

6- Plant Protection Practices

a. Cultural practices

1-Use of Cleaned Seeds:

Use only certified seeds. If seeds are free from any foreign matter viz., weed seeds, spores of fungal diseases and infected grains, the problem of weed, disease and pest infestation after sowing can be minimized to a greater extent. The seeds having low viabilities should also be culled. Only cleaned seeds should be used.

2-Pre-Sowing Irrigation

Pre-sowing irrigation is recommended for flushing the weeds. After flushing, the field is ploughed and weeds are destroyed. The weed-seed bank is exhausted in this way. The tillage operation also destroys the eggs and larvae.

3-Summer Ploughing

During summer the field should be ploughed by deep plough. The eggs and small crawlers living in the soil are exposed. The eggs get killed and insects may die due to intense heat or be eaten by birds on exposure.

b. Inter cropping and trap crops

Intercropping is growing two or more crops next to each other at the same time. The main purpose of intercropping is to produce more crops in a given area. It also makes use of resources (nutrients) that would otherwise not be used by a single crop. For example, cabbage along with carrot or tomato is an important intercrop combination to manage Diamond Back Moth effectively.

Some advantages of intercropping

- 1- Increasing productivity of yield advantages.
- 2- Reduce competition for environmental resources like land, labor, time, water and nutrients.
- 3- Better weed control by crop plant competition.
- 4- Intercropping may help to minimize the effect of diseases and insects.
- 5- Improvement the soil fertility and greater availability of nitrogen.

However, intercropping has **some disadvantages** such as allelopathic effects, which is a direct or indirect harmful effect. Chemical compound in the environment produced by one compound may effect on the growth rate of the other by changing only the rate of uptake of growth resources.

Types of intercropping

Intercropping divided to following four groups:

- 1- Row-intercropping: one or more plants or crops simultaneously planting in the regular rows.
- 2- Mixed-intercropping: is the system under which two or more crops are grown together with no row arrangement.
- 3- Strip-intercropping: growing two or mor plants together in different strips wide and that are narrow enough to permit some interaction.
- 4- Relay-intercropping: grow two or more crops simultaneously with overlapping life cycle that second crop is cultivated after the first crop when reached to reproductive stage before it is ready for harvest.

Trap Crops Pests are strongly attracted to certain plants. When these plants are sown in the main field or along the borders, the pests gather on them. Raising trap crops as inter and/or border crops is an important cropping system approach.

c. Mixed Cropping

Mixed cropping or mixed species cropping is growing of two or more plant species in the same field in the same year without distinct row. The different seeds are sown at the same time, after mixing either by broadcasting or planted Culture and Mechanical Practices in rows. This system of cropping intensifies the farm system and ensures increased productivity and biodiversity of the field. Such system of cropping is often considered as a promising technique to develop sustainable farming system as it has multifunctional roles and higher productivity.

The advantages of mixture

- 1- Better use of time and use more crops per unit in the same land.
- 2- Reducing the effect of extreme climate like wind, temperature and rainfall.
- 3- Decreasing water evaporation from the soil.
- 4- Raise microbial activity in the soil.
- 5- Decline the soil erosion.

While, the disadvantages of mixed cropping are:

- 1- Competition between plants on nutrient, water and light.
- 2- Allelopathic effect between different plant species due to plant produced toxins.
- 3- Damaging of one crop component than other crop in harvesting, due to plant height and seed grain size during the time of maturity via harvesting.

d. Growing disease resistant varieties

Use of Tolerant/Resistant Varieties Selection of resistant or tolerant varieties is a very important factor while examining the diversity and intensity of pests in a particular place. Plants have their own sophisticated mechanisms to protect from the pest attack. Majority of the traditional varieties are resistant to many pests. A series of resistant varieties specific to the region have been developed for all crops.

Other natural practices include

1. Flooding

Flooding/Irrigation can be used to control soil borne pests. For example, if the field is infested with termites, flooding the field will help to control them. Similarly, many insects like cutworms, potato tuber moth and root grubs can not withstand flooding and get killed. It also prevents many insects from egg laying because of destruction of their habitats

2. Exclusion of pathogen

The principle of exclusion and avoidance is to keep the pathogen away from the growing host plant. This practice commonly excludes pathogens by disinfection of plants, seeds, or other parts, using chemicals or heat.

3. Application of organic amendments

Organic amendments applied seasonally are the best agronomic strategy to improve the biological, chemical and physical characteristics of soils, and enhance crop tolerance and productivity in saline calcareous soils. The extensive use of fertilizers and pesticides leads to problems of environmental quality and product quality and safety. A decline in productivity, soil salinization, and groundwater pollution

problems are paid more and more attention. The primary care taken by customers is pesticide residue or food safety problems. A large number of discarded agricultural wastes such as manure, crop straw, and product residues lead to a lot of spoilage of microorganisms and bacteria. Burned crop straw pollutes the air. Using biotechnology, we can change agricultural wastes into high-quality organic fertilizer, which leads us in the direction of development in modern agriculture.

4. Physical methods

5. Application of biocontrol agents

6. Using Biodynamic liquid pesticides

7. Manipulation in Sowing Dates

Manipulation in Sowing Dates Changing the sowing/planting dates can help in the avoidance of egg laying period of certain pests and establishment of plants before the pest occurrence. It also facilitates the early maturation of the crop before the pest incidence. Irrigation can be used to control soil borne pests. For example, if the field is infested with termites, flooding the field will help to control them. Similarly, many insects like cutworms, potato tuber moth and root grubs cannot withstand flooding and get killed. It also prevents many insects from egg laying because of destruction of their habitats.

8. Elimination of Host Plants Summer Ploughing

Management of Alternate Hosts Plants Many smuts reproduce and survive on weeds or alternate hosts and then after attaining certain stage of their life cycle, attack the main crops. It is therefore, usually desirable to destroy such habituating alternate plants growing in the vicinity of main crop field. At the same time utmost care should be taken to preserve the plants supporting the life of natural enemies.