

Non Pesticidal Management options

Deep summer ploughing

The practice has come a long way as a part of the cultural practice by the farming community. This tends to reduce soil born insects and those, which pass any developmental stages under the soil by -

- * Mechanically damaging the pest
- * Burying and exposing the developmental stages of the pest
- * Changing the physical conditions of the soil thereby hastening the growth or increasing the vigor of the crop

This has been used as the prophylactic measure under Non-Pesticidal Management of *Helicoverpa*. The deep summer ploughing exposes pupae in torpid stage to the natural enemies like birds/ and to the scorching sun. Thus the roles of the natural mortality factors have been enhanced to keep the population under check.

Burning of farm refuge/ stubble

The farming sections know the habit of burning the stubbles left in the field since times immemorial. This is one of the effective traditional/cultural methods that would certainly keep the incidence to the lower degree. Farmers adopt burning of stubble's between 6.30 p.m. to 8.00p.m. The flames entice the nocturnal insects especially the moths that fall prey to the flames.

Intercropping & mixed cropping

Growing of two or three different crops within the same field reduces the chance of loss incurred due to the failure of a crop being lost due to some constraints. The Medak farmers are adapted to Sorghum +red gram inter cropping as a tradition of their cropping system. Farmers find the practice as viable and sustainable rather than growing pure crops. The habit of Sorghum + Red gram cropping encourages the birds to alight especially during the panicle stage of the sorghum. Thus hastens and harnesses the birds as natural enemies in the ecosystem.

Mixed cropping of different cereals, millets, pulses and oilseed crops simultaneously on the same piece of land with or without any row proportion is also a valid practice to overcome vagaries of weather abnormalities and crop failures. This practice minimizes risk in case of crop failures, acts as barrier for pests, builds soil fertility and makes the farmer self-sufficient.

Trap cropping

Small plantings of the susceptible or preferred crop of a pest grown near the main crop act as a trap crop. Farmers adopt marigold as a trap crop for the gram pod borer reduces the pest load on pigeonpea. The flowers that have been oviposited by the female moths of *Helicoverpa* can be picked out and destroyed.

Crops Pest Trap crops

Cotton *Spodoptera* Castor, Sunflower

Cotton, Chickpea *Helicoverpa* Marigold
Pigeonpea *Helicoverpa* Marigold
Ground Nut *Spodoptera* Castor
Cotton Spotted boll worm Bhendi

Crop diversity

Diversity in crops plays an important role in pest management. Traditional agriculture systems are highly diverse; this diversity helps to insure against losses due to pests. Non Pesticidal management of pests requires a multi -pronged approach –soil fertility management – use of locally adopted resistant varieties, mixed cropping, use of pest repelling plants and habitat creation to encourage natural predators.

Bird perches

The birds are the potent predators on the larvae of insects. The chance of gram pod borer larvae being predated by the Avian gets hastened by erecting the bird perches randomly in the field. A wooden log or a branch bifurcated at the top provided with an earthen container filled with water mixed with cooked rice attracts the birds. The farmers of Medak region adopt the broadcasting of puffed rice to attract the birds in their fields.

Manual collection & destruction of larvae

Farmers to save the crop from the damage adopt the mechanical picking, collecting and killing of larvae of *Helicoverpa*. The larvae after collection will be burnt and destroyed. Alternately, Shaking of branches may be done and the larvae collected can be thrown to flames.

Natural Extracts

The low cost natural extracts as chief options in taming the gram pod borer include:

- Cattle dung + urine extract
- Jaggery solution
- Neem seed kernel extract
- Tobacco Extract

(a) Cattle dung + Urine solution spray

Farmers use this spray to nourish the crop plants besides reducing the pest attack. The spray discourages the infestation and improves the crop health and flower retention of the stand by means of trace elements presented in it. For getting the desirable results, it is always advisable to spray after 3.30 p.m. Increasing the number of sprays to two or three times produce the effect desired.

Preparation

The cattle urine of 3 to 5 liters mixed with 3 to 5 kg of dung is allowed to ferment for four

days in a tank covered with a lid. The slurry is allowed to pass through a diaphanous cloth to get the stock solution. Adding 200 to 250 g of quick lime neutralizes the acidity of the solution. The stock solution thus obtained is adequate to be sprayed on one acre of field after diluting it with 50 to 80 liters of water.

(b) Jaggery solution spray

Farmers record attraction of ants to the pigeonpea fields sprayed with 5 per cent Jaggery solution. The sweetness of the solution allures the ants that predate upon the eggs of *Helicoverpa* besides preying upon the initial instar stages of the larvae. Four kilograms of Jaggery dissolved in eight liters of water acts, as the stock solution, which is made to 80 liters, will be adequate for one acre of field. Farmers witnessed this besides attracting ants, also helped in improving the texture of leaf.

(c) Neem Seed Kernel Extract (NSKE)

Farmers have been used to spraying NSKE which acts as a ovi-positional deterrent. The leaves and other parts of the plant sprayed with the extract repels the larvae from feeding resulting in death due to starvation.

Preparation of Extract

Take 3 to 7 kg of Neem seed and pound it gently. The powder obtained will be taken in muslin cloth and tied to get a pouch, which is allowed to soak in 50 to 80 L of water for over night. The pouch is thoroughly squeezed for four to five times to get the extract into water. 50 to 100 g of detergent is added to the extract to get milky white NSKE.

Farmers adopt the following practices to ensure the access and efficacy of the extract:

- Collect the Neem fruits during bearing season and air-dry them under shade.
- Do not use the seeds over eight months of age. The seeds stored over and above this age lose their activity and hence not fit for NSKE preparation.
- Spray the extract after 3.30 P.M. to get effective results.

d) Tobacco Extract

Tobacco is cultivated for use in the tobacco industry to make cigarettes, bidis and chewing tobacco. It has excellent insecticide properties and farmers use for killing of insect pests since time immemorial. However its usage must be restricted in causing harm to beneficial insects and not advocated much.

Preparation:

Take 250-g tobacco waste and boil it in 4 liters of water for half an hour. Cool it and filter through muslin cloth. Add 30-g soap and mix well. Dilute 1part extract with 4 parts of water and use as spray. Adding a little lime powder increases the efficacy of the extract.

e) Chilly + Garlic Extract

Chilly and garlic are available in every household and the farmers found excellent pest control properties with both the extracts when sprayed on crops. It acts, as ovi-position deterrent and female moths won't like to lay eggs on treated surface. Further if any early

stages of larvae were present, they get killed due to pungent properties of extract.

Preparation:

Take 3-4 kg of green chillies and 400-700 grams of garlic cloves. Grind them separately. Dissolve the green chillies paste in 8-10 liters of water and garlic paste in 150-200-ml kerosene and filter them separately by means of thin muslin cloth. Mix both the extract and also add 50g soap to the filtrate. Dilute 1 part of the extract with 4 parts of water to spray.

Mechanical collection:

Farmers practice hand picking and shaking branches to dislodge if the pest reaches severity. With the advent of pesticides, these methods were rarely practiced. Shaking method is found to be most effective for pest control when pesticides do not control pest. In these methods, 3 or 4 family members enter in to the field and shake the branches to dislodge the pest.

Pheromone Traps (for Monitoring and mass trapping Insect Pests)

Sex Pheromone lures:

Adult female insects that are ready for mating emit species-specific chemical odors to attract the males. The methods of utilizing these chemicals produced by insects for their procreation, as tools for their destruction were developed and are popularly known as Pheromone traps. Pheromones synthesized in the laboratory are formulated and supplied in the form of lures, to be used along with suitable traps to deceive, attract and trap male insects.

Monitoring:

Installation of pheromone traps with suitable lures @ 2-3 per acre can provide information on pest incidence and intensity in crop fields. Based on the number of males caught, the timing and frequency of control measures can be determined.

Mass trapping:

Sex pheromone traps can also be used as devices for reducing the population of target pests. The majority of females present in cropped fields remain unmated and lay infertile eggs as a result of mass trapping of males.

H-NPV virus :

In the fields, natural mortality of *Helicoverpa* can be seen due to infestation of disease causing virus particles. Such larvae can be collected and may be utilized again for checking *Helicoverpa* populations. The virus is specific to *Helicoverpa* larvae causing heavy mortality but has no deleterious effect on non-target insects, animals or crops; it is therefore safe for natural enemies and the environment.

Method of preparation:

- ◆ Larvae died due to infection of NPV are seen in the field.
- ◆ Collect 400 NPV affected *Helicoverpa* larvae from field.

- ◆ Grind the collected larvae.
- ◆ Filter the solution obtained using a thin cloth
- ◆ Dilute the NPV solution to 100 liters and add 100g of robin blue to protect from UV light in the field.
- ◆ Spray this solution during evening hours
- ◆ Insects controlled *Helicoverpa*, *Spodoptera*.
- ◆ Virus of one insect species does not kill the other species
- ◆ Virus infected dead larvae are observed hanging head upside down from top branches 2-5 days after spraying the solution in the case of *Helicoverpa* and split body in case of *Spodoptera*.
- ◆ Within 10 days all the larvae in the field are infected with NPV.

Application of NPV:

NPV is sensitive to ultra violet rays of sun. Options for improving the effectiveness of the NPV include spraying late in the day after peak sunshine. Additionally adding UV absorbents such as 1ml of robin blue to a liter of spray solution has been reported as improving the effectiveness of NPV. For Pigeonpea HNPV should be used at 500 LE per ha and chickpea 250 LE per ha.

Usage of organic manures

In addition to above NPM options, wide usage of organic manures such as tank silt, farmyard manure, green leaf manuring (with *Glyricidia*, *Pongamia*, *Cassia tora*), green manuring (with sunhemp, *Daincha*, different legumes), processed manures (like vermicompost, neem cake, pongamia cake), penning (sheep and goat stalling overnight in the field) etc are encouraged to make "soil fertile and healthy". A fertile and healthy soil acts as first defense mechanism against pest and diseases.