BOTANICALS IN ORGANIC FARMING

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ABSTRACT

Botanical pesticides are agricultural pest management agents which are based on plant extracts. In modern times these have been used as alternatives to synthetic chemicals in organic pest management. The practice of using plant materials against field and storage pests however has a long history in many indigenous and traditional farming communities across the world. The ecological pest management is a holistic method based on the synergy of a variety of farming practices. Indigenous knowledge which is holistic, site-specific and experience based has therefore much to offer modern endeavours to practice a more sustainable agriculture and pest management strategies which consider the welfare of both humanity and the environment.

Introduction

Pests have been responsible for more loss of life and destruction of property than by wars, floods, earthquakes, fire and famine in the history of man. Some of the recent scenario includes:

- Crop loss at 6-7 thousand crores/annum.
- Pesticide usage in India: worth Rs. 800 crores.
- Insecticides like DDT, BHC, Allethrin, Methyl bromide, aluminumphsophide, Ethylene dibromide and Malathion.
- Severe health hazards.
- Resistance against these chemicals.

Medicinal and aromatic plants are a group of plants having unique property in their parts certain chemicals (secondary metabolites) being utilized in curing ailments or as a source of flavors and fragrances, can also be used as biocides (botanical pesticides).

Several components of essential oil have been identified as

- Short term (Eg: linalool, menthol, pulegone) pesticides.
- Long term (eg. benzaldehyde, carvacrol, carvone, cinnamaldehyde) pesticides.

Insect Pest

An insect whose population increases to such an extent as to cause economic losses to crops or a nuisance and health hazards to man and his livestock will be declared as pest.

- Favourable weather conditions.
- Large-scale monoculture of crops.
- Accidental introduction of a pest into a new area.
- It kills natural enemies and lifts natural control.
- Indiscriminate use of pesticides.

Botanicals /Biocides

The Botanicals are plant products that have been used to control pests.

Secondary Plant Substance

Several classes of secondary plant substances present in medicinal and aromatic crops are responsible for pest management.

Disadvantages of Pesticides

- Hazards to man, Problem of resistance, Pest resurgence&Secondary pest outbreak.
- Danger to pollinators, Effects onwildlife&deleterious effects on plants.
- Hazards of pesticide residue&unsettling the ecological balance.

- Low mammaliar toxicity, Environment friendly&broad spectrum.
- To overcome pest resistance&to overcome pest resurgence.

Ashwagandha
Scientific Name*: Withania somnifera* **Family**: Solanaceae
Chemical Constituents: Withanine & somniferine **Uses**: Insecticidal.

Ambrette
Scientific Name*: Abelmoschus moschatus* **Family**: Malvaceae
Chemical Constituents: Farnesol, ambrettolidin. **Uses**: Insecticidal

Patchouli
Scientific Name*: Pogostemon patchouli* **Family**: Lamiaceae
Chemical Constituents: Eugenol, patchoulinol **Uses**: Insecticidal

Rosemary
Scientific Name*: Rosemarinus officinalis* **Family**: Lamiaceae
Chemical Constituents: Linalool, Thymol & carvacrol. **Uses**: Antibacterial.

Thyme
Scientific Name*: Thymus vulgaris* **Family**: Lamiaceae
Chemical Constituents: Thymol, linalool. **Uses**: Insecticidal.

Neem
Scientific Name*: Azadirachta idica* **Family**: Meliaceae
Common name: Neem
Chemical Constituents: Azadirachtin Nimbin and Nimbidin **Uses**: Insecticidal.

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Adathoda
Scientific Name*: Adathodavesica* **Family**: Acanthaceae
Common name: Malbar nut

Chemical Constituents: Adtodine & adhavasinone **Uses**: Insecticidal.

Aloevera
Scientific Name*: Aloe barbadensis* **Family**: Liliaceae
Common name: Indian aloe.
Chemical Constituents: Barbaloin, Isobarbaloin, Aloin A and Aloin B. **Uses:** Insecticidal

Periwinkle
Scientific Name*: Catharanthus roseus.* **Family**: Apocynaceae
Common name: Sadabahar, Kasikanagile
Chemical Constituents: Vincristin Vinblastin **Uses**: Insecticidal.

Datura
Scientific Name*: Datura spp.* **Family**: Solanaceae
ChemicalConstituents: Hyoscyamine & hyoscine **Uses**: Rodenticidal & Acaricidal.

Sweet flag
Scientific Name*: Acorus calamus.* **Family**: Araceae
Chemical Constituents: Acorin Acoradin **Uses**: Insecticidal.

Pyrethrum
Scientific Name*: Chrysanthemum cinerariaefolium* **Family**: Astraceae
Chemical Constituents: Pyrethrin I & II, Cinerin I & II, Jasmoline.
Mode of Action: Knock down effect.

Mints
Scientific Name*: Mentha spp.* **Family**: Lamiaceae
Common name: Pudina
Chemical Constituents: Menthol Carvone Limonene & linalool **Uses**: Fumigant & Insecticidal

Ocimum
Scientific Name*: Ocimum sanctum* **Family**: Lamiaceae
Common name: Holy basil Sweet basil
Chemical Constituents: Ocimin, linalool **Uses**: Insecticidal.

Lemon grass
ScientificName*: Cymbopogon flexiousus* **Family**: Graminae
Chemical Constituents: Cymbopogone Cymbopogonol. **Uses**: Insecticidal,

Antifeedant activity

Chemical sprayed food deters insects from feeding are called antifeedants. With these the insects die slowly of starvation.

Mode of action

Inhibiting gustatory (taste) receptors of the mouth region.

Advantages

- Affects phytophagous insects only and Eco-friendly.
- Spraying with Antifeedant, the pest turn to feed on weeds.

Disadvantages

- Only chewing type of insects are affected but not sucking type.
- New growths of plant are not protected.
- Insects are not immediately killed.

Ovicidal activity

- Ovicides are those group of compounds which kill the embryo at egg stage.
- Neem based products have shown ovicidal actions against mites like *T. urticae.*

Mode of Action

Disturbance in the hormonal balance.

Insect attractants

Chemicals that cause insects to make oriented movements towards their source are called insect attractants.

Mode of Action

Attracts misguide the insects to wrong host plants, wrong mating partners or wrong ovipositional sites, whereby their number will go down by starvation or by producing unfertilized eggs.

Advantages

- Do not disrupt the eco-system or food chain.
- They are specific for some insects and do not affect the non-targets.
- Do not cause environmental pollution.

Disadvantages

- Insects can always find untreated hosts, so their number may not be affected.
- The attractants cannot be relied as a sole control measure can only be used in Integrated control programme.

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Antiviral activity

Essential oil of *Ocimum sanctum* has shown significant inhibition against legume viruses including cowpea mosaic virus (89%), mungbean mosaic virus (90%), bean mosaic virus (92%) at 3000 ppm concentration.

Nematicidal

The damage caused by plant parasitic nematodes, especially by root-knot nematodes, represents one of the major obstacles for the production of an adequate food supply.

Antibacterial

- Problem of bacterial disease can be solved with the use of botanical pesticides like Neem extracts *Oscimum spp*., *curcuma longa,* garlic extracts, *Adathoda vasica* and essential oil from marigold.
- Neem formulations are superior to manage the bacterial blight of beans.

Rodenticide

- Some botanicals are also used against vertibrate field as well as storage pests and rodents.
- Tulsi on long term feeding to male rats showed a decrese in sperm count and sperm mortality.
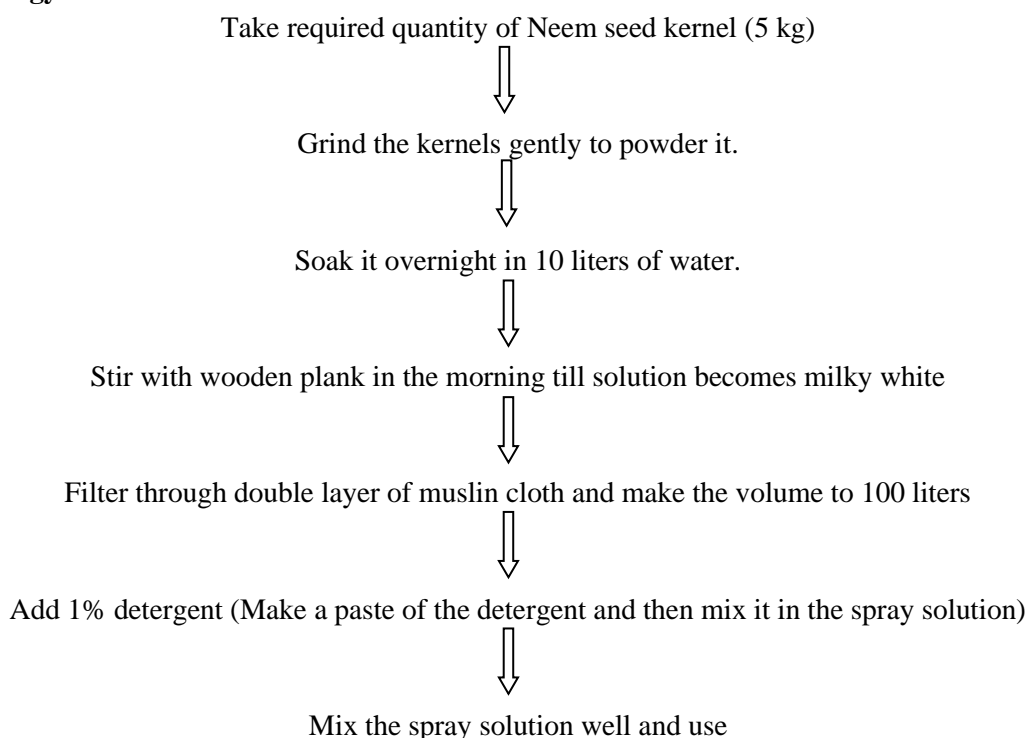
Antifungal

Antifungal activities of certain essential oils or their components have also been assessed and found effective for *Penicillium digitatum.*

Neem Seed Kernel Extract (NSKE) preparation (5 % solution)

Materials required:

- Neem seed kernels (well dried) – 5 kg
- Water (reasonably good quality) – 100 liters
- Detergent (200 g)
- Muslin cloth for filtering

Methodology

Take required quantity of Neem seed kernel (5 kg)

⇩

Grind the kernels gently to powder it.

⇩

Soak it overnight in 10 liters of water.

⇩

Stir with wooden plank in the morning till solution becomes milky white

⇩

Filter through double layer of muslin cloth and make the volume to 100 liters

⇩

Add 1% detergent (Make a paste of the detergent and then mix it in the spray solution)

⇩

Mix the spray solution well and use

Conclusion

There is evidently much more to organic, sustainable farming than the use of botanical pesticides. Nevertheless, botanical pesticides could play an important role in taking indigenous farming practices into a new and sustainable future. Not only are they considerably safer, both for humans and the environment, but could contribute to the fusion of the traditional and the modern, the indigenous and the global. With the realization that the Green Revolution has failed, the future of agricultural pest management focus should instead of looking to chemicals, high-technology and 32 industry, be on the farmer's natural instincts and acquired experience. Botanical pesticides could no doubt be part of this shift to appropriate technology.

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