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Investigating the Symptoms of Insect Infestation on Plants in Bukit Kor, Terengganu, Malaysia

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Abstract: Malaysia is a tropical country with a large area of agricultural land. Plant growth in Bukit Kor depends on a tropical climate with high rainfall and relatively humid and warm temperatures throughout the year. Plants are living organisms that grow and develop in a place. Plants have an essential role in the ecosystem, providing oxygen, food for humans and animals, and beauty in the form of plants. Insects are animals with rigid bones and a body shape divided into specific parts, such as the head, body, and abdomen. Types of sucking insects that can cause damage to coconut plants besides aphids and mites include whiteflies, aphids, or mites; aphids or mites suck liquid from plant shoots, causing damage to leaves and other insects. This study concludes that the pest attack on the *Gelandir* plant is that sucking insects such as aphids or mites can cause damage to the plant by sucking the liquid from the leaves, which can eventually result in holes in the leaves. Many losses are experienced by the plant owner, such as economic, productivity, and environmental losses.

Keywords: Plants; Insects; Infestation; Bukit Kor Marang, Terengganu.

1. Introduction

Bukit Kor is a site in Malaysia, a tropical country with a large area of agricultural land. Plant growth in Bukit Kor depends on a tropical climate with high rainfall and relatively humid and warm temperatures throughout the year. Plants growing in Bukit Kor have the potential to be a source of oxygen and reduce the negative impacts of climate change. Plants are living organisms that grow and develop in a particular place (Fernando, 2012; Holdrege, 2013; Niklas, 1997). Plants have an essential role in the ecosystem, providing oxygen, food for humans and animals, and beauty in the form of plants (Chivian, 2002; Sen & Samanta, 2015; Usman et al., 2014). Plants can also be the target of pest attacks, such as aphids, that can damage plant growth and health (Asharo et al., 2022; Hasibuan, 2023). Developing Indonesia's agricultural sector has become essential to the country's economic development. The agricultural sector has a vital role in providing food, a source of labor, and being one of the country's foreign exchange earners. Based on

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classical analysis pioneered by Kuznets, the agricultural sector is a potential economic sector that can contribute to national economic growth and development. The agricultural sector involves several subsectors: food crops, horticulture, forestry, plantations, livestock, and fisheries. One part of the horticulture subsector includes

Insects comprise the class Insecta, which comes from the Latin *insectum*. Insecta is called Insectum, which means cut into parts called insects. Insects are animals with rigid bones and a body shape divided into certain parts, such as the head, body, and abdomen (Oramahi & Wulandari, 2017; Snodgrass, 1963; Yaqoob, 2023). Insects can be pests on plants, such as aphids or mites that suck liquid from leaves, which can cause damage to plants. This study aims to identify what types of insects are disturbing the plants studied. Thus, the definition of nuisance insects has not been found in the search results provided. However, insects are one organism that can be a plant nuisance. These insects can cause damage to plants, such as rice stem borers, that can cause symptoms, such as the growing point of young plants turning brown, dry, and then dying. Control of these insects can be done effectively and efficiently, such as by using natural enemies or biological agents.

2. Materials and Methods

This study was conducted using descriptive methods with direct observation of the farmland of Bukit Kor Marang, Terengganu, Malaysia. Three species of plants grow naturally on the land. The variables were observed by exploring/identifying the symptoms of plant-insect attacks in the Bukit Kor farmland area. This research was conducted in September 2023 at an altitude of 35m above sea level. Branch scissors, paper, stationery, boards, and cameras were the tools and materials used in this study.

3. Results and Discussion

Bukit Kor is one of the agricultural experimental land sites handed over by the government of Terengganu, Malaysia, to the Universiti of Malaysia Terengganu (UMT). Its purpose is to conduct research and develop various types of horticultural crops, providing practical experience to students at the university. Bukit Kor is located in a highland area in the Marang region of Terengganu. The soil around Bukit Kor has a rock and sand texture, but the soil in the valley has a fertile organic nature, making it suitable for growing various plants.

Figure 1. List of plants with symptoms of insect infestation

Figure 1 captures the insects that disturb the plants as aphids. Horn beetles are insects that can damage ornamental plants. Symptoms of horn beetle infestation can be seen in leaves that turn yellow, dry, or look damaged, so there is no dung for the pests to eat. Adult horned beetles must be removed from the plant manually, as insecticide treatments will not penetrate the shells of these insects. Types of sucking insects that can cause damage to coconut plants other than aphids and mites include whiteflies, horn beetles, or mites; aphids or mites suck the liquid on the top of the plant, causing damage to the leaves and other insects.

3.1. First Plant

Perforated plant leaves are caused by insects such as caterpillars, aphids, and grasshoppers. Caterpillars, such as the small bagworm (*Pteroma Plagiophleps*) and yellow butterfly caterpillar (*Eurema blanda*), attack the leaves and curl or steal the tasty parts of the leaves (Heinrich & Collins, 1983; Turlings et al., 1995). Aphids, such as aphids or mites, suck the juices on plant shoots and dry the leaves. Locusts, such as wood locusts and cone locusts, attack the leaves and shoots of plants by feeding and making holes. The types of sucking insects that can cause holes in plant leaves include aphids, mites, whiteflies, caterpillars, and locusts. Aphids or mites suck the juices on the plant, causing damage by drying the leaves.

Whiteflies also suck juices from the plant, which can cause the leaves to turn yellow and fall. Caterpillars are small bagworms, and yellow butterfly caterpillars attack the leaves by curling or stealing parts of the leaf. In addition, grasshoppers such as wood locusts and cone locusts can also attack the leaves and shoots of plants by feeding and making holes. The symptoms of attack caused by green locusts are holes on the surface of the leaves and tears on the edges of the leaves. Part of the leaves attacked by green locusts can be categorized as the level of damage that is moderately attacked because the number of leaves attacked by green locusts does not dominate. Meanwhile, the bagworm damage level is yellowing, and the leaves are falling. How to deal with whiteflies on plants includes several steps that can be taken to reduce the damage caused by this pest. One way is to use contact insecticides on the plant's twigs to eradicate whiteflies. Another method is to use dish soap mixed with warm water and spray it on the plant.

3.2. Second Plant

Attacks by pathogenic fungi can cause banana leaves to turn yellow and brown (Jeger et al., 1995; Raut & Ranade, 2004). The first symptoms usually include leaves turning yellow from the edges, then brown and drying out. Apart from that, sucking insects such as aphids or mites can also cause damage to plants by sucking fluids from the leaves. It is important to identify the cause of problems with banana leaves, whether it is attacked by pathogenic fungi or sucking insects, to be able to take appropriate steps to overcome damage to banana plants. Banana leaf rollers are leaf-destroying pests that make leaf rolls by cutting a portion of the leaf, starting from the edge of the leaf parallel to the main leaf bone and attached with fine white threads released by the caterpillar larvae. Symptoms that appear on banana leaves attacked by sucking insects include several steps that can be taken to identify the cause of problems on banana leaves. One way to do this is to look at the symptoms of infected banana leaves, such as yellowing leaves, brown spots, stunted growth, and aphid secretions producing honeydew. Be sure to inspect your plants regularly and deal with sucking insects as quickly as possible to reduce the damage caused by these pests. How to identify sucking insects on banana leaves includes several steps that can be taken to identify the cause of problems on banana leaves. One way that can be done is to carry out a visual inspection of banana leaves to recognize symptoms of sucking insects, such as leaves that turn yellow or turn brown and dry out. If necessary, use a microscope to identify sucking insects such as aphids or mites. Additionally, use reference sources such as pictures or descriptions of sucking insects to help in identifying them. Be sure to inspect your plants regularly and deal with sucking insects as quickly as possible to reduce the damage caused by these pests.

3.3. Third Plant

Coconut plants that become hollow can be caused by insects such as beetles, which suck the juice from the plant and cause the leaves to turn yellow and fall, as well as aphids or mites, which suck the fluid from the shoots of the plant and cause damage to the leaves (Devasahayam, 2011; Jeger et al., 1995; Pepper, n.d.). Inspecting plants regularly and dealing with insects as quickly as possible is important to reduce the damage caused by these pests. Horned beetle pests usually attack the pupus leaves (spear leaves) and make holes in the pupus leaves that have not yet opened, usually visible signs of attack in the form of symmetrical cuts in both leaf inserts. Horned beetle control by citation and application of insecticides requires high costs. Using pheromones is more effective, safe for the environment, and cheaper than citation. Damage caused by pests is known from stem bite marks. Severe attacks occur when the pests damage the growing point, resulting in stunted growth or even plant death. The duration of the attack on the growing point ranges from 4-6 days, then the insects will settle down to reproduce or move to neighboring coconut trees. Rhinoceros beetle infestation may be followed by sago weevil (Rhynchoporussp.) infestation or bacterial/snake infection that will cause rotting. Several steps can be taken to deal with insect pests that disturb coconut plants without using insecticides. One way is to use natural methods such as spraying dishwashing soap mixed with warm water to repel sucking insects. Apart from that, it is also essential to clean and destroy fallen fruit regularly to reduce the habitat of insect pests. By regularly inspecting the plants and taking action as quickly as possible, the damage caused by sucking insects to coconut plants can be minimized.

3.4. Fourth Plant

Sucking insects such as aphids or mites can cause holes in gelandir plants. These insects cause damage to plants by sucking fluids from the leaves, which can ultimately result in holes in the leaves of coconut plants. To overcome this problem without using insecticides, several effective steps include spraying dish soap to repel sucking insects, cleaning and destroying fallen fruit regularly, as well as natural pest control such as using predators or parasites, which can reduce the population of sucking insects. By carrying out appropriate preventive and intervention measures, damage caused by sucking insects to

coconut plants can be minimized. Habitat is determined by the insect's ability to live and the resources available, one of which is prey or host. Most species of Coccinellidae predators, both larval and adult stages, prey on small soft-bodied insects such as aphids (*Aphididae spp.*), scale insects, and insect telurs. Different ecosystems and prey are likely to cause different species of Coccinellidae predators.

This insect is seen when the plant is 3 months old and attacks the bulbs with symptoms of bite marks. Attacks the leaves by making holes in the center or damaging the leaves. Important pests that attack sweet potato plants are leaf destroyers: *caterpillars Agrius sp*., *Heliothis armigera*, *Spodoptera litura*, *Tabidia sp*., and *beetles Aspidomorpha sp*. Tuber destroyers are *beetles Cylas formicarius* and *beetles Leucopholis sp* and *grubs Omphisa sp*. *S. litura* pests cause damage in the dry season by eating chili leaves from the tip to the top and bottom of the leaves. The attack of this pest causes holes and irregular leaves, which inhibit the photosynthesis process. The continuous use of chemical pesticides results in pests becoming resistant to these pesticide compounds, the reduction of natural enemies so that there is a burst of pest populations, the emergence of secondary pests, and the problem of insecticide residues increases along with its increased use.

4. Conclusions

This study concludes that many plants are damaged, on average, by insects such as horn beetles, mites, and beetles, which cause holes in the leaves to turn yellow or perforated. The owners of these plants experienced many losses. Losses to plant owners whose plants are disturbed by insects can be caused by various things, such as (a) Economic losses: Economic losses caused by insects can include costs to control them, costs to build structures that reduce them and costs to repair damage caused by them. (b) Loss of productivity: Insects can reduce plant productivity by inhibiting plant growth, reducing fruit quality, and reducing the amount of fruit produced. (c) Environmental losses: Insects can reduce environmental quality by inhibiting plant growth, reducing fruit quality, and reducing the amount of fruit produced. To overcome losses caused by insects, plant owners can carry out regular plant inspections and treat insects as quickly as possible to reduce losses caused by insects.

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