

NABS *News Letter*

National Academy of Biological Sciences

Volume - 12(1)

FOR PRIVATE CIRCULATION ONLY

January 2021

Founder President

Prof. Dr. S. Kannaiyan
Former Vice-Chancellor, TNAU &
Former Chairperson, NBA, GOI, Chennai

Patron & President Dr. V. A. Parthasarathy
Vice-President Dr. D. J. Bagyaraj

Secretary Dr. T. Marimuthu
Treasurer Dr. T. L. Baskaran

Editorial Committee
Editor in Charge
Dr. S. Nakkeeran

Members
Dr. T. Marimuthu Dr. T.L. Baskaran
Dr. N. Thajuddin Dr. S. Nakkeeran
Dr. K. Kathiresan Dr. M. Prakash

Contents

From the Desk of President	1
Message from Vice-President	2
Message from Editor	2
News and Events	3
Research Highlights	4
Awards, Recognitions & Honors received by members of NABS	7
Activities of Members of NABS	8
An appeal to contribute to Corpus Fund	10
An appeal to contribute to defray cost of printing - NABS Book	10
Enroll yourself as member of NABS	11

From the Desk of President.....



Dear NABSians,

Greetings from NABS.

I wish all the members of NABS a happy, prosperous and wellness filled year of 2021 and ahead. Hope, all the members are safe at home with their family members. With all enthusiasm, we planned to organize the First NABS-International Conference on “*Life Sciences: Contemporary approaches in Biological Science for Food, Health, Nutrition Security and Conservation of Biodiversity*” at Annamalai University from 23 to 25 July 2020. Of course every member knows that the conference could not be held due to COVID-19 pandemic. Hopefully, if everything goes well we will plan to have the conference during July/August 2021 at the same venue.

I also wish to congratulate all the members who have made lot of achievements in their academic career in 2020, in spite of all the odds you had.

We are also planning to have online EC & AGM during March 2021.


(V. A. Parthasarathy)
President, NABS

2. Message from Vice-President...



Dear Members of NABS,
Greetings.

I wish all the NABSians a very happy and prosperous New Year 2021.

We are all biologists. The varieties of biological systems are referred to as biological diversity or biodiversity. This includes all species of plants, animals and microorganisms in different ecosystems of the planet Earth. A healthy biodiversity offers i) many biological resources like food, fiber and fuel, medicinal resources of pharmaceutical drugs, ornamental plants, *etc.*, ii) ecological services such as soil formation, nutrient cycles, pollution breakdown *etc.*, and iii) social benefits like education, research, recreation, tourism *etc.* Convention on Biological Diversity Conference of the Parties in 2006 validated the importance of biological diversity. The different biological species depend on each other to ensure survival and functioning. For example, though nitrogen is present in the atmosphere, plants cannot use it directly and so depend on N-fixing bacteria in soil for N nutrition. Other example is nearly 130,000 plants depend on bees for pollination. For a number of years biologists have been studying nature to see how various biological systems work, produce and conserve resources. Some have projected a value to the ecosystem services provided by the biodiversity. For example, the estimates are 90 billion dollars per year for N-fixation, 160 billion dollars per year for biocontrol of pests and 200 billion dollars per year for pollination. The main threat to biodiversity on earth is the human intervention like destruction of above ground biodiversity, modern agricultural practices, industrial pollution, *etc.* As far as possible let us try to conserve our biodiversity which provide us innumerable benefits. It is estimated that nearly 40% of the world economy and 80% of the needs of the poor are derived from biological resources. We are all members of the NABS. The primary objective of the Academy is to foster and promote the new biological knowledge that has emerged from recent advances in biological sciences. Thus as members of the NABS let us spread the importance of biodiversity and the methods to conserve them to others who are not familiar with it.

(D.J. Bagyaraj)
Vice-President

3. Message from Editor in Charge



Dear Members of NABS,
New Year Greetings.

Let us live and grow with microbes

Plants evolve with highly complex microbiome including fungi, archaea and bacteria dwelling in different organs of plants. The role of microbiome was recognized since 19th century; however the investigation and interest in plant-associated microbiome had its fragrance since the 80s. The plant microbiome in rhizosphere, phyllosphere and endosphere has vital functions in promoting plant health and growth. An understanding on the factors associated with assemblage of microbiome and their functions during plant microbiome interaction can benefit both plant and microbial partners. It facilitates to fish out better candidates and introduce them through the discovery of appropriate delivery system into suitable ecological niche. Fascinating functions of plant microbiome open new avenues to integrate them as a component in crop production to mitigate the emerging challenges in crop production. The integration may be either as microbial strains or consortia. But, on the other hand, functioning of the plant, mediated by the microbiome is influenced by plant genotype and farming practices. In this juncture, harnessing the plant breeding strategies and adoption of suitable farming practices that improve the interactions between plant and microbes would pave the way for the potential harvest on the benefits of plant microbiota.

The level of understanding on plant microbiome, their function and exploitation has increased substantially in the recent past. However, microbial exploration is feasible only by a better understanding on how microbial inoculants modulate the resident microbiome and how does complex microbiota affect the activity of the applied strain or how microbial inoculants colonize the plant environment in the field. However, the success, under field conditions, are often variable. Hence, there is an urgent need to improve the commercial success through precise selection of microbes and formulations with appropriate delivery system. But, in most of the cases, only single microbial antagonist is delivered to plant either through seed treatment or soil application or foliar spray. However, microbes are trained to live as a community and not as a nuclear family. Hence, harnessing the merits of microbes at field level must be focused towards designing a smart microbial consortia reflecting on the assemblage of microbes in plants and the practice of agricultural management techniques that favors microbiota with beneficial crop traits or a new generation of plant breeding approaches enhancing the interaction of microbial communication network that improve crop productivity by reprogramming the agriculture. In the present day scenario, the analysis of commercial bio-pesticides used for the management of plant diseases registered with Central Insecticide Board, Faridabad reveal only the existence of *Trichoderma harzianum*, *Trichoderma viride*, *Bacillus subtilis* and *Pseudomonas fluorescens*. The decades of research on the discovery of microbials used to improve the plant traits with the huge investment from various funding agencies are still living only as freeze dried powders and not brought into use by the farming community. It warrants a serious thinking and reorientation of the strategies and policies by the researchers and policy makers. Then only a suitable alternative can be made available to step into microbial green revolution for doubling the income of the farmers.

Thus, let us understand the language of microbes to harness the merit of microbiome for better prosperity.

(S. Nakkeeran)
Editor in charge, NABS NL

4. News and Events

4.1. News

4.1.1. Obituary

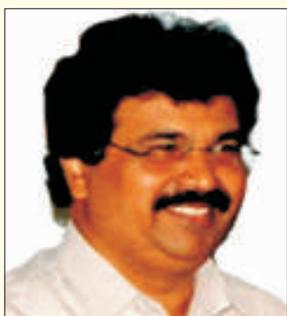
Dr. K. Natarajan,
[10-07-1946 to 24-01-2021]

Formerly Professor of Soil Science & Agricultural Chemistry, TNAU & Member, Executive Council of NABS



- Dr. K. Natarajan has been ably serving as a member of Executive Committee of National Academy of Biological Science since 2011. His services during his tenure as a member of NABS, member of EC, member of Technical Review Committee are remembered very well.
- He is the recipient of the prestigious award from “Fertilizer Association of India” for his outstanding doctoral thesis in 1989.
- Earlier in 1970s he was associated in a program “Soil Test based Crop Response Studies” in the state of Tamil Nadu conducted in Cauvery Delta region on a massive scale under the leadership of Dr. A. Dhanabalan Mosi, the then Agricultural Chemist and with the patronage of Mr. A. Venkataraman, the then Project Director, IADP, Thanjavur. His contributions, in the program, are well remembered by his colleagues and authorities in the state of TN. Later he moved to TNAU and rose to the position of Professor and retired on 31-07-2006.
- Dr. K. Natarajan attained eternal bliss on 24 January 2021 at his residence due to brain related problem. He is survived by his wife and two married daughters.
- NABS-ians deeply condole the demise of Dr. K. Natarajan and convey the grief and sorrow to the grieved members of his family and friends. WE pray ALMIGHTY to give his family members all the strength to bear the great loss. MAY HIS SOUL REST IN PEACE!

4.1.2. Dr. N. Thajuddin, Indian Microbiologist in the top 2 per cent of Best Scientists in the World- A Stanford University survey.



Stanford University of the United States of America has recently released a list of top 2% of the most cited scientists in diverse academic disciplines. A total number of ~160K professionals were enlisted from all over the world. Out of which approximately 1.5K scientist are Indians representing varied institutions. Prof. Loannidis *et al.*, compiled the list of scientists who were actively involved in research and assessments and analyzed the citations with a new set of parameters. This database included the top 2% of scientists of the world. The results so obtained have been segregated into 22 scientific area and 176 sub areas recently published in the Journal PLOS Biology. Prof. N. Thajuddin, Professor in Microbiology, and Principal Investigator in National Repository for Microalgae and Cyanobacteria Freswahter (DBT Sponsored), Bharathidasan University, Tiruchirappalli 620 024, Tamil Nadu, India is one of them who got enlisted at Sr. No. 145480 for his research accomplishment in the field of Biotechnology, Plant Biology and Botany, and Enabling & Strategic Technologies. To celebrate his attainment, he was felicitated by Microbiologist Society,

India. He keep receiving wishes and honors from Vice chancellors of various Universities, Professors, Scientists, Students and industrialists for his deserving acknowledgement for his hard work and dedications towards his research.

Dr. N. Thajuddin, one of the EC members NABS is the recipient of Dr. G. S. Venkataraman Memorial NABS-Best Scientist Award (2014) and Prof. M. S. Swaminathan NABS-Leadership Award (2012).

Congratulations ...Dr. Thajuddin.

4.1.3. First NABS-International Conference

- The First NABS-International conference with the theme, “*Life Sciences: Contemporary Approaches in Biological Sciences for Food, Health, Nutrition Security and Conservation of Biodiversity*” (12th NABS- Conference) scheduled from 23 to 25 July 2020 at Annamalai University Chidambaram was postponed due to Covid-19 pandemic. It is planned to have the Conference during July/August 2021 at the same venue.
- For any updates, you may please visit the following website or contact Organizing Secretary / Secretary, NABS.

Website :

NABS : www.nabsindia.org / www.annamalaiuniversity.ac.in

Contacts :

Organizing Secretary : nabsauconference2020@gmail.com
Secretary, NABS : secretarynabs@gmail.com

4.1.4. EC & AGM online meeting

- The 20th Executive Council Meeting and 16th Annual General Body Meeting are scheduled via zoom platform during March 2021. Members will be informed of it through e-mail.

5. Research Highlights

5.1. *Madhuca diplostemon* (C.B.Clarke) P.Royen - A critically endangered species rediscovered.

Madhuca diplostemon (C.B.Clarke) P.Royen which belongs to the family Sapotaceae is a critically endangered and endemic species of the Western Ghats, is rediscovered from a sacred grove near Paravur in Kollam district in Kerala. Koonayil Ayiravilli Siva Temple is one of the oldest temples in Kerala is the only known locality of this taxon. It was first collected by Robert Wight, a surgeon-botanist of the East Company during 1835 and the present gathering hence forms the rediscovery of this species after a hiatus of 184 years. This is the only known locality of this rare species in the World represented by a single mature individual.



It is a small tree reaching to a height of 4 m tall with fissured bark and yellowish white blaze. The leaves obovate, suborbicular-obovate or narrowly obovate and are more or less spirally arranged and converged

towards the branch tip. The flowers are off-white or greenish-white and are borne mainly from the axils of the leaves with fairly long pedicels. Fruits are ellipsoid in shape, beaked at apex often 23 cm long with single narrowly ellipsoidal seed within it. The flowering and fruiting was observed in January to March. However, due its poor fruit set, no new born saplings were seldom observed.

**Shailajakumari S.¹, Santhosh Kumar E.S.^{1*}, Sreekala A.K.1,
Parthipan, B.² & R. Prakashkumar¹**

¹Jawaharlal Nehru Tropical Botanic Garden and Research Institute,
Palode, Thiruvananthapuram, Kerala 695 562, India.

²Department of Botany, S.T. Hindu College, Nagercoil P.O., Nagercoil, Tamil Nadu 629 002, India.

*E-mail: santhoshkumares@gmail.com

5.2. Bacterial endophytes mediated transcriptional reprogramming triggers plant immune response for the management of plant diseases

Role of plant growth promoting rhizobacteria (PGPR) in growth promotion and induction of resistance against various plant pathogens have been extensively studied. However, MAMP (Microbe Associated Molecular Pattern) triggered immunity (MTI) against plant pathogens including fungi and virus are not well exploited. The present study enlightens the role of two MAMP genes including, flagellin (Flg) and elongation factor (EF-Tu) in the induction of plant defense against GBNV infecting tomato. Secondary metabolites of *Bacillus amyloliquefaciens* (VB7), effectively suppressed GBNV symptom expression up to 84% compared to untreated control in cowpea, the indicator host plant. *Agrobacterium tumefaciens* EHA105 clones expressing the MAMP genes were drenched in the root zone to assess the induction of resistance against GBNV in tomato. Treatment with *A. tumefaciens* EHA105 clones containing flagellin (Ag- Ba.Flg) and elongation factor-TU (Ag-Ba.EF-Tu) genes delivered as soil drench and foliar spray, reduced virus titre to 0.369 OD and 0.379 OD respectively as compared to control 1.249 OD. Further there was an increased expression of defense associated genes including, MAPKK1, WRKY33BB, NPR1 and PR1. The present investigation clearly indicated the efficiency of MAMP genes in triggering defense mechanism in tomato against GBNV. The suppression of GBNV virus symptom in tomato plants was studied and correlated with increased PAL, PPO and PO activity. Thus, the bacterial community can be explored well to trigger the immune response of the host plants for the management of soil borne pathogens and viral diseases.

Nakkeeran,S*, Saravanan, R., Khadiri Mabendra and Renukadevi, P

*Department of Plant Biotechnology, Centre for Plant Molecular Biology and Biotechnology
Tamil Nadu Agricultural University Coimbatore 641 003

5.3. Multitudinous potential of *Trichoderma* species in imparting resistance in cucumber plants against fungal nematode complex.

The present study focuses on the development of potent bioformulation towards suppression of fungal nematode complex. *Trichoderma* spp. effectively inhibited mycelial growth of *F. oxysporum* f. sp. *cucumerinum* F1 and egg hatchability and juvenile mobility of *M. incognita*. SEM observations revealed that *T. koningiopsis* TRI 41 effectively hyperparasitised and lysed the mycelium of *F. oxysporum* f. sp. *cucumerinum* F1, eggmass and individual eggs of root knot nematode. Further, a shift in the non-volatile organic compounds (NVOC) profile of TRI 41 was also detected at the hyperparasitised region. *In vitro*, TRI 41 produced maximum indole acetic acid - IAA (15.25 µg/ml) and gibberellic acid-GA (10.40 µg/ml) in PDB. *T. koningiopsis* TRI 41 increased the root length (28.74 cm), shoot length (14.64 cm) and stem girth (1.76 cm) of cucumber seedlings to the maximum in vermicompost:soil:sand medium. Furthermore, TRI 41 influenced the root architecture of cucumber plants and altered the root exudate pattern in the

rhizosphere of 35 days old cucumber seedlings. Various nonvolatile organic compounds with antifungal and antibacterial activity were detected in the rhizosphere. Under field conditions, seed treatment with the consortia of the isolates, *T. koningiopsis* TRI 41, *T. asperellum* TRI 15 and *T. asperelloides* TNAU Tad 1 @ 1 ml/kg of seed (0.1%) combined with soil drenching of 100ml gel formulation in 100 liters of water over 1000 m² area of polyhouse on 15, 30, and 45th days after sowing indicated that the incidence of fungal nematode complex was 13.45% with 80.0 fruits/plant and with a mean yield of 15.01 t/1000m². For instance the untreated control was reported with 41.32 PDI, 52.0 fruits/plant and with a mean yield of 10.20 t/1000m².

Sreenayana B¹, Vinodkumar S^{1&2} and Nakkeeran S^{1*}

¹Department of Plant Pathology, Centre for Plant Protection Studies, Tamil Nadu Agricultural University, Coimbatore, Tamil Nadu, India.

²Faculty of Agricultural Sciences, SRM Institute of Science and Technology, Kattankulathur, Tamil Nadu, India.

³Department of Nematology, Centre for Plant Protection Studies, Tamil Nadu Agricultural University, Coimbatore, Tamil Nadu, India.

5.4. Abstract of paper presented for Carl Linnaeus Award [Paper listed for competition]

Evaluation of anti-insect properties of *Acorus calamus* Linn. Emulsion oil and Aerosol formulations against pulse beetle, *Callosobruchus maculatus* (Fabricius)

Post-harvest loss caused by unscientific storage, insects, rodents, microorganisms etc., are the main reasons for major food grain loss. In India, annual storage loss of food grain has been estimated as 14 -million tonnes. Management of these insects relies heavily on the use of synthetic insecticides and fumigants, which resulted in many environmental and efficacy deterioration. Phyto-insecticides have long been touted as attractive alternatives for pest management. *Acorus calamus* Linn. is one of the important phyto-insecticide which is known to possess wide varieties of anti-insect properties. Still their commercial use is highly restricted due non availability of formulations. Hence, emulsion oil and Aerosol formulations of *A. calamus* essential oil has been attempted. The results clearly indicated the supremacy of both the formulations in effectively controlling the pulse beetle. When the emulsion oil formulation at 10% concentration was tested at 50 - 200 µl. Application of the formulation @ 200 µl had the highest mortality with less reduction in weight of grain. It is also significantly effective in the reduction of oviposition and progeny production of *C. maculatus*. The F1 emergences of adult beetles were also reduced in treatment sets. The characteristic peak of essential oil seen at 2950 and 2800 cm⁻¹ corresponding to -OH group highlighted the presence of essential oil in the formulation through FTIR studies. In Aerosol, the one side treated gunny bags possessed repellence only up to 14 days where as the gunny bag if treated both the sides was very effective even after 28 days after treatment.

Anitha Santhanakrishnan* and Selvamuthukumaran Thirunavukkarasu

Phyto Insecticide Research Laboratory, Department of Entomology,
Faculty of Agriculture, Annamalai University, Annamalainagar 608002
Email: anithaento1993@gmail.com

5.5. Abstract of paper presented for Prof. M. S. Swaminathan Award [Paper listed for competition]

Diversity of Arthropods in Bhendi ecosystem, *Abelmoschus esculentus* L. (Moench)

Arthropod diversity plays an important role in enhancing crop yield. Therefore, present investigation was carried out to study the arthropod biodiversity, seasonal incidence of arthropods in bhendi ecosystem during September 2017 to April 2018 at Perur, Thondamuthur, Narasipuram and Agricultural College and Research Institute, Coimbatore.

A total of 27,332 arthropod fauna individuals from 257 species belonging to 104 families, 236 genera and 15 orders from two classes viz., Insecta and Arachnida have been observed. The order Hymenoptera was the most diversified with 61 species of 21 families followed by Coleoptera (52 species in 15 families), Hemiptera (36 species in 19 families), Lepidoptera (30 species in 11 families), Diptera (18 species in 11 families), Orthoptera (11 species in 5 families), Odonata (9 species in 3 families), Dictyoptera (5 species in 3 families), Dermaptera (2 species in 2 families), Thysanoptera and Isoptera (2 species each in 1 family) and Neuroptera and Embioptera (1 species each in 1 family). A total of 26 species of spiders under 16 genera and 8 families and mites under 1 genera, 1 species and 1 family was observed during the period of study.

The diversity of the predators was maximum and comprised of 82 species followed by herbivores (66 species), tourists and pollinators (32 species in each), parasitoids (29 species), detritivores and scavengers (6 species). The relative abundance of herbivores, predators, parasitoids, spiders, pollinators and tourists were 61.82, 17.09, 8.56, 8.79, 3.19 and 0.54 per cent, respectively.

The seasonal incidence of arthropods in bhendi ecosystem was recorded at weekly basis. Spider population was positively correlated with relative humidity and sunshine hours. Regarding class Insecta, the population was negatively correlated with temperature and rainfall. In case of Order Coleoptera, positive correlation with temperature and relative humidity but negative correlation with rainfall and sunshine hours was observed.

Kavinilavu, M.¹, Vishnupriya, R.²

¹Ph.D Scholar, Department of Agricultural Entomology, TNAU, Coimbatore-3

²Professor, Department of Agricultural Entomology, TNAU, Coimbatore-3

E-mail: ¹nilavukavi1976@gmail.com, ²vishnupriyaento@gmail.com

6. Awards, Recognitions, Honors received by members of NABS

- | | |
|----------------------|--|
| Aswath, Chenna Reddy | <ul style="list-style-type: none"> ■ Awarded Dr. M. M. Atavar award by Indian Academy of Horticulture Sciences (2020). |
| Bagyaraj, D.J. | <ul style="list-style-type: none"> ■ Nominated as a Member of the Monitoring Committee for overseeing the quality of People's Biodiversity Registers (PBRs) by NBA, Chennai; MoEFCC, New Delhi for 2 years w.e.f. January 20, 2020. ■ Nominated as Chairman, RAC of the ICAR-NBAIM, Mau for 3 years w.e.f. Jan 24, 2020. ■ Nominated as a Member of BOS in Microbiology, Sikkim University, Gangtok for 3 years w.e.f. January 15, 2020. ■ Nominated as a Member of Expert Committee for evaluation of project completion reports under Organismal and Evolutionary Biology - Plant Sciences by SERB, DST for 3 years w.e.f. March 3, 2020. ■ Nominated as a Member of the PAC to review the progress of network project on AMAAS of ICAR-NBAIM for 3 years w.e.f. September 3, 2020. |
| Singh, R. K. | <ul style="list-style-type: none"> ■ Received Fellowship of National Academy of Agricultural Sciences (2021). ■ Received an award- Dr. NGP Rao Endowment Award (2021). |
| Yashpal Singh Malik | <ul style="list-style-type: none"> ■ Assumed charges as Dean, College of Animal Biotechnology (Guru Angad Dev Veterinary and Animal Sciences University, Ludhiana) on 7th October 2020 |

7. Activities of Members of NABS

7.1. Dr. D.J. Bagyaraj

1. As Convener/ Resource Person of the National Academies (INSA, NASI, IASc) Lecture Workshops, delivered lectures as given below:

- “Microbial inoculants for sustainable cultivation of medicinal plants” and “Microorganisms as a source of human medicine” at KBN College, Vijayawada on October 19-20, 2020.
- “Mycorrhizal symbiosis” and “Soil biodiversity” at Teresian College, Mysore on Oct 21-22, 2020.
- “Diversity of mycorrhizae and their role in agriculture” and “Soil biodiversity-Present scenario” at St Joseph's College, Trichy on November 11-12, 2020.
- “AM fungi for sustainable agriculture, horticulture and forestry” and
- “Ecology of AM fungi” at Bharathiar University, Coimbatore on November 18-19, 2020.

2. Delivered invited talk on “Soil biodiversity” on World Soil Day programme organized by MSSRF, Chennai on December 3, 2020.

3. As a Member of the selection committee selected candidates for Sumer Research Fellowship 2021 offered by the three national science academies on December 14-15, 2020.

4. As an expert attended ICAR-NBAIM, Mau Annual Review Workshop on the Network Project on AMAAS-2020 on July 1-2, 2020.

5. Invited to attend workshop on Commercialization of Microbes Based Technologies” organized by ICAR-NBAIM, Mau on September 23, 2020.

6. As Member of the Monitoring Committee of People's Biodiversity Register of NBA, Chennai attended the meetings on June 3, October 22 and November 26, 2020.

7. Attended meeting of BOS in Microbiology of Sikkim University, Gangtok on July 16, 2020.

7.2. Dr. S. Nakkeeran

• **Virtual Lecture Workshop on “Microbial Biotechnology for Sustainable Agriculture” was conducted on February 5th and 6th, 2021 at Hindusthan College of Arts and Science, Coimbatore. It was organized by the National Academies- INSA, NSAI, IASc. As Resource Person of the National Academies (INSA, NASI, IASc) Lecture Workshops, delivered lectures as given below:**

- PGPM - the next generation bio-pesticides for the management of soil borne diseases.
- **Does the immunity induced by microbes confer resistance to viral diseases?**

7.3. Dr. M. Prakash

International Webinars organized as Organizing Secretary:

- **“OMICS in Crop Improvement”** at the Department of Genetics and Plant Breeding, Annamalai University on 21-08-2020.

- “**Biodiversity Conservation and Mitigation of Impacts of Climate Change**” at the Department of Genetics and Plant Breeding, Annamalai University on 26-08-2020.

International Webinars organized as Director:

- “**Genetic Improvement of peppers for fruit quality traits**” at the Department of Genetics and Plant Breeding, Annamalai University on 27-08-2020.
- “**Coastal Agriculture**” at the Department of Genetics and Plant Breeding, Annamalai University on 28-08-2020.

8. Publications

a. Books

Commercial Flowers (3rd revised Edn.), Vol.1, 2020. Senior Editor: C. Aswath; Editor Emeritus: T.K. Bose; Editors: V.A. Parthasarathy, L.P. Yadav, P. Pal, K.Dutta, Rajiv Kumar and P. Das., Astral International (P) Ltd., New Delhi [ISBN:81-85421-75-2]

Fruits: Tropical and subtropical (4th revised Edn.) Vol.2, 2020. Senior Editor: V.A. Parthasarathy; Editor Emeritus: T.K. Bose; Editors: S. K. Mita, B. Ghosh, I. Chakraborty and D. Sanyal., Astral International (P) Ltd., New Delhi [ISBN:81-85421-75-2]

Vegetable Crops (4th revised Edn.), Vol.3, 2020. Senior Editor: M.G. Som; Editor Emeritus: T.K. Bose; Editors: V.A. Parthasarathy, A. Chattopadhyay, T.K.Maity and J. Kabir., Astral International (P) Ltd., New Delhi [ISBN:81-85421-75-2]

b. Book-Chapters

Ijinu, T. P., **George, V.** and Pushpangadan, P. 2020. Bioprospecting of Medicinal and Aromatic Plants, In: **Peter, K. V.** (Ed.), Bioprospecting of Underutilized Horticulture Crops, pp.1-23, Brillion Publishing, New Delhi. ISBN: 978-93-89350-10-4.

Ijinu, T. P., Aswany, T., **George, V.** and Pushpangadan, P. 2020. Basil, In: Singh, B. and **Peter, K. V.** (Eds.), Green, Spouts and Edible Flowers, pp.51-66, Brillion Publishing, New Delhi. ISBN: 978-93-89350-68-5.

c. Journals

Desai, S., **Bagyaraj, D.J.** and Ashwin, R. 2020. Inoculation with microbial consortium promotes growth of tomato and capsicum seedlings raised in pro trays. *Proc. Natl. Acad. Sci., India, Sect. B Biol. Sci.* 90: 21-28. (Open Access).

Sukeerthi, D., Nikhil, N., Ashwin, R. and **Bagyaraj, D.J.** 2020. Microbial consortium promotes growth of zinnia and balsam seedlings raised in pro trays. *J. Flori. Landscap.* 6: 04-08 (Open Access).

Raghu, H.B., Ashwin R., Ravi, J.E. and **Bagyaraj, D.J.** 2020. Enhancing plant quality and out-planting growth of *Acacia auriculiformis* in dry wasteland plantations by inoculating selected microbial consortium in the nursery. *Can. J. For. Res.* 50: 736-741. (Closed Access).

Nikhil, S. N., Ashwin R., Harinikumar, K.M. and **Bagyaraj, D.J.** 2020. Development of microbial consortia for growth improvement of neem. *Forestist*, 71: 18-24. (Open Access).

Mathimaran, N., Sekar, J., Thimmegowda, M. N., Prabavathy, V. R., Yuvaraj, P., Kathiravan, R., Sivakumar, M. N., Manjunatha B. N., Bhavitha, N. C., Sathish, A., Shashidhar, G. C., **Bagyaraj, D. J.**, Ashok, E. G., Sigh, D., Kahmen, A., Boller, T. and Mäder, P. 2020. Intercropping transplanted pigeon pea with finger millet: Arbuscular mycorrhizal fungi and plant growth promoting rhizobacteria boost yield while reducing fertilizer input. *Front. Sustain. Food Syst.*, 4: Article 88. <https://doi.org/10.3389/fsufs.2020.00088> (Open Access).

Raghu, H.B., Ashwin R., Ravi, J.E. and **Bagyaraj, D.J.** 2020. Microbial consortium improved growth and performance of teak (*Tectona grandis* L.f.) in nursery and field trials. *Proc. Natl. Acad. Sci., India, Sect. B Biol. Sci.* 90:903-909. (Closed Access).

Marysovia, F., Nikhil, S. N., Ashwin R., **Bagyaraj, D.J.** 2020. Influence of microbial consortium in the production of china aster and gaillardia seedlings. *J. Hort. Res.* 28: 21-28. (Open Access).

Chen, X., Veena, R.K., Ramya, H., Janardhanan K. K. and **George, V.** 2020. Gano oil: A novel antinociceptive agent extracted from *Ganoderma lucidum* inhibits paw oedema and relieves pain by hypnotic and analgesic actions of fatty acid amides, *Journal of Ethnopharmacology*, 263, DOI: 10.1016/j.jep.2020.113144

Chithra, M.A., Ijnu, T.P., Kharkwal, H., Sharma, R.K., Janardhanan, K.K., Pushpangadan, P. and **George, V.** 2020. *Cocos nucifera* L. inflorescence extract: An effective hepatoprotective agent, *Indian Journal of Traditional Knowledge*, 19 (1), 128-136. <http://nopr.niscair.res.in/handle/123456789/52824>

9. An appeal to contribute for Corpus Fund

Corpus Fund for Prof. S. Kannaiyan Memorial Award is being mobilized. NABS thankfully acknowledge the contributions made by members to Prof. S. Kannaiyan Memorial Corpus Fund [vide list below- continuation]

S.No.	Name of contributor	Amount (Rs.)	S.No.	Name of contributor	Amount (Rs.)
73					

We earnestly appeal to all the rest of the Life members, NABS Fellows / Associate Fellows, Corporate Life Members, Corporate Fellows, Awardees of NABS and well-wishers to contribute to this noble cause. The Fund shall be transferred on line to the Savings Account of **National Academy of Biological Sciences**

[Vide details for online transfer in item 11.1. of NL]

10. An appeal to contribute for Printing of NABS-Book

The members of NABS were requested to contribute to defray the expenses incurred on printing the book. Many members have responded. The contribution by members is listed. The contribution shall be transferred on line to the Savings Account of **National Academy of Biological Sciences**.

[vide list below-] [Vide details for online transfer in item 11.1. of NL].

S.No.	Name of contributor	Amount (Rs.)	S.No.	Name of contributor	Amount (Rs.)

11. Enroll yourself as a member and be a part of NABS

Types of Membership available (one time payment)

A. Life Member	: ₹ 5,000/- or US\$ 200/-
b. Provisional Life Membership	: ₹ 5,000/- or US\$ 200/-
c. Corporate Life Member	: ₹ 10,000/- or US\$ 400/-
D. Corporate Fellow	: ₹ 1,00,000/- or US\$ 4000/-

- Duly filled membership form shall be sent as Secretary NABS in WORD format by E-mail to secretarynabs@gmail.com
- The prescribed membership fee shall be transferred on line

11.1. Account details of National Academy of Biological Sciences

Name of the account holder : National Academy of Biological Sciences
Account number : **10496978637**
Type of account : Savings Account
Name of Bank : State Bank of India, Valmikinagar Branch,
Thiruvanmiyur, Chennai - 600 041
Branch code / IFSC code : Branch code: 11721 - IFSC code: SBIN0011721

Down load your application from www.nabsindia.org

Address for all correspondences

Prof. T. Marimuthu, Ph.D., FNABS., FISNS.
Secretary, NABS
NABS-Secretariat,
Room No. 209, Second Floor, CAS in Botany, University of Madras,
Guindy Campus, Chennai - 600 025.
E-mail: secretarynabs@gmail.com Visit: www.nabsindia.org

Disclaimer

The authors are responsible for the information related to Research notes and short communications of this issue

Published by

Prof. T. Marimuthu, Ph.D., FNABS., FISNS.
Secretary, NABS
NABS-Secretariat, Room No. 209, Second Floor, CAS in Botany, University of Madras, Guindy Campus, Chennai - 600 025,
On behalf of National Academy of Biological Sciences

An appeal to members of NABS

Kindly inform change of address including phone numbers and
E-mail to the Secretary, NABS by
E-mail (secretarynabs@gmail.com)

Circulated to members as E-copy on 16.02.2021