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Biopesticides: An Alternative Approach for Agricultural Output (Food) and Environmental Safety

Grace Cornelius[1], Garima Lohiya[2], Dr. Rashmi Sharma[3]
Research Scholar[1, 2], Associate Professor[3]
Zoology Department,
Samrat Prithviraj Chauhan Government College, Ajmer (Raj.)

Abstract- **Agriculture contributed the major portion of our economic value, although with the increasing population there is a requirement of highly nutritional, disease preventive and easily cultivated and prepared crops. This direct the farmers for applying conventional pesticides in exceeding amount, but with the higher amount synthetic pesticides encompass resistancy for insects after certain time, also through Biomagnifiaction pesticides causes many health problems which is responsible for asthma, kidney failure, arthritis, blood pressure (heart problems), skin disease, cancer etc. In this domain there is a requirement of a substitutional trend to control crop field insect with negligible harmful effect to non targeted organism, this promoted biopesticides application. This review paper enlightens the food and environmental safety with insect pest management through biopesticides.**

Key words: ***Agriculture, biomagnification, biopesticides, insect management.***

INTRODUCTION

Disparaging activities of many pests like plant foes (bacteria, fungi, nematodes etc.), insects and weed escorting the ascending destruction of field crops. Agriculture and plant territories contributed higher amount to maintain ecological, social, economical system [1], but over a decade ago by the application of conventional pesticides insects become resist to them and encompasses many chemical substances which would biomagnified time respectively. Insects are small in size but in large quantity they became detrimental and contributed major insesticidal effect. Greater than 60% of population directly dependant on agricultural activities and remain on indirectly involved in easily pest affected food industries, forestry, poultry, dairy and many other agribusiness. From past decades farmers and many food product manufacturing companies, used synthetic chemicals to produce, process and preserve the food & crops to enhancing the crop production. Local farmers exploited conventional pesticides in crop fields to get higher field products and these insecticides are responsible to acute and chronic toxicity. These conventional pesticides became the key factors for lot of diseases like lung, prostate, skin, throat, breast cancers, leukemia, lung diseases, respiratory problems, reproductive problems, hypertension and skin disorders. By the overconsumption of the pesticides and their adverse effect on human, animal and environmental health they become a global concern; to inhibit their lethal properties there is a need of sustainable, healthy and immunoprotective biopesticides which will of low cost, pest specific, non toxic, ecologically safe and reducible.

WHAT IS BIOPESTICIDES?

Biopesticides are any naturally occurring pesticides or derived from natural material (plants, animals, bacteria, fungi and minerals etc.) to destroy or kill the host specific insect-pest. They are biological controlling agents of weeds, insects, crop pest, fungi, bacteria, virus, rodents, microbes and derived from living organism as plants (Azadirachta, Datura, Eucalyptus, Calotropis etc.) and their products (phytochemicals, microbial products) or byproducts (semiochemicals) to inhibit the target organism by non toxic methods [1].

CATEGORIES OF BIOPESTICIDES

Biopesticides are divided into three major classes –

1. Microbial pesticides
2. Biochemical pesticides
3. Plant- Incorpotated –Protectants (PIP_s)

Microbial pesticides are composed of microbes like bacteria, virus, fungi or protozoa animals/ Protozoans, they are the operative component in microbial pesticides and act against specific insect pest. Pesticides are scathel for only targeted species and one of the best example of that is Bacillus thuringiensis also known as Bt; Bacillus produces a specific kind of protein crystalline, and this crystalline proteins after binding with host insect gut receptor identify the species and destroy them [1]. Bio chemical pesticides are natural components like sex attractants or pheromones to attracting insect to entrap and impede with their mating behavior and some kind of essential oils also used as attractants. Plant-incorporated-protectants (PIPs) are genetically modified plant and by the genome modification these natural plant products act as insect resistant species , Bt protein is one of them, this Bt toxin is non toxic and environmentally acceptable and work upon only specific pest species.

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AGRICULTURAL OUTPUT AND ENVIRONMENTAL SAFETY

Agriculture sector strengthen the Indian economic value through crops export and also by agribusiness to improving and enhancing the agricultural food by genetically modified advance technologies; From 1960s, commonest way to control the pest has been the excessive use of conventional pesticides and in 1940s such pesticides were implemented as DDT (dichloro-diphenyl-trichloroethane) with carbamate pesticides & organophosphate [2]. Green revolution technology in which water, biofertilizers, synthetic chemicals were used to enhances agricultural output, but with the increasing food and feed the severe use of these pesticides and their residues in field contaminated the water, air ,soil, and other natural resources; beside this bioaacumulation of chemicals inherits carcinogens. The crop productivity increases with the increasing use of agrochemicals but with that they also express adverse health and environmental effect. Unsystematic use of these agrochemicals affect soil health and quality, water quality, air and also affect the health of human and warm blooded animals by gene variation, gene erosion, deformities, cancer, teratogenesis, lower birth rate, high mortality etc.

BIOPESTICIDES IN INDIA

With the ecofriendly, safe and environmentally suitable approach biopesticides application play major role in agriculture, forestry, food and environment also. Many research are already in practicise to controlling crop pest & insects; because through vector born diseases they reflected agriculture output, food chain and non targeted organism. From past decades In India biopesticides become the major source of healthy, organic, immunoenhancing and defensive key for food and environment. There are some pesticides which are registered and applied to insect management-

Table 1: Biopesticides registered as Insecticides Act, 1968. [1]

S.NO.	BIOPESTICIDES
1.	Bacillus sphaericus
2.	Bacillus thuringiensis var.galleria
3.	Bacillus thuringiensis var. kurstak
4.	Bacillus thuringiensis var. israelensis
5.	Trichoderma harzaianum
6.	Trichoderma viride
7.	Pseudomonas fluoresens
8.	Neem based pesticides
9.	Beauveria bassiana
10.	NPV of Helicoverpa armigera
11.	NPV of Spodoptera litura
12.	Cymbopogan

GLOBAL MARKET OF PESTICIDES

Globally biopesticides or plant protectants (bioinsecticides, bionematicides, biofungicides) are the key driver of the insects control and they become field crop improving agents. 700 products are available in the market and 175 registered biopesticides active component already accessible in the market [3]. The North America biopesticide market was valued at USD 1159.66 million in 2017, and is expected to reach USD 2304.2 million by 2023. The US has the largest share with 80% of the market share. North America and Mexico is the fastest growing market with 16.4% CAGR during 2018-2023. Indian biopesticides market produced returns of $102 million in 2016 and is expected to provide $778 million by 2025, growing at a CAGR of 25.4%. China at the position of fastest growing biopesticides using country with $CAGR_s$ of 18.5% for volume consumption and 19.4% for value demand over the 2014-2020 analysis periods [3].

In India biopesticides contributed only 4.2% of overall plant $protectant_s$ with the less residual property, no harmful effect, higher efficacy it is anticipated to articulate ascending growth of their use 10% accordingly in next coming years. Now only 12 biopesticide have been registered for insect pest management according to Act 1968 (as on 2008) [4], including Azadirachta indica (neem), Bt, Trichoderma Nuclear Polyhedrosis Virus, they all are originated and used in India. Globally many bacteria, virus, nematodes and plants contributed the major percentage of plant protectants as Bacillus thuringiensis (Bacteria), Metarhizium anisopliae (fungi), Baculovirus (Virus), Nematodes Steinernema (Rhabditia), Nosema (Protozoa), botanical insecticides.

BENEFITS OF BIOPESTICIDES

The increasing potency of biopesticides use is based upon the advantages which relied with this are-

1. Biopesticides has zero/less harmful property.
2. They are insect specific or act against only targeted organism without effecting beneficial pests.
3. They are ecologically safe and environmentally acceptable.
4. With the lesser cost and higher efficacy. They cause zero residual effect.
5. Biopesticides are not altering the gene information.
6. They are not changing the nutritive value of crops, fruits, nuts or vegetables.

LIMITATIONS

Now, in a 21st century when everyone believes on fast working and readily available product our farmers are also become smart, advance and used to of the conventional pesticides for higher agriculture production in a limited season or time . Our farmers are well known to hazardous,

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noxious ecological, social and environmental effects of these synthetic pesticides but for the financial need and higher crop yield they become avoider. So it is necessary to provide readymade, fully packed, cheap and processed biopesticides for direct applications in crop fields.

CONCLUSION

Globally, with the increasing population there is a need of easily cultivated, highly nutritional, lower price, immunoprotective, and non dangerous field crops. In this domain biopesticides turn out to be a better ecofriendly tool for the healthy human and environmental health; in this era there is a necessities that government and other pesticides manufacturing organization step forward in the direction of bioproduct or plant made pesticides for insect pest control and immunity enhancing, profitable, healthy, easily available organic product with no outstanding effect. Availability of biopesticides could be easy for the farmers that they may use it without any uncertainty to food and provide a pure and vigorous environment.

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