

MANAGEMENT OF INSECT PESTS OF CRUCIFERS IN NETTED STRUCTURES

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Introduction

Crucifers include the leafy vegetables such as chai sim, kailan, kiew chai, pek chai, cabbage, tua chai (sawi pahit), lettuce and ensabi. Large scale growing of crucifers is mostly carried out in netted structures these days. The scenario of pest infestations in netted structures is slightly different from the open fields. From our pest management trials, we have observed that the major pest problems in netted structures are caused by diamond back moth, cutworm, flea beetle and aphid, where as in the open system, centre-grub and cluster caterpillar are also problematic. The adult centre-grub and cluster caterpillar are rather big and thus are naturally excluded by the net. The cutworm adult is bigger in size than the centre-grub and cluster caterpillar adults. However, this particular cutworm has the habit of laying its egg masses on the net and upon hatching; the newly hatched larvae would enter the netted structure, by hanging down on a fine thread. This thread-like secretion is produced by them in order to reach the crops. For insects, this special adaptation is for survival.

Management of insect pests of crucifers

Pest management is a big challenge for vegetable growers. However, if preventive and direct (curative) measures are combined in an optimal way, the risk of infestation by pests can be reduced to a level that does not cause economically harmful yield reductions. In our trials in farmers' fields and our own observation plots at ARC Semongok, we have found that integrated pest management (IPM) is the way. IPM uses a combination of several control options that are cheap and sustainable. IPM approaches can include the use of insecticides, but the main aim is to reduce the use of these chemicals.

The most important element of IPM is pest monitoring. Daily inspection of the crops should be made, to assess the occurrence of pests. Yellow sticky traps are effective for the monitoring of the adults, while the larval stages are monitored by visual inspection on the underside of the leaves.

Knowledge about insects and their biology helps the growers to choose effective preventive crop protection measures. As many factors influence the development of pests, it is crucial to take immediate measures at the most sensitive points. This can be accomplished through the correct timing of management practices, a suitable combination of different measures, or the choice of a selective method.

Nowadays consumers are concerned about residual pesticide levels in the vegetables they eat. At the same time, growers often resort to chemical control as it is the easiest and fastest solution. However, it is not always the most suitable method. The other options available to growers are cultural and biological control methods. The former is inculcated into husbandry practices and incorporated into farming systems but it takes more effort and requires a longer period to show results. The latter is available as commercial products, specifically for certain pests and also existing in the natural farming ecosystem, when the beneficial insects (predators and parasites) feed on the pests.

Preventive measures

The approach towards overcoming pest problems should be long-term. Thus, the easiest and most effective way of doing this is to prevent potential pest situations within the farm. Adoption of good agricultural practices which include both cultural and agronomic measures is the prerequisite for sound pest management. Some of the measures that have been proven to be effective are as follows:

Use of netted structure. The use of the netted structure is as a physical means of excluding the insect pests has been very successful in reducing pesticide residue problems in vegetables.

Crop rotation. Crop rotation is a practice where a crop planted in an area is replaced by another crop in the next season. It is best to choose different crop types from different families for rotation. This is to disrupt the pest life cycles. An example of crop rotation is planting crucifers followed by legumes and then cucurbits or other root crops.

Sanitation measures. Removal and disposal of insect-infested plant parts and crop residues are useful pest management measures against some pests.



Removal of crop residues from vegetable bed

Use of flame thrower. The use of flame thrower as surface soil treatment would kill the pests on residual crops and soil surface. This also kills weed and grass seeds. This method is particularly effective against the flea beetle which pupates in the soil and also against the snails.



Farmer using flame thrower to kill pests on vegetable bed

Proper planting density. Proper planting density should be adopted to prevent overcrowding. A dense or overcrowded crop prevents good coverage during spraying of insecticides. It also provides hiding places for the pests. Thinning or transplanting of seedlings is usually practised.



Transplanting of seedlings

Crop fallow. In cases of serious pest infestations, it is best that a fallow period be observed. This is to break the pest life cycles and to prevent build-up of pest population.



Crop fallow in netted structure

Curative measures

Curative measures are used when the pest population already exists and it is important to take immediate measures to avoid crop loss.

Yellow stick traps. Yellow sticky traps could be used for both monitoring and control purposes.



Yellow sticky traps in netted structure

Pheromone traps. Pheromone traps for diamond back moths and cutworms are also available, but currently they are expensive to use.

Chemical control. The use of insecticides should be the last option. It is important when deciding to use an insecticide that the correct dosage and the correct choice be made. Always read the label and all instructions on the label must be adhered to, in particular observing the pre-harvest interval of the used product. In other words, the vegetables should not be harvested before the stated pre-harvest interval or waiting period is due. Only products recommended for the target pests and crops are to be used. The user should select those products which are less toxic and to use a variety so that the pest will not build up resistance to the chemical. The toxicity of insecticides is shown by the different colour bands which are normally at the bottom of the labels on the product. Growers are encouraged to use products with the 'WHITE' colour bands (eg. Bio-pesticides, *Bacillus thuringiensis* group) and 'BLUE' colour bands (eg. pyrethroid group). The products have shorter pre-harvest intervals.

The usual practice is spraying before the next crop is planted, to get rid of the residual pests and also the earwigs which are usually brought in with the fresh poultry manure and the soil from outside. This is a good practice, as the insecticides are not used directly on the crops. However, this practice should also be restricted to the use of the less toxic ones such as those with the 'BLUE' colour bands. During heavy pest infestation, insecticides should be used

during the early stages i.e. first to second weeks of the crop cycles as the crop cycles for crucifers are very short. Depending on the variety, they range from three to four weeks. Spraying is more effective when it is carried out in early morning or late evening when it is cool, as the pests often go into hiding during the hot time of the day.

Bio-pesticides. The use of bio-pesticides for pest control is highly recommended. They are safe to the users and the environment and do not cause any residue problem in the farm produce. Various products are available in the markets. Some of these examples are neem extracts (eg. Neemix), *Bacillus thuringiensis* (eg. Lepicide, Protect, Thurex, Agree, Dipel, Bactospeine, Centari, Thuricide, Florbac, Biobit). These bio-pesticides are effective against the larvae of the moth group of insects such as diamond back moth, cutworm, centre-grub and cluster caterpillar.