Agri Stimulus

Ag Biologicals

In This Issue

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Ag biologicals: A surging business opportunity

Agriculture biologicals have been around for more than three decades in global agriculture. However, their importance and wide-scale use has expanded recently due to shifts in consumer preferences towards more nutritious and safe organic food. The global ag biologicals market was valued at USD 9.9 billion in 2020 and is expected to reach USD 18.9 billion by 2025 growing at a CAGR of 13.7%. While in India, the Ag Biological Market was valued at USD 730 Million in 2020 and is projected to reach USD 919 Million by 2025-26 at a CAGR of 4.1%. The key drivers for ag-biologicals in the Indian market include ever-growing food demand as a result of increasing population, consumer focus shifting to safer foods that is linked to an increase in demand for organic products.

Ag biologicals are microbial and plant-derived biochemical solutions that help in the production of healthier crops by improving yield and protecting crops against pests and diseases. Currently, the biological products are extensively used in Integrated Pest Management (IPM) practices where they are applied as complementary to synthetic plant protection chemicals. Ag biologicals bring in a wide range of sustainable agriculture practices into production systems starting from the soil and seed treatments to their application as fertilizers, plant growth promoters, crop protectors, etc.

Ag biologicals are likely to play a vital role in catering to not only crop protection & enhancing crop productivity, but also ensuring long-term sustainable agricultural practices. Biocontrols is one of the largest segments of ag biologicals that mainly consists of bioinsecticides, biofungicides, bionematicides, etc. This segment is likely to substitute chemical methods or reduce their usage as new chemicals with new delivery methods and reduced dosage are becoming a norm. Further, the emergence of pests, safety considerations for human and environmental health, and reductions in Maximum Residual Levels (MRLs) of food crops will help in increasing the market of biocontrols.

Biostimulants is another ag

biologicals segment that is likely to acquire a major share in field-level crop stress management and therefore is expected to become the prime focus for the Agri-input companies to include in their product portfolio. The products like seaweed extracts, organic acids like humic acid and folic acid, etc. increase plants' nutrient absorption capacity and enhance plant growth. They also help in boosting immunity by increasing the efficiency of metabolic pathways. The demand for biostimulants is surging due to the growing demand for organic food, advancement in farming practices and technologies, and safer foods for a growing population.

There has been active participation of global Ag input leaders in strategic M&As and partnerships with leading biologicals companies such as FMC Corporation's alliance with Chr. Hansen, Novozymes, Cytozyme and Marrone Bio; UPL's acquisition of Arysta (Crop protection & life science company); Syngenta's acquisition of Valagro (leading biologicals company). Such associations will help ag input companies offer a holistic portfolio that would include Ag biologicals products complementing the already existing traditional synthetic crop protection products.

In years to come, the ag biological segment will foresee a significant surge in both Indian as well as international markets. Increasing investments by key international organizations in R&D of Ag biologicals due to surge in global organic food market is expected to additionally benefit the market. Furthermore, the segment will witness active participation from both private and public sectors, encouraging the growth of Ag biologicals as part of a long-term sustainable alternative solution for excess use of chemical inputs in agriculture. Despite challenges like lack of quality testing standards, low adoption and awareness rates among farmers, etc; Ag biologicals is demonstrating immense potential to meet the demands of modern-day consumers in terms of food safety along with uplifting bottom line growers through its sustainable alternative solutions in the farming ecosystem.

Seaweeds based Biostimulant- an upcoming ag-biological

Seaweeds are multi-cellular, macroscopic organisms found in coastal, marine ecosystems and are rich in micro and macro nutrients polysaccharides, proteins, polyunsaturated fatty acids (PUFAs), polyphenols, phytohormones, enzymes, osmolytes and bioactive peptides. The seaweeds extracts are widely used as biostimulants defined as "any substance or microorganism applied to plants with the aim to enhance nutrition efficiency, abiotic stress tolerance and/or crop quality traits". They are derived from the extraction of several microalgae species, which depending on the extraction methodology leads to the production of complex mixtures of biologically active compounds. Seaweed extracts increase tissue concentrations, root to shoot transport of micronutrients and improve mineral composition of plant tissues.

The seaweed- based biostimulant market was valued at USD 2.6 billion in 2019 and is projected to reach USD 4.9 billion by 2025, at a CAGR of 11.24%. This is approximately 33% of the total global biostimulant market. Europe accounts for nearly 40% of the global seaweed based biostimulants market, followed by Asia pacific at around 26%. In India, seaweed based biostimulants

account for about 39% of the total Indian biostimulant market.

CSIR – CSMCRI (Central Salt and Marine Chemical Research Institute, Bhavnagar, Gujarat, India), has been working on the development of seaweed-based biostimulants that will help increase crop productivity in India by up to 37%. Currently the demand for seaweeds in India is 450,000 tons of solid biostimulants. India produces only 5-8% of the amount of seaweeds needed, the rest is imported. India is just starting to witness the usage of seaweeds in biostimulants. NITI Aayog, has also set up a committee to explore how seaweeds are grown. CSMCRI is partnering with many private entities to use their technology. One of their licensees, AquAgri Processing Private Limited, has built a plant for the production of seaweed sap biostimulant. Other companies like IFFCO and Vikas Crop Care have also collaborated with CSMCRI for licensing their technology. Some of the companies involved in the commercial seaweed products are PI Industries, BASF, Acadian Agritech, AgriGro, Technaflora, Green Air Products, etc. The major sources for seaweed includes Ascophyllum nodosum followed by Durvillaea sp., Kappaphycus alvarezii and Ecklonia maxima.

Government has recognized biostimulants as a valuable plant growth promoter by regulating the biostimulants. The country's first patent on biostimulant has been granted to a Bangalore- based company, Sea6energy for the application filed in May 2015. The patent is for 'A biostimulant formulation for improving plant growth and uses thereof". Sea6 energy has patented some unique molecules from cultivated red seaweeds that can specifically stimulate metabolic pathways in plants and these compositions are subject of their granted patents. The product has already received patents in USA, Europe, Japan, China, Malaysia, Australia and South Africa with same set of claims.

Seaweeds are the major type of biostimulants in India and worldwide and have an advantage of its application across the various crop segments. Its application on agricultural crops have potential to increase the rate of germination, crop growth, yield and quality of produce which is proven through various research experiments conducted in India aa well as

globally. These are anag-biologicals and with recent regulations, the industry will move with much higher growth rate than anticipated. The current gap between demand and supply of seaweeds can be reduced by its commercial cultivation. Big giant, Pepsi Food Ltd. has already taken a step in the direction by commercial cultivation along a 10 km stretch in Tamil Nadu, with technical support from CSMCRI. The industry players need to invest more in research and development and innovating on the different seaweed product types along with commercial cultivation of seaweeds to reduce imports which will further drive the industry.

New regulations for Biostimulants - A step forward !

Biostimulants are unique, environment friendly and have potential to substantially increase crop yields by enhancing nutrient uptake and metabolic pathways. It is difficult to categorize bio-stimulants as fertilizers or as pesticides, as they enhance the overall well-being of plants. India is now one of the few countries globally to define separate regulations for biostimulants. The current recognition of biostimulants as a new category of products in the recently announced, "Fertilizer (Inorganic, Organic or Mixed) (Control) Amendment Order 2021", on February 23, 2021, clearly defines regulations for registration of biostimulants. As per the new order, biostimulants are, "*substance or microorganism or a combination of both whose primary function when applied to plants, seeds or rhizosphere is to stimulate physiological processes in plants and to enhance its nutrient uptake, growth, yield, nutrition efficiency, crop quality and tolerance to stress, regardless of its nutrient content, but does not include pesticides or plant growth regulators which are regulated under the Insecticide Act, 1968 (46 of 1968)*".

The key aspects of regulation in the order include 8 different categories of biostimulants and a provision of a new category, if the product cannot be classified under the mentioned categories. All the manufacturers and/or importers of biostimulant are now required to apply to the Controller (Form G) along with the supporting data relating to: a) Chemistry, b) Bio-efficacy trials, c) Toxicity and d) Heavy metal analysis report for specifying it as a biostimulant. In addition, it has now become mandatory to submit an affidavit stating that the product is not laced with pesticide and is free from heavy metal concentration beyond specified concentrations. Labelling, sampling specifications with analysis from Good Laboratory Practice (GLP) or National Accreditation Board for Testing and Calibration Laboratory (NABL) accredited laboratory, and methodology for testing have also been described in detail along with all the forms and their requirements. These regulations will have the desired impact in controlling the quality of the biostimulants

In the absence of regulations and registration guidelines, the biostimulant market has been flooded with substandard / spurious products with exaggerated claims. These products adversely affect the genuine industry players and dent farmer's confidence in efficacy of biostimulants. The new regulatory and monitoring frameworks will not only boost the confidence of the biostimulant market players but is also expected to increase the R&D investments leading to development and marketing of new and better quality products. Farmers will benefit by having access to

superior quality of products. The regulations will also encourage new product development and filing of intellectual property. Overall, the inclusion of biostimulants under FCO is a step in the right direction which will be beneficial for the industry as well as the farmers.

EU was the first to formally agree upon a set of rules in 2018, as a stepping stone to create a functional regulatory framework for bio-stimulants and regulate the market, for selling them on the EU internal market with a CE-mark and in 2020, the U.S. Environmental Protection Agency (EPA) has released updated draft guidelines for Biostimulant products. While he EU relies on suitable quality parameters and evidence requirements for biostimulants, US does not have distinct framework and fits the biostimulants in the existing pathways, which has led to overstated claims and a buyer-beware environment. To avoid the spurious claims, like the EU model, Indian regulations require detailed specification of the biostimulants, and tolerance limits and also testing methodologies have been specified.

INDUSTRY SPEAKS

Use of Ag Biologicals in Indian Agriculture - 'Challenges and way forward'

Dr. Selva (Selvasundaram Rajagopal)
Vice President - Global Product Development Director - Agrinos India

In the recent years, keenness on using Agricultural Biologicals in India has increased many folds all the way through crop production and protection. Primarily field-oriented research studies have demonstrated the commercial benefits of these products and dependable performance in integrated crop, pest, and disease management systems. It is observed that India occupies a comparatively healthier position in the arena of Ag biologicals, in terms of growth of usage, percentage share of the total Ag product market and in research publications. Most of the Ag Biologicals are derived from living organisms such as plants, insects, animals, microbes, and others. They can be altered to improve suitability for agricultural uses. These naturally occurring solutions can complement on fertilizer use efficiency and reduce pesticide load to help farmers to improve crop health and productivity to a greater extent while limiting the environmental impact of agriculture. Naturally occurring pheromones, biostimulants, natural proteins and chitin helps to manage pests through non-toxic mechanisms or by modifying the behaviour. Microbials such as fungi, bacteria, virus and protozoa are more importantly used biologicals for pest and disease management. Microbial products are derived from naturally occurring microorganism such as bacteria, fungi or nematodes can be applied on crops to protect plants from pestsand diseases or in the soil to enhance plant productivity and soil fertility. Each individual strain is relatively specific to a particular target pest like weeds, insects, and diseases. They have the potential to deliver sustainable, cost effective solutions that lead to increased yield with meagre input. Commercially

available microbial products especially fungal based products controls thrips, mite and coleopteran pests of crops. Bio-fertilizers having beneficial microbes can help to improve plant access to use nitrogen, phosphate, potassium and other nutrients by mounting along with roots to enhance the plant uptake. Biological products can be a major component in the integrated pest, disease, and crop management.

In India, the Ag Biological products market is growing progressively at the rate of 14 % than the chemicals of about 2 %, although their volumes are still less critical. There are many national and international companies are introducing innovative technology products, their market is growing, and prominence will be more in the coming years. Biological products are increasingly used in combination with traditional bio inputs like compost manure, vermicompost etc., in both conventional and organic agriculture.

Ag Biologicals yet facing issues on regulatory approvals since suitable guidelines are not available. Certain bacterial, fungal, and viral formulations designated for pest and disease control were brought under guidelines of Central Insecticide Board (CIB), Ministry of Agriculture for registration. Whereas bio and organic fertilizers were kept under Fertilizer Control Order (FCO)
1985 in section 3 of essential commodities by Ministry of Agriculture, Government of India for approval. New characters of bacteria, fungi, and their combinations (consortia) cannot find a way to be registered since guidelines are not available. Even in bio-fertilizers category, only FCO prescribed microbes are approved for use through State Agriculture Departments. Scientists in the Universities/ Research Institutes and Establishments working on biological products research should be able to submit the data and get their new Ag Biologicals approved for use. Present guidelines need to be revised as per the requirements. Counterfeit bio products (laced with chemical pesticides) need to be clogged which is dragging behind the potential use of biologicals in Agriculture.

AGRI SPOTLIGHT

Strategic collaboration to discover, develop and launch novel biological approaches to enhance soil fertility

AgBiome and Mosaic support the development of innovative agricultural technologies that help growers increase nutrient use efficiency and ultimately minimize fertilizer loss to the environment. This collaboration will allow to leverage AgBiome's proprietary platform that comprises the world's largest, most diverse, fully-sequenced collection of microbes coupled with innovative product discovery technology. Mosaic will lend its industry-leading expertise in soil health and product development, as well as its global distribution and sales network.

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Novel method of storing and delivering microbes through biocapsules receives patent

The use of bio-capsules will help to reduce the use of pesticides and chemical fertilizers in addition to improving soil quality and environmental conditions,. The patent was issued for the method after detailed examination and analysis of the technology developed by the scientists of Indian Institute of Spices Research (IISR). IISR Bio-capsule is the first encapsulated bio fertilizer. The patented product is used for spices cultivation, vegetable cultivation and other crops.

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World's first GE tomato launched, developed using CRISPR/Cas9 technology

Sicilian Rouge High GABA tomato was developed by Sanatech Seed, the Japanese start-up using cutting edge CRISPR/Cas9 gene editing technology. It contains high levels of Gamma-AminoButyric Acid (GABA), an amino acid believed to aid relaxation and help lower blood pressure. Sicilian Rouge is a popular tomato, and consumers are already used to buying products with a high GABA content so the new product will not be a surprise for the consumers.

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Yellow tomato with high levels of pro-lycopene developed through Genome editing

Kochi based Agrigenome labs, has demonstrated the application of the CRISPR Cas9 technology to change the colour of tomato to yellow and improve its traits. This was achieved by editing the gene that codes for CRTISO, an enzyme which is responsible to make the red pigment lycopene. The research was done in collaboration with SciGenom Research Foundation and SciGenom Labs.

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Next Generation Microbiome Research predicted by Purdue University

Research related to microbes have not reached the level where the crops are benefited. Recently group of scientists in Purdue reviewed the research paper on agricultural microbiome that comprehensively combines knowledge about plant, soil and insect microbes work to portray an integrated complex interactions to harness microbes to improve crops.

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Meristem partners with Planet Earth for developing biologicals

Meristem Crop Performance Group and Planet Earch Agronomy enters into a strategic product development alliance for developing biologicals in USA. Meristem have experience of working in biologicals and biostimulants all over the world and Planet Earch provides agronomic solutions to growers for nearly 30 years.

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Patent granted to PowerPollen® for pollination on-demand technology

The U.S. Patent and Trademark Office (USPTO), has recently granted patent to PowerPollen®, an agtech company for applying preserved or fresh pollen outside the window of natural pollination of maize seed. With this technology pollination is no longer dependent on the window period of approximately three hours of male plant's daily shedding. Collected pollen can be applied to female plants at any time of day or night thus aiding in maximize yield and reduce the impact of adverse weather conditions that hinder pollination.

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AI to automate and streamline seed quality analysis

The researchers used light-based technology like that deployed in plant and cosmetics analysis to acquire images of the seeds. They have used machine learning to automate the image interpretation process, minimizing some of the difficulties of conventional methods. The process provides information about the seed's chemical composition, from which its quality can be inferred. The technique is non-invasive and does not destroy the products analyzed or generate residues.

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Terabytes of geospatial data open for agri-tech entrepreneurs and businesses

Skymet is providing free access to its 10-year geospatial proprietary farm-level data repository through a digital platform 'SkAlgeo'. The datasets include Greenness Index, the Standard Precipitation Index, information related to crop health and soil moisture among others. This gives an opportunity for people to explore and develop different use cases.

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Squash variety released by Rijk Zwaan with resistance to New Delhi virus

Past decade Tomato Leaf Curl New Delhi (ToLCNDV) virus for squash growers in the Mediterranean region is causing several damages resulting in lower yields. Leading vegetable breeding company, Rjik Zwaan has recently released resistant variety with first batch of seeds already supplied to selected growers for use in upcoming season.

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Blogs

Biopesticides to Play a Critical Role in Pest Management in Future

Ag Biologicals - answer to soil health and residue free agri-produce

Disruptive Technology for Nitrogen Fixation in agriculture

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