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Green Pesticide- An Eco-Friendly Approach for Pest Management

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Introduction:

Agriculture is the backbone of the Indian economy, contributing nearly 20.2% of the country's gross domestic product. Nearly 70% of rural India is reliant on agriculture. After the green revolution that began in the 1960s, there has been a significant increase in crop yield, but this has been accompanied by an increase in the use of nitrogenous fertilizers, chemical pesticides, and pesticide-resistant insect pests and pathogens. Consequently, insect pests degrade a vast quantity of farm food products. Farmers use a large quantity of chemical pesticides in order to control the destructive insects. The use of chemical insecticides without discrimination has negative effects on both beneficial insects and humans. Green insecticides, botanical insecticides or plant-based insecticides are recommended as safer alternatives to modern synthetic insecticides in order to counteract this negative impact.

Impact of Chemical pesticides:

The use of pesticides has minimized the risk posed by insect pests by swiftly eliminating them. It is approximated that only 0.1% of pesticides used to protect crops reach their intended target, with the remaining 99.9% entering the environment and threatening non-target organisms. However, the indiscriminate utilization of pesticides over a long time frame has not only been found to be harmful to soil microflora, wildlife, and human life, but it has also contributed to some adverse effects, such as the development of insect resistance, toxicity to non-target organisms, regeneration and emergence of new pests, unacceptable levels of residues on seeds, vegetables, and fruits, and changes in pest population dynamics, all of which contribute to soil depletion. Each year, approximately one million people were poisoned by pesticides due to increased dosages and administration frequency. These horrifying facts necessitate more eco-friendly and secure crop protection alternatives.

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Green Pesticides: A Safe and Ecofriendly Approach

Some substances derived from plants are more secure and efficient against diseases, herbivorous insects, nematodes, and other organisms. Over millions of years, plants and insects have co-evolved, and as an outcome, plants have evolved specific bioactive molecules to combat insect damage. These secondary biologically active metabolites are employed as insecticides, insect growth regulators, antifeedants, ecdysones, juvenile hormones, repellents, attractants etc. Due to the many activities of plant molecules, green pesticides can be considered as an important alternative source chemical pesticides. Farmers who are struggling with the increasing prices and dangers of synthetic chemicals can cultivate their own crops that produce pesticides. Biodegradable materials that are commercially feasible and environmentally friendly.

1. Azadirachtin

Azadirachtin possesses potent antifeedant properties against an array of insect pests and its impacts are influenced by contact chemoreceptors (primary antifeedancy action) and internal feedback systems (secondary antifeedancy action). The latter is linked to toxic effects on the gastrointestinal tract, including enzyme production, cell proliferation, and motility of insects. (Timmins and Reynolds, 1992; Nasiruddin and Mordue (Luntz), 1993a). Insects vary widely in their behavioral sensitivity to azadirachtin. The sucking pests like whitefly, aphid, jassid and desert locust *Schistocerca gregaria*are most sensitive, being suppressed to only 0.007 ppm (diet). (Isman, 1993; Mordue (Luntz) and Blackwell, 1993). Although *Schistocerca gregaria* prefers starvation to ingestion of azadirachtin, the major antifeedant effects of azadirachtin applied systemically to plants occur at concentrations much higher than those that cause IGR and sterility effects. (Lowery et al. Isman, 1993; Nisbet et al., 1993, 1994;).

2. Garlic Extract

Commercial pesticides containing garlic as an active component, and garlic extracts made at home are also widely used. Garlic possesses anti-feedant, insecticidal and repellent properties. It has been observed that garlic is effective against a broad spectrum of insects at various stages of life (eggs, larvae and adults). Included are ants, aphids, armyworms, diamondback moths, and other caterpillars including codling moths, pulse beetles, whiteflies, wireworms, capra beetles, mice, mites, moles, epilachna beetles, termites, and fungal bacteria

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and nematodes. Garlic is non selective in nature. It can kill even beneficial insects. Consequently, it should be utilised with carefulness. It is not suggested for aphid control because it kills the insects' natural enemies. Garlic spray appears to have no effect on adult ladybirds (Ellis et al., 1992). (Brooklyn Botanic Garden, 2000).

3. Ginger Extract

Compounds isolated or obtained from the rhizome of *Zingiber officinale* Roscoe (ginger) were examined for their insect growth-inhibiting, antifeedant, and antifungal properties. These compound showed moderate IGR, antifeedant, and antifungal activity against *Spilosomaobliqua* and *Rhizoctonia solani*, respectively. Dehydroshogarol displayed the highest IGR activity, while dehydrogingerone exhibited the highest antifungal activity.

4. Pyrethrins

Pyrethrins belongs to category of plant based compounds that exert powerful insecticidal action by attacking the nervous system of insects; they are derived primarily from the Cinerarifolium family of Asteraceae. Pyrethrins are a naturally occurring insecticide found in chrysanthemum flowers and are commonly considered to be organic. Pyrethrins pause the closing of sodium gated channels that are voltage-gated in insect neurons, resulting in recurrent and extended neuronal firing. This overexcitation leads to the loss of motor control and paralysis, resulting in the insect's demise. By integrating insecticides with synthetic synergists like piperonyl butoxide, resistance to pyrethrins has been bypassed. Together, such two compounds inhibit insect detoxification, causing insect death. Synergists increase the efficacy of pyrethrins, so smaller doses are useful. It is effective as an insecticide because it preferentially targets insects rather than mammalian species in order to enhance hepatic metabolism. Mammals can rapidly metabolise pyrethrins and have elevated body temperatures that inhibit pyrethrins' effectiveness. Pyrethrins are potent insecticides, but at small concentrations they also repel insects. Due to their insecticidal and repellent properties, pyrethrins have been extremely effective in reducing the populations of insects such as ants, spiders, and lice that harm humans, plants and farm animals, thereby reducing their potential to serve as disease vectors such as mosquitoes, fleas, and ticks.

5. Karanj

Karanj(*Pongamia pinnata)*oil is effective against a variety of insect pests, including sprout and fruit-eating insects (Rao et al., 2002), aphids , whiteflies and planthoppers

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(Hiremath et al., 1997), ticks, leaf beetles (Reddy et al., 1990), flies (Mathur et al., 1990) and mosquito larvae (Sagar et al. , 1999). Leaf extract from karanj is said to be effective against some insects. Effectiveness of karanj Oil reported to check the growth of *Callosobruchus*species .Pierradkaranj oil has also been reported to be effective against some grain pests of preserved mung bean when used as a pretreatment for preservation (Babu et al., 1989). Karangi Seed Oil is known to contain active metabolites such as karanjin, pongamol, glabrin and pinnatin.

Overall karanjin is effective against a wide range of insects.

Drawbacks of green pesticides:

- Green pesticides takes a long time to control pests as compared to chemical pesticides.
- There is absence of residual action for most botanicals.

Conclusion:

Green pesticides are a relatively safer strategy than using chemical or chemically-derived pesticides and pose few risks to humans and the environment. The main advantages of using biopesticides to control crop pests are: Environmental safety along with host specificity. Furthermore, the costs associated with developing and approving green pesticides are relatively lower than those of chemical pesticides. Furthermore, the continued development of chemical resistance and increasingly restrictive legislation require intensive research on the development of green pesticides in both the private and public sectors.

Reference

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