

Significant Use of Botanicals in Pest Management

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SUMMARY

The botanicals are now emerging as one of the prime means to protect crops and their products and the environment from pesticide pollution, which is a global problem. But most of them generally degrade within few days or within a few hours, so these insecticides must be applied more often. Many plants possess insecticidal properties, but pest control products directly obtained from plants pyrethrum (pyrethrin), neem (*Azadirachta indica*), rotenone, quassia and tobacco leaf extract are successfully used to control insect pest.

INTRODUCTION

Pesticides have become one of the inevitable parts in Indian agriculture. The higher dosage of these chemicals on per hectare basis has led to many environmental and health hazards. The problems caused by synthetic pesticides and their residues have increased the need for effective biodegradable pesticides with greater selectivity. Botanicals effectively meet this criterion because insecticides are naturally occurring chemicals derived from plant or sometimes even minerals so they are also called as natural insecticides. These botanicals have been used since many years and there is a record of these botanicals in pest management in Hindu book i.e. Rig Veda wherein the plant products are used and likewise botanical insecticides are also used in China as early as 1200 BC. In India our own domestic plant that is neem and its parts like flowers, fruits, leaves, bark and roots are regarded as Panchamrit by Charakrishni. These botanicals have been used extensively during 1700 and 1800 before the invention of synthetic insecticides. Botanicals are obtained from many different families but Meliaceae family consists more than 500 plants which are known to be contained the principal products of insecticides followed by Myrtaceae, Asteraceae, Euphorbiaceae, Leguminosae etc. Botanicals are very much important in pest management because they can easily break down and thereby there is no residual effects on other non-target insects and some of the botanicals they are fast acting on selective insects and produce high toxicity to target insects similar to chemical insecticides and they leave least phytotoxicity on plants and another most important one is they are naturally available and locally available. The cost of botanicals are less. Botanicals like eucalyptus can produce up to 100% control in stored grain pests like *Tribolium Confusum* and normally these botanicals they are used as natural grain protectants in most of the areas even in India also. The custard apple effective in management of stored grain pests. Pyrethrum, Rotenone and Nicotine they act as Chemosterilants which inhibit reproduction in insects and inhibit the production of off springs. Pyrethrins when applied with PBO enhance its insecticidal activity. Rotenone which is extracted from the roots of *Derris elliptica*, it is a broad spectrum contact and stomach insecticides and effective against sucking pest and caterpillars, it inhibits respiratory metabolism. Sabadilla which is derived from seeds of tropical lily and contains principal insective property that is Veratrine which act as contact poison and affect the insect nervous system which cause paralysis in insects. Ryanodine which is obtained from the woody stems of this *Ryania* tree, the principal insecticidal properties is Ryanoids which is an alkaloid.

It mainly acts on muscular system so on the basis of this product scientist have the synthesized Chlorantraniliprole and also Cyantraniliprole and also Flubendiamide. It act slowly as stomach poison and target pests are both thrips and caterpillars. In market it is available as dust during earlier days. Nicotine which obtained from tobacco plants that is *Nicotiana rustica* and *Nicotiana tobaccum* affect on the insect by inhibiting the nerve impulses in the nervous system of the insects it is extremely fast acting causing severe disruption and failure of this nervous system and this product could be used as fumigant and also as dust in the management of various insect pests. Some of the botanicals they act as IGR i.e. insect growth regulator such as neem which affect most of the lepidopteran and coleopteran larvae. Limonene or Linool is obtained from the skin of this citrus peel extracts which is effective against some of the insect pests. Nicotine is very effective against both sucking pests and also the chewing insects like caterpillars. Rotenone used to control Bugs, aphids, potato beetles, spider mites, carpenter ants. *Ryania* is effective against Codling moths, potato aphids, onion thrips, and corn earworms. Sabadilla used against Grasshoppers, armyworms, aphids, cabbage loopers, squash bugs. Neem is quite popular

in India which is very much used in the management of insect pests on various crops, the active ingredient that is Azadirachtin is present in both seeds and the leaves. Both the neem kernel and neem oil is being used as insecticides against various insect pests. The commercially available are Achook, Bioneem, Econeem, Neemax, Shaktiman etc.

Mechanism of action of pesticides of plant origin Compound

Compound	Plant source	System	Mechanism of action
Essential oils	<i>Azadirachta indica</i> , <i>Mentha</i> <i>Lavendula spp.</i>	Cholinergic system	Inhibition of Acetylcholinesterase
Nicotine	<i>Nicotiana</i> <i>Haloxylon salicornicum</i> , <i>Stemona japonicum</i>	Cholinergic system	Cholinergic acetylcholine nicotinic receptor Agonist/antagonist
Pyrethrin	<i>Chrysanthemum cinerariaefolium</i>	Mitochondrial system	Sodium and potassium ion exchange disruption
Rotenone	<i>Lonchocarpus spp.</i>	Mitochondrial system	Inhibitor of cellular respiration (mitochondrial complex I electron transport inhibitor (METI))
Ryanodine	<i>Ryaniaspp</i>	Mitochondrial system	Affect calcium channels
Sabadilla	<i>Schoenocaulon officinale</i>	Mitochondrial system	Affect nerve cell membrane action
Azadirachtin	<i>Azadirachta indica</i>	Miscellaneous	Hormonal balance disruption

Botanicals can be used as direct spraying and for the amendment of soil so that they are going to inhibit the soil inhabiting insects and at the same time they are going to improve the soil structure and some of the cases where botanicals can be used as intercropping system to manage important insect pests for example marigold can be intercrop with tomato or brinjal in the management of root-knot nematodes.

CONCLUSION

Botanicals are very important in pest management programs over synthetic pesticides because of less effect or no effect to the environment, very little risk of development of pest resistance, cause less damage to the non-target insects, there is no adverse effect on plant growth and quality, locally available and less expensive compared to the synthetic insecticides. One can use these botanicals very much integrate with other tactics. Botanicals can be well utilized in biological control system so thereby it is going to save or spare the natural enemy. Hence if you apply these botanicals you can save the natural enemies.

REFERENCES

Sanjay Guleria and A.K. Tiku. 2015. Botanicals in Pest Management: Current Status and Future Perspectives.