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BIOPESTICIDES: AN ECO FRIENDLY APPROACH

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Abstract

The Risks which are associated with chemical pesticides are of great concern to public and environment hence biopesticides can be used as an alternative. They are living organisms, cultivated in laboratory in large scale and used to control harmful organisms; they kill organisms by biological effects. They are obtained from natural material, less toxic, biodegradable, host specific, effective in less quantity, economic, safe for workers, farmers, public, animals and environment. They are mainly of three types i.e., Microbial pesticides, biochemical pesticides and Plant incorporated Protestants. Although large number of biopesticides is available but their use is not so popular, due to lack of awareness. More biopesticides need to be searched, as well as awareness about them among farmers is also required. In the present paper different types of biopesticides, their significance and suggestions have been discussed.

Keywords: - Biopesticides, Microbial, Chemical pesticides, Eco friendly, Awareness.

1. INTRODUCTION

In developing countries like India agriculture play a vital role as on one hand it fulfills the food requirement of population and on another hand it uplifts economy of the country. From time immemorial agriculture is facing destructive activities of numerous pests, resulting in decreasing yield. Use of chemical pesticides degrades soil and ground water by polluting them. Chemical pesticides enter into the food web of ecosystem and causes adverse effects. Therefore need of hour is to use alternative eco friendly biopesticides. These pesticides are eco friendly as they are obtained from naturally occurring substances, plants and microbes and control pests by non toxic mechanism. They are host specific with high multiplication rate and eco friendly.

2. OBJECTIVE

Interest in use of biopesticides is based on the advantages of use of biopesticides and disadvantages of use of chemical pesticides. Biopesticides are important because they are capable of maintaining natural diversity without use of any artificial or synthetic residues. Chemical pesticides are relatively, costly and harmful as they cause soil & water pollution, allergic diseases, may be poisonous, residues may remain in food, degrades the quality of food, harmful to non targeted species. In contrast biopesticides do not harm to non targeted species , eco friendly, relatively cheaper , highly specific, no harmful residues remains in food, fodder etc.

3. METHODOLOGY

Survey of literature was done by author in reference to advantages of biopesticides and disadvantages of chemical pesticides and types of biopesticides. I would like to highlight what biopesticides are and how their use can keep safe ecosystem.

4. RESULT

Types of Biopesticides: - On the basis of origin of biopesticides they are of three types:

i. Microbial biopesticides
    a. Bacteria
    b. Actinomycetes

c. Fungi

d. Viruses

e. Protozoas

ii. Biochemical Pesticides

iii. Plant incorporated protectants.

4.1. Microbial Biopesticides

They are originated from microorganisms. They are target specific. On the basis of types of microbes they are of different types.

i. Bacteria: - Most widely known variety of bacterium is *Bacillus thuringiensis* or Bt, which can control certain insects in cabbage, potatoes and other crops. It produces protein which is harmful to specific insect pest (Suman Gupta & A.K. Dixit 2010). This protein binds to larval gut receptor making insect larvae to starve. It is used worldwide as it has highest efficacy as biopesticides. *Bacillus subtitis* produces antibiotics against certain plant pathogens, *Bacillus megaterium* controls vascular pathogens.

ii. Actinomycetes: - Some of the actinomycetes like *Streptomyces* produces antibiotics and used as biopesticides, as they destroy fungal hyphae. They control *Fusarium solani, Fusarium oxysporum, Rhizoctonia soalani* etc. It helps in controlling scab diseased in potatoes & soft rot disease in sweet potatoes.

iii. Fungi: - Fungi are diverse group of organisms and are found almost in every environment therefore fungal biopests are also diverse in nature and affecting the diverse pest. Different fungal biopesticides are used to control different plant diseases caused by other fungi, bacteria, nemotodes, insects etc. Most common fungal biopesticides are *Trichoderma viride*, *Beauveria bessiana, B. netathizium, Entomophaga zoopthera, Paecilomyces normuraea, Gliocladium, Pennicillium funiculosum, Aspergillus umbrosus.* Out of them *B. bessiana* is effective in controlling troublesome crop pest such as aphids, thrips and whitefly - even chemical pesticide resistant strain such as Q-Biotype whitefly. *Trichoderma* is effective against different soil borne diseases; some of them are useful in controlling late blight disease. *Ampelomyces quisqualis* is used to control powdery mildew of grapes, tomatoes etc. *Arthrobotrys oligospora* is used to control root knot of brinjal *Arthrobotrys dactyloides* is used to control root knot of brinjal and tomato.

iv. Viruses: - Among viruses most common virus which is used as biopesticides is Nucleopolyhedrosis virus (NPV), used against bollworm, which damages cotton & cabbage. A Granulosis virus (GV) is used as biopesticides for *Spodoptera litura* control. Baculovirus biopesticides have many advantages as tool in IPM (Integrated pest management), highly specific, naturally occurring, limited host range, safe for livings & without lethal effect on non targeted organisms (Beas et al. 2014). After Bt, baculovirus is the second most commonly used virus (Kulshretha et al. 2014).

v. Protozoa: - Protozoa are single cell organism present in water and soil. *Mamameba locustae* and *Mattesia* are protozoa which are used as biopesticides against grasshoppers and Lepidoptera and coleoptera respectively. *Nosema locustae* is a natural bio control agent of grasshopper (90 species) and is non toxic to vertebrates.

4.2. Biochemical pesticides

They are herbal substances therefore also known as plant pesticides. They are naturally produced by microorganisms and plants and control pests by non toxic mechanism. They are biodegradable. They include insects sex pheromones that interfere with mating, scented plant extract that attract insect pest to trap. Extracts of plants like neem, garlic, onion, turmeric, ginger, tobacco, papaya, tulsi, aloe, calotropis etc. are also effective in curing different plant diseases (Kandapal, 1914). Plant biopesticides may not only be killer, may be repellent,

antifeedant or growth regulator. Extract of *Butea monosperma* flowers are used as termiticides. *Nicotiana tobacum* & *Zingiber zerumbet* used to control aphids & larvae. Pulp of *Allium sativum* is used agaisnt *Pseudomonspora cubensis.* Use of plant pesticides has been mentioned in Rigveda also.

4.3. Plant Incorporated Protectants (PIPS)

These are genetically modified material, produces by scientists by inserting genes in to plants or other micro organisms, so it produces its own biopesticides. Several genetically modified crops are being developed.

5. DISCUSSION

Physicochemical properties of soil before and after treatment of chemical pesticides have been studied by (Goyal, 2014). Effect of chemical pesticides on crops and its harmful effects on human health have been reported by (Goyal, 2014). Agriculture runoff is the primary caused of water pollution (Sudha et al. 2011). Toxicity of different insecticides to grasshopper is reported by Tanu Sharma (Sharma, 2011). The advantages of eco friendly pesticides are described by Chaturvedi et al. (Chaturvedi et al. 2012). In vitro effect of DDT & Dimethonate on growth of non symbiotic bacteria is reported by Vasundriya et al. (Vasundriya et al. 2012). Instead of using chemical pesticides biopesticides offer an eco friendly effective solution. The National farmer policy 2007 strongly recommended promotion of biopesticides for increasing agricultural production, health of farmers and to keep safe environment (Gupta et al. 2010).

Biopesticides do not harm non targeted species, do not pollute environment, no harmful residues remain in food & fodder, highly specific, cheaper but performance may be variable due to influence of various factors of environment.

6. CONCLUSION

Interest in biopesticides is based on disadvantages associated with chemical pesticides as they are not environment friendly, cause's serious health hazards due to presence of their residues in food & fodder, while biopesticides do not leave harmful residues, do not destroy non target species as they are highly specific. Chemical pesticides may cause genetic variation in plants, reduction of beneficial species. Some biopesticides may be excellent alternatives to chemical pesticides; its adoption by farmers has to be motivated for maximizing gains. Increasing health consciousness has created a demand of organic food. This indicates huge scope for growth of biopesticides. Rich traditional knowledge may provide valuable clues for developing newer and effective biopesticides. Stress on organic farming will definitely increase adoption of biopesticides by farmers.

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