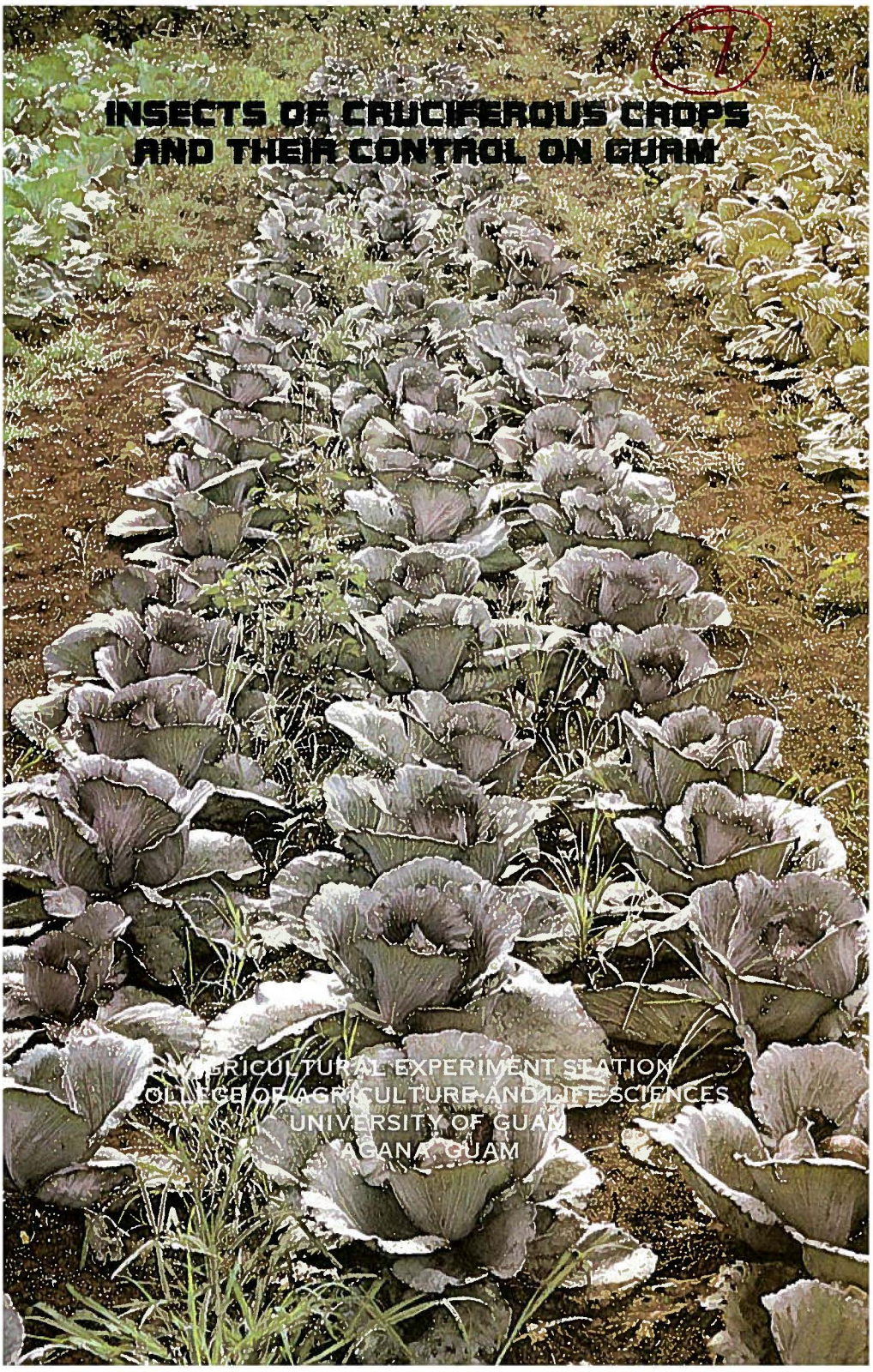
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INSECTS OF CRUCIFEROUS CROPS
AND THEIR CONTROL ON GUAM
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INSECTS OF CRUCIFEROUS CROPS AND THEIR CONTROL ON GUAM

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INTRODUCTION

Crucifers are the second most common group of vegetable crops grown on Guam. Crucifers include all crops belonging to the family Cruciferae such as, cabbage, Chinese cabbage, radish, cauliflower, kohlrabi, Brussels sprouts, turnip, collard, etc. All cruciferous crops are infested by a specific group of insect pests. Most of them are of Asiatic origin, except the cosmopolitan ones. The control measures recommended in the continental United States are frequently not applicable due to various reasons such as differences in pest species, climatic conditions, cultural practices, environmental factors, or natural enemies.

Indiscriminate use of insecticides in the past has resulted in the development of pest resistance to insecticides and in the destruction of natural enemies in the field. For pest control to be more economical, an integrated approach, often referred to as pest management, must be adopted by combining control methods such as crop rotation, destruction of crop residues, growing resistant varieties, trap cropping, utilizing natural enemies, etc.

An important factor for success in vegetable pest management is to recognize the pest species and to use the correct insecticide, or other method of control.

This bulletin is intended to provide information to help farmers recognize the cruciferous crop pests on Guam and to select and use the best method of control.

There are ten insects considered to be pests of cruciferous crops on Guam. For each insect a description along with a brief life history, type of damage, and appropriate control measures are discussed. An appendix of metric-English weight and measurement conversion is included.

Diamondback Moth - *Plutella xylostella*

1. Diamondback moth: *Plutella xylostella*

Description

The small light green caterpillar of this moth rarely is more than one centimeter in length. This caterpillar wiggles actively when disturbed by a touch. The cocoon covering the pupa is made of transparent loosely spun silk and is normally fastened to the underside of a leaf.

Life History

The female moth typically lays one to three eggs in one spot on a cabbage leaf. Eggs are oval, flattened, translucent and light yellow in color. These eggs hatch into small caterpillars which feed by boring into the leaves of the cabbage for two to three days, after which they feed on the outside of the leaves. Upon reaching the size of one centimeter, the caterpillar becomes a pupa enclosed in a loosely spun transparent cocoon attached to the underside of the outer cabbage leaves. The adult moth emerges from the pupa after four to six days.

Damage

The caterpillar eats the surface of the outer leaves. If the caterpillars are present in sufficient numbers, economic damage will result, particularly if the cabbage plants are small.

Control

a) Biological sprays

Bacillus thuringiensis formulations like Biotrol, Thuricide and Dipel are effective in controlling this pest by spraying at one tablespoon of the insecticide per gallon of water.

b) Natural Enemies

A local parasite of the diamondback moth, *Chelonus blackburni,* has been recorded on Guam but it is not very effective. Three different parasites of this pest, namely, *Apanteles plutelle, Thyraeela colaris,* and *Tetrastichus sokolowskii* from India, and a parasite, *Diadegma insularis,* from Hawaii were introduced to Guam. Their establishment is still uncertain.

c) Resistant Varieties

The head cabbage variety "Ruby ball" is not preferred by this pest in the presence of other normal green colored varieties.

2. Asiatic cabbage borer: *Hellula undalis*

Description

The caterpillar is about two centimeters in length and when mature has a dark head and a light reddish colored body.

Life History

The female moth lays single eggs on the cabbage leaves. These eggs hatch, and the caterpillars feed until becoming pupae. Adult moths emerge out of pupae.

Damage

This caterpillar bores into the leaf petioles or veins of the mature

Cabbage borer - *Hellula undalis*

plants; in young plants it feeds on the terminal bud.

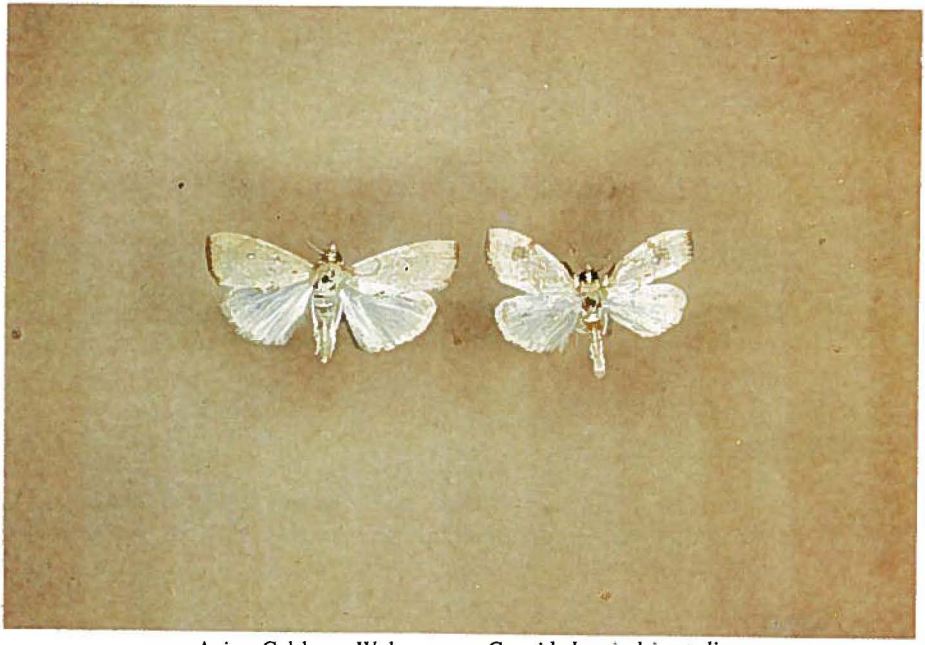
Control

a) Chemical

Spraying with an insecticide like Dibrom at two teaspoons in one gallon of water is necessary soon after noticing this pest in the field. In some seasons, cabbage borer infestations start even when the plants are in the cotyledonous seedling stage and in this case the borer feeds on the terminal buds and destroys the crop.

b) Host Preference

It prefers raddish and Chinese cabbage more than head cabbage, turnip, kohlrabi, broccoli and Brussels sprouts.



Asian Cabbage Webworm - *Crocidolomia binotalis*

3. Asian cabbage webworn: *Crocidolomia binotalis*

Description

This slender green caterpillar has four white stripes running along the back and sides. The caterpillars are usually found in close groups when very small. As the caterpillar length approaches one centimeter, these groups will spread out over the cabbage leaves and particularly around the inner head. These caterpillars construct thin silken webbing and feed on the leaves by remaining underneath the webbing.

Life History

The female moth lays a smooth surface mass of eggs which hatch into a close group of small caterpillars. As they grow, the group spreads out over the cabbage. The resting stage (the pupa) is spent in the soil until the pupa becomes an adult moth.

Damage

The larvae generally feed on the cabbage leaf surface but as they grow they tend to eat into the inner head portion of the cabbage plant.

Control

a) Chemical

Spraying Dibrom at two teaspoons per gallon of water at three to four day intervals controls this pest.

b) Natural Enemies

The eggs are parasitized by a parasite, *Trichogramma* sp., and the larvae are parasitized by *Aphanogmus* sp. to a certain extent.

c) Host Preference

It prefers Chinese cabbage and turnip followed by broccoli and Brussels sprouts and to a certain extent head cabbage, radish and kohlrabi.

4. Cutworm: *Spodoptera litura*

Description

This multicolored smooth-skinned caterpillar frequently acquires a dark skin color as it matures to about three centimeters in length. The body is stout and considered hairless. The very young caterpillars are found all over the cabbage whereas the older caterpillars tend to eat into the head.

Life History

The female moth is brownish with silvery markings on the forewings. She lays a hairy surfaced mass of eggs mostly on the lower surface of leaves which hatch into a group of small caterpillars that spread out rapidly. When the caterpillars become mature, they develop into pupae which rest in the soil until emerging as adult moths.

Damage

The caterpillar generally feeds on the cabbage leaf surface but as it grows, it moves into the inner head portion of the plant.

Control

a) Chemical

Cutworm - *Spodoptera litura*

Spraying with Sevin or Dibrom at two teaspoons per gallon of water controls this pest.

b) Natural Enemies

A microsporidian disease is known to affect the caterpillars in the field. In addition, an egg parasite, *Telenomus* sp., and two larval parasites, *Apanteles marginiventris* and *Meteorus* sp., are very common on Guam.

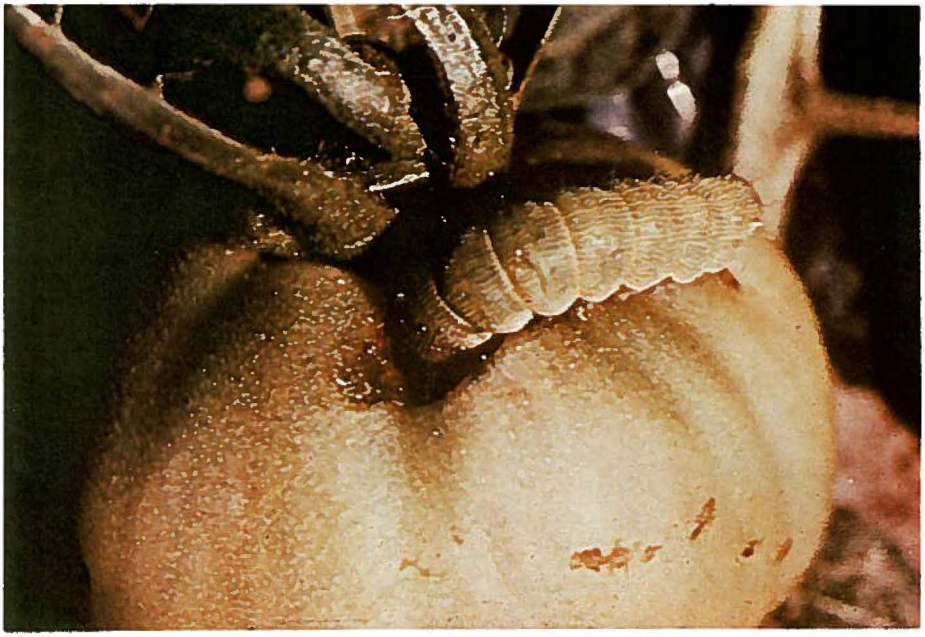
c) Host Preference

It prefers head cabbage and kohlrabi more than other cruciferous crops.

5. Corn earworm: *Heliothis armigera*

Description

The caterpillar of this pest varies greatly in coloration. The young caterpillars always have dark bristle-like hairs spread over the body



Corn earworm -*Heliothis armigera*

whereas those approaching two centimeters in length have hairs which are spread further apart and are usually light in color.Generally one or more caterpillars occur per infested cabbage plant but a single caterpillar can ruin the head.

Life History

The adult moth lays single eggs on the cabbage plants. The eggs hatch into small caterpillars which soon feed on the inner head portion of the cabbage. After reaching maturity, the caterpillar attains a resting stage called the pupa. The pupa remains in the soil until becoming an adult moth.

Damage

The growing caterpillar seeks to be alone and inside a safe place. It therefore generally feeds on the inner portion of the cabbage head creating an unsightly head. This cavity also fills with excreta that is difficult to remove by washing.

Control

a) Chemical

Spraying with Sevin or Lannate at two teaspoons per gallon of water controls this pest. Lannate is very toxic.

b) Natural Enemies

The ecto-parasite that attacks *S. litura* also parasitizes the corn earworm larva on Guam.

Garden looper - *Chrysodiexis chalcites*

6. Green garden looper: *Chrysodeixis chalcites*

Description

This distinctly green caterpillar moves by humping its back with appropriate movement of the rear and front legs. The caterpillar is slender and when mature is about two centimeters long. It is typically found on the outer leaves of cabbage.

Life History

The adult moth lays single eggs on the cabbage leaf. The eggs hatch and the caterpillars grow to about two centimeters in lenght. The caterpillars then become pupae and remain on the cabbage plant covered in silken cacoons until becoming adult moths.

Damage

Holes approximately one to two centimeters in width may be the result from feeding by the green garden looper. These holes are typically found in the outer leaves of cabbage plants.

Control

a) Chemical

Sevin or Dibrom at two teaspoons per gallon of water controls this pest.

b) Natural Enemies

A polyembryonic parasite, *Copidosoma* sp., attacks the larvae on Guam.

Turnip aphid - *Hyadaphis pseudobrassicae*

7. Turnip aphid: *Hyadaphis pseudobrassicae*

Description

A small whitish-green plant louse about the size of small bird shot is found in dense clusters on the cabbage plant.

Life History

The wingless adult aphid lays young aphids, bypassing the egg stage. If food becomes unsatisfactory, the adult females develop wings and fly to a satisfactory host plant.

Damage

Cabbage leaves curl, crinkle or form cups where the aphids are feeding. In severe infestations, the cabbage plants begin to wilt and die.

Control

a) Chemical

Spraying with Malathion at one tablespoon per gallon of water controls this pest.

b) Natural Enemies

A fungus disease affects this pest during the rainy season.

c) Host Preference

Chinese cabbage, turnip, kohlrabi and radish are preferred more than other cruciferous crops.

8. Leafminer: *Liriomyza sp.*

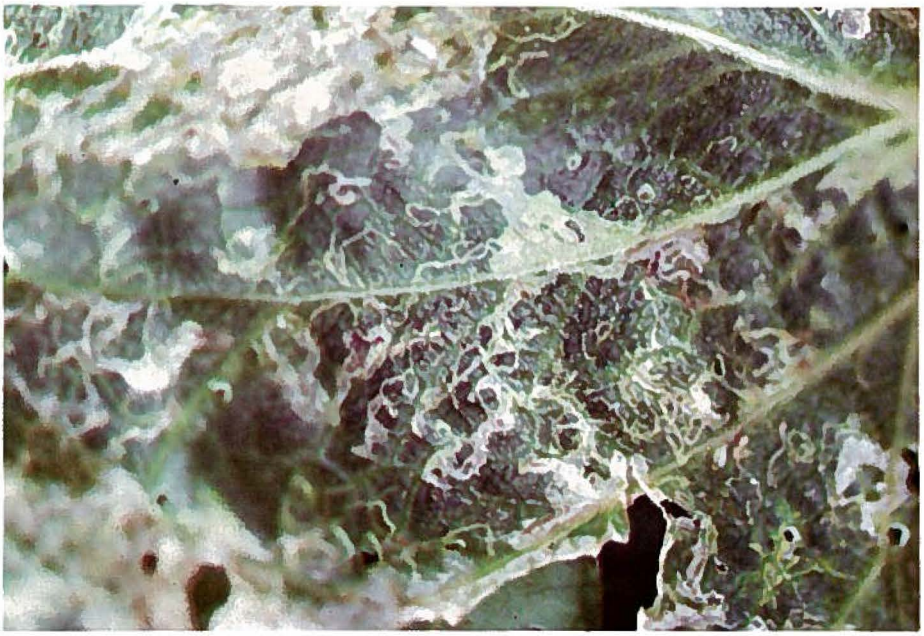
Description and Damage

This leafminer is the maggot of a small fly which burrows and tunnels inside the cabbage leaf. The damage appears either as a whitish spot or as a whitish winding trail. Both types of damage are between the upper and lower surfaces of the leaf. These wounds weaken the plant and reduce the sale value of the cabbage. When the maggots reach maturity, they come out of the tunnel, fall to the ground and pupate in the soil.

Control

Chemical

Spraying with Cygon or Diazinon at two teaspoons per gallon of water should be done whenever leafminer damage symptoms



Leafminer - *Liriomyza sp.*

are noticed in the field. Be sure to read the label when working with Diazinon or Cygon. They are moderately toxic.

9. Fleahopper: *Halticus tibialis*

Description and Damage

This is a small bug that looks somewhat like a shiny black aphid

Flea hopper - ***Halticus tibialis***

but has a jumping habit that distinguishes it as a fleahopper. Small pale spots appear on the leaves where the fleahopper has been sucking. The fleahopper body is only about two millimeters in length. However, it is a very active insect.

Control

a) Chemical

Spraying with Malathion at one tablespoon per gallon of water will control this pest.

b) Host Preference

It prefers Chinese cabbage more than all other cruciferous crops.

10. Ants: *Solenopsis sp.*

Description and Damage

This ant moves in trails along the ground under cabbage plants and cuts the plant off at ground level.

Control

Chemical

If the ants are found at seeding time, the field should be sprayed with Diazinon at two tablespoon per gallon of water immediately after planting. If the ants are damaging young transplanted seedlings, Diazinon should be used at one tablespoon per gallon of water.

Other species of ants may nest close to mature plants and may be seen crawling on them if the plants are infested with aphids, mealybugs, whiteflies or scale insects. These ants are there to feed on honeydew secreted by these other insects. Aphids, mealybugs whiteflies and scale insects also cause crop damage and by taking appropriate measures to control them, the ants that are on the plants will also be controlled.

A Final Suggestion

In the past, indiscriminate pesticide use has intensified rather than alleviated the insect problems of farmers. How can this be true when all we wanted to do is destroy the pests?! The fact is that

many pesticides kill a wide variety of insects but not all insects are harmful. Many beneficial insects are the enemies of other insects. When we destroy these beneficial insects, the balance of nature is disturbed. The unfortunate result of this imbalance has often been an abnormal increase of certain insect pest populations so that more and more pesticide must be used to control the pest. To avoid this condition, we recommend less frequent use of pesticides at the appropriate time. See your extension agents!

Watch Your Step!

In the control of insect pests, five ideas must be considered:

1. You must apply the correct pesticide (as allowed by the present law) to achieve the maximum result. Read the label!

2. Spreader-sticker mixed with an appropriate pesticide formulation improves control.

3. Sprayers must be calibrated and adjusted for maximum efficiency and good coverage.

4. New pesticides become available that are not listed in this publication. See your extension agent!

5. You must apply the correct pesticide at the proper life stage of the insect.

By the latter statement, it is meant that if the target insect is in its resting stage i.e. the pupa, you probably will not be successful using a pesticide to kill it. The same concept applies to using pesticides on the eggs of an insect. It is generally best to apply the pesticide on the younger feeding form of the insect pest. For example, apply the pesticide that the extension agent recommends, to the young worms of the corn earworm before the worms mature and move inside the cabbage head.