

B.2. Identification of Insects

ជំងឺកសិកម្ម

B.2.1. Beet Army Worm (*Spodoptera exigua*)



Picture 165 : Mass of eggs.



Picture 166 : First instars of larvae.



Picture 167 : Adult larva.



Picture 168 : Mature larva.



Picture 169 : Pupa.

Description:

Eggs are laid in clusters at the underside of leaf, greenish to white in color.

Mature larvae are about 25 mm long, green with a yellow underside and dark green.

Pupa is about 15 to 20 mm long, light brown.

Pupation occurs in the soil.

Moth has a wingspan of 25 to 32 mm. The adult moth is gray with two yellow marks near the centers of the fore wings. The moths are night flyers.



Picture 170 : Adult moth (from the top).



Picture 171 : Adult moth (from the side).

Damage:

The larva feeds on the foliage of plants, and can completely defoliate small ones. Smaller larvae devour the parenchyma of leaves, so that all that remains are the thin epidermis and veins. Larger larvae tend to burrow holes through thick areas of plants.

Host plants: Bean, peas, celery, lettuce, potato, tomato, eggplant, cotton, tobacco, onion, corn, pepper, cabbage, soybean, peanut, flower crops and others.

ជំងឺកាត់ដើម

B.2.2. Black Cut Worm (*Agrotis ipsilon*)



Picture 172 : Eggs.



Picture 173 : Larva.



Picture 174 : Nymph.

Description: Eggs are usually laid in soil. Larva is gray or brown, seldoms seen during the day. The mature larva is 30 - 40 mm long. Adults have a wingspan of about 35 - 50 mm, are brownish in color with black slashes near the outer edges of the front wings.



Picture 175 : Moth.

Damage: This pest attacks all garden vegetables, especially new seedlings and transplants by cutting down the stem.

Host plants: Cotton, crucifers, cucurbits, egg plant, tomato, pepper, groundnut, maize, sweet potatoes, rice, onions and others.

ជំងឺចង្កូតស្ពីរូងបណ្តុល

B.2.3. Cabbage Head Caterpillar (*Crocidolomia binotalis*)



Picture 176 : Eggs.



Picture 177 : Larvae after hatching.



Picture 178 : Young larva.



Picture 179 : Mature larvae.



Picture 180 : Nymph.



Picture 181 : Adult moth.

Description: The eggs are laid in clusters and held together by gelatinous glue. The newly hatched larva is slender and greenish-yellow in color and has a dark-brown head. As the larva grows, its body becomes green and its head becomes brown with light patches, and then turns whitish with longitudinal stripes (three dorsal and two lateral) as it matures. These stripes disappear only when larvae are close to pupation. A mature larva measures 1.2-1.6 cm long. Pupation is in the soil. Adult moths are grayish-brown in color, with a wingspan of 1 cm. Each front wing has a black spot and zigzagging pale brown lines. It is active in the twilight, night and dawn hours.

Damage: For the first 4 or 5 days from hatching, the small larvae feed on the underside of leaf. Older larvae feed under a web of silk on young leaves, petioles and growing points of the plant, often damaging it entirely, by eating most of the soft tissue leaving only the ticker veins.

Host plants: Cabbage, cauliflower, Chinese cabbage, broccoli, radish, watercress, cotton and others.

ជំងឺចង្កូង

B.2.4.

Cabbage Looper (*Trichoplusia ni*)



Picture 182 : Eggs and young larva.



Picture 183 : Young larva.



Picture 184 : Young larva.



Picture 185 : Adult larva.



Picture 186 : Pupa.



Picture 187 : Mature pupa.



Picture 188 : Adult moths.



Picture 189 : Adult moth.

Description: The eggs are laid on the underside of the lowest leaves and are round, ridged, tiny and white. Young larvae have a black head then become green. Older larvae are light green with a white stripe along each side of the body and two white stripes along the back. Pupation is in the cocoon under the leaf. The pupa is light green in the early stage and turns to dark brown in the mature before becoming an adult. Adults are grayish to dark brown with a silvery spot near the center.

Damage: Larval feeding on foliage is usually initiated on mature leaves and can occasionally occur on the surface of mature fruits. Older larvae consume large irregular areas of leaves, characteristically leaving the larger leaf veins.

Host plants: Cabbage, cauliflower, celery, pea, potato, lettuce, tomato, tobacco, cucumber, cotton, soybean, pepper, watermelon and others.

ជំងឺវត្សក្រុយ

B.2.5. Cabbage Webworm (*Hellula undalis*)



Picture 190 : Eggs.



Picture 191 : Young larva.



Picture 192 : Adult larva.



Picture 193 : Adult larva and pupa in cocoon.

Description: Eggs are oval and about 1 mm long, grayish-white at first, later acquiring a pinkish color. Caterpillars are dusty yellow with broad purple stripes along their 15mm long bodies. Larvae produce a lot of silk, in which they form webs on leaves for protection. Pupa is yellowish-brown, occurs within a cocoon made of silk and soil particles. Adults have brownish-yellow with mottled with darker brown. Wingspan is about 18 mm.



Picture 194 : Adult moth.

Damage: Larvae damage leaves, bore into buds, stems, and stalks. They destroy or disfigure buds and sometimes kill entire plants.

Host plants: Broccoli, cabbage, cauliflower, Chinese mustard, eggplant, mustard and others.

ជំងឺវាយសណ្តែក

B.2.6. Diamond Back Moth (*Plutella xylostella*)



Picture 195 : Eggs.



Picture 196 : Young larva.



Picture 197 : Adult larva.



Picture 198 : Mature larva.



Picture 199 : Pupa.



Picture 200 : Mature pupa.

Description: Eggs are yellow or pale green in color. The larvae are green. They feed on the lower surface of the leaf. Pupation occurs in a loose silk cocoon and is usually formed on the lower or outer leaves. In cauliflower and broccoli, pupation may occur in the florets. Initially, the pupae are light green but as they mature, they become brown as the adult moth.

The adult is a small, slender, grayish-brown moth. It is marked with a broad cream or light brown band along the back.

Damage: Diamondback moth larvae feed on leaves, buds, flowers, seed pods, green outer layer of the stems. Small incomplete holes are caused by young larvae, while larger complete holes are caused by mature larvae. Larvae also feed on developing heads of cabbage, causing deformed heads and soft rots.



Picture 201 : Adult moth.



Picture 202 : Adult moth.

Host plants: The pest attacks only plants in the Cruciferous family: cabbage, mustard, coli flower, broccoli, Chinese kale and others.

សត្វទារក

B.2.7. Striped Flea Beetle (*Phyllotreta striolata*)



Picture 203 : Egg.



Picture 204 : Larva feeding on root hair.



Picture 205 : Pupa.



Picture 206 : Adult.

Description: Eggs are oval to elongate white , laid in the soil close to the host plant. Larvae are white with brown-headed when fully grown, and 3.2 to 5.0 mm long. Pupa is white.

Adults are shiny black with a greenish tinge, 1.5 to 2.5 mm long, having a wavy yellow line running the length of each wing cover.



Picture 207 : Adults chewing leaf.

Damage: Larvae feed on roots and leaves. Adult flea beetles cause the most damage by feeding on foliages, cotyledons, and stems. As flea beetles feed, they create shallow pits and small rounds.

Host plants: Potato, egg plant, tomato, pepper, cabbage, mustard and others.

B.3. Diseases

ជំងឺម៉ូសាអ៊ិច

B.3.1.

Turnip Mosaic Virus



Picture 208 : Early stage of the disease on the seedling (Chinese cabbage).

Description:

Plant appears stunted with mottled leaves. The typical mosaic symptom often develops first on the leaf under surface as dark green spots which turn necrotic forming a ring spot pattern.



Picture 209 : Late stage of the disease on the seedling (Chinese cabbage).

Damage:

The disease limits plant development, especially leaf.

Factors favoring disease

development: Disease is transmitted by aphids.



Picture 210 : Severe stage of the disease on the seedling (Mustard).

Host plants:

Crucifers, beets, spinach, tobacco and others.

ជំងឺរលួយទន់

B.3.2.

Bacterial Soft Rot (*Erwinia carotovora*)



Picture 211 : Soft rot on leaf of cabbage (Cabbage).

Description:

Infected plant tissues first develop a water-soaked lesion that enlarges rapidly in diameter and depth. The affected area becomes soft and mushy and generally turns a dark color in advanced stages of disease development. Disease losses from soft rot may occur in the field, transit, or storage.

Damage:

Damage leaf, flower or whole plant.



Picture 212 : Soft rot on cauliflower (Cauliflower).



Picture 213 : Soft rot on broccoli (Broccoli).



Picture 214 : Decayed and collapsed plant (Chinese cabbage).

Factors favoring disease development:

- Infected plant debris left rotten in the field.
- Plant wounds and injuries.
- Hot and damp weather with plenty of rainfall.

Host plants:

Potato, sweet potato, cassava, onion, cabbage and other crucifers, carrot, tomato, beans, corn, cotton, coffee, banana, and many other succulent agricultural crops.

ជំងឺអុតកង

B.3.3. Alternaria Leaf Spot (*Alternaria* spp.)



Picture 215 : Early ring spot lesion (Cabbage).

Description:

The disease first appears as small dark brown or black spots on leaves. As the spots enlarge a definite zonation, or concentric rings, they become evident. As spores are produced, the spots, especially in the center, become darker than other areas of the spots. With development of numerous spots, the leaves may turn yellow and die. Spots on stems and leaf petioles are elongate and purple to brown.



Picture 216 : Old ring spot lesion.

Damage:

Produce lesion on the leaves.



Picture 217 : Ring spot.

Factors favoring disease development:

The pathogens are seedborne. They also sporulate profusely on debris from infected plants, and persist on susceptible weeds. *Alternaria* is readily spread by wind. The disease is enhanced by warm and wet weather with an optimum temperature between 25 and 30° C.



Picture 218 : Numerous circular spot on leaf (Chinese cabbage).

Host plants:

Tomato, melon, cucumber, celery, cabbage, kale, cauliflower and others.

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B.3.4. Clubbed Root (*Plasmodiophora brassicae*)



Picture 219 : Healthy root and clubbed root.

Description:

The disease is caused by soil-borne fungus. Infected plants at first appear normal, but as they mature, they become unthrifty, grow slowly, wilt during sunny days and become stunted. Affected plants have large galls or clubs on the roots and will produce a poor crop, or no crop at all.



Picture 220 : Affected root (Chinese cabbage).

Damage:

The disease damages a root system that is a main source of nutrients and water supply, resulting in the unhealthy plant and died in severe infection.

Factors favoring disease development:

- Presence of pathogen or its spores in soil.
- Acid soil (pH < 7).
- Contaminated agricultural equipment.



Picture 221 : Affected crops wilt during day time.

Host plants:

Cabbage, cauliflower, kale, broccoli and others.

ជម្ងឺផ្លូវតសំឡី

B.3.5. Downy Mildew (*Peronospora brassicae*)



Picture 222 : Upper surface of leaf (Cabbage).



Picture 223 : Under surface of leaf (Cabbage).



Picture 224 : Under surface of dried leaf (Cabbage).

Description:

The disease is caused by fungus pathogen. It initially appears as irregular yellow patches on the leaves. These lesions later turn tan to light-brown. Under cool and humid weather conditions, the fungus develops white fungal growths on the undersides of leaves. Heavily infested leaves will have a blighted appearance as a result of numerous infected sites. Early symptoms on transplants may resemble bacterial leaf spot. Severely diseased seedlings are stunted that will die eventually.

Damage:

- Damage seedling.
- Damage leaves.

Factors favoring disease development:

- Cool and warm moist weather conditions.
- Weeds found in between the crops.
- Infected leaves that are left to rot in the field.
- Poor plant aeration.
- Spores can be carried by insects, wind, rain, and tools.

Host plants:

Tobacco, crucifers, soybeans, alfalfa, onion, and others.

Part II. Integrated Pest Management (IPM)

Integrated Pest Management (IPM)

Integrated Pest Management (IPM) is a system of crop management which includes all measures to control pests and assure growth of crops in order to get high yield with sustainable production and economic efficiency and to minimize the risk to human health and environment. The IPM carefully considers reducing pesticide use to control the pests. The basic concept of the crop management is to well understand a crop eco-system including predators and other factors. The first step to understand the crop eco-system is to check crops regularly. The long experiences by the IPM show that the good crop management can reduce agricultural inputs including pesticides without decreasing the yield.

Through the National IPM Programme, the MAFF has been recommending farmers to firstly consider using various approaches than the use of pesticides in order to tackle any pest problem within the context of the IPM. It is because they can effectively work against the pests in most cases, while they are generally inexpensive and friendly to our health and environment. In other words, chemical control measures should be applied only when they are absolutely necessary as the last measure.

The implementation of the IPM is based on the 4 principal concepts below.

- Better crop growth: farmers should have knowledge about seed selection by choosing good seeds which are high-yielding, resistant to insects and diseases, and suitable to local conditions and environment. Besides that farmers should be aware of soil preparation, transplanting, crop control and balanced use of fertilizers.
- Preservation of beneficial insects: farmers should recognize types and population of beneficial insects in the fields by understanding their habits and preys. Based on this knowledge, farmers must be able to carefully consider measures to protect their crops, especially before their decision to use chemical pesticides. In addition, farmers can preserve the beneficial insects by reducing to use chemical pesticides or trying to use less poisonous pesticides which cause less adverse effects on humans, animals and environment. This knowledge may help farmers think about economic efficiency in their production.

- Regular field check: This is an important work that leads farmers to control and evaluate their field situations such as plant growth, water, soil, weeds, presence of beneficial and harmful insects and their damages. Through this practice, farmers can know about the problems and take necessary and appropriate measures on time.
- Farmers become experts on their production: In order to promote their self-confidence and independence, it is necessary to improve farmers' knowledge about the field check, field analysis and self-decision through exchanges of their experiences with technical experts or among their counterparts in their communities. With this knowledge, farmers will share what they know with others.

Finally, below are practical examples on how to control rice pests with the IPM. Although there are many different methods under the IPM strategy, actual methods to be used will depend on the crop and pest situation, infrastructure under which the crop is produced, as well as the availability of resources.

For more detailed information about those methods and strategies of the IPM, please contact the National IPM Programme in the MAFF.

| Control on rice pests with the IPM |
|--|
| 1. Diseases of rice |
| 1.1. Brown Spot: <ul style="list-style-type: none"> a. Use varieties that are resistant to fungus infection. b. Soak seeds in warm water (53-54 °C) by 10 – 12 mn before planting. c. Apply fertilizers properly. d. Manage water in the field. Keep the soil dampened at least. e. Avoid overdosing nitrogen fertilizers and apply the small amount at the early stage for their use in the next stage. f. Use fungicides under the direction of technical expert at the tillering and early reproductive stages. |
| 1.2. Blast: <ul style="list-style-type: none"> a. Use resistant varieties. b. Plant rice at the early rainy season. c. Avoid planting densely. d. Planting in row so that light and air can pass through. |

- e. Avoid overdosing fertilizers, especially nitrogen.
- f. Use nitrogen fertilizers in balance.
- g. Use fungicides as the last resort under the direction of a technical expert, only when the other measures mentioned above are failed.

1.3. Sheath Rot:

- a. Plant with appropriate density.
- b. Apply potassium fertilizer at the tillering stage to strengthen the stem and leaf tissues.
- c. Spray Sulphate Calcium and Zinc to leaf at the tillering stage.
- d. Remove infected stubbles and weeds from the field.
- e. In case of severe infestation, use fungicides under the direction of a technical expert at the reproductive stage.

1.4. Sheath Blight:

- a. Plant with appropriate density.
- b. Apply nitrogen appropriately.
- c. Remove infected stubbles and weeds.
- d. In case of severe infestation, use fungicide under the direction of a technical expert.

1.5. Leaf Blight:

- a. Use resistant varieties.
- b. Remove rice stubbles and weeds.
- c. Keep water in nursery with shallow level and have small waterways.
- d. Plough and dry the soil after the harvest.
- e. Apply fertilizer, especially nitrogen fertilizer in balance.
- f. Plant rice with appropriate density.

1.6. Leaf Streak:

- a. Use resistant varieties.
- b. Soak seeds in warm water before planting.
- c. Apply fertilizer in balance. Avoid overdosing nitrogen fertilizer.
- d. Plant with appropriate density.
- e. Plough the field after the harvest.
- f. Remove stubbles and weeds.
- g. Build small waterways in nursery.

1.7. Rice Yellow Dwarf and Rice Ragged Stunt Virus:

- a. Use varieties which are resistant to insect vectors (brown planthopper).

- b. Apply fertilizer in balance. Avoid overdosing nitrogen fertilizer.
- c. Remove infected hills from the field and destroy them.
- d. Remove stubbles.
- e. Control brown planthoppers by practicing IPM.

1.8. Tungro:

- a. Use resistant varieties.
- b. Remove infected hills and destroy them.
- c. Plough after the harvest to destroy stubbles.

2. Insects of rice

2.1. Rice Thrip:

- a. Apply ash to the infected field.
- b. Submerge the nursery/direct seedling field.
- c. Use a soaked mosquito net or kroma made of cotton threads to cover the nursery and wring it to kill thrip.
- d. After irrigation, apply urea to improve the growth.

2.2. Brown Planthopper:

- a. Prepare the nursery away from electric light.
- b. Use resistant varieties.
- c. Field should be planted at the same period.
- d. Avoid planting during the outbreak of brown planthopper.
- e. Remove weeds from the field and surroundings.
- f. Apply fertilizer in balance (avoid overdosing nitrogen).
- g. In case of the enormous presence of brown planthoppers, submerge the nursery and move a mosquito net to catch brown planthoppers.
- h. Use fire trap to observe a population of brown planthoppers and take measures on time.
- i. Preserve beneficial insects by reducing to use chemical pesticides.
- j. In case the measures mentioned above are failed, use of chemical insecticides is the last resort under the direction of a technical expert in order to minimize the adverse effects on human, animal and environment.

2.3. Rice Case Worm:

- a. Create a noise by using wooden rattle during the nursery stage in order to reduce the damages caused by case worm.
- b. Irrigate the nursery at level of leaf collar, and use a mosquito net to catch

the worm.

- c. Drain water by using filter to catch worm. Reirrigate in the next 2-3 days.
- d. Apply ash to the place where insects infest.
- e. Apply neem leaves to the place where insects infest.
- f. Preserve beneficial insects by reducing to use chemical pesticide.
- g. Release ducks to the field.
- h. In case the measures mentioned above are failed, use less toxic fungicide by following recommendations of a technical expert.

2.4. Yellow Stem Borer:

- a. Use resistant varieties.
- b. Plough the field after harvest.
- c. Destroy eggs during transplantation.
- d. Apply fertilizer in balance.
- e. Preserve beneficial insects.
- f. In case the measures mentioned above are failed, use less toxic fungicide by following recommendations of a technical expert.

2.5. Rice Army Worm:

- a. Plough the field before planting.
- b. Remove weeds from the field and surroundings.
- c. After irrigation, remove floated things.
- d. Preserve beneficial insects by reducing to use chemical fertilizers.
- e. In case of outbreak, dig long shallow holes surrounding the field and fill them up with ash to prevent the migration of army worm.
- f. In case the measures mentioned above are failed, use chemical insecticide by following recommendations of a technical expert.

2.6. Leaf Roller:

- a. Plant rice far from the shade and with appropriate density.
- b. Remove host plants.
- c. Apply fertilizer appropriately (avoid overdosing nitrogen).
- d. Preserve beneficial insects by reducing to use chemical insecticide.
- e. In case the measures mentioned above are failed, use chemical insecticide by following recommendations of a technical expert.

2.7. Black Bug:

- a. Remove host plants.
- b. Apply fertilizer appropriately.

- c. Submerge field and remove insects by using a mosquito net.
- d. Drain the field (black bugs do not like the dry environment).
- e. Crush black bugs and mix them with water and spray it to expel the black bug.
- f. In case the measures mentioned above are failed, use chemical insecticide by following recommendations of a technical expert.

2.8. Rice Bug:

- a. Remove host plants.
- b. Spray aromatic soap solution to expel the rice bug.
- c. Use prahok near the field to attract the rice bug.
- d. Use a mosquito net to remove the rice bug, crush and put it in water and spray it to expel the rice bug.
- e. In case the measures mentioned above are failed, use chemical insecticide by following recommendations of a technical expert.

2.9. Golden Apple Snail:

- a. Prepare to dig a long shallow hole and post a wooden picket so that snails can lay egg. By using this measure, the eggs can be removed.
- b. Drain the field and pick snails up from the long shallow hole.
- c. Release ducks to the field.
- d. Organize a campaign to eliminate snails, buy and destroy them or use them as animal feeds.
- e. In case the measures mentioned above are failed, use chemical insecticide by following recommendations of a technical expert.

2.10. Rat:

- a. Destroy the rat's habitat in community level by organizing a campaign to eliminate or buy them.
- b. Use bamboos or plastic tubes as rat's habitat surrounding the field.
- c. Use traps to catch rats.
- d. Use poisonous bait to kill rats.
- e. Use iron wire with electronic battery to kill rats at night (be careful of it during the operation).
- f. Preserve the predators like owl, python, etc.

Part III. Pest Control by Using Pesticides

A. Warning on Use of Pesticides

Pesticides are poisonous in case they are not properly handled and used. Always read and carefully follow all precautions and safety recommendations given on the container label. Store all chemicals in the original labeled containers in a locked cabinet or shed, always away from foods and feeds and out of reach of children and unauthorized persons, pets and livestock. Confine chemicals to property being treated. Avoid drift onto neighboring properties, especially gardens containing fruits or vegetables ready to be picked. Never reuse or burn the empty container or dispose of them in such a manner that they may contaminate the water supplies or natural waterway.

Please contact the agricultural extension official in your local area to get more information on how to use pesticides properly.

B. How to Read Labels of Pesticides

Once it was decided that a pesticide must be used as a last measure, a pesticide must be correctly selected and used to solve pest problems. It must be remembered that a pesticide should not be bought and applied simply because of the cheap price. It is a waste of time and money if it is not effective against the pest. It is very important for the end-users to properly read and understand the label information of pesticides and know which pesticide they should buy and use to solve their pest issues effectively. Therefore, this Section explains about important information in the labels of pesticides that the end-users need to know so that they can properly select and use a correct pesticide against their pest problems.

Below is the label sample and information about each section in the sample that the end-users need to know.

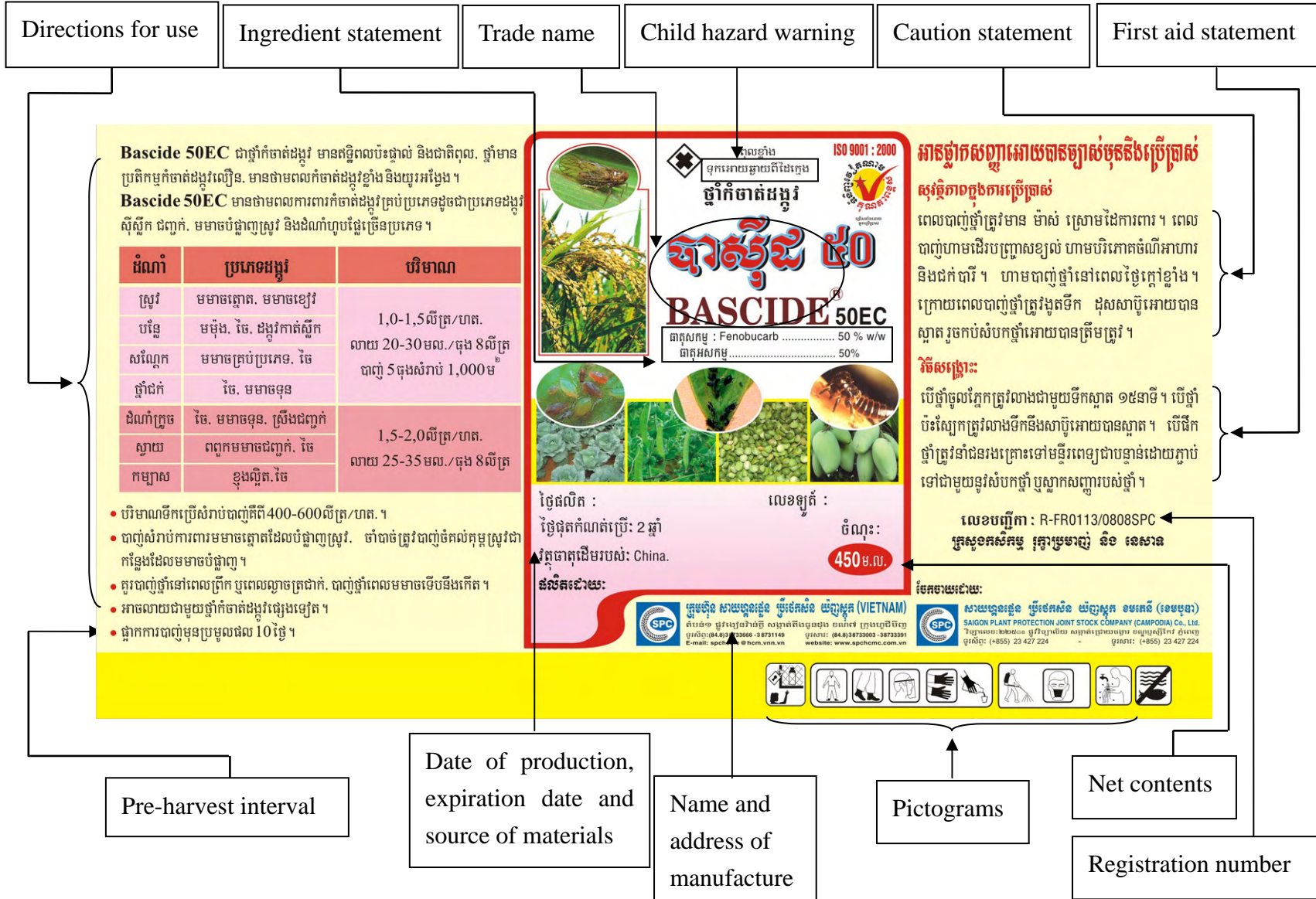
1. Warning or caution statements:

It indicates all types of hazards that the product poses, ways to avoid them, emergency first aid measures, and types of exposure that require medical attention, etc.

2. Directions for use:

It indicates how to use the product properly to get the best results. It is especially important to follow instruction on the recommended dose rate and crops for which the product should be used. The dose rates are the amount of pesticide to be applied per hectare which has been evaluated by manufacturers through research. The dose rates must be strictly followed to effectively kill the pests. Higher dose rates than what is recommended can lead to higher levels of pesticide residues in agricultural produce which can be harmful to humans.





Example 1: Label of a pesticide.






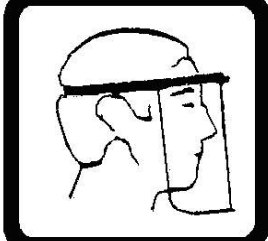
(Reference): Pictograms:

Related to the warnings and directions on use, there might be pictograms which are intended to provide graphical advice concerning the product. Most common pictograms are as follows.

Pictograms:

| | | | |
|---|---|---|--|
|  |  |  |  |
| Corrosive. | Irritant or Harmful. | Poisonous. | Environmental hazard. |

| | | |
|--|--|--|
|  |  |  |
| Dangerous / harmful to animals. | Dangerous / harmful to fish and water. | Keep locked away and out of reach of children. |

| | | | |
|---|---|--|---|
|  |  |  |  |
| Wash after use. | Wear an apron. | Wear boots. | Wear face protection. |
|  |  |  |  |
| Wear gloves. | Wear protection over nose and mouth. | Wear overalls. | Wear respirator. |

3. Registration numbers:

It is very important for the end-users to check if the product has the registration number because it is banned to sell pesticides without registration by the MAFF. Registration number means that the MAFF has approved and registered its intended use of product and the quality has been properly checked.

4. Type of formulation:

Only a certain component of a pesticide product has activity against pests, and this component is called the active ingredient as indicated as “ingredient statement” in the Example 1. Active ingredients are rarely applied in a pure form. Instead, manufacturers mix the active ingredient with various other components to make a pesticide formulation in order to dilute the active ingredient and to make the product safer and more effective, or easier to measure, mix and apply, or to improve storage. There are several types of formulations like Emulsifiable Concentrate (EC), Wettable Powder (WP), and Granule (G), etc. and each formulation has its advantages and disadvantages.

(Reference): Hazard/Toxicity:

In order to protect our health and environment, it is also very important to fully understand the meaning of the hazard/toxicity of the product. Hazard/Toxicity means the measure of how poisonous the pesticide is to man. It must be remembered that high toxicity to man does not necessarily mean that the pesticide is highly toxic to the pest. The World Health Organization (WHO) classification is most commonly used, while there are other classifications such as the one by the Environment Protection Agency (EPA) of the U.S.

Based on the WHO and other classifications, the MAFF officially classifies the pesticides as **“Permitted, Restricted, or Banned for Use.”** For more detailed information on the MAFF’s classification of pesticides, please contact the nearest agricultural office.

Below are the hazard categories and band colors for the labels of pesticides in Cambodia, Thailand, and Vietnam and the actual labels with the band colors.

| Level of Hazard or Toxicity | Hazard Classification made by the World Health Organization | Hazard categories and band colors on the labels | | |
|-----------------------------|---|---|--------------------------|---------------------------|
| | | Cambodia | Thailand | Vietnam |
| Extremely hazardous | Class I a | High toxicity | Extremely hazardous | Category I: Very toxic |
| Highly hazardous | Class I b | | Highly hazardous | |
| Moderately hazardous | Class II | Medium toxicity | Moderately hazardous | Category II: Highly toxic |
| Slightly Hazardous | Class III | Low toxicity | Slightly hazardous | Category III: Dangerous |
| Low hazard | Unlikely to present acute hazard in normal use | | Unlikely to be hazardous | |

Source: Technical guidebook for traders (MAFF).



Example 2: Thai label of a pesticide with the red band.

(Source: http://thailand.ipm-info.org/your_poison/07_what_types_of_pesticides.htm)



Example 3: Label of a pesticide with the yellow band.

5. Name of Product and Pesticide Type:

It is necessary to carefully check a type of a pesticide product according to a type of a pest that you tackle. There are 7 major types of pesticides according to types of pests against which they are used.

- | | |
|-------------------|--------------------|
| (1) Insecticides. | (5) Rodenticides. |
| (2) Fungicides. | (6) Molluscicides. |
| (3) Herbicides. | (7) Nematicides. |
| (4) Acaricides. | |

6. Names of the manufacturer and distributor:

It is important for the end-users to check if the manufacturer and distributor are officially licensed by the MAFF because only licensed manufacturers and distributors are duly authorized to trade and sell pesticides by law. Please contact the nearest agricultural office to know the licensed manufacturers and distributors.

C. Insect/Disease of Rice and Applicable Active

Ingredients

| No | Insect/Disease | Applicable active ingredient |
|----|--------------------|---|
| 1 | Rice Army Worm | (1) Chlorpyrifos (2) Cypermethrin (3) Deltamethrin (4) Diazinon (5) Emamectin benzoate (6) Fenvalerate (7) Quinalfos Others |
| 2 | Black Bug | (1) Carbosulfan Others |
| 3 | Brown Planthopper | (1) Buprofezin (2) Chlorpyrifos (3) Dinotefuran (4) Etofenprox (5) Fenobucarb (6) Fipronil (7) Imidacloprid Others |
| 4 | Golden Apple Snail | (1) Metaldehyde (2) Niclosamide Others |
| 5 | Green Leafhopper | (1) Buprofezin (2) Deltamethrin (3) Dinotefuran (4) Etofenprox (5) Fenobucarb (6) Fipronil (7) Imidacloprid (8) Carbofuran (9) Isoprocarb Others |
| 6 | Leaf Folder | (1) Abamectin (2) Cartap (3) Chlorantraniliprole (4) Chlorpyrifos |

| | | |
|----|-------------------|---|
| | | (5) Cypermethrin (6) Deltamethrin (7) Diazinon (8) Emamectin benzoate (9) Fenitrothion (10) Fipronil (11) Quinalphos Others |
| 7 | Rice Bug | (1) Deltamethrin (2) Etofenprox (3) Fenitrothion Others |
| 8 | Rice Case Worm | (1) Deltamethrin (2) Diazinon Others |
| 9 | Rice Thrip | (1) Cypermethrin (2) Deltamethrin (3) Dimethoate (4) Dinotefuran (5) Emamectin benzoate Others |
| 10 | Yellow Stem Borer | (1) Abamectin (2) Cartap (3) Chlorantraniliprole (4) Deltamethrin (5) Diazinon (6) Dinotefuran (7) Emamectin benzoate (8) Fipronil Others |
| 11 | Blast | (1) Benomyl (2) Carbendazim (3) Isoprothiolane (4) Tricyclazole Others |
| 12 | Leaf Blight | Not available. |
| 13 | Leaf Streak | Not available. |
| 14 | Tungro | Please use applicable active ingredients to control Green Leafhoppers which spread Tungro virus. |

| | | |
|----|-------------------------|---|
| 15 | Rice Grassy Stunt Virus | Please use applicable active ingredients to control Brown Planthoppers which spread this virus. |
| 16 | Rice Ragged Stunt Virus | Please use applicable active ingredients to control Brown Planthoppers which spread this virus. |
| 17 | Sheath Rot | (1) Benomyl (2) Carbendazim (3) Copper oxychloride (4) Hexaconazole (5) Mancozeb (6) Prochloraz (7) Propiconazole (8) Propineb (9) Thiophanate methyl Others |
| 18 | Sheath Blight | (1) Benomyl (2) Carbendazim (3) Iprodione (4) Pencycuron (5) Propiconazole (6) Triciclazole+Propiconaz (7) Validamycin Others |

D. Insect/Disease of Chinese Cabbage and Applicable Active Ingredients

| No. | Insect/Disease | Applicable active ingredient |
|-----|--------------------------|--|
| 1 | Beet Army Worm | (1) Abamectin (2) Azadirachtin (3) Bacillus thuringiensis (4) Carbaryl (5) Chlorantraniliprole (6) Chlorpyrifos (7) Cypermethrin (8) Emamectin benzoate (9) Esfenvalerate (10) Etofenprox (11) Malathion (12) Permethrin (13) Spinosad Others |
| 2 | Black Cut Worm | (1) Acephate (2) Chlorpyrifos (3) Cyfluthrin (4) Cypermethrin (5) Diazinon (6) Esfenvalerate (7) Fenpropathrin (8) Lambda cyhalothrin (9) Permethrin Others |
| 3 | Cabbage Head Caterpillar | (1) Abamectin (2) Bacillus thuringiensis (3) Cypermethrin (4) Deltamethrin (5) Emamectin benzoate (6) Permethrin Others |
| 4 | Cabbage Looper | (1) Acephate (2) Azadirachtin (3) Bacillus thuringiensis (4) Carbaryl |

| | | |
|---|-------------------|---|
| | | <ul style="list-style-type: none"> (5) Chlorantraniliprole (6) Chlorpyrifos (7) Cyfluthrin (8) Cypermethrin (9) Emamectin benzoate (10) Esfenvalerate (11) Fenpropathrin (12) Lambda cyhalothrin (13) Malathion (14) Permethrin (15) Spinosad Others |
| 5 | Cabbage Webworm | <ul style="list-style-type: none"> (1) Abamectin (2) Acephate (3) Bacillus thuringiensis (4) Chlorantraniliprole (5) Chlorpyrifos (6) Etofenprox (7) Permethrin (8) Profenopos (9) Spinosad (10) Tebufenozide Others |
| 6 | Diamond Back Moth | <ul style="list-style-type: none"> (1) Abamectin (2) Acephate (3) Azadirachtin (4) Bacillus thuringiensis (5) Carbaryl (6) Cartap (7) Chlorpyrifos (8) Chlorantraniliprole (9) Cyfluthrin (10) Cypermethrin (11) Deltamethrin (12) Diazinon (13) Dinotefuran (14) Emamectin benzoate (15) Esfenvalerate (16) Etofenprox (17) Fenpropathrin |

| | | |
|----|----------------------|--|
| | | (18) Fipronil (29) Indoxacarb (20) Lambda cyhalothrin (21) Permethrin (22) Profenopos (23) Spinosad (24) Tebufenocide Others |
| 7 | Striped Flea Beetle | (1) Azadirachtin (2) Carbaryl (3) Cyfluthrin (4) Cypermethrin (5) Deltamethrin (6) Diazinon (7) Dimethoate (8) Dinotefuran (9) Esfenvalerate (10) Fenpropathrin (11) Imidacloprid (12) Lambda cyhalothrin (13) Malathion (14) Permethrin (15) Thiamethoxam Others |
| 8 | Turnip Mosaic Virus | Not available. |
| 9 | Bacterial Soft Rot | Not available. |
| 10 | Alternaria Leaf Spot | (1) Chlorothalonil (2) Mancozeb (3) Propineb Others |
| 11 | Clubbed Root | Not available. |
| 12 | Downy Mildew | (1) Chlorothalonil (2) Mancozeb (3) Propineb (4) Thiram Others |

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2. List of Insect/Disease and their Host Plants

| No | Insect/Disease | Crops |
|----|--------------------------|--|
| 1 | Rice Army worm | Rice, corn, and others. |
| 2 | Black Bug | Rice, and corn. |
| 3 | Brown Planthopper | Rice. |
| 4 | Golden Apple Snail | Rice, taro, and others. |
| 5 | Green Leafhopper | Rice, corn, sugar cane, and others. |
| 6 | Leaf Folder | Rice, maize, coconut, banana, tobacco, sugarcane, and others. |
| 7 | Rice Bug | Rice, tea, guava, mango, and others. |
| 8 | Rice Case Worm | Rice, Cyperaceae, and others. |
| 9 | Rice Thrip | Rice, maize, and others. |
| 10 | Yellow Stem Borer | Rice, maize, and others. |
| 11 | Blast | Rice. |
| 12 | Leaf Blight | Rice, and others. |
| 13 | Leaf Streak | Species of Oryza. |
| 14 | Tungro | Rice and some wild rice species. |
| 15 | Rice Grassy Stunt Virus | Rice. |
| 16 | Rice Ragged Stunt Virus | Rice, and others. |
| 17 | Sheath Rot | Rice, maize, and others. |
| 18 | Sheath Blight | Citrus, chili, groundnut, crucifers, soybean, cotton, rice, lettuce, maize, potatoes, and others. |
| 19 | Beet Army Worm | Bean, peas, celery, lettuce, potato, tomato, eggplant, cotton, tobacco, onion, corn, pepper, cabbage, soybean, sweet potato, peanut, flower crops, and others. |
| 20 | Black Cut Worm | Cotton, crucifers, cucurbits, egg plant, tomato, pepper, groundnut, maize, sweet potatoes, rice, wheat, onions, and others. |
| 21 | Cabbage Head Caterpillar | Cabbage, cauliflower, Chinese cabbage, broccoli, radish, watercress, cotton, and others. |
| 22 | Cabbage Looper | Cabbage, cauliflower, Chinese cabbage, broccoli, radish, watercress, cotton, and others. |
| 23 | Cabbage Webworm | Cabbage, cauliflower, Chinese mustard, eggplant, and others. |
| 24 | Diamond Back Moth | The pest attacks only plants in the Cruciferous family: cabbage, mustard, coli flower, broccoli, Chinese kale, and others. |
| 25 | Striped Flea Beetle | Potato, egg plant, tomato, pepper, cabbage, |

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| | | mustard, and others. |
| 26 | Turnip Mosaic Virus | Crucifers, beets, spinach, tobacco, and others. |
| 27 | Bacterial Soft Rot | Potato, sweet potato, cassava, onion, cabbage and other crucifers, carrot, tomato, beans, corn, cotton, coffee, banana, and many other succulent agricultural crops. |
| 28 | Alternaria Leaf Spot | Tomato, melon, cucumber, celery, cabbage, kale, cauliflower, and others. |
| 29 | Clubbed Root | Cabbage, cauliflower, kale, broccoli, and others. |
| 30 | Downy Mildew | Tobacco, crucifers, soybean, onion, and others. |

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គម្រោងស្តីពី

ការពង្រឹងសមត្ថភាពសម្រាប់ការត្រួតពិនិត្យបរិមាណគុណភាពសម្ភារកសិកម្ម

(ជីគីមី និងថ្នាំកសិកម្ម)

អសយដ្ឋាន : នាយកដ្ឋាននីតិកម្មកសិកម្ម

ក្រសួងកសិកម្ម រុក្ខាប្រមាញ់ និងនេសាទ

#២០០ ផ្លូវព្រះនរោត្តម ភ្នំពេញ កម្ពុជា

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អសយដ្ឋាន : #២០០ ផ្លូវព្រះនរោត្តម ភ្នំពេញ កម្ពុជា

អគ្គនាយកដ្ឋានកសិកម្ម

អសយដ្ឋាន : ផ្លូវ ៦៥៦ សង្កាត់ ទឹកល្អក់ ៣ ខណ្ឌទួលគោក ភ្នំពេញ កម្ពុជា

Project of Capacity Building of Quality Standard Control of Agricultural Materials
(Chemical Fertilizers and Pesticides)

c/o Department of Agricultural Legislation, Ministry of Agriculture, Forestry and
Fisheries

200 Preah Norodom Blvd., Phnom Penh, Cambodia

Department of Agriculture Legislation

200 Preah Norodom Blvd., Phnom Penh, Cambodia

General Directorate of Agriculture

N° 54, St. 656, Sangkat Toek Laak III, Khan Toul Kork, Phnom Penh, Cambodia

