Ecofarming
e-Magazine for Agriculture and Allied Sciences
http://www.ecofarming.rdagriculture.in
e-ISSN: 2583-0791

Exploring the Regulatory Framework for Bio pesticides in India

1. **Dr. Manmohan Kumar**
   IPL Biological Ltd, Gurugram
2. **Mr. Subhash Thakur**
   IPL Biological Ltd, Gurugram
3. **Mr. Shailesh Kannojia**
   IPL Biological Ltd, Gurugram

Received: November, 2024; Accepted: December, 2024; Published: January, 2025

Introduction

Biological pesticides – "biopesticides" – protect plants/ crops from microbial pest control agents (biopesticides). There's a growing interest in India from people in the agricultural sector and policymakers who want to adopt cost-effective, environmentally sustainable methods for crop protection. The agriculture sector is a key part of the Indian economy, so it's important to have a solid regulatory framework in place to ensure the quality, safety, and effectiveness of new, sustainable biological pesticides. The government is committed to fostering technological advancements in agriculture, which is essential for ensuring food security for a growing population. This includes regulating microbials as biopesticides to safeguard public and environmental safety. The Green Revolution isn't a long-term solution because intensive agriculture can harm the environment. These impacts include loss of biodiversity, extinction of organisms, pollution of terrestrial and aquatic ecosystems, health risks to humans, and, of course, the negative effects of using too many biocides, especially chemical pesticides. Pesticide pollution is a big problem for the human, environment and eco-system. It can make pests resistant to treatment, and drive up the cost of crop protection. This is especially important because we need to make sure that the food we eat is safe. Pesticides are used a lot in India, so manufacturers are interested in standardizing and adapting to Indian regulatory standards. However, India is still setting up its regulatory framework, so there are still a lot of gaps in the information. The paper gives policymakers a way to look at a few key regulatory issues: registration, data requirements, different studies for products registration, labelling, safety studies and guidelines, import regulations, categorization, and governing body. The paper brings together the results of two surveys. One was a scoping survey of biopesticides manufacturers, consultants, and legal experts in this field. The other was a review of the background of biopesticides. It looked at why they're needed, the different types, how well they work, and safety issues. It also looked at the regulations and research involving microorganisms.

Early History of Biological Pesticides

Ancient Practices: Ancient civilizations used natural substances for pest control. For example, people in China, Egypt, and India used plants and natural enemies to control pests.

19th-Century Discoveries: People started studying biological pest control in the late 19th century. Researchers started using natural enemies like ladybugs to control aphids. This led to modern biological pesticides.

20th Century Developments: Entomopathogenic fungi and bacteria emerged. The bacteria *Bacillus thuringiensis* (Bt) was discovered in the early 20th century. B.t is used as a microbial insecticide. It targets specific pests but not beneficial organisms.

Modern Era and Innovations: Integrated Pest Management (IPM): By the 1970s and 1980s, IPM was becoming popular. It combined biological control with other pest management strategies. This approach was more sustainable and used fewer chemical pesticides.

Types of biopesticides

There are different types of biopesticides

1-Microbial pesticides contain natural microorganisms that control pests. They can be pathogens or beneficial microbes.

Bacterial: *Bacillus thuringiensis* (Bt) and *Bacillus subtilis*: It targets specific insects, particularly caterpillars, some beetles and nematodes control.

Fungi: *Beauveria bassiana* and *Metarhizium anisopliae:* It's effective against various insects, particularly in agricultural settings.

Viruses: Nucleopolyhedrovirus (NPV): It targets specific insect pests, which are commonly used in agriculture.

2-Plant-incorporated protectants (PIPs): are genetic modifications of plants that allow them to produce proteins that are resistant to pests. Genetically Modified Organisms (GMOs): For example, there's Bt cotton and Bt corn, which express proteins from *Bacillus thuringiensis* to deter specific pests.

3. Botanicals:-

Neem oil: It comes from the *neem* tree and stops insects from growing and feeding.

Parthenium are extracted from chrysanthemum flowers and are really effective against a wide range of insects.

4. Natural Enemies:-

These involve using predators, parasitoids or pathogens to control pest populations.

5. Biochemical Pesticides:-

These work by disrupting the physiological processes of pests through natural substances. They include:-

Insect Growth Regulators (IGRs): Substances that interfere with the growth and development of insects (e.g., methoprene).

Pheromones: Used in traps to disrupt mating and communication among pests.

The regulatory framework for biopesticides in India

1. ***Regulatory Authorities :*** Central Insecticides Board and Registration Committee (CIB&RC) Operates under the Ministry of Agriculture and growers' Welfare. The CIB&RC is responsible for the regulation and enrollment of all fungicides, including biopesticides, in India. The CIB has created a set of rules and data conditions for a range of physical and chemical parcels, including analysis, toxin, ecotoxicity, chemistry, memoir efficacy, packaging, and labelling. The National Bureau of Agriculturally Important Microorganisms (NBAIM) certifies the natural characteristics of the strains submitted by aspirants through DNA fingerprints. The aspirant must induce efficacy data at an exploration centre in line with ICAR and SAU guidelines. The CIB has also set norms for the introductory installations demanded to make biopesticides. These include conditions for product, mixing, expression, lab outfit, and other applicable areas. In 2019, the CIB changed how it classifies biopesticides. There are different orders league- I (grounded on limited data) and league- II (grounded on complete data). The commission decided that biopesticides with the same strain or emulsion (including botanical products and pheromones) should be registered under Tier- II. This is because they've formerly been introduced in the country in line with the applicable laws. The Indian government has also introduced other programs to support organic husbandry. One illustration is the National Programme for Organic Production

(NPOP), which began in 2001. National Biodiversity Authority (NBA) regulates the use of natural coffers and their associated knowledge, especially concerning biopesticides deduced from indigenous natural coffers. In India, state agrarian universities (SAUs) and the Indian Council of Agricultural Research (ICAR) collect data on fungicide remainders on registered crops. The Food Safety and Standard Authority of India (FSSAI) evaluates this data to set maximum residue situations (MRL).

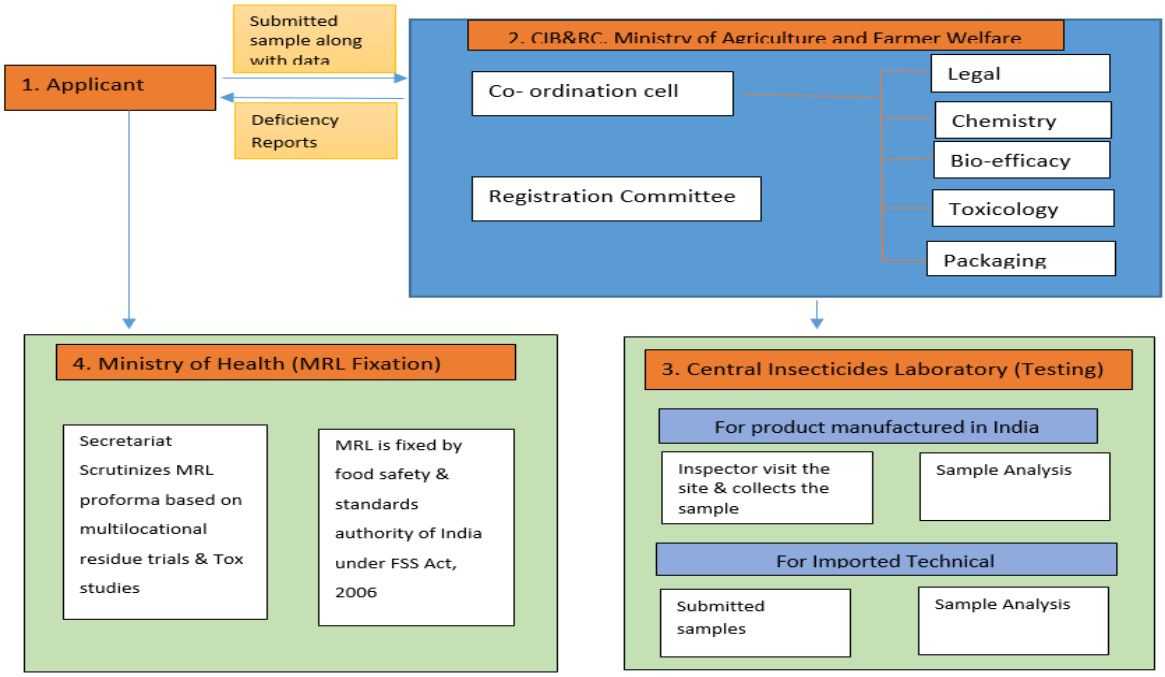
2. ***Legislative Framework:*** Insecticides Act, 1968 this is the main law for registering, making, and dealing fungicides in India. It explains how fungicides are approved, including safety tests, effectiveness, and toxicology for chemical and natural fungicides. Environmental Protection Act, 1986 it sets rules for guarding and perfecting the terrain, including guidelines for assessing the impact of using biopesticides.
3. ***Registration Process:*** Biopesticides manufacturers must submit operations for enrollment that include data on I- efficacy substantiation that the biopesticides works against the target pest. II- Safety Toxicological data to assess pitfalls to humans, creatures, and the terrain. III- product Process How the biopesticides is made

4. ***Testing and Evaluation***: Biopesticides are tested for:-

I-***Impact on other species:*** Checking if it affects helpful insects and other organisms.

II-***Efficacy Trials***: Testing in the field to see how well it works in different environments.

Regulatory Frame work in India



The importance of regulatory in the use of biopesticides

Biopesticides protect crops. India's food consumption is set to rise by 2.0 - 3.0 % in a year. Food production will probably rise by 3.5% in the next 10 years. It's hard to produce enough safe, nutritious, high-quality food. Regulating the use of biopesticides is important for safety, effectiveness, quality, the environment, market confidence and compliance. Make sure biopesticides are used correctly, that there are safe alternatives and that farms and the environment are protected. Biopesticides must be regulated before use. This means deciding when, where, why and how much pesticides are used for pest control.

The legislative reforms pertaining to the regulation of biopesticides in India

India has been putting a lot of work into making changes to the rules around biopesticides. The aim is to promote sustainable agriculture and address environmental concerns. The Central Insecticide Board and Registration Committee (CIB&RC), which is part of the Ministry of Agriculture and Farmers Welfare, is in charge of regulating biopesticides. However, the regulatory guidelines have previously been geared towards chemical pesticides, which has led to delays and uncertainty in the registration process. There are different registration requirements for different types of biopesticides, such as Entomopathogenic Fungi, Botanical Pesticides, Antagonistic Bacteria, and Antagonistic Fungi, as set out in the Insecticides Act of 1968. On top of that, new initiatives like the Consortium of Bio-pesticides and updated section 9(3) registration processes have been introduced to establish new regulations and streamline the regulatory process. And some reformation will be required import and export and the biopesticides technical. The idea is to create a good environment for the growth of the biopesticides industry in India.

The market for bio pesticides

The global biopesticides market is growing fast. The biopesticides market in India is expected to reach $ 217.97 million 2024. The Indian biopesticides market is growing 8.0 to 9.0 % annually, because more farmers are aware of the benefits of sustainable agriculture and there is a demand for organic products. It is globally estimated to grow by 12-15% a year in the next few years because more people want organic food and there is a need for sustainable pest management solutions.

Regulatory support: Many countries are making it easier to use biopesticides by changing the rules.

New technology: New biotech pesticides are being developed that work better and last longer. Research in pesticides is driving the market.

Export Opportunities: India's biopesticides market is becoming more popular for export as more countries want organic and eco-friendly pest management solutions.

Ecosystem Services: People are starting to see that biopesticides help biodiversity and ecosystems. This is helping the market grow.

Challenges and Future Outlook

Challenges: Despite positive trends, India faces challenges. Awareness and adoption: While more farmers know about biopesticides, many still don't know how to use them well.

Efficacy perception: Some farmers may think biopesticides are less effective than synthetic pesticides, which could stop them being used.

Regulatory Hurdles: Some regions have long approval processes for new products

Future Outlook: Integrating biopesticides with precision agriculture can help manage pests better, using the right amount and avoiding waste. Further research will lead to new biopesticides that are more effective, specific and stable. Governments are supporting biopesticides, making it easier to get approval, offering incentives for development, and promoting sustainable agriculture. Working together can help develop and adopt biopesticides faster. Networking and partnerships help people share knowledge and use resources better. As people focus more on sustainability, biopesticides will become more accepted by farmers and consumers who want to protect the environment. The global biopesticides market is set to grow as developing countries see its potential in sustainable agriculture.