

To make the agriculture more attractive, less expensive and more remunerative, certain measures are being considered in which availability of certified seeds, proper use of fertilizers, good water management and Integrated Pest management is important. Insects, disease, rodents and weeds adversely affect the crop in the state every year. Some of the important problems of Rabi crops are pod borer of gram and arhar, white gerui and alternaria blight of mustard, late blight of potato, powdery mildew of peas, infertility in arhar and feloris minor of wheat.

Till date, chemicals are being used to overcome this problem. These chemicals are not only expensive but it pollutes the environment also and there are possibilities of accidents also. The residue of these fertilizers often remains with the fruits and vegetables and adversely affects the health of consumers. Continuous use of chemicals has developed immunity in many insects and many less important insects have become big problems. Along with this, parasite insects present in the field and environment are also finished as a result ecological balance is disturbed. The system on which emphasis is given to overcome this problem is known as Integrated Pest Management. In this system, emphasis is given on management of pest rather than eradication of insects, disease and weeds. In fact, our intention is not to finish any insects for ever but take such measures which can limit their number/density and they can not harm more. The important points of this system are as follows:

- To diagnose the problems, different measures are integrated rather than adopting one measure, viz., use of disease resistant variety and other cultivation activity, technical and organic means and use of chemicals etc.
- Chemicals should be used only when it is required. Chemicals should be used only when the number/density of the insects and disease reaches to a certain level.
- The means adopted should not be only effective but less expensive also.
- It can save environment and atmosphere from pollution.

First requirement of the Integrated Pest Management is regular survey of crops so that the farmers and workers are aware of different insects and disease conditions. Management of training for farmers and worker is also required so that the farmers can realize the problems and they can have the ability to understand the different stages of the problems on use of chemicals or other work become essential.

Organic means are very important in Integrated Pest Management which includes parasite/predator insects, fungus, bacteria, virus and other organism which is used to control the harmful insects and diseases of the crop. Normally, they perform their work in the environment and keep the problems in limit but their normal activity is adversely affected in today's intensive cropping system. Excessive use of chemicals is biggest problem in it. Effective organic control of many insects and other problem has exercised in the state. Some of the examples of successful control are pyrrilla insect of sugarcane, pod borer of gram and hyacinth. Nuclear Poly Hydrosis Virus (NPV) at the rate of 200 larval equivalents has been found very useful in control of pod borer insect of gram. Hyacinth, which is the biggest problem

of ponds in the state can be controlled effectively by *Neochatina quili*. This insect species can be available in Organic Control Laboratory, Modipuram, Meerut.

Farmers have the knowledge of that number/intensity of the main insect/diseases on which chemicals can be used. This includes all insects of paddy, mahu of mustard and insects of cotton. In Universities and other Institutes of the state, research I continued on these subjects. Knowledge gained from the research and experiment will help adoption of Integrated Pest Management in effective manner. Adoption of Integrated Pest Management will reduce expenditure on farm protection chemicals, the farmers will get relief and the environment will be saved.

### **(A) Cultivation Activity**

Work related to field

#### **Plough In Summer**

- By doing so, the insects hidden in the soil, comes on the surface and get destroyed in scorching sun light. The birds eat the living and dead insects and destroy them.

#### **Cleaning of Field**

- Weeds grow with the crop in the field. They conserve pests. Keep the field clean by hoeing and weeding. This controls unnecessary growth of pests.
- Selection of healthy seeds of resistant variety.
- Selection of healthy seeds for prevention of seed borne disease.
- As far as possible, sow in time. There is relatively higher menace of disease insects in late sown crop.
- Keep more distance between two plants. It makes hoeing, weeding and other cultivation activity easier and insect/disease menace is also reduced.
- Formation of mud roads/bunds: For easiness of cultivation related activity, leave 1-2 rows after every 20-25 rows.
- Fertilizers, manures and micro nutrients should be used in balanced quantity.
- Make suitable arrangement of water. Not much water should remain filled in the field. Make arrangement of excess water.
- Harvesting of Crop: It should be done just at the surface of the ground.

### **(B) Mechanical Control: Work related to Mechanical Prevention**

Collect and destroy the eggs and larva of the pests or keep them in bamboo cage for protection from animal groups who control them.

- Separate the insects and disease infested part of the plant.
- Use light trap or ferroman trap.

### **(C) Organic Control**

Conserve predators and parasites insect for this and leave them out, if required.

#### **(D) Activity related to Weed Control**

- Weeds should not be allowed to grow in the drains made for irrigation and on bunds.
- As far as possible, plough in summers to destroy perennial weeds and grass etc.
- Destroy the weeds present in the field as far as possible.
- Keep the seeds free of weeds.
- Hoe and weed after 4-6 weeks of sowing as required.

#### **Pest Management in different crops of Rabi**

##### **(A) Wheat**

- Adopt above suggested measures for weed control.
- Leave weekly in the field the egg parasite for control of stem borer insects when its menace appears in the field.
- Up root the infested plant from annavrit kandua before the awn membrane is ruptured. And burn them. If there is menace of mahu insect, see if the friend insect Indra gop beetle is present in sufficient number or not. If the beetles are present, never use chemicals. Take the beetles from other place and leave in the field.
- Rodent Control  
For rodent control, program should be conducted in large number in summer season to reduce the number of rodents. In different stages of standing crops, regular surveillance of the field is necessary to check the presence of rodents. The rodents come in the field from the neighboring areas. Hence its effective control is essential to check the increase of number of rodents to a large extent.
- Deep plough of field is essential so that holes situated in deep is broken and destroyed.
- At the time of sowing, make the bunds of the fields in a definite size and cut in regularly so that there is no space for rodents to hide.
- Remove all old holes in the field and all other possible places where the rodents can live.
- Mouse traps can also be used locally for rodent control.

**If by adopting above methods, rodent control is not satisfactory, use following chemicals method:**

- Give first 2 days non poisonous feed. Then give 10 to 15 grams of poisonous feed per live hole of which 1 part is zinc phosphide and other is mustard oil. Or,
- Use poisonous feed made of 100 gram barium carbonate, 860 grams of wheat flour, 15 gram of sugar and 2.5 gram of mustard and sweet oil. Or,
- Place 1 to 2 cake made of bromadiolon 0.005% (11 gram cake per hole) wrapped in paper or polythene in the holes. The poison affects slowly, the rodents bleed and died.
- Promote cats, owls and snakes.

##### **(B) Integrated Pest Management(IPM), Surveillance and Estimation on Rye and Mustard Crop**

- A quick survey is required to prepare estimates of pests and their natural enemies and number the level of important diseases in mustard production area at an interval of 10-15 days.
- Economic Loss Level- For beetles in mustard, 30% infested plant or 30-35 mahu per 10 cm long stem will be deemed to be economic loss level.

### **Sowing of Disease Resistant variety**

Crop can be saved from diseases by sowing different disease resistant variety. Following varieties has been proved resistant to diseases mentioned against their name. Its sowing should be promoted.

Resistant Species Name of the Diseases for Which it is Resistant

R.C. 781 Alternaria Blight

T 4A Y.R.T 3, T. 6 White Rust

R.H 30 Aphid and White Rust

- For control of beetle menace in mustard, mustard should be sown early ( up to first week of October).
- Variety of mustard T-59 is sown early. This variety is saved from beetle.
- Where menace of beetle is more, toria-mustard should be sown. Beetle menace is less on it. Treat the seeds with some fungicides before sowing to prevent it from seed and soil borne diseases.

### **Methods of Mechanical Control**

- Pluck the beetle infested twigs in the end of December and buried in the earth.
- Pluck the infested leaves in early stage and destroy them.
- Collect the eggs and larva of insect and destroy them.

### **Method of Organic Control**

- Natural enemies of pest of mustard such as beetle Chrysopa sirifid should be conserved in crop environment.
- Ratio of pests and their natural enemies should be 2:1.

### **Chemical Control**

As per requirement, use recommended chemicals. This should be taken as a last measure. Use safe chemicals for safe environment of natural enemies of pest of mustard. Chemicals should be used only when the number of pests exceeds the economic loss level. If the ratio of pests and their natural enemies should be 2:1, do not spray any chemical or pesticides.

### **(C) Gram**

Gram crop is grown in abundance in Uttar Pradesh because this is an important pulse crop. This crop can be gone alone or along with mustard, wheat, barley etc. Different types of insects/diseases harm the gram crop heavily, e.g, cut worm cuts the growing plant of gram at the surface. Secondly, pod borer insects eat the leaves of the plant in early stage and harm the plant. The insect menace is increased at the time of pod formation.

In that stage, the insect bores the pod and enters in it or sometimes half of it hangs out side and eats all grains in the pod as a result, the pod remains empty. Control of pod borer insect is often impossible by chemicals because resistance to different pesticides has been developed in this insect. Due to all these reasons, it has become essential that Integrated Pest management is adopted in gram for prevention of harmful insects and disease. In this method, more than one control measures can be adopted to get rid of insects/diseases. Secondly, environment can be saved from pollution caused by use of pesticide chemicals.

### **Harmful insects of Gram**

- Cut worm
- Pod borer insect
- Aphid
- Termite

### **Diseases of Gram**

- Built
- Root rot
- Escochyta Blight

### **Natural enemies of harmful insect/disease in gram**

<b>(A) Predators</b>	<b>(B) Parasite insect</b>	<b>(C) Insect Pest</b>	<b>(D) Fungal Disease</b>
1. Chrysopa	1- Campolittle chloride	1- N.V.B, 2- Depal -8L (Bacillus uringensis)	Seed treatment by Trichoderma Viridi. (For control of Fuselium, Rhizotonio and Macrophomia)
2- Indra Gop beetle	2- Brachone		
3- Sirfid fly	3- Apelentis		
4- Predator bugs	4- Kilonis		
5- Spiders			
6- Predator birds (crow, Mynah, Peacock etc)			

### **Sowing of Resistant Varieties**

- Sowing of Escochyta blight resistant variety - Gaurav (H-75-35) G.N.G 146 and V.G-261
- Built resistant variety such as J.P- 315, I.C.C-32 Kabuli gram, K.W.R 108 K.J.D- 1168A, G.J-16, D.C.P-92-3
- Resistant variety of Root Rot: Control of insects/disease by adopting following methods of Integrated Pest Management in j.G.8 crop of gram:

- Apply deep plough in summer so that hidden insects can come out and get destroyed from the heat.
- Sow selected resistant variety against pest and disease.
- Select and use of healthy seeds.
- Treat the seeds with pesticide and fungicide.
- Promote early sowing.
- Sow mustard, linseed and wheat crop with gram as intercrop.
- Keep proper distance between row to row and plant to plant.
- Adoption of suitable crop cycle.
- Destroy crop residue at the end of the crop.

#### **(a) Mechanical Control**

- Pick the larva of pod borer insect by hand and destroy them.
- Trap the adult insects by using ferroman trap and destroy them.
- Collect the adult insects by light trap and destroy them.

#### **(b) Organic Control**

Conserve the predators/parasite insect in following ways so that the insects and disease can be controlled:

- No or less use of pesticides chemicals.
- Adopt ratio of pests and their natural enemies as a guide.
- By adopting economic loss level
- Use pesticides in infested area when it is required most.
- Tie the woods on bamboo for birds. Remove when the crop ripens.

#### **(c) Control of Pod Borer Insect by NPV**

- This is a viral disease which affects the larva of pod borer insect of crop. Due to this disease, the larva hangs downwards and dies after falling from the plant.
- The sap of 250 dead larva of infested plant mixed with 200-300 liter and 0.5% gur should be sprayed where the larva is seen at the rate of 1 larva per 10 plants.

#### **Following care should be taken at the time of spray of NPV**

- Spray NPV at the time of sunset so that NPV can be saved from the adverse effect of ultra violet rays of sun light.
- Do not prepare solution of NPV well before the time of spray. Prepare the solution only when it is to be sprayed.
- Shake the solution well before it is poured in the spray pump.
- Spray is done in such a manner that it falls on the leaves.

#### **Method of Organic Control**

In pulses crop, different types of natural enemies of the pests are found which can be used for pest control.

#### **Natural Enemies of Pest of Pulse Crop**

<b>(A) Predators</b>	<b>(B) Parasite Insect</b>	<b>(C) Predator Birds</b>	<b>(D) Insect Disease</b>
Predator Flies	Campolatis Claridi	Crow	NPV
Predator Insect	Bracone Wasp	Myna	
Chrysopa	Apentalis Wasp	Baya Weaver Bird	
Indragop Beetle	Kelonis	Peacock	
Sirafid lye	Trichogrma		
Predators Bugs			
Predator Bugs			

By conservation of above organic control factors and leaving them in the crop fields, harmful insects of pulse crop can be controlled. Farmers must know about these beneficial insects See different disease resistant varieties of pulses crop in crop details.

### **Adopt following programs for treatment of disease in pulses:**

- Sow disease resistant variety and disease free seeds.
- Treat 1 kg seed with thirum or 2.5 gm PNV(Brasicol)
- Up root infested plant and destroy them.
- Apply deep plough in summers and grow crops for green manure so that microbes of ukatha are destroyed.
- Adopt crop cycle with cereals so that they are not affected by ukatha.
- Use pesticides to destroy insect responsible for infertility in arhar so that disease is not spread.
- For phytothera (arhar), it is necessary that water is not filled in the field. To avoid water logging, make drains towards the slope and sow the seeds on the bunds.
- As required, spray 0.03% dithane M-45 or blytox 0.4%.
- Spray recommended chemicals to kill white fly which is vector of yellow mosaic virus of urad and moong.
- If required, spray 0.4% solution of soluble sulphur for treatment of powdery algae of urad and moong.
- Use carbendasim for sarcospori or macrofonia of urad and moong.
- Sow early for prevention of Rhysectonia vatatocola. Timely irrigation in early sown variety reduces the disease.

### **Crop: Arhar**

#### **(A) Mechanical Control**

- Pod borer insect causes less harm to early ripening variety such as T-21, UPAS-120 rather than late ripening variety. Pod borer insect causes no harm to medium ripening variety of arhar in northern India
- Destroy ratoon of arhar in summer or plants grown here and there.
- Pick kafoli beetle with hands and collect pod bugs and destroy them.

#### **(B) Chemical Control**

- Use Indosulfan (0.07%) or monocrotophos (0.04%) or dimethoate (0.03%) for control of pod borer. If there is problem of pod borer flies, give priority to monocrotophos or dimethoate.

## **CROP: GRAM**

### **(A) Mechanical Control**

- Menace of pod borer insect is reduced in northern part of the country if the crop is sown early.
- The cells of cutworm and pod borer insect are destroyed if deep plough is ploughed in summer season.
- In case of problem of termite in the region, use rot manure.

### **(B) Chemical Control**

- For control of pod borer insect in gram, spray neem oil (5%) or Indosulphan (0.07%). Spray Malathion (5%) or Indosulphan (4%).

### **(C) Organic Control**

- Spray 2-3 times 250-500 equivalent larvas NPV in a week.

### **Precaution for chemical control in IPM Demonstration**

- Use pesticides only when the number of pests crosses the economic loss level.
- Use pesticides only when it is required.
- Use only that pesticide which kill the harmful insects only and does not harm beneficial insects and organic control factors.
- Never spray different pesticides mixed together.
- Use pesticides at right time.
- Use water in appropriate quantity for spray of pesticides. If the quantity of water is less, spray will not be proper.
- Take care of wind direction at the time of spray of pesticides.
- Clean your hands and legs with soap after spray of pesticide and take bath afterward.
- Do not use biri, tobacco at the time of use of spray.
- Use goggles in eyes and close the mouth with clothes.
- Use that pesticide which is registered by registration committee of Government of India or decided by nearest University or State government
- See ISI mark and date of expiry printed on the on the packets of pesticides
- Use eco friendly pesticides only.