NATIONAL ACADEMY OF BIOLOGICAL SCIENCES
Founded 2004

NABS News Letter

National Academy of Biological Sciences

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Contents

From the Desk of President...

Dear NABSians,

I extend a very warm New Year and Season's Greetings to all the NABSians and their family for healthy, prosperous, purposeful and fun filled years ahead.

You may recall that an wonderful event of NABS- Seminar on "Biodiversity Conservation-Status, Future and Way Forward" which was 7th in its series and also the 10th year of NABS' birth which was organized in collaboration with Department of Biotechnology, K. S. Rangasamy College of Technology, Tiruchengode, Namakkal District of Tamil Nadu. I take this opportunity to thank Lion Dr. K.S. Rangasamy, MJF., Founder and President, K.S.R. Group of Educational Institutions, Tiruchengode; Dr. K. Thyagarajah, Principal, K. S. Rangasamy College of Technology; Coordinator, Dr. P. Ponmurugan of Department of Biotechnology and Organizing Secretary, Dr. S. Anita of K. S. Rangasamy College of Technology, Tiruchengode, Namakkal, Tamil Nadu and their team for the unstinted support in successfully organizing a memorable event at KSRCT.

I also thank the Patron. Prof. R. R. Hanchinal, Chairperson, PPV & FRA, GOI and the first recipient of NABS-Life Time Achievement Award for the exemplary support given to NABS and specially to the seminar.

Now, NABS has announced a long list of awards besides the regular Fellowship / Associate Fellowship' Prof. S. Kannaiyan Memorial Award, NABS- Life Time Achievement Award, NABS-Leadership Award, NABS-Best Woman Scientist Award, NABS-Best Scientist Award [*Dr. G. S. Venkataraman Memorial NABS-Best Scientist Award (under Basic Sciences); Dr. B. P. Pal Memorial NABS -Best Scientist Award (Under Agricultural Sciences and Forestry); Dr. V. S. Alwar Memorial NABS-Best Scientist Award (under Veterinary and Fisheries); Dr. Smt. Rajammal P. Devadas Memorial NABS-Best Scientist Award (under Food Sciences)*], NABS-Young Scientist Award and NABS-Best Research Paper Award *[Prof. T. S. Sadasivan Memorial NABS Best Research Paper Award (under Basic Sciences); Prof. G. Rangawami Memorial NABS Best Research Paper Award (under Agricultural Sciences & Forestry); Dr. C. M. Singh Memorial NABS Best Research Paper Award (Veterinary & Fisheries); Dr. V. Subrahmanyan Memorial NABS Best Research Paper Award (under Food and Nutrition)]* for the year 2014.

The patronage to NABS is increasing every year for which I am thankful to all the EC members for their sustained efforts in taking NABS to higher and higher ladder. The Eighth series of seminar and the ninth Annual meeting is planned to be held at University of Mysore in collaboration with Department of Studies in Biotechnology, UoM during the middle of August 2015 with the theme "Biological Products for Crop and Human Health-Problems and Prospects".

I thank all the NABSians, Vice-President, Secretary, Foreign Secretary, Treasurer, Editor and all the EC members their tireless efforts in making things happen.

(V. A. Parthasarathy)
President, NABS

2. From Editor's Desk

Greetings for the New Year!

The year 2014 has been a year of unprecedented growth and I sincerely wish that in 2015 NABS continues to make a tremendous impact on the society on a regular basis. Over the past 12 months we have continued to expand, reflecting the success and credibility of our academy and our programs have continued to generate interest from a wider audience. What gladdens me is that our success has been acknowledged by other organizations and academies that now look to learn from us.

But the best manifestation of our success is the continuing dialogue and scientific exchanges that have given us the collective strength to draw attention to the growing challenges faced by society. Nevertheless, these challenges are not insurmountable, provided we continue to work together towards the common goal of a happy and hope-filled future. This is one reason why the forthcoming eighth NABS-National seminar on "Biological Products for Crop and Human Health-Problems and Prospects" to be held during August 2015 at University of Mysore is eagerly anticipated.

Be that as it may, the year 2015 is the International Year of Soils. While trying to enhance crop yields, we have been abusing the soil, the world over. Healthy soils are the foundation for food, fuel, fibre and even medicine. The UN kicked off 2015 as the International Year of Soils, in an effort to raise awareness and promote more sustainable use of this critical resource. Soils are not a 'Forgotten Resource'. In fact, they are vital, critical for our well-being and are the basis for food, feed, fuel and fibre. In this year, let us vow that we at NABS will play an active role in promoting the cause of soils.

Lastly, I would like to thank all our members for their hard work for the academy during last year, and I truly appreciate all the help and support we received from various institutions and universities. I also take this opportunity to congratulate all the NABSians who received awards and recognitions from various institutions and organizations during 2013-2014.

Let us look forward to another productive year ahead, and I once again wish you all a very happy 2015.

(M. Anandaraj)

3. News and Events

i. Eighth NABS-National Seminar

The eighth NABS National Seminar on "Biological Products for Crop, Animal and Human Health: Problems and Prospects" is scheduled to be held on 21 & 22 August 2015 at University of Mysore, Mysore, Karnataka. Detailed announcement will follow shortly.

ii. Interactional Symposium on Plantation Crops

The Interactional Symposium on Plantation Crops (PLACROSYM XXI) hosted by Indian Institute of Spices Research, Kozhikode and organized by 12 research and development organizations dealing with plantation crops in the country, was held during 10-12 December 2014 at Kozhikode. The symposium was inaugurated by Prof. M.S. Swaminathan, Emeritus Chairman, MSS Research Foundation, Chennai, and Dr. P. Rajendran, Vice Chancellor, Kerala Agricultural University presided over the function and Dr. N.K. Krishna Kumar, Deputy Director General (Hort. Science), ICAR, New Delhi delivered the keynote address. Dr. M. Anandaraj, Director, Indian Institute of Spices Research, Kozhikode and General Chairman, PLACROSYM XXI welcomed the gathering while Dr. S. Devasahayam, General Convenor, proposed the vote of thanks. Several publications to mark the occasion were released and awards to distinguished scientists and farmers were distributed. Eleven lead talks, 26 oral papers and 220 poster papers were presented in six technical sessions. The symposium was attended by over 350 delegates from abroad and India.

iii. 55th Annual Conference of AMI

Dr. K. Kumar, Professor of Microbiology, TNAU and NABS Fellow as organizing secretary organized a National Conference on Empowering Mankind with Microbial Technologies (AMI-EMMT-2014) during November 12-14, 2014 at Tamil Nadu Agricultural University, Coimbatore. About 1200 participants from all over India participated in the Conference. Foreign delegates from Australia, Brazil, Germany and USA also participated and delivered lead lectures. Eight technical sessions including a Plenary lecture session and concurrent sessions on Agricultural Microbiology, Medical and Veterinary Microbiology, Environmental Microbiology, Microbial diversity & bioprospecting, Anti microbial compounds and Microbial fuels, Food & Industrial Microbiology and Fermentation Technology and AMI Award lectures and four Poster sessions were held and about 900 papers were presented in the Conference.

Special Budding Scientists session, the highlight of the conference was organized in which Ms. Masha Nazeem, Young Inventor of India and M.Tech student of SRM University, Chennai shared her passion for Science who started developing novel technologies at the age of eight and has 8 patents to her credit.

About 50 different groups of School students from Coimbatore displayed their exhibits/models covering the application of Microbiology in Agriculture, environment, food, human health and energy sectors. best exhibits were awarded with cash and certificates. Dr.K.Kumar, Professor, Dept. of Agrl. Microbiology, Tamil Nadu Agricultural University, Coimbatore and the NABS fellow was the Organizing Secretary of the above Conference.

iv. Dr. Gero Benckiser

NABS Fellow and delegate from Germany participated in the above Conference as Invited Speaker and delivered a lead lecture. He was so generous to contribute his entire travelling allowance of Rs. 51,260/- paid to him by the Organizers to Prof. S. Kannaiyan Memorial Cropus Fund.

4. Awards and Recognition received by members of NABS

Congratulations to all the NABSians who received awards and recognition from various institutions and organizations in the country and outside during 2013-2014.

Name of Member / Name of Award /Recognition received

Anandaraj, M

- Received Dr C S Venkataram Memorial Trust Award and was conferred with "Distinguished Plantation Scientist Award" conferred for outstanding contributions to plantation crops and spices.

Anil Kumar

- Received INSA Teachers' Award-2014.

Bagayaraj, D. J.

- United Nations General Assembly has decided to declare 2015 as the "International Year of Soils". The Secretariat for the "International Year of Soils" based in FAO, Rome, initiated the programme on "Global Soil Partnership (GSP)" to facilitate and implant work on healthy productive soils. He has been nominated as a Task Force Member of GSP to contribute towards sustainable soil management using microorganisms.
- European Commission (EC), Brussels, has decided to bring out a "Global Atlas of Soil Biodiversity" which includes different soil biota underpinning ecosystem productivity. He has been invited by EC to contribute on "Mycorrhizal Fungi" along with 3 more scientists one each from USA, Brazil and China.

Brahma Singh

- Conferred with Fellow of Horticultural Society of India (2014).

Hanchinal, R. R.

- Conferred with Fellow of Indian Society of Genetics and Plant Breeding. " Nominated as Chairman, QRT, Tobacco by ICAR, New Delhi.

Nirmal Babu, K

- Received Dr C S Venkataram Memorial Trust Award and was conferred with "Distinguished Plantation Acientist Award" conferred for outstanding contributions to plantation crops and spices.

Prabakaran, G.

- Conferred with Fellowship by Hind Agri-Horticultural Society (FHAS), U.P. under Plant Sciences. Ramasamy, K. " Received "Best Vice Chancellor Award 2014" from Hon'ble Union Minister of Agriculture Sh. Radha Mohan Singh on 31.12.2014 on the Occasion of National Seminar on "Empowering Youth in Agriculture and All India Agricultural Students Association [AIASA] Annual Function 2014. Shivanna, H.
- Assumed charges as Vice-chancellor, University of Agricultural Sciences, Bengaluru, Karnataka on 15 January 2015.

Singh, D. R.

- Has been appointed as Director, NRC for Orchids (ICAR), Sikkim

Tilak, K.V. B. R.

- Received 'Life Time Achievement Award' for his contributions in Agricultural Microbiology at the National Workshop on PGPR held at Banaras Hindu University, Varanasi during October 7-9,2014.
- Received 'Life Time Achievement Award' in Life Sciences at the 3rd Global Sustainable Biotech Congress held at North Maharashtra University, Jalgaon during 1-5 December2014.

Vijai Kumar Gupta

- Nominated as one of the members of Editorial Board of Archives of Phytopathology and Plant Protection published by Taylor & Francis, UK
- Dr. J. C. Edward Medal 2015 for outstanding contribution in Microbiology to be conferred during 17th Indian Agricultural Scientists and Farmers' Congress on " Agri-Innovation for enhancing Production scheduled on 21-22 February 2015 at Allahabad, India.

Note: Full address of members is available in website of NABS [nabsindia.org]

5. Research notes and short communications

i. Bioencapsulation: Novel method for smart delivery of agriculturally important microorganisms

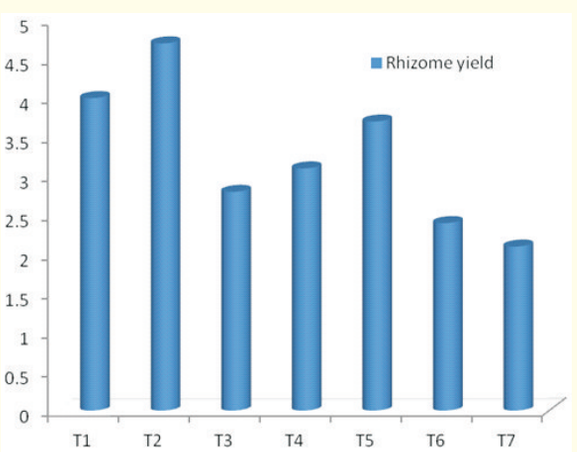
Biofertilizers are available in different formulations, the common types being liquid, peat, granules, and freeze-dried powders. However, a perfect formulation heretofore does not exist and each type has its own advantages and limits. Nevertheless, a promising advancement has been the development of techniques that allow encapsulating the microbial strain in a nutritive shell or capsule and deliver them to the targeted site. While encapsulating techniques have been fairly successful in the laboratory, attempts to emulate the performance in the field have been largely unsuccessful. Therefore, presently no such commercial products are available in the market.

Successful development and field testing of biocapsules containing plant growth promoting rhizobacteria (PGPR), *Bacillus amyloliquefaciens* IISR GRB 35 has been done at ICAR- IISR, Calicut. The process involves encapsulating PGPR in a gelatine capsule (Fig 1). The total weight of the biocapsule is 1g. The process of making the formulation is simple and does not require any sophisticated equipment and conditions except basic facilities. The buffering and protecting agents prevent its desiccation and ensure protection against environmental stress. Hence, it can be stored at room temperature, which in turn would help in saving energy. The capsule formulation contains PGPR in an immobilized/inactive condition with a population of 10^9 CFU/g. The cells can be activated by suspending the capsule along in 100 mL of sterile distilled water or boiled and cooled water followed by incubation for 1h at room temperature. Further incubation from 12-24h is done at room temperature with intermittent mixing or shaking resulting in an increase in population to 10^{10} CFU/g. It can be diluted to 10^8 CFU/ mL prior to use. This reduces number

of capsules required and therefore the cost of investment. After dilution, the seeds or seedlings or rhizomes are soaked in the suspension for 30 minutes before sowing/ transplanting into the main field. The remaining suspension can be used as soil drench.

We tested capsules containing PGPR B. *amyloliquefaciens* on growth promotion and disease control through field experiments on ginger. The capsules were either activated or non-activated before use. Activation means suspending a capsule (10^{10} CFU mL^{-1}) in 100 mL sterile water and incubating at 28^0C for 24h followed by dilution of this 100 mL suspension to 10 L (10^8 CFU mL^{-1}). Ginger rhizomes are then soaked in this suspension for 30 minutes before planting. Non activated capsule means suspending the capsule in 100 mL water followed by dilution to 10L just 30 minutes before planting (i.e. no incubation at 28^0C for 24h). The treatments consisted of Non activated capsule (1 capsule/ 5kg seed- T1); Activated capsule (2 capsules/ 5 kg seed- T2); Activated capsule (1 capsule/ 10kg seed- T3); Activated capsule (1 capsule/ 5kg seed-T4); Talc formulation (10g/ 10L- T5); Metalaxyl- Mancozeb (1.25g/ L- T6); Absolute control- T7. Results (Figs 2 & 3) revealed that the treatments, T1 (Non activated capsule-1 capsule/ 5kg seed) and T2 (2 capsule/ 5 kg seed) recorded markedly greater rhizome yield and lower soft rot incidence compared to other treatments especially the chemical treatment, Metalaxyl- Mancozeb (T6). The results showed that PGPR delivery through encapsulation was markedly better than talc based formulation with respect to yield and at par with Metalaxyl- Mancozeb in case of disease suppression.

Fig. 1: Gelatine capsules containing PGPR *Bacillus amyloliquefaciens* IISR GRB 35



T1 - Non activated capsule (1 capsule/ 5kg seed)
T2 - Activated capsule (2 capsule/ 5 kg seed)
T3 - Activated capsule (1 capsule/ 10 kg seed)
T4 - Activated capsule (1 capsule/ 5 kg seed)
T5 - Talc formulation (10g/ 10L)
T6 - Metalaxyl- Mancozeb (1.25g/ L)
T7 - Absolute control

Fig. 2: Effects of different modes of delivery of PGPR IISR GRB 35 on ginger rhizome yield (kg bed^{-1} of size 3 x 1 m^2)

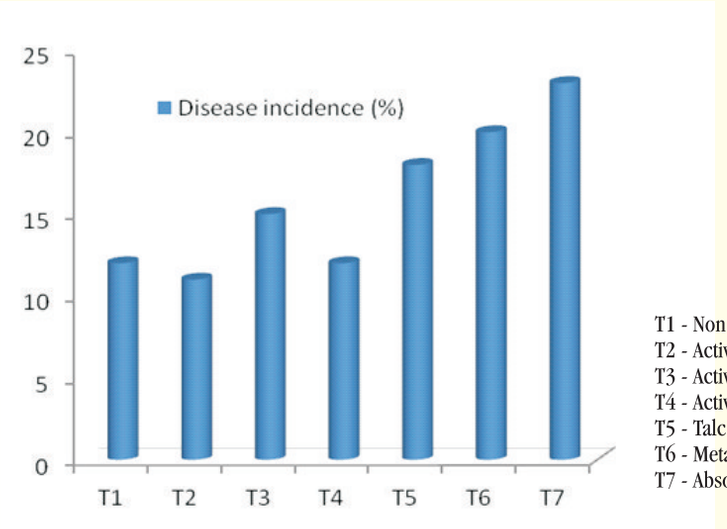


Fig. 3: Effects of different modes of delivery of PGPR IISR GRB 35 on soft rot (*Pythium myriotylum*) incidence (%) in ginger

Since the population remains at 10^9 CFU, the number of capsules required will be markedly less compared to talc formulation. For instance, the normal requirement of talc formulation of PGPR for ginger crop is 20 kg ha^{-1}. However, it can be replaced with just 200 biocapsules weighing 200g, a marked decrease of 100 times by volume. Other advantages include reduced cost of handling and transport, no harmful by products, less requirement of inorganic and inert material and storage at normal temperature. Besides, the shelf life of encapsulated PGPR at room temperature was found to be a staggering 16 months compared to 3-8 months in case of talc based formulations. What makes the technique all the more exciting is that it can be used to deliver all kinds agriculturally important microbes *viz*., N fixers, nutrient solubilizers/ mobilizers, PGPR, fungal spores, biocontrol agents like *Trichoderma* etc. to any crop whatsoever.

The technology is being commercialized by the Business Planning and Development Unit of the Indian Institute of Spices Research (ICAR), Kozhikode. The patent for this invention entitled '**A novel method of storing and delivering PGPR/microbes through biocapsules**' has been filed (Application No.**3594/CHE/2013** dated 13/08/2013). Considering the fact that encapsulation technologies involve high production cost, more handling work at the industry level, and special equipments, the success of this microbial delivery system in the field, the low production costs and ease of handling and storage apparently means that the technology is affordable and cost effective to be readily adopted by manufacturers and farmers. While, presently no such commercial products are available in the world market, the successful laboratory and field testing of this novel microbial delivery system represents a giant leap in biofertilizer formulation and production.

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ii. Studies on antioxidant activity with different extracts of *Acalypha indica* and *Euphorbia hirta*

Oxidation is a basic part of the aerobic life and metabolism. During oxidation many free radicals are produced which have an unpaired, nascent electron. Biological antioxidants are compounds that protect biological systems against the harmful effects of the processes. Total phenolic content in the extracts was

determined by the method with some modifications using the Folin- Ciocalteu reagent. The total flavonoid concentration of the extracts of the aerial parts of *Acalypha indica* and *Euphorbia hirta* was determined by using aluminium chloride. The total flavonones content in the extracts of *A. indica* and *E. hirta* was determined by the method using 2,4- dinitrophenyl hydrazine. Total tannin content in the extracts was determined by the method with some modifications using the Folin- Ciocalteu reagent. Total alkoloid content in the extracts was determined by the method with some modifications using the tropaeolin "OO" reagent. The extract was dissolved in a known volume of methanol. The scavenging ability of the inherent antioxidants of the extracts towards the relatively stable free radical DPPH assay was determined by using sample 1.5 ml with 3ml of 200µM DPPH solution. The total antioxidant activity of the extracts of the aerial parts of *A. indica* and *E. hirta* was determined by using ABTS free radical scavenging assay. Total phenolic content in the extracts of the aerial parts of *A. indica* and *E. hirta,* the ethyl acetate and methonolic extracts of the aerial parts of *A. indica* and *E. hirta* showed higher levels of total phenolic contents than the diethyl (201.80+_SD), (22.43+_SD) and ethanolic extracts (245.05+_SD), (105.05+_SD). The ethyl acetate (209.68+_SD), (200.97+_SD) and methonolic extracts (206.09+_ SD), (148.67+_SD) of the aerial parts of *A. indica* and *E. hirta* showed higher levels of total flavonoid contents than the diethyl ether and ethanolic extracts.

Recently the flavonoids and flavonones have aroused considerable interest because of their potential beneficial effects on human health. They have been shown to have, antialergic, anti-inflammatory, anti-platelet, antioxidant, anti tumor and antiviral activities. The total tannin content of the extracts of the aerial parts of *A. indica* and *E. hirta*, the ethyl acetate(10.15+_ SD),(12.10+_SD) methonolic (7.60+_ SD), (11.90+_SD) and ethanolic extracts(8.81+_ SD), (9.59+_ SD) of the aerial parts of both the plants *A. indica* and *E. hirta* showed higher levels of total tannin contents than the diethyl ether extracts. The presence of tannin in the plants implies that they may have astringent properties and in addition, could quicken the healing of wounds and burns. The diethyl ether (0.31+_SD), (0.06+_ SD) and ethanolic extracts (0.20+_ SD),(0.08+_ SD) of the aerial parts of both the plants *A. indica* and *E. hirta* showed higher levels of total alkaloid contents than the other extracts. Alkaloids are the most efficient therapeutically significant plant substance. Pure isolated alkaloids and the synthetic derivatives are used as the basic medicinal agent because of their analgesic antispasmodic and bacterial properties. The DPPH scavenging effects of the extracts of the aerial parts of plants *A. indica* and *E. hirta.* The extracts had significant scavenging effects on the DPPH radical. The positive DPPH test suggests that the samples are free radical scavengers. These results indicate that the extracts of the aerial parts of *A. indica* and *E. hirta,* particularly the ethyl acetate extracts (86.03+_SD),(98.92+_SD) exhibited the ability to quench the DPPH radical, suggesting that the extracts are good antioxidants with radical scavenging activity. The extracts had significant scavenging effects on the ABTS radical. These results indicated that the extracts of the aerial parts of plants *A. indica* and *E. hirta,* particularly the ethyl acetate (96.37+_SD), (95.81+_SD) and methanolic extracts (91.08+_ SD),(94.04+_ SD) exhibited the ability to scavenge the ABTS radical, suggesting that the extracts are good antioxidants with radical scavenging activity.

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An appeal to contribute for Corpus Fund

Corpus Fund for Prof. S. Kannaiyan Memorial Award is being mobilized. NABS thankfully acknowledge the members who have contributed to Prof. S. Kannaiyan Memorial Corpus Fund
[Vide list below- continuation]

55. Dr. M. Subramanian

56. Gero Benckiser

We earnestly appeal to all the rest of the Life members, NABS Fellows / Associate Fellows, Corporate Life Members, Corporate Fellows and well wishers to contribute to this noble cause. The amount may be paid as Cash or through a Demand Draft / Multicity Cheque drawn in favour of **National Academy of Biological Sciences** payable at Chennai.

The fund may also be electronically transferred to the Savings Bank account of the Academy held at

State Bank of India; **Branch:** Valmiki Nagar, Chennai-600 041

Branch code : 11721

IFS code : SBIN0011721.

SB Account No. of the Academy : 104 9697 8637

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

Types of Membership available (one time payment)		
A. Life Member	:	A2,500/- or US$ 100/-
b. Corporate Life Member	:	A10,000/- or US$ 400/-
c. Corporate Fellow	:	A1,00,000/- or US$ 4000/-

- Details of Payment **:** The prescribed membership fee may be paid either as Indian rupee or US $ or Demand Draft / Multicity Cheque drawn in favor of "**National Academy of Biological Sciences**" payable at Chennai.
- The fee may also be electronically transferred to the SB account of the academy held at State Bank of India, Valmikinagar branch, Thiruvanmiyur, Chennai- 600 041, Tamil Nadu.
- **Account No.: 10496978637 / IFS code: SBIN0011721**
- Down load your application from www.nabsindia.org

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