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A Brief Outline on Nanobiopesticides

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ABSTRACT

Biopesticides which are derived from biological substances such as plants, microbes, etc. aims to control, kill and destroy the harmful pests. They serve their purpose in a target specific way, with no harm to the environment. Nanotechnology which deals with particles less than 100 nm is an emerging field nowadays which is applied in various fields including agriculture. This technology is used to modify the biopestides into nano sized particles to increase its specifity towards insects pests. Plants compounds having pesticidal activities can be used to synthesize nanobiopesticides in various methods like biological,physical or chemical. In this review the importance of different nanobiopesticides and their action have been discussed.

KEY WORDS: BIOPESTICIDES, NANOTECHNOLOGY, NANOBIOPESTICIDES.

INTRODUCTION

Huge crop losses occur due to insect pest attack which leads to the development of synthetic chemical pesticides. But they did not proved to be promising as large chemical accumulation occur in soil which deteriorates the health of soil, plants as well as animals.

In this situation, nanotechnology emerged as a new field whose materials size is less than 10-9. Scientists have been using nanoparticles for plant growth stimulation, insect-pest control, disease diagnosis in plants, post-harvest management (1, 2). Due to hazardous effects of chemical pesicides the market for biopesticides have developed a little. Biopesticides are substances made of biological substances which control, kill, and destroy the insect –pests. Pesticides obtained from plants are known as Botanicals which act as natural defense against harmful plant pests since many decades.

Nanotechnology and its Application: Nanotechnology consists of materials which have a dimension less than or equivalent to 100 nm. Nanoparticles can be prepared from organic or inorganic sources by physical, chemical or biological methods. The field of nanotechnology is hugely developing nowadays creating tremendous impact on agricultural and medical field. Owolade (2008) showed that nanobiopesticides, nanomicrobicides, are being used efficiently in agriculture (3). Nanotechnology has various applications in the field of chemical, agricultural, medical, cosmetic industries among many others. Metallic and polymeric nanoparticles have been used in controlling various insect pests destroying foods.

Biopesticides and their advantages: The type of pesticides which are obtained from natural sources such as animals, plants, microbes such as fungi, bacteria etc. are known as biopesticides. Biopesticides include neem oil, canola oil from plants as well as fungi like *Beauveria* sp. or bacteria like *Pseudomonas* sp. and Bacillus sp. Biopesticides are advantageous than chemical pesticides in various ways such as specific and slow mode of action, safer to the humans and environment, do not form residues in soil,

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breakdown rapidly in the environment, low risk to non-target organisms, broad spectrum of action (4). Due to these advantages biopesticides should be used in place of chemical pesticides.

Biopesticides based on Nanotechnology: Plant kingdom is a rich source of organic compounds which are used as medicines, hallucinogens, pesticides etc. Thus the plants with medicinal and pesticidal values should be exploited through nanotechnology to suppress harmful plant pests. Plants can be utilized as an important source of nanoparticle based biopesticides. Compounds from different plants have been used to synthesize nanoparticles which have various beneficial applications on plants have been listed in Table 1.

Table 1. Nanoparticle based biopesticides derived from plant compounds

Plant name	Nanoparticles synthesized	Mode of action
Anacardium occidentale (Kaaju)	Au, Ag, Cu	Insecticidal (5)
Azadirachta indica (Neem)	Ag, Cu	Insecticidal (6)
Brassica campestris (mustard)	Zn, Ag	Insecticidal mainly beetles (7)
Capsicum annum (chilli)	Cu, Ag, Au	Beetles (8)
Curcuma longa (turmeric)	Ag, Zn	Pesticidal (9)
Euphorbia sp.	Ag, Pt	Insecticidal (10)
Ocimum tenuiflorum (tulsi)	Ag	Insect repellent (11)
Ricinus communis (castor)	Au, Ag	Pesticidal (12)
Fenugreek	Ag	Insect repellent (13)
Pyrethrum	Au, Ag	Bees (14)

CONCLUSION

To protect our environment from deleterious effects of synthetic pesticides, use of botanical based nanopesticides should be done by farmers. Nanobiopesticides application should also be started in field experiments, research works for biotic stress control. It provides a good alternative to the animal and environmental safety.

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