci Rep 6, 18743, 2016.
- 97. Kaczmarek, J.C., Patel, A.K., Kauffman, K.J., *et al.* Polymer-lipid nanoparticles for systemic delivery of mRNA to the lungs. Angew Chem Int Ed Engl 55, 13808, 2016.
- Moffett, H.F., Coon, M.E., Radtke, S., *et al.* Hit-and-run programming of therapeutic cytoreagents using mRNA nanocarriers. Nat Commun 8, 389, 2017.
- 99. Weide, B., Pascolo, S., Scheel, B., *et al.* Direct injection of protamine-protected mRNA: results of a phase 1/2 vaccination trial in metastatic melanoma patients. J Immunother (Hagerstown, MD: 1997), **32**, 498, 2009.
- Kanasty, R., Dorkin, J.R., Vegas, A., and Anderson, D. Delivery materials for siRNA therapeutics. Nat Mater 12, 967, 2013.
- 101. Li, B., Luo, X., Deng, B., *et al.* An orthogonal array optimization of lipid-like nanoparticles for mRNA delivery in vivo. Nano Lett **15**, 8099, 2015.
- 102. Liu, L., Wang, Y., Miao, L., *et al.* Combination immunotherapy of MUC1 mRNA nano-vaccine and CTLA-4 blockade effectively inhibits growth of triple negative breast cancer. Mol Ther **26**, 45, 2018.
- 103. Lv, H., Zhang, S., Wang, B., Cui, S., and Yan, J. Toxicity of cationic lipids and cationic polymers in gene delivery. J Control Release **114**, 100, 2006.
- Landesman-Milo, D., and Peer, D. Toxicity profiling of several common RNAi-based nanomedicines: a comparative study. Drug Deliv Transl Res 4, 96, 2014.
- Knudsen, K.B., Northeved, H., Kumar, P.E., *et al.* In vivo toxicity of cationic micelles and liposomes. Nanomater Nanotechnol Biol Med **11**, 467, 2015.
- Semple, S.C., Akinc, A., Chen, J., *et al.* Rational design of cationic lipids for siRNA delivery. Nat Biotechnol 28, 172, 2010.
- 107. Suhr, O.B., Coelho, T., Buades, J., *et al.* Efficacy and safety of patisiran for familial amyloidotic polyneuropathy: a phase II multi-dose study. Orphanet J Rare Dis **10**, 109, 2015.
- 108. Ramaswamy, S., Tonnu, N., Tachikawa, K., *et al.* Systemic delivery of factor IX messenger RNA for protein replacement therapy. Proc Natl Acad Sci U S A **114**, E1941, 2017.
- 109. Bahl, K., Senn, J.J., Yuzhakov, O., *et al.* Preclinical and Clinical Demonstration of Immunogenicity by mRNA vaccines against H10N8 and H7N9 Influenza Viruses. Mol Ther 25, 1316, 2017.
- 110. Pipeline. Moderna Therapeutics. www.modernatx.com/ pipeline (last accessed October 10, 2017).
- 111. Karagiannis, E.D., Urbanska, A.M., Sahay, G., *et al.* Rational design of a biomimetic cell penetrating peptide library. ACS Nano 7, 8616, 2013.
- 112. Annabi, N., Tamayol, A., Uquillas, J.A., *et al.* 25th anniversary article: rational design and applications of hydrogels in regenerative medicine. Adv Mater **26**, 85, 2014.

- 113. Malda, J., Visser, J., Melchels, F.P., *et al.* 25th anniversary article: engineering hydrogels for biofabrication. Adv Mater **25**, 5011, 2013.
- Kauffman, K.J., Webber, M.J., and Anderson, D.G. Materials for non-viral intracellular delivery of messenger RNA therapeutics. J Control Release 240, 227, 2016.
- 115. Zhu, J. Bioactive modification of poly(ethylene glycol) hydrogels for tissue engineering. Biomaterials **31**, 4639, 2010.
- Rodell, C.B., and Burdick, J.A. Materials science: radicals promote magnetic gel assembly. Nature **514**, 574, 2014.
- 117. Yue, K., Trujillo-de Santiago, G., Alvarez, M.M., Tamayol, A., Annabi, N., and Khademhosseini, A. Synthesis, properties, and biomedical applications of gelatin methacryloyl (GelMA) hydrogels. Biomaterials **73**, 254, 2015.
- Li, Y., Tang, Y., Narain, R., Lewis, A.L., and Armes, S.P. Biomimetic stimulus-responsive star diblock gelators. Langmuir 21, 9946, 2005.
- 119. Mahkam, M. Novel pH-sensitive hydrogels for colonspecific drug delivery. Drug Deliv **17**, 158, 2010.
- 120. Kim, Y.M., and Song, S.C. Targetable micelleplex hydrogel for long-term, effective, and systemic siRNA delivery. Biomaterials **35**, 7970, 2014.
- 121. Kim, Y.M., Park, M.R., and Song, S.C. An injectable cell penetrable nano-polyplex hydrogel for localized siRNA delivery. Biomaterials **34**, 4493, 2013.
- 122. Kim, Y.M., Park, M.R., and Song, S.C. Injectable polyplex hydrogel for localized and long-term delivery of siRNA. ACS Nano **6**, 5757, 2012.
- 123. Nguyen, M.K., McMillan, A., Huynh, C.T., Schapira, D.S., and Alsberg, E. Photocrosslinkable, biodegradable hydrogels with controlled cell adhesivity for prolonged siRNA delivery to hMSCs to enhance their osteogenic differentiation. J Mater Chem B Mater Biol Med 5, 485, 2017.
- 124. Huynh, C.T., Nguyen, M.K., Naris, M., Tonga, G.Y., Rotello. V.M., and Alsberg, E. Light-triggered RNA release and induction of hMSC osteogenesis via photodegradable, dual-crosslinked hydrogels. Nanomedicine (Lond), 11, 1535, 2016.
- 125. Huynh, C.T., Nguyen, M.K., Tonga, G.Y., Longe, L., Rotello, V.M., and Alsberg, E. Photocleavable Hydrogels for Light-Triggered siRNA Release. Adv Healthc Mater 5, 305, 2016.
- Murdan, S. Electro-responsive drug delivery from hydrogels. J Control Release 92, 1, 2003.
- 127. Jackson, A.L., and Linsley, P.S. Recognizing and avoiding siRNA off-target effects for target identification and therapeutic application. Nat Rev Drug Discov **9**, 57, 2010.
- 128. Wang, L.L., and Burdick, J.A. Engineered hydrogels for local and sustained delivery of RNA-interference therapies. Adv Healthc Mater **6**, 62017, 2017.
- Servick, K. This mysterious \$2 billion biotech is revealing the secrets behind its new drugs and vaccines. Science (New York, NY). AAAS, 2016. DOI: 10.1126/science.aal0686.
- 130. Nguyen, K., Dang, P.N., and Alsberg, E. Functionalized, biodegradable hydrogels for control over sustained and localized siRNA delivery to incorporated and surrounding cells. Acta Biomater 9, 4487, 2013.
- 131. Ma, Z., Yang, C., Song, W., Wang, Q., Kjems, J., and Gao, S. Chitosan hydrogel as siRNA vector for prolonged gene silencing. J Nanobiotechnol **12**, 23, 2014.

- 132. Wei, X., Shao, B., He, Z., *et al.* Cationic nanocarriers induce cell necrosis through impairment of Na(+)/K(+)-ATPase and cause subsequent inflammatory response. Cell Res **25**, 237, 2015.
- 133. Verma, A., and Stellacci, F. Effect of surface properties on nanoparticle-cell interactions. Small **6**, 12, 2010.
- Cai, L.H., Panyukov, S., and Rubinstein, M. Mobility of nonsticky nanoparticles in polymer liquids. Macromolecules 44, 7853, 2011.
- 135. Pun, S.H., Bellocq, N.C., Liu, A., *et al.* Cyclodextrinmodified polyethylenimine polymers for gene delivery. Bioconjug Chem **15**, 831, 2004.
- 136. Liu, L., Zheng, M., Librizzi, D., Renette, T., Merkel, O.M., and Kissel, T. Efficient and Tumor Targeted siRNA Delivery by polyethylenimine-graft-polycaprolactoneblock-poly(ethylene glycol)-folate (PEI-PCL-PEG-Fol). Mol Pharm 13, 134, 2016.
- 137. Dhaliwal, A., Oshita, V., and Segura, T. Transfection in the third dimension. Integr Biol (Camb) **5**, 1206, 2013.
- 138. Nguyen, M.K., Jeon, O., Krebs, M.D., Schapira, D., and Alsberg, E. Sustained localized presentation of RNA interfering molecules from in situ forming hydrogels to guide stem cell osteogenic differentiation. Biomaterials 35, 6278, 2014.
- 139. McKinlay, C.J., Vargas, J.R., Blake, T.R., *et al.* Chargealtering releasable transporters (CARTs) for the delivery and release of mRNA in living animals. Proc Natl Acad Sci U S A **114**, E448, 2017.
- 140. Takahashi, K., and Yamanaka, S. Induction of pluripotent stem cells from mouse embryonic and adult fibroblast cultures by defined factors. Cell **126**, 663, 2006.
- 141. Takahashi, K., Tanabe, K., Ohnuki, M., *et al.* Induction of pluripotent stem cells from adult human fibroblasts by defined factors. Cell **131**, 861, 2007.
- 142. Nakagawa, M., Koyanagi, M., Tanabe, K., *et al.* Generation of induced pluripotent stem cells without Myc from mouse and human fibroblasts. Nat Biotechnol **26**, 101, 2008.
- 143. Wernig, M., Meissner, A., Cassady, J.P., and Jaenisch, R. c-Myc is dispensable for direct reprogramming of mouse fibroblasts. Cell Stem Cell 2, 10, 2008.
- 144. Hochedlinger, K., Yamada, Y., Beard, C., and Jaenisch, R. Ectopic expression of Oct-4 blocks progenitor-cell differentiation and causes dysplasia in epithelial tissues. Cell 121, 465, 2005.
- 145. Foster, K.W., Liu, Z., Nail, C.D., *et al.* Induction of KLF4 in basal keratinocytes blocks the proliferationdifferentiation switch and initiates squamous epithelial dysplasia. Oncogene **24**, 1491, 2005.
- 146. Okita, K., Nakagawa, M., Hyenjong, H., Ichisaka, T., and Yamanaka, S. Generation of mouse induced pluripotent stem cells without viral vectors. Science (New york, NY) 322, 949, 2008.
- 147. Chou, B.K., Mali, P., Huang, X., *et al.* Efficient human iPS cell derivation by a non-integrating plasmid from blood cells with unique epigenetic and gene expression signatures. Cell Res **21**, 518, 2011.
- Stadtfeld, M., Nagaya, M., Utikal, J., Weir, G., and Hochedlinger, K. Induced pluripotent stem cells generated without viral integration. Science (New York, NY) 322, 945, 2008.
- 149. Kaji, K., Norrby, K., Paca, A., Mileikovsky, M., Mohseni, P., and Woltjen, K. Virus-free induction of pluripotency

and subsequent excision of reprogramming factors. Nature **458**, 771, 2009.

- 150. Woltjen, K., Michael, I.P., Mohseni, P., *et al.* piggyBac transposition reprograms fibroblasts to induced pluripotent stem cells. Nature **458**, 766, 2009.
- 151. Woltjen, K., Hamalainen, R., Kibschull, M., Mileikovsky, M., and Nagy, A. Transgene-free production of pluripotent stem cells using piggyBac transposons. Methods Mol Biol (Clifton, NJ) **767**, 87, 2011.
- 152. Chang, C.W., Lai, Y.S., Pawlik, K.M., *et al.* Polycistronic lentiviral vector for "hit and run" reprogramming of adult skin fibroblasts to induced pluripotent stem cells. Stem Cells **27**, 1042, 2009.
- 153. Fusaki, N., Ban, H., Nishiyama, A., Saeki, K., and Hasegawa, M. Efficient induction of transgene-free human pluripotent stem cells using a vector based on Sendai virus, an RNA virus that does not integrate into the host genome. Proc Jpn Acad Ser B Phys Biol Sci **85**, 348, 2009.
- 154. Chen, I.P., Fukuda, K., Fusaki, N., *et al.* Induced pluripotent stem cell reprogramming by integration-free Sendai virus vectors from peripheral blood of patients with craniometaphyseal dysplasia. Cell Reprogram **15**, 503, 2013.
- 155. Ye, L., Muench, M.O., Fusaki, N., *et al.* Blood cellderived induced pluripotent stem cells free of reprogramming factors generated by Sendai viral vectors. Stem Cells Transl Med **2**, 558, 2013.
- 156. Churko, J.M., Burridge, P.W., and Wu, J.C. Generation of human iPSCs from human peripheral blood mononuclear cells using non-integrative Sendai virus in chemically defined conditions. Methods Mol Biol (Clifton, NJ) **1036**, 81, 2013.
- 157. Zhou, H., Wu, S., Joo, J.Y., *et al.* Generation of induced pluripotent stem cells using recombinant proteins. Cell Stem Cell **4**, 381, 2009.
- 158. Kim, D., Kim, C.H., Moon, J.I., *et al.* Generation of human induced pluripotent stem cells by direct delivery of reprogramming proteins. Cell Stem Cell **4**, 472, 2009.
- 159. Zhang, H., Ma, Y., Gu, J., *et al.* Reprogramming of somatic cells via TAT-mediated protein transduction of recombinant factors. Biomaterials **33**, 5047, 2012.
- Link, N., Aubel, C., Kelm, J.M., *et al.* Therapeutic protein transduction of mammalian cells and mice by nucleic acid-free lentiviral nanoparticles. Nucleic Acids Res 34, e16, 2006.
- 161. Warren, L., Ni, Y., Wang, J., and Guo, X. Feeder-free derivation of human induced pluripotent stem cells with messenger RNA. Sci Rep **2**, 657, 2012.
- 162. Papapetrou, E.P., Tomishima, M.J., Chambers, S.M., *et al.* Stoichiometric and temporal requirements of Oct4, Sox2, Klf4, and c-Myc expression for efficient human iPSC induction and differentiation. Proc Natl Acad Sci U S A **106**, 12759, 2009.
- 163. Preskey, D. An mRNA-Reprogramming Method with Improved Kinetics and Efficiency and the Successful Transdifferentiation of Human Fibroblasts Using Modified mRNA. United Kingdom: PhD Department of Biomedical Sciences, University of Sheffield.
- 164. Preskey, D., Allison, T.F., Jones, M., Mamchaoui, K., and Unger, C. Synthetically modified mRNA for efficient and fast human iPS cell generation and direct

transdifferentiation to myoblasts. Biochem Biophys Res Commun **473**, 743, 2016.

- 165. Yakubov, E., Rechavi, G., Rozenblatt, S., and Givol, D. Reprogramming of human fibroblasts to pluripotent stem cells using mRNA of four transcription factors. Biochem Biophys Res Commun **394**, 189, 2010.
- 166. Schlaeger, T.M., Daheron, L., Brickler, T.R., *et al.*. A comparison of non-integrating reprogramming methods. Nat Biotechnol **33**, 58, 2015.
- 167. Kubler, H., Scheel, B., Gnad-Vogt, U., *et al.* Selfadjuvanted mRNA vaccination in advanced prostate cancer patients: a first-in-man phase I/IIa study. J Immunother Cancer **3**, 26, 2015.
- 168. Rittig, S.M., Haentschel, M., Weimer, K.J., *et al.* Intradermal vaccinations with RNA coding for TAA generate CD8+ and CD4+ immune responses and induce clinical benefit in vaccinated patients. Mol Ther **19**, 990, 2011.
- 169. Yucer, N., Holzapfel, M., Jenkins Vogel, T., *et al.* Directed differentiation of human induced pluripotent stem cells into Fallopian tube epithelium. Sci Rep **7**, 10741, 2017.
- Cachet, E.M., K.C., and Davies, J.A. Synthetic Biology Approaches for Regenerative Medicine. US: Wiley-Blackwell, 2015.
- 171. Kim, J.B., and Spiegelman, B.M. ADD1/SREBP1 promotes adipocyte differentiation and gene expression linked to fatty acid metabolism. Genes Dev **10**, 1096, 1996.
- 172. Sugiyama, O., An, D.S., Kung, S.P., *et al.* Lentivirusmediated gene transfer induces long-term transgene expression of BMP-2 in vitro and new bone formation in vivo. Mol Ther **11**, 390, 2005.
- 173. Lacoste, A., Berenshteyn, F., and Brivanlou, A.H. An efficient and reversible transposable system for gene delivery and lineage-specific differentiation in human embryonic stem cells. Cell Stem Cell **5**, 332, 2009.
- 174. Lenzi, J., Pagani, F., De Santis, R., *et al.* Differentiation of control and ALS mutant human iPSCs into functional skeletal muscle cells, a tool for the study of neuromuscolar diseases. Stem Cell Res **17**, 140, 2016.
- 175. Hausburg, F., Na, S., Voronina, N., *et al.* Defining optimized properties of modified mRNA to enhance virusand DNA- independent protein expression in adult stem cells and fibroblasts. Cell Physiol Biochem **35**, 1360, 2015.
- 176. Sze, S.K., de Kleijn, D.P., Lai, R.C., *et al.* Elucidating the secretion proteome of human embryonic stem cell-derived mesenchymal stem cells. Mol Cell Proteomics 6, 1680, 2007.
- 177. Gnecchi, M., He, H., Noiseux, N., *et al.* Evidence supporting paracrine hypothesis for Akt-modified mesenchymal stem cell-mediated cardiac protection and functional improvement. FASEB J **20**, 661, 2006.
- 178. Haider, H., Jiang, S., Idris, N.M., and Ashraf, M. IGF-1overexpressing mesenchymal stem cells accelerate bone marrow stem cell mobilization via paracrine activation of SDF-1alpha/CXCR4 signaling to promote myocardial repair. Circ Res 103, 1300, 2008.
- 179. Tang, Y.L., Zhao, Q., Qin, X., *et al.* Paracrine action enhances the effects of autologous mesenchymal stem cell transplantation on vascular regeneration in rat model of myocardial infarction. Ann Thorac Surg **80**, 229, 2005.

- Li, H., Zuo, S., He, Z., *et al.* Paracrine factors released by GATA-4 overexpressed mesenchymal stem cells increase angiogenesis and cell survival. Am J Physiol Heart Circ Physiol **299**, H1772, 2010.
- 181. Yang, F., Cho, S.W., Son, S.M., *et al.* Genetic engineering of human stem cells for enhanced angiogenesis using biodegradable polymeric nanoparticles. Proc Natl Acad Sci U S A **107**, 3317, 2010.
- 182. Dong, F., Patnaik, S., Duan, Z.H., Kiedrowski, M., Penn, M.S., and Mayorga, M.E. A novel role for CAMKK1 in the regulation of the mesenchymal stem cell secretome. Stem Cells Transl Med 6, 1759, 2017.
- 183. Zhong, Q., Zhou, Y., Ye, W., Cai, T., Zhang, X., and Deng, D.Y. Hypoxia-inducible factor 1-alpha-AAmodified bone marrow stem cells protect PC12 cells from hypoxia-induced apoptosis, partially through VEGF/PI3K/ Akt/FoxO1 pathway. Stem Cells Dev 21, 2703, 2012.
- 184. Herrmann, J.L., Weil, B.R., Abarbanell, A.M., *et al.* IL-6 and TGF-alpha costimulate mesenchymal stem cell vascular endothelial growth factor production by ERK-, JNK-, and PI3K-mediated mechanisms. Shock **35**, 512, 2011.
- 185. Shi, R.Z., Wang, J.C., Huang, S.H., Wang, X.J., and Li, Q.P. Angiotensin II induces vascular endothelial growth factor synthesis in mesenchymal stem cells. Exp Cell Res 315, 10, 2009.
- 186. Wang, M., Zhang, W., Crisostomo, P., *et al.* STAT3 mediates bone marrow mesenchymal stem cell VEGF production. J Mol Cell Cardiol **42**, 1009, 2007.
- 187. Tang, J.M., Wang, J.N., Zhang, L., *et al.* VEGF/SDF-1 promotes cardiac stem cell mobilization and myocardial repair in the infarcted heart. Cardiovasc Res **91**, 402, 2011.
- 188. Xu, B., Luo, Y., Liu, Y., Li, B.Y., and Wang, Y. Plateletderived growth factor-BB enhances MSC-mediated cardioprotection via suppression of miR-320 expression. Am J Physiol Heart Circ Physiol **308**, H980, 2015.
- Lu, P., Jones, L.L., and Tuszynski, M.H. BDNFexpressing marrow stromal cells support extensive axonal growth at sites of spinal cord injury. Exp Neurol **191**, 344, 2005.
- 190. Nagy, J.A., Dvorak, A.M., and Dvorak, H.F. Vascular hyperpermeability, angiogenesis, and stroma generation. Cold Spring Harb Perspect Med **2**, a006544, 2012.
- 191. Yang, R., Ogasawara, A.K., Zioncheck, T.F., *et al.* Exaggerated hypotensive effect of vascular endothelial growth factor in spontaneously hypertensive rats. Hypertension **39**, 815, 2002.
- 192. Lui, K.O., Zangi, L., Silva, E.A., *et al.* Driving vascular endothelial cell fate of human multipotent Isl1+ heart progenitors with VEGF modified mRNA. Cell Res 23, 1172, 2013.
- 193. Levy, O., Zhao, W., Mortensen, L.J., *et al.* mRNAengineered mesenchymal stem cells for targeted delivery of interleukin-10 to sites of inflammation. Blood **122**, e23, 2013.
- 194. Liao, W., Pham, V., Liu, L., *et al.* Mesenchymal stem cells engineered to express selectin ligands and IL-10 exert enhanced therapeutic efficacy in murine experimental autoimmune encephalomyelitis. Biomaterials **77**, 87, 2016.
- 195. Lai, R.C., Yeo, R.W., Tan, K.H., and Lim, S.K. Exosomes for drug delivery - a novel application for the mesenchymal stem cell. Biotechnol Adv **31**, 543, 2013.

MRNA IN TISSUE ENGINEERING AND REGENERATIVE MEDICINE

- 196. Pegtel, D.M., Cosmopoulos, K., Thorley-Lawson, D.A., et al. Functional delivery of viral miRNAs via exosomes. Proc Natl Acad Sci U S A 107, 6328, 2010.
- 197. Yu, B., Kim, H.W., Gong, M., *et al.* Exosomes secreted from GATA-4 overexpressing mesenchymal stem cells serve as a reservoir of anti-apoptotic microRNAs for cardioprotection. Int J Cardiol **182**, 349, 2015.
- 198. Li, W., Mu, D., Tian, F., *et al.* Exosomes derived from Rab27a-overexpressing tumor cells elicit efficient induction of antitumor immunity. Mol Med Rep 8, 1876, 2013.
- 199. Squadrito, M.L., Baer, C., Burdet, F., *et al.* Endogenous RNAs modulate microRNA sorting to exosomes and transfer to acceptor cells. Cell Rep **8**, 1432, 2014.
- 200. Lamichhane, T.N., Sokic, S., Schardt, J.S., Raiker, R.S., Lin, J.W., and Jay, S.M. Emerging roles for extracellular vesicles in tissue engineering and regenerative medicine. Tissue Eng B, Rev 21, 45, 2015.
- 201. Deregibus, M.C., Cantaluppi, V., Calogero, R., *et al.* Endothelial progenitor cell derived microvesicles activate an angiogenic program in endothelial cells by a horizontal transfer of mRNA. Blood **110**, 2440, 2007.
- 202. Margariti, A., Winkler, B., Karamariti, E., *et al.* Direct reprogramming of fibroblasts into endothelial cells capable of angiogenesis and reendothelialization in tissue-engineered vessels. Proc Natl Acad Sci U S A **109**, 13793, 2012.
- 203. Szabo, E., Rampalli, S., Risueno, R.M., *et al.* Direct conversion of human fibroblasts to multilineage blood progenitors. Nature **468**, 521, 2010.
- Son, E.Y., Ichida, J.K., Wainger, B.J., *et al.* Conversion of mouse and human fibroblasts into functional spinal motor neurons. Cell Stem Cell 9, 205, 2011.
- 205. Ieda, M., Fu, J.D., Delgado-Olguin, P., *et al.* Direct reprogramming of fibroblasts into functional cardiomyocytes by defined factors. Cell **142**, 375, 2010.
- 206. Ott, H.C., Clippinger, B., Conrad, C., *et al.* Regeneration and orthotopic transplantation of a bioartificial lung. Nat Med **16**, 927, 2010.
- 207. Uygun, B.E., Soto-Gutierrez, A., Yagi, H., *et al.* Organ reengineering through development of a transplantable recellularized liver graft using decellularized liver matrix. Nat Med **16**, 814, 2010.
- Niklason, L.E., Gao, J., Abbott, W.M., *et al.* Functional arteries grown in vitro. Science (New York, NY) 284, 489, 1999.
- 209. Petersen, T.H., Calle, E.A., Zhao, L., *et al.* Tissueengineered lungs for in vivo implantation. Science (New York, NY) **329**, 538, 2010.
- Sander, J.D., and Joung, J.K. CRISPR-Cas systems for editing, regulating and targeting genomes. Nat Biotechnol 32, 347, 2014.
- 211. Wang, K., Ouyang, H., Xie, Z., *et al.* Efficient generation of myostatin mutations in pigs using the CRISPR/Cas9 system. Sci Rep 5, 16623, 2015.
- 212. Hsu, P.D., Lander, E.S., and Zhang, F. Development and applications of CRISPR-Cas9 for genome engineering. Cell **157**, 1262, 2014.
- 213. Sato, M., Miyoshi, K., Nagao, Y., *et al.* The combinational use of CRISPR/Cas9-based gene editing and targeted toxin technology enables efficient biallelic knockout of the alpha-1,3-galactosyltransferase gene in porcine embryonic fibroblasts. Xenotransplantation **21**, 291, 2014.
- 214. Mandal, P.K., Ferreira, L.M., Collins, R., et al. Efficient ablation of genes in human hematopoietic stem and ef-

fector cells using CRISPR/Cas9. Cell Stem Cell 15, 643, 2014.

- 215. Yang, L., Guell, M., Niu, D., *et al.* Genome-wide inactivation of porcine endogenous retroviruses (PERVs). Science (New York, NY) **350**, 1101, 2015.
- 216. Estrada, J., Martens, G., Li, P., *et al.* Evaluation of human and nonhuman primate antibody binding to pig cells lacking GGTA1/CMAH/β4GalNT2 genes. Xenotransplantation 22, 194, 2015.
- 217. Li, P., Estrada, J.L., Burlak, C., *et al.* Efficient generation of genetically distinct pigs in a single pregnancy using multiplexed single-guide RNA and carbohydrate selection. Xenotransplantation **22**, 20, 2015.
- Zhou, J., Wang, J., Shen, B., *et al.* Dual sgRNAs facilitate CRISPR/Cas9-mediated mouse genome targeting. FEBS J 281, 1717, 2014.
- 219. Zhou, J., Shen, B., Zhang, W., *et al.* One-step generation of different immunodeficient mice with multiple gene modifications by CRISPR/Cas9 mediated genome engineering. Int J Biochem Cell Biol **46**, 49, 2014.
- 220. Niemann, H., and Petersen, B. The production of multitransgenic pigs: update and perspectives for xenotransplantation. Transgenic Res **25**, 361, 2016.
- 221. Carter, D.B., Lai, L., Park, K.W., *et al.* Phenotyping of transgenic cloned piglets. Cloning Stem Cells **4**, 131, 2002.
- 222. Wang, Y., Du, Y., Shen, B., *et al.* Efficient generation of gene-modified pigs via injection of zygote with Cas9/ sgRNA. Sci Rep **5**, 8256, 2015.
- 223. Niu, Y., Shen, B., Cui, Y., *et al.* Generation of genemodified cynomolgus monkey via Cas9/RNA-mediated gene targeting in one-cell embryos. Cell **156**, 836, 2014.
- 224. Wang, H., Yang, H., Shivalila, C.S., *et al.* One-step generation of mice carrying mutations in multiple genes by CRISPR/Casmediated genome engineering. Cell **153**, 910, 2013.
- 225. Hai, T., Teng, F., Guo, R., Li, W., and Zhou, Q. One-step generation of knockout pigs by zygote injection of CRISPR/Cas system. Cell Res 24, 372, 2014.
- 226. Yin, H., Song, C.Q., Dorkin, J.R., *et al.* Therapeutic genome editing by combined viral and non-viral delivery of CRISPR system components in vivo. Nat Biotechnol 34, 328, 2016.
- 227. Wu, X., Scott, D.A., Kriz, A.J., *et al.* Genome-wide binding of the CRISPR endonuclease Cas9 in mammalian cells. Nat Biotechnol **32**, 670, 2014.
- 228. Petersen, B., Frenzel, A., Lucas-Hahn, A., *et al.* Efficient production of biallelic GGTA1 knockout pigs by cytoplasmic microinjection of CRISPR/Cas9 into zygotes. Xenotransplantation **23**, 338, 2016.
- 229. Huh, D., Matthews, B.D., Mammoto, A., Montoya-Zavala, M., Hsin, H.Y., and Ingber, D.E. Reconstituting organ-level lung functions on a chip. Science (New York, NY) **328**, 1662, 2010.
- 230. Bhatia, S.N., and Ingber, D.E. Microfluidic organs-onchips. Nat Biotechnol **32**, 760, 2014.
- 231. Yin, X., Mead, B.E., Safaee, H., Langer, R., Karp, J.M., and Levy, O. Engineering stem cell organoids. Cell Stem Cell **18**, 25, 2016.
- 232. Fatehullah, A., Tan, S.H., and Barker, N. Organoids as an in vitro model of human development and disease. Nat Cell Biol **18**, 246, 2016.
- 233. Bujak, R., Struck-Lewicka, W., Markuszewski, M.J., and Kaliszan, R. Metabolomics for laboratory diagnostics. J Pharm Biomed Anal 113, 108, 2015.

- 234. Wishart, D.S. Emerging applications of metabolomics in drug discovery and precision medicine. Nat Rev Drug Discov **15**, 473, 2016.
- 235. Larance, M., and Lamond, A.I. Multidimensional proteomics for cell biology. Nat Rev Mol Cell Biol 16, 269, 2015.
- 236. Cranford, S.W., de Boer, J., van Blitterswijk, C., and Buehler, M.J. Materiomics: an -omics approach to biomaterials research. Adv Mater **25**, 802, 2013.
- 237. Obregon, F., Vaquette, C., Ivanovski, S., Hutmacher, D.W., and Bertassoni, L.E. Three-dimensional bioprinting for regenerative dentistry and craniofacial tissue engineering. J Dent Res **94**, 143S, 2015.
- 238. Murphy, S.V., and Atala, A. 3D bioprinting of tissues and organs. Nat Biotechnol **32**, 773, 2014.
- 239. Verhulsel, M., Vignes, M., Descroix, S., Malaquin, L., Vignjevic, D.M., and Viovy, J.L. A review of microfabrication and hydrogel engineering for micro-organs on chips. Biomaterials **35**, 1816, 2014.
- 240. Choi, N.W., Cabodi, M., Held, B., Gleghorn, J.P., Bonassar, L.J., and Stroock, A.D. Microfluidic scaffolds for tissue engineering. Nat Mater **6**, 908, 2007.

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Peptide decorated glycolipid nanomicelles for drug delivery across the blood-brain barrier (BBB)†

S. Meenu Vasudevan,^{a,b} N. Ashwanikumar^c and G. S. Vinod Kumar 🕑 *^a

This interdisciplinary research highlights the engineering of glycolipid nanomicelles with surface modification using a BBB crossing peptide for *in vivo* drug delivery especially for glioma therapy. We demonstrated an eco-friendly, green synthesis of a nanomicelle followed by felicitous characterization which substantiates the merits of the drug delivery system.

Despite the significant advances in the field of nano drug delivery systems (DDSs), the treatment of central nervous system (CNS) diseases like glioma, Parkinson's disease, Alzheimer's disease, epilepsy, stroke, brain trauma, *etc.* is limited due to the inefficiency of the cargo to cross the blood-brain barrier (BBB).^{1,2} The tight endothelial cell monolayer associated with pericytes and astrocytes in the BBB restricts the transport of 98–100% of the drug molecules to the brain.³ In the case of glioma, the BBB was found to be intact during the first stage which allows us to design a nanocarrier by exploiting the principle of active transport using targeting ligands on the surface of the nanocarrier. The DDS can be designed by engineering an apt amphiphilic polymeric nanocarrier surface-modified with a targeting ligand to breach the BBB.

Polymeric nanomicelles are regarded as promising carriers for small molecule hydrophobic drugs because of their good stability and biocompatibility *in vitro* and *in vivo*.⁴ Tailor-made amphiphilic polymers when exposed to an aqueous environment spontaneously form self-assembled nanomicelles having a core-shell architecture which serve as ideal hosts for hydrophobic drugs. Many natural and synthetic polymers have been used for the preparation of amphiphilic polymeric micelles. Chitosan is one of the major biocompatible polymers with a glycosamine backbone and used as a hydrophilic part of the amphiphilic system.⁵ A major drawback of naive chitosan is its aqueous solubility and its tendency to precipitate at physiological pH.⁶ Glycol chitosan (GC) is a commercially available water-soluble, biocompatible and biodegradable derivative of chitosan,⁵ which is used as a drug delivery scaffold in the present work.^{7,8} To impart suitable amphiphilicity to GC, we have conjugated it to a biocompatible aliphatic long-chain fatty acid namely stearic acid (SA). The amine functionality of GC was selected as the binding site to retain the intact ethylene glycol moiety which is essential for the aqueous solubility of GC. The synthesized stearoyl-*g*-glycol chitosan (SAGC) was used for surface modification with an apt targeting ligand.

Site-specific delivery of polymeric nanomicelles can be achieved by the use of suitable receptor targeting ligands. Over the years, several receptors like integrin, folate, transferrin, etc. have been employed by researchers for targeting nanomicelles.9 Unfortunately, the abundance of these receptors in the majority of tissues limited the brain-specific delivery and necessitated the development of highly specific brain targeting ligands. In addition to this, the BBB acts as a major hurdle for the aforementioned targeting ligands. To solve these problems, specific brain targeting short peptide sequences have been developed by the use of the in vivo phage display technique.¹⁰ One such peptide (TGN peptide-TGNYKALHPHNG) was identified by Li et al. using a filamentous M13-phage with the aid of a random 12 mer peptide library displayed on the capsid surface of this phage having BBB targeting ability.^{11,12} AS TGN peptide demonstrated superior brain targeting efficacy, we have used this peptide as the targeting moiety and conjugated it to our glycopolymer (SAGC) to produce a hybrid, peptide decorated nanomicelle named "TSAGC". The development of nanomicelles of TSAGC, encapsulation of a model hydrophobic drug (Curcumin), and their efficacy in crossing the BBB for brain delivery were demonstrated in the present work by various physicochemical and biological analyses. As most of the drugs used in brain diseases are hydrophobic, we

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Yield evaluation of oyster mushroom on dust waste of some common timber species

Minnu Tomy and C. Sneha*

Sir Syed College, Taliparamba, Kannur, Kerala, India-670142 *Corresponding author, Email: snehacof@gmail.com

ABSTRACT

An investigation on the feasibility of utilizing sawdust of locally available timber species as potential substrates for cultivation of oyster mushrooms was carried out at the Department of Forestry, Sir Syed College, Kerala during 2013-14. Oyster mushroom (*Pleurotus spp.*) was selected for the study, because it is the most suitable species for utilization lignocellulosic wastes. Its conversion rate i.e., mushroom production from the substrate is highest and the rate of growth is very fast. Sawdust of most commonly available five timber species were used as substrates which include *Swietenia macrophylla*, *Tectona grandis*, *Xylia xylocarpa*, *Terminalia bellirica* and *Melicope lunu-ankenda*. A control treatment was maintained using mixture of saw dust of all these five species in equal proportions. All these six substrates were well sterilized, spawn were inoculated and allowed to incubate under suitable temperature and relative humidity. Mycelial growth and pin head formation was fastest in *Xylia* and slowest in *Terminalia*. In *Melicope* no pin head formation occurred even though there was good mycelia growth. Mushroom yield was maximum in control and minimum in *Melicope*.

Key words: Oyster mushroom; dust waste; lignocellulose; spawn

The increasing expansion of agro industrial activity has led to the accumulation of large quantity of ligno cellulosic residues all over the world. Zhang (2008) estimated that the global production of ligno cellulosic biomass is more than 200×10⁹ tons per annum. Cultivation of edible mushroom is one of the most economically viable processes for the bio conversion of ligno cellulosic wastes (Bano et al., 1993; Cohen et al., 2002) which otherwise may cause serious environmental and health hazards. It offers an opportunity to utilize renewable resources for the production of protein rich food (Philippousis et al., 2007). Ligno cellulosic compounds are difficult to handle and dispose due to their chemical structure and decomposition properties. Edible mushroom or fungi possess approximate enzymatic mechanism for transformation of

complex organic macro molecules into simple compounds.

Various ligno cellulosic substrates such as sawdust, wood chips, corn stalk, cotton stalk, rice straw, waste hulls and other agricultural wastes can be used for mushroom cultivation (Oei, 1996; Dundar et al., 2008). Digestion of cellulose produces glucose and cellobiose, while digestion of hemicellulose produces mostly xylose and other sugars, such as glucoronic acid and galacturonic acid as secondary products (Jefferies, 1990; Clarke, 1997). Since many sugars are released which are converted into sources of carbon when lignocellulosic substrates are digested, lignocellulosic substrates therefore are good substrate for mushroom cultivation (Keller, 1993). Sawdust is the best as a substrate for its physical Home / About the Journal

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Research Paper

Prayers of Refugees

Abdul Samad K

(Research Scholar, Department of English and Comparative Literature, Central University of Kerala)

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I. INTRODUCTION

The appalling photo of a dead migrant father and his less than two-year-old daughter lying face down in the gloomy waters on the Mexican side of the Rio Grande evoked a numbing memory of another tragedy that had made the global headlines four years ago. The iconic image of Alan Kurdi lying face down in the sand on Turkey shore had triggered a dramatic upsurge in global concern over the refugee crisis. Sea Prayer is the fictional representation of Alan Kurdi's tragedy written by Khaled Hosseini, one of the most widely read and beloved authors of the day. The novel was published in 2017 in the wake of commemorating the second anniversary of Alan's fatal death.

Khaled Hosseini, the author of The Kite Runner, has been the Goodwill Envoy to the UNHCR (United Nations High Commissioner for Refugees)since 2006 and the founder of The Khaled Hosseini Foundation. Being a refugee himself, Hosseini's writings largely depict the vulnerabilities of the refugees and the sobering experiences of the victims of humanitarian crises. The Kite Runner beautifully but powerfully illustrates the deadly experiences of becoming an Afghan refugee in a post-Soviet invasion of Afghanistan. His other two novels also expose the pains and the agonies of displaced people. Sea Prayer is his new literary venture that vividly reflects upon the danger in perilous sea-crossing which has become an inevitable chance in the survival of a refugee.

A refugee is a person who is fleeing life-threatening conditions. Civil war, violence, and persecutions have accelerated the growth in the number of refugee productions in Middle East nations. Since the inception of the Syrian Civil War, the Middle East has witnessed the flow of a mammoth number of displaced people who are in search of a better life condition in European as well as American nations. There is a surge of literary productions that poignantly deal with the desperate plights of the refugee community. Refugee literature largely addresses the issue of political unrest, displacement, the question of identity and national security, and the risks involved in being a refugee. Exit West written by MohsinHamida, A Land of Permanent Goodbyes by journalist turned novelist AtiaAbawi and The Silence and the Roar by NihadSirees are a few novels that vividly translate the real experiences of Syrian refugee crisis into literature.

Sea Prayeris a short piece of fiction with a powerful language. Written in verse, the novel is composed in the form of a letter from a father to his beloved son on the eve of their desperate sea journey. Marwan is lying on the lap of his affectionate but desperate Syrian father. Before stepping into the brink of the disaster with the dearest ones, the father tells his soul-stirring memories of childhood to his son. This reminiscence renders to the readers a sharp contrast between the pre- and post-civil war Syrian life. In the first half of the novel, he recalls that the life in the city of Homs was, once, tranquil; embellished with 'the stirring of olive trees', 'beating of goats' and 'the clanking of cooking pots.' The farms were filled with the herd of cows and the wildflowers. His beautiful memories of social as well as political harmony that had existed in Homs city prompts him to wish his son also had remembered them. But Marwan is unlucky to do so as the Homs he knows is a different world.

The second half of the novel sketches out war-torn Syria. Now, the tranquility of Homs city seems to be a mere dream to the father. Starvation replaced the farming, and the farmlands transformed into a burial land. Instead of clanking, one can now hear the terrible sounds of the bombing.Marwan knows only the darkness; the darkness of blood and death.Towards the end of the novel, the father who was once a citizen of Syria identifies himself as a refugee. Like any other runaway refugees from war-torn countries like Eritrea, Afghan, Iraq, Somalia and Libya, Marwan's father is also about to embark on his precarious journey to find a new homeland.

Hosseini caricatures the desolate experience of becoming a displaced person/community. Displaced people are treated as unwelcome/uninvited guests in foreign lands. So the hope for finding a peaceful life is unimaginable in the case of a refugee. There is none to listen to the cries of the children, the worries of the



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(1) Suchat Tachaudomdach (Architecture Technology, Department of Industrial Technology, Chiang Mai Rajabhat University, Thailand)

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Table of Contents

by their authors.

Articles

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