

MECHANICAL AND CULTURAL METHODS OF PEST CONTROL

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The chemical approach to crop protection against pest, disease and weed infestations poses many problems. Disruption of balance in the ecosystem, resurgence of resistant pest and disease epidemics, pollution of human and animal life and of the environment and the effects on non-target organisms are a few of the undesirable consequences of unilateral pesticide promises. It is therefore most important to adopt alternative control strategies which are blessed with preserving the environment, while maintaining satisfactory levels of agricultural productivity. Two alternative pest control techniques proven to be successful particularly from the farm operator's point of view are, (1) Mechanical Control (2) Cultural Control.

1. Mechanical Control

Mechanical Control is a method whereby machinery mechanism, force or combination of force and machinery is employed to control pests. The machines may either be power operated, high technology types or manually operated simple tools. The technique of mechanical control, however, depends on whether control is aimed at a weed or an insect pest; accordingly two control procedures are identified:

(a) Mechanical Control of Weeds

Weed infestations of different farming systems can be effectively brought under control by many a mechanical means; the use of tools such as mowers, slashers, hoes and other tools reduce weed growth by severing the green aerial parts; and repeated slashing will starve the plant which ultimately results in its death. The hand weeder

is a successful implement in the uprooting of weed plants that complete particularly with wet paddy. Under home gardening operations weeds could be hand-pulled and destroyed or tread into mud. Flooding is still another efficient system of mechanical weed control in paddy while burning is gainfully employed in the control of weeds in chena cultivation.

(b) Mechanical Control of Insect Pests and Diseases

Food traps and light traps are useful techniques of pest control. Rodents which damage paddy and yam plots in particular are controlled by the use of food traps while insect pests are caught in light traps. A light trap consists of an element producing a bright light which is surrounded by a container of water, placed out in the field, in the night. Insects attracted by the light get trapped in water surrounding the source of light. In a recent experiment carried out in India with the use of different lights, it was revealed that the white light trap was about the most effective while other colours-yellow, blue, green and red-have been almost equal in attraction, catching about one-third to two-third the number of insects caught in the white light trap.

Hand picking and destroying of insects and their different growth stages-egg, larva, cocoon and adult insect-have proven to be an effective control method under small populations of groundnut caterpillar, pod caterpillar and blister beetle of pulse etc. The destruction of insect affected crop habitat, such as leaf webbs of Okra, fruits affected borer, cucurbit fruits damaged by fruit fly and twigs of

citrus infested by leaf miner are some examples of mechanical control. With greater pest densities, however, a sweep net has to be employed to catch the insects and destroy them thereafter. Similarly disease infested crop parts could be removed by simple surgery. In the case of infestation of virus, entire plants could be uprooted and destroyed.

2. Cultural Control

The cultivation practices themselves on crops could be modified without affecting the productivity, in order to bring down pest population below the economic injury level. Also, the different cultural practices help create a micro-environment conducive to better crop growth; they do not demand supplementary input materials other than a few more labour hours. Some important cultural methods of pest and disease control are outlined below:

(a) Resistant Varieties

The selection and breeding of crop varieties resistant to insect pests and diseases have demonstrated the enormous potential of this method in the reduction of pests and diseases. In certain cases there are no effective methods of control of certain plant diseases, particularly those caused by viruses; here the only available alternative would be the cultivation of resistant varieties.

(b) Crop Sanitation

Pest and disease infested plants, fruits, crop residue etc. would serve as a potential source of re-infection. Collecting and destroying them and in general, the maintenance of a good sanitary standard in crop production would bring down the pathogens to a value enough to avoid re-infection. Consequently the pest and disease populations are lessened, followed by a low incidence of crop loss by their attack.

(c) Crop Rotation

Repeated cultivation of a single crop results in the progressive build up of soil-borne insect pests and pathogens, that are specially injurious to that crop. Furthermore, certain pests are associated with specific crop types which feed voraciously and multiply rapidly with the presence of the same crop. In addition, the progressive cultivation of the same crop favours the increase in uncontrollable growth of weeds which could be checked by the adoption of a different crop in the successive season. Hence, crop rotation would be an effective and profitable method of reducing insect pests, diseases and even some weeds.

(d) Catch Crop

Insect pests are not attracted towards some crop varieties and when those crops are cultivated together with another crop which is readily susceptible to a particular pest, the overall incidence of pest attack has been found to be low. This technique has a very good application in reducing pest populations in multiple cropping programmes.

(e) Time of Cultivation

The time of cultivation can influence the rapid development and multiplication of pests. For example, some insect pests, multiply swiftly and reach very high levels during certain seasons, while the pest population is less throughout the rest of the season. The time of planting can therefore be adjusted in such a way to plant the crop when the pest population is low. By the time the pest number increases, either the crop may be ready to harvest or may not be there in the field, thus ensuring the protection of crop by pest attack.

(f) Selection of Crops

Some crops when planted in an area where the environmental factors are optimum for its development, grow rapidly and give an early harvest. On the otherhand when the same crop is planted on land where the factors of crop growth are below the optimum requirement, the growing period is substantially lengthened and as a result the incidence of pest attack may be high. Still other crops are more susceptible to particular pest and disease attacks when planted in an area where the incidence of attack is reported to be high. Similarly short-aged crops are preferred to long-aged crops; in the latter case the period of crop exposure to natural calamities such as pest and disease outbreaks, is high, since it is subjected to a greater risk of pest attack. Therefore, the selection of crops with particular reference to the climate of the area, where it is expected to be planted, is a good strategy to minimise pest outbreaks.

(g) Plant Spacing

The dense type of planting favours the development of diseases and pests in many cases. The adjustment of plant spacing to the recommended level should therefore be employed in order to lower pest and disease attack. It has now been suggested that the devastating incidence of Brown Plant Hopper attack at Amparai is partly attributed to the high paddy plant density. Experience also indicates a positive relationship between the paddy plant density and the occurrence of diseases of fungal origin.

(h) Fertilizer Practices

When all required nutrients are available in a balanced form, it has been observed that crop growth is more steady while pest and disease attacks are also at minimum. On the otherhand indiscriminate use of one plant nutrient over others, for example

excess nitrogen, favours a luxurious growth of plants causing an increase in the degree of susceptibility to insect pests and diseases; two cases at hand are the high incidence of Rice Blast disease associated with more nitrogenous fertilizer and the greater degree of paddy leaf folder attack with imbalanced nitrogen fertilization. Hence, by ensuring the application of correct fertilizer materials with optimum dosages at the right time, crop resistance to pest and diseases can be improved.

(i) Soil Management

At the time of establishment of crop plants, land preparation has to be done effectively so that different growth stages of insect pests and soil borne pathogens are surfaced for the action of natural forces, which results in the reduction of pests particularly those inhabiting the soil. Land preparation is also important in the control of weeds. Further, soil management practices should be adopted in such a way that soil erosion is minimised and the fertility of the soil is improved; the growth of crop plants on such soil becomes vigorous; leading to the greater resistance to pest and disease outbreaks.

(j) Staggering of Cultivation

Pests which feed on crop plants transfer themselves to alternate hosts during the off season. The growth and multiplication of pests during the off season becomes low because the alternate host plants do not provide the ideal source of food for the insects. However, an increase in extent of staggered planting techniques, combined with cultivation of varieties in different ages classes, provides a continuous source of food for insect pests throughout the year. This leads to the rapid proliferation of pest and disease population the control of which requires the