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PEST MANAGEMENT IN NATURAL FARMING: A HOLISTIC APPROACH TO SUSTAINABLE AGRICULTURE

*NIVEDHA. S[1] and M. S. MARICHAMY[2]

Introduction:

After Green Revolution in 1960 Indian agriculture has started using pesticides and chemical fertilisers in a huge amount. Due to the excessive utilization of the chemicals, their marginal utility is decreasing day by day which leads to decrease in the net income as well as the amount of debt is increasing for the farmers. Chemical pesticides destroy natural enemies, bees and non-target organisms. Resurgence of target pests and outbreak of secondary pests are other side effects. It also affects the soil health, purity of the ground water, biodiversity of the local area as well as health of human. All the negative impact of this chemical fertilizers has led to develop an agroecological and sustainable farming system that ensure a good ecology as well as provides benefits to the society. Under such condition Zero Budget Natural Farming (ZBNF) has come into existence which is an alternative method to feed the large population and maintain the sustainability in production.

In natural farming, insect-pests on plants are managed by the farmers with natural products prepared easily by them from local resources at almost negligible cost. Palekar has emphasized two-pronged strategy for plant protection, one of initial protection through seed treatment and second through their use as spray. The naturally prepared and nature-friendly mixtures or astras shall keep the crop free from insect-pests and diseases and also take cognizance of the venomous effects of pesticides.

Neem (*Azadirachta indica)* is considered as the most useful traditional plant in India. It is also called “the wonder tree” that has multiple pesticidal, medicinal and anti-feedant properties, making it ecofriendly. Almost all parts of neem tree, like leaf, drupes, bark and seed contain a pool of biologically active constituents. It consists of a large number of bitter principles *viz.*, azadirachtin, azadiradione, fraxinellone, nimbin, salannin, salannol, vepinin and vilasinin in considerable quantities. Azadirachtin has proven effectiveness as a pesticide against about 300

NIVEDHA. S[1] and M. S. MARICHAMY[2]

[1]PG scholars, Pandit Jawaharlal Nehru College of Agriculture and Research Institute, Karaikal, U. T. of Puducherry 609603

[2]Faculty, Pandit Jawaharlal Nehru College of Agriculture and Research Institute, Karaikal, U. T. of Puducherry 609603

insect species and is reported as non-toxic to humans. The biological effects of neem products are insect growth regulation, feeding deterrent and oviposition deterrent effect.

Habitat diversification

Habitat diversification makes the agricultural environment unfavourable for growth, multiplication and establishment of insect pest populations. The following are some approaches by which the pest population can be brought down.

1. Trap crop

Trap crops are planted along with the main crop – protect from a specific pest. Planted as intercropping with the main crop or as a border or in strip.

Main crop	Trap crop	Insect-pests attracted by trap crop
Tomato	African marigold	Fruit borer
Cabbage	Mustard	Diamondback moth
Cucumber, Water melon, Musk melon	Summer squash	Pickle worm, Cucumber beetle
Tomato, Beans	Summer squash	Whitefly
Bell pepper	Sunflower, Sorghum	Stink bug
Common bean	Egg plant	Silverleaf whitefly
Onion	Carrot	Thrips
Lettuce	alfalfa	Plant bug
Okra	Short duration Pigeon pea	Fruit worm
Cabbage, Cauliflower	Radish	Cabbage borer

2. Border crop/ Barrier crop

Border plants are used bordering a primary crop to restrict the movement of insect pests. Ideally border crop should be attractive to the natural enemies and non-host to the vectors.

Example-

- ❑ Maize as a border crop with cauliflower, watermelon
- ❑ Sorghum as a border crop with cauliflower
- ❑ Pigeon pea as a border crop with okra and chilli
- ❑ Sweet corn as a border crop with Amaranthus

The two-way strategy recommended for crop protection by Palekar

A. Seed treatment

Beejamrutha

Beejamrutha is a traditional seed treatment technique that originated in ancient Indian agriculture. It involves the preparation of a nutrient-rich mixture that is applied to seeds before sowing. It is effective in

protecting young roots from fungus along side soil-borne and seedborne diseases which regularly affect crops after the monsoon period.

Requirement- It is basically made up of water (20l), cow dung (5kg), urine (5l), lime (50gm) and just a handful of soil.

Preparation

- ✔ Take 5 kg of cow dung in a cloth and bound it by small rope as a small bundle and hang it for a night (12hr.) in 20 litre of water.
- ✔ In another container dissolve 50 g of lime in 1litre of water and keep it for a night.
- ✔ Next day morning squeeze the cow dung in water add handful of soil and stir well.
- ✔ To the solutions add 5 litre of Desi cow urine and lime water and stir well.

Usage

Add beejamrutha to the seeds of any crop, coat them, mixing by hand, dry them well in shade and use for sowing. For leguminous seeds, just dip the seeds quickly (5 minutes) and dry them well in shade and use for sowing. While transplanting, the roots of the seedlings/setts/cuttings may be dipped in beejamrutha solution for five minutes and then planted/ transplanted.

B. Botanical extract for insect-pest control (as sprays) under natural farming

1. Neemastra

Neemastra is used to prevent or cure diseases, and kill insects or larvae that eat plant foliage and suck plant sap. This also helps in controlling the reproduction of harmful insects. Neemastra is very easy to prepare and is an effective pest repellant and bioinsecticide for Natural Farming.

Requirement: 200 litre water, 2 kg cow dung, 10 litre cow urine, 10 kg fine paste of neem leaves along with short branches.

Preparation of Neemastra:

- ✔ Take 200 litre of water into a drum and add 10 litre of cow urine
- ✔ Then add 2 kg of desi cow dung
- ✔ Next, add 10 kg of crushed neem leaves along with its short stems or branches
- ✔ Stir all the above contents in clockwise direction with a thick wooden stick
- ✔ Cover the drum with a gunny bag
- ✔ Prepare and keep Neemastra in shade to prevent sunlight and rainfall exposure.
- ✔ Stir the above solution every morning and evening in clockwise direction for one minute.
- ✔ After 48 hours, filter the solution and store it for use.

Method of Application: Use the above prepared and filtered Neemastra without

dilution with water. Neemastra so prepared may be stored for use up to 6 months.

Controls: All the sucking pests, jassids, aphids, white fly and small caterpillars are controlled by Neemastra.

2. Agniastra

Requirement- 20 litre cow urine,2 kg neem leaves paste, 500 gm tobacco powder, 500 gm green chilli paste, 250 gm garlic paste

Preparation of Agniastra

- ✔ Take 20 litre cow urine in a suitable vessel.
- ✔ Add into it paste of 2 kg neem leaves, 500 gram tobacco powder, 500 gram green chilli paste, 250 gram garlic paste.
- ✔ Boil the above contents on slow flame
- ✔ Allow the above contents to cool for 48 hours in shade
- ✔ Stir the contents in clockwise direction twice a day for one minute
- ✔ Filter the solution and store it in earthen pot for future use

Method of Application: Use 6 litre of Agniastra diluted with 200 litre of water on standing crop in one acre field. It can be stored for three months

Control- It is used to control all sucking pests and caterpillars.

3. Brahmastra

This is a natural insecticide prepared from leaves which have specific alkaloids to repel pests. It controls all sucking pests and hidden caterpillars that are present in pods and fruits.

Requirement- 20 litre Cow Urine, 2 kg Neem leaves along with short stems or branches, 2 kg Karanj leaves, 2 kg Custard Apple leaves, 2 kg Datura leaves, 2 kg Castor leaves, 2 kg Mango leaves and 2 kg Lantana leaves.

Preparation of Brahmastra

- ✔ Take 20 litre of cow urine in a suitable vessel
- ✔ Add a crushed and ground leaves in a vessel
- ✔ Boil the solution on slow flame
- ✔ Allow the solution to cool for 48 hours in shade.
- ✔ Stir the contents in clockwise direction twice a day for one minute
- ✔ After 48 hours, filter the solution and store it in earthen pot for future use

Method of Application: Use 6 litre of Brahmastra diluted with 200 litre of water as foliar spray on the standing crop in one acre field. Brahmastra can be stored for six months

4. Darekastra / Paudhastra

Method of Preparation

- ✔ Cut the branches of darek tree along with leaves in small parts.
- ✔ Add 40 litres water, 2 litres cow urine, 400 g cow dung and 2 kg chopped branches in a barrel.

- ✔ Stir the solution for 2-3 minutes in clockwise direction so that all the contents are mixed well.
- ✔ Keep stirring the solution intermittently for 2 days in clockwise direction for 2-3 minutes and then cover with jute bag.
- ✔ After that, strain the solution through a cloth and store in a barrel/drum.

Method of application- Spray 40 litres in 1 bigha area. This solution can be stored for upto 6 months.

Control- It is used to control sucking insect-pests and young caterpillars attacking fruits and vegetables.

5. Dashparni Ark

Requirement- 5 kg Neem leaves, 2 kg each of Lantana leaves, Pungam leaves, Nerium leaves, Jatropha or castor leaves, Guduchi leaves, Custard apple leaves, Calotropis leaves, Papaya leaves, Vitex leaves, 5 litre Cow urine, 2 kg Cow dung, 170 litres water

Method of Preparation

- ✔ Take a 200 litre plastic drum.
- ✔ Pour 170 litres of water. Soak all 10 different leaves given above in the water.
- ✔ Pour 5 litres of cow urine and 2 kg of cow dung on top of the submerged leaves.
- ✔ Mix them well and leave it for 5 days.
- ✔ On sixth day, add 5-7 litres of water and again thoroughly mix all the contents. Leave the contents as it is for 30 days.
- ✔ The container should be kept in the shade and covered with a wire mesh or mosquito net to prevent houseflies from laying eggs and the formation of maggots in the solution.
- ✔ After 30 days, the contents can be filtered and ready for field application.

Application- Foliar application of dasparni ark will be effective in the management of all kinds of insects as a prophylactic measure.

6. Five leaves extract

Preparation

- ✔ Collect the leaves of *Azadirachta indica*, *Vitex negundo*, *Calotropis gigantea and Datura metel* and *Aloe vera* each weighing 1 kg.
- ✔ Cut the leaves into small pieces, grind with cow urine at 2 litres per kg of fresh leaves and allowed for fermentation for 15 days with frequent stirring.
- ✔ Filter the contents and apply as foliar spray @ 10 per cent

Control- It control the sucking pests like whiteflies, aphids, thrips and red spider mites

7. 2G extract

Method of Preparation

- ✔ Mix chilli paste in 10 l of water and boil.
- ✔ Mix garlic paste with equal amount of kerosene and kept for 12- 24 hours.
- ✔ Mix 150g of common soap powder with 250 ml of water.
- ✔ Mix the above ingredients and filter the content and spray @ 2%

8. 3G extract

Requirement- 1 kg of ginger, 1 kg of garlic and 1 kg of green chillies.

Preparation

- ✔ Grind ginger, garlic and green chillies with cow urine at 2 litres / kg and mix together
- ✔ Keep it for fermentation up to 15 days with regular stirring twice a day.

Application- Filter the contents and apply as foliar spray @ 5 per cent for the management of sucking pests and leaf feeding insects.

9. NEEM SEED KERNEL EXTRACT- 5%

- ✔ Grind the Neem seed kernel (5 kg) gently to powder it. S
- ✔ oak it overnight in 10 litre of water.
- ✔ Stir with wooden plank in the morning till it becomes milky white.
- ✔ Filter through a muslin cloth and make the volume to 100 litre.
- ✔ Add 1% detergent (Make a paste of the detergent).
- ✔ Mix the spray solution well and use.