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Summary

My research interest in the crop production aspects of spices, medicinal and aromatic plants. My Ph.D. program entitled “Rapid propagation and conservation of selection leguminous medicinal plants using *in vitro* techniques” received Jawaharlal Nehru Award for Outstanding Post-graduate Agricultural Research in Horticulture. I have been working on the area of plant biotechnology with special emphasis on plant tissue culture and *in vitro* conservation techniques of cryopreservation of various medicinal plants. In addition to this, I am working on standardisation of agrotechniques, biostimulant application for plant growth promotion, bioelicitation for enhancement of secondary metabolite production, and drought mitigation studies.

Research Highlights

- Rapid propagation of medicinal plants like *Aegle marmelos*, *Clitoria ternatea*, *Mucuna pruriens*, *Tinospora cordifolia*, *Plumbago rosea* and *Indigofera tinctoria*
- Standardised *in vitro* conservation via slow growth in legumes – *Mucuna pruriens*, *Clitoria ternatea*, *Indigofera tinctoria*
- In vitro regeneration and conservation of artificial seeds (encapsulation technology) has been developed for *Tinospora cordifolia*, *Aegle marmelos*, *Clitoria ternatea* and *Indigofera tinctoria*
- Development of cryopreservation protocols for *Aegle marmelos*, *Clitoria ternatea*, *Indigofera tinctoria* and *Plumbago rosea*
- Standardisation of nursery management techniques in *Symplocos cochinchinensis*
- Enhancement of seed germination and plant establishment in *Ocimum sp.*, *Withania somnifera*, Kiriyathu and *Ashwagandha*
- Positive impact of biostimulants and bioinoculants on plant growth and secondary metabolite production was observed in *Ocimum basilicum* and *Withania somnifera*.
- Plant growth promotion and secondary metabolite enhancement in *Curcuma aromatica* and *Piper longum* by the foliar applications of biostimulants.
- Chitosan mediated growth promotion and enhanced secondary metabolite production in Turmeric, Kasthuri Turmeric and Thipali
- Bioethanol production was realized from watermelon rind, pineapple and banana waste by microbial fermentation using the microbes, *Saccharomyces cerevisiae* and *Zymomonas mobilis*

Experience

Joined Kerala Agricultural University as Assistant Professor (Horticulture) in the year 2006

Education

- Graduated in Agricultural Science from Kerala Agricultural University (1998)
 - Post Graduation in Horticulture from Kerala Agricultural University (2001)
 - Ph.D in Horticulture from Kerala Agricultural University (2005)
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Area of Specialization

Plant tissue culture, cryopreservation, biostimulant application, plant stress mitigation

Awards & Recognitions

- July 17th, 2007- Jawaharlal Nehru Award for Outstanding Post-graduate Agricultural Research in Horticulture- 2006 (Research programme on “Rapid propagation and conservation of selected leguminous medicinal plants using *in vitro* techniques”)
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Research Projects

Ongoing

1. Chitosan mediated elicitation of plant growth and alleviation of biotic stress in black pepper (*Piper nigrum* L.) Funded by State Planning Board, Government of Kerala (as Principal Investigator)
2. "In vitro stimulation and production of biomolecules and Allele mining for identification of biosynthetic gene clusters encoding potential anticancer and other novel biomolecules in selected medicinal yams (As Project Associate)

Completed

1. *In vitro* regeneration and conservation of Chittamruthu (*Tinospora cordifolia* (Willd.) Miers ex Hook.F. & Thoms). Funded by State Planning Board, Government of Kerala (as Principal Investigator)
2. Bio-energy production from agricultural waste- Advanced Centre for Integrated Biotechnology Funded by ICAR 100 crore Development Grant (as Principal Investigator-Research)
3. Biotechnology Colloquium. Funded by Kerala State Council for Science Technology and Environment- Science Popularisation Program (as Principal investigator)
4. Yield enhancement strategies for production of anticancer and other therapeutic compounds by cell and tissue culture of *Tinospora cordifolia* and *Withania somnifera* Funded by State Planning Board, Government of Kerala (As Project Associate)
5. Germplasm collection, evaluation and evolving management practices for regular bearing in clove (*Syzigium aromaticum* (L) Merr. & Perry) accessions Funded by State Planning Board, Government of Kerala (As Project Associate)
6. Characterisation, in vitro culturing and in vitro manipulation for enhanced productin ofsecondary metabolites of medicinal orchids and *Aloe vera* L. (*A. barbadensis* Mill.) Funded by State Planning Board, Government of Kerala (As Project Associate)

1. MD Dongare, S Alex, KB Soni, KP Sindura, DS Nair, R Stephen, E Jose. 2023. Cross-species transferability of IRAP retrotransposon markers and polymorphism in black pepper (*Piper nigrum* L.). Genetic Resources and Crop Evolution. 1-13
2. Ajil, MS., Deepa S Nair, GS Sreekala, S Alex. 2022. Propagule selection and pretreatment for nursery plant establishment of *Symplocos cochinchinensis* (Lour.) S. Moore Medicinal Plants-International Journal of Phytomedicines and Related Industries. 14(3): 429-440
3. Bijula, BL., Swapna Alex, KB Soni, KN Anith, M Joy, Deepa S Nair, R Beena, Amala Benny. 2022. Algicidal Effects of Green Synthesized Silver Nanoparticles using *Tinospora cordifolia* on *Chlamydomonas reinhardtii*. Journal of Pure & Applied Microbiology . 16 (2):1122-1229
4. T Anargha, GS Sreekala, Deepa S Nair, M Abraham. 2021. Genetic variability, correlation and path analysis in ginger (*Zingiber officinale* Rosc.) genotypes. Journal of Tropical Agriculture 58 (2)
5. Deepa S. Nair, Reghunath B.R., Soni, K.B. and Swapna Alex. 2019. Cryopreservation of encapsulated axillary buds of *Clitoria ternatea* (L.). CryoLetters. 40 (1) : 28- 35
6. Hembade, V.L., Swapna Alex, Soni, K.B., Lekha Sreekantan, Deepa S. Nair and Reghunath, BR. 2019. Presence of integrase core domain in the mutant type of black pepper (*Piper nigrum* L.) 'Thekken' with altered inflorescence architecture. Indian J. Exptl. Biol. 57: 770-77
7. Anand Vishnu Prakash, Deepa S. Nair, Swapna Alex and Soni, K.B. 2018. Calcium alginate encapsulated synthetic seed production in *Plumbago rosea* L. germplasm exchange and distribution. Physiol. Mol. Biol. Plants. 24 (5): 963-971
8. K.N. Anitha, S. Aswinia, Shilpa Varkeya, , N.V. Radhakrishnan and Deepa S. Nair. 2018. Root colonization by the endophytic fungus *Piriformospora indica* improves growth, yield and piperine content in black pepper (*Piper nigrum* L.). Biocatalysis and Agricultural Biotechnology. 14: 215- 220
9. Deepa E, Deepa S. Nair, Swapna Alex, K.B. Soni and M.M. Viji. 2018. Effect of plant stimulants on shoot proliferation from nodal segments of *Aegle marmelos* L. (Corr.). Medicinal Plants. 10(1): 58-64
10. Swapna Alex, Ann Saira, Deepa S. Nair, K.B. Soni, Lekha Sreekantan, Rajmohan, K. and Reghunath B.R. 2017. Bioethanol production from Water melon rind by fermentation using *Saccharomyces cerevisiae* and *Zymomonas mobilis*. Indian Journal of Biotechnology 16; 663- 666
11. Lekshmi, R.S., Soni, K.B., Swapna Alex, Deepa S. Nair, Lekha Sreekantan and B.R. Reghunath. 2017. A rapid protocol for somatic embryogenesis mediated regeneration in banana (*Musa* spp.) cv. Nendran. J. Hortl. Sci .Vol. 11(2): 116-123
12. Deepa S. Nair and B.R. Reghunath. 2009. Cryoconservation and regeneration of axillary shoot meristems of *Indigofera tinctoria* (L.) by encapsulation-dehydration technique. In Vitro Cellular and Developmental Biol. 45: 565-573
13. Deepa S Nair and Reghunath, BR. 2008. Effective Use of Encapsulation-Dehydration Technique in Cryopreserving Somatic Embryos of Butterfly Pea (*Clitoria ternatea* L.) Journal of herbs, spices & medicinal plants 13 (3), 83-95
14. Akhilraj, BC., Deepa S Nair, GS Sreekala, KN Anith, T Sajitharani. 2020. Effect of physical seed pretreatments on morphology and yield of *Ocimum basilicum* L. *Journal of Pharmacognosy and Phytochemistry* 9 (5), 2631-2635
15. Deepa S. Nair, Reghunath B.R., Soni K.B., Alex S. 2016. "In vitro regeneration and conservation of Indigo (*Indigofera tinctoria* L.) by slow growth induction". International Journal of Environment Agriculture and Biotechnology. 1(4):0873-0884
16. Subba, Ashish; Alex, Swapna; Soni, K. B.; Nair, Deepa S.Nair; Reghunath, B. R. 2014. Isolation of genomic DNA from mature leaves and spikes of black pepper (*Piper nigrum* L.), J. Pl Sci. Res. 30(1):21-25
17. Swapna Alex., Preetha Rani.M.R., Soni. K. B., Deepa S. Nair and B. R. Reghunath. 2012. Biosynthesis of silver nanoparticles with antibacterial activity using leaf extract of *Michelia champaca* (L). Journal of Plant Science and Research 28 (1):81-86
18. Deepa S. Nair and Reghunath B.R. 2002. Root growth, yield and nodule formation of *Clitoria ternatea* L. accessions intercropped in coconut garden. South Indian Horticulture. 50 (1/6), 284-288
19. Deepa S Nair and Reghunath, BR. 2002. Performance of *Clitoria ternatea* L. as an intercrop in coconut garden Journal of Plantation Crops 30 (1): 58-61
20. Deepa S Nair and Reghunath, BR. 2002. Evaluation of *Clitoria ternatea* I. accessions for alkaloid content in seeds and roots. *South Indian Horticulture* . 50 (4/6): 676-679

Seminar Proceedings/Abstracts

- 1) Dhyana, T., Sonia, N.S., Sindhura, K. P. and Deepa, S. Nair. 2023. Molecular diversity of Chittamruthu (*Tinospora cordifolia* (Willd.) from Northern districts of Kerala [abstract]. In: Abstracts, Biozion : The Biotech Capstone Science – Society Interface; 7-11, August, 2023, Vellayani, College of Agriculture, Vellayani, p.11. Abstract No. BAG 04.
- 2) Dr. Deepa S Nair and Sri. Akhil Raj B.C. 2021. Hormonal seed priming enhances germination and plant growth in *Ocimum tenuiflorum*. International Horticulture Conference on Next Generation Horticulture 2021 held at TNAU Coimbatore from 16-19th September 2021. 172p
- 3) Akhilraj, B. C., Deepa, S. Nair, Sonia, N. S., Anith, K. N., and Sajitharani, T. 2020. Germination and plant growth responses of *Ocimum basilicum* to seed pre-treatments. Proceedings of National webinar on spice improvement, processing and marketing on 7th and 8th Oct., 2020 organised by RARS(SZ), Vellayani(Kerala Agricultural University) Thiruvananthapuram, Kerala, India. Abstract No pp.
- 4) Anargha T., Sreekala G. S. and Deepa S, Nair. 2020. Rhizome characters of ginger (*Zingiber officinale* Rosc.) genotypes of Kerala. Proceedings of National webinar on spice improvement, processing and marketing on 7th and 8th Oct., 2020 organised by RARS(SZ), Vellayani (Kerala Agricultural University) Thiruvananthapuram, Kerala, India.SI 07, 115p.
- 5) Akhilraj, B. C., Nair, D. S., Sreekala, G. S., Anith, K. N., Rani, S, T, 2020. Seed pre-treatments enhanced germination and plant growth in *O. tenuiflorum* L.International Web Conference on “Perspective on Agricultural and Applied Sciences in Covid-19 Scenerio (PAAS-2020) on October 4-6, 2020 jointly organised by Agricultural and Environmental Technology Development Society, Uttarakhand, India. 247p.
- 6) Anargha, T., Sreekala, G.S. and Deepa S. Nair. 2019. Variability in ginger accessions for morphological and yield traits. Proceedings Provectus Plantae 2019. International Conference on Exploring the Scope of Plant Genetic Resources 22-24th May 2019. Dept. of Botany, University of Kerala, Kerala, India Abstract PGR 3 pp 348-350.
- 7) Sowmya A.S., Deepa S. Nair, Swapna Alex, Soni, K.B, Manju R.V and Reghunath B.R. 2019. Shoot proliferation responses of *Plumbago rosea* L. to different media and growth promoting additives. Proceedings Provectus Plantae 2019. International Conference on Exploring the Scope of Plant Genetic Resources 22-24th May 2019. Dept. of Botany, University of Kerala, Kerala, India Abstract CPC 34 pp106-109
- 8) Sonia N.S., Jessykutty, P.C., Sreekala, G.S. and Deepa S. Nair. 2019. Aminoacid profiling in Milk Yam (*Ipomoea digitata* L.). Proceedings Provectus Plantae 2019. International Conference on Exploring the Scope of Plant Genetic Resources 22-24th May 2019. Dept. of Botany, University of Kerala, Kerala, India Abstract PFP 37 pp260-262
- 9) Deepa S. Nair.and B.R. Reghunath. 2007. Micropropagation of Naikurna (*Mucuna pruriens* Baker non DC.) through axenic cultures of leaf explants. Proceedings of Sixth National Seminar on Medicinal Plants, 14-15 March, 2007, Thiruvananthapuram, Kerala, India.Abstract: 6
- 10) Deepa S. Nair. and B.R. Reghunath. 2006. Effect of explant and plant growth regulators on somatic organogenesis of *Indigofera tinctoria*. Proceedings of Fifth National Seminar on Medicinal Plants,27-28 March, 2006, Department of Pharmacognosy, Government Ayurveda College, Thiruvananthapuram, Kerala, India, pp.153-157
- 11) Deepa S. Nair and B.R. Reghunath. 2005. Effect of desiccation of encapsulated axillary shoot meristem of *Indigofera tinctoria* , in cryopreservation and regeneration of shoot.. Proceedings of Fifth National Congress on Medicinal Plants, 4 – 5 December, 2005, Oushadi, Thiruvananthapuram, Kerala, India, pp. 53-56
- 12) Deepa S. Nair and B.R. Reghunath. 2005. Natural plant sweetener drugs. Fourth National Seminar on Medicinal Plants, 15 – 16 March, 2005, Department of Pharmacognosy, Government Ayurveda College,Thiruvananthapuram, Kerala, India, Abstract: 12

- 13) Deepa S. Nair and B.R. Reghunath. 2005. Nitrogen fixing potential of *Clitoria ternatea* L. grown as intercrop in coconut garden. Global Eco Meet-Prithvi 2005, 19-28th February, 2005, Thiruvananthapuram, Kerala, India Abstract: EL 4-8
- 14) Deepa S. Nair and B.R. Reghunath. 2002. Impact of Biotechnology on Mediculture. Proceedings of National Environment Awareness Campaign: Seminar on Medicinal Plants, 12-13 August, 2002, Ayurveda College Pharmacognosy Unit, Kerala State Committee on Science, Technology & Environment and Department of Dravyaguna Vijnanam, Government Ayurveda College, Thiruvananthapuram, Kerala, India, pp. 47-54
- 15) Santhosh kumar, T., M.S. Sheela, Jiji. T and Deepa S. Nair. 2001. Nematode association in Chethikoduveli, *Plumbago rosea* L.” National Congress on Centenary of Nematology in India. Appraisal and Future Plans. 5-7 December 2001, IARI, New Delhi, Abstract : 84

Popular Articles

1. Ann Sneha Baby and Deepa S Nair. 2022. SPICE SPENT no more a waste. Kerala Karshakan e-journal. p.27-33
2. Ann Sneha Baby and Deepa S. Nair. 2023. Aromatic Crops: a sustainable approach for remediation of heavy metal contaminated sites. Keralakarshakan e journal
3. Ann Sneha Baby, Deepa S. Nair, Maneesha Elsa Jacob and Ragin Shaji. 2022. Injiyile vilaparipalanam. Kerala Karshakan 67(5): 54-55
4. Shaji, R. and Deepa S. Nair. 2020. Ashwagandha: An Herbal Miracle. Agrobios Newsletter. 19(7): 74-75.
5. Rajeswari E. and Deepa S. Nair. 2020. *Plumbago rosea*: A versatile Medicinal Plant. Agrobios Newsletter. 29(6): 60-61.
6. Akhilraj, B. C., Sonia, N. S and Deepa S. Nair. 2020. *Ocimum* sp. – A traditional first aid kit. Kerala karshakan e-journal 8 (3): 05-07.
7. Deepa S. Nair and Aparna, B. 2007. Improving Post harvest life of cut flowers. Intensive Agriculture. Jan-June, 2007
8. Deepa S. Nair and Aparna, B. 2007. *Oru mazha vannal manjal nadam* Karshakan, Mar-apr 2007.
9. Deepa S. Nair and Aparna, B. 2007. *Pudumazha ethiyal ehjkrishi tudangam*. Karshakan, Mar- Apr 2007
10. Aparna, B. and Deepa S. Nair. 2006. *Vilakalude utpadanathinu nakam*. Kalpadhenu, Apr- June, 2006
11. Deepa S. Nair and Aparna, B. 2006. *Pachila valangalude vila ariyuka* Karshakasree, Dec, 2006

Books/Chapters in Books

1. Deepa S. Nair and Minmini, K. P. 2023. Export oriented medicinal plants. In: Nihad K., Abdul Haris A., and Anithakumari, P. Horticultural Techniques for income maximization from coconut based cropping system – Training notes. ICAR – Central Plantation Crops Research Institute, Kasargod. p.73-83.
2. Deepa S Nair. 2019. Plant propagation techniques in Horticulture In: tactics of being agripreneur learning the rock. Ed: Sreedaya G.S, Seema S and Anilkumar. Satheesh Serial Publishing House, Delhi
3. Deepa S. Nair, Swapna Alex and Soni, K.B. 2015. Tissue culture vazhayude uthpadana ടിഷ്യൂകൾച്ചർ വാഴയുടെ ഉൽപാദനരീതിയും, ലഭ്യതയും. വാഴകൃഷി – ഒരു വഴികാട്ടി. (eds. Usha C. Thomas, Sheela K.R and Allan Thomas). NARP (SR), KAU & NABARD, pp 16-24.
4. Deepa S. Nair and B. R. Reghunath. 2007. Rapid propagation of *Clitoria ternatea* L. through somatic embryogenesis from leaves. In: Recent trends in Horticultural Biotechnology. (eds. Keshavachandran et al.) New India Publishing Agency, New Delhi, pp. 311-314

5. Deepa S. Nair and B.R. Reghunath. 2006. Scope of sustainable agriculture. In: Trends in Organic Farming in India (Eds. S.S. Purohit and Dushyent Gehlot), Agrobios Jodhpur, 438p.

Student Guidance (Major Advisor)

M. Sc. (Hort.) Plantation Crops and Spices: 8 completed; 3 ongoing
M.Sc. (Ag) Plant Biotechnology: 4 completed
B.Sc-M.Sc.(Integrtaed) Biotechnology: 3 completed
Ph. D (Hort.): 4 ongoing

Other Institutional Responsibilities

1. Currently acting as student Advisor/faculty mentor to 15 Undergraduate students.
2. NSS Program Officer (1.11. 2018 to 22.11.2021)
3. Member Project Co-ordination Groups – Medicinal and Aromatic Plants; Spices and Plantation Crops

Membership in Professional Associations

1. Life Member of Horticultural Society of India