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POST-HARVEST DISEASES IN INDRALAYA DISTRICT, SOUTH SUMATRA

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Abstract

The agricultural sector, especially in Indonesia, is always faced with problems from various factors that can reduce the productivity of a plant. One of these factors is the presence of attacks from plant-disturbing organisms. The method used in this research is by using a purposive sampling method. Samples of diseased plants were observed and taken for observation in the Phytopathology Laboratory, Plant Protection Study Program, Faculty of Agriculture, Sriwijaya University. From the observations that have been made, it was found that many chili plants were attacked by Colletotrichum Rot disease Erwinia caratovora in carrots, anthracnose in oranges and bananas, anthracnose in mangoes, and papayas. Many postharvest diseases found in plants in Indralaya are caused by pathogens in the form of fungi and bacteria.

Keywords : observation, post-harvest, anthracnose, indralaya

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1. Introduction

Plant Pest Organisms (PPO) can reduce crop productivity by damaging plant productivity which impacts on farmers' income [1]. Insects are one of the plant-disturbing organisms, apart from insects there are also other organisms such as bacteria, fungi and nematodes. In addition, there are non-microorganisms that can infect plants and cause disease, namely viruses. Plant disease is an abnormal condition experienced by an infected plant caused by microorganisms [2] and changes in the function of host cells and tissues as a result of continuous interference by pathogenic agents or environmental factors and the development of symptoms and the inability of plants to produce sufficient yields. both quantity and quality. Plants can be said to be sick if there are abnormal changes in some plant organs [3]. Diseases in plants can limit the production of agricultural products [4]. Many factors can affect crop yields, one of which is plant disease. Various diseases that generally arise have different symptoms.

The causes of disease can be divided into two groups, namely biotic or parasitic and abiotic or non-parasitic [5]. Biotic, namely the causes of diseases that are contagious or infectious, for example fungi, bacteria, nematodes, mycoplasma and parasitic higher plants. Abiotic is the cause of disease that is non-infectious or non-infectious [6]. Diseases due to abiotic causes are often called physiological/physiological diseases, while their pathogens are called psychopathies. These psychopathies include unfavorable weather conditions, unfavorable soil conditions, and damage due to mechanical and chemical substances [7]. Complex interactions between hosts, pathogens, and the environment can support the development of plant diseases [8].

Diseases that attack plants do not only occur during the planting process, but can also occur in postharvest activities. Postharvest is a stage of activity starting from the process of harvesting fruit or vegetables, threshing, transportation, drying and storage until vegetables and fruit are ready to be marketed or consumed. [9]. Postharvest losses in fruits and vegetables are high, around 10–40%, depending on the commodity and the technology used for packaging. The spoilage of fruits and vegetables harvested in developed countries due to postharvest handling is estimated at 20–25%. Post-harvest losses in developing

countries are often high due to inadequate storage and transportation facilities. Poor packaging can cause contamination [10].

The level of damage to a plant due to disease caused by microorganisms greatly determines the yield of a diseased plant [11]. Based on research [12], fungi that cause postharvest disease in several food commodities are *Colletotrichum capsici* found in chilies, *Rhizoctonia solani* in bananas and tomatoes, *Amerosporium* sp. in papaya, *Pythium* sp. bananas, *Fusarium solani* on mango, banana, and papaya, and *Phomopsis* sp. on tomatoes. Therefore, to minimize the losses faced by farmers, standards are made in carrying out disease control measures. Disease attacks on plants both on seeds and during postharvest can cause losses to farmers because agricultural production can decrease. Diseases that attack plants can have economic, social and ecological impacts. Thus, precise and accurate exploration and diagnosis of plant diseases is important in preventing loss of productivity and quantity of agricultural products [13]. After a disease diagnosis is made, appropriate control can be determined to address the plant disease problem.

2. Materials and Methods

This study used a survey method. Observation and sampling were carried out using purposive sampling. The research was conducted on several plantations and harvested from the morning market in Indralaya and was carried out from October 2022. Samples of diseased plants were taken from chili, orange, banana, mango, papaya plantations and yields from carrots at the morning market. Diseased plant samples were observed for symptoms of disease in the field and taken to the Phytopathology Laboratory, Plant Protection Study Program, Faculty of Agriculture so that the cause of the plant disease was known.

3. Results and Discussion

The results obtained from several post-harvest diseases based on observations in Indralaya are as follows.

Postharvest Disease in Chili and Carrots

Symptoms of anthracnose can attack all parts of the plant such as stems, stalks, leaves and fruits. infection on the fruit symptoms begin in the form of small spots that are blackish in color and slightly bend. Further attacks cause the fruit to shrink, dry, rot and fall. The spots are round or concave and develop on immature/ripe fruits of various sizes. Usually the shape of the spots varies on one affected fruit. When the disease hardens, the spots will coalesce. masses of pink to orange fungal spores form on the surface. Old spots with touch will feel black dots. The spots may extend to the stem and leave irregular dark red spots. Factors that influence the development of *Colletotrichum* sp. for the growth of *Colletotrichum* sp. strongly influenced by environmental factors, such as pH, temperature, humidity, spacing and cleanliness of the environment around the plantation. The optimal pH for the growth of *Colletotrichum* is pH 5-7 [14].

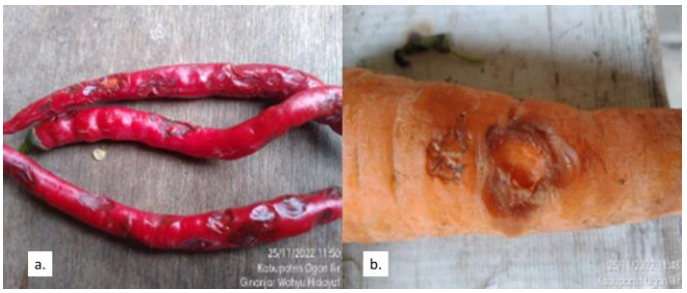

Figure 1. Diseases on chili and carrot plants, (a) *Colletotrichum* on chili plants (b) *Erwinia caratovora* on carrots.

Mushrooms belonging to the genus Colletotrichum belong to the Ascomycota group, which teleomorphically are also known as mushrooms belonging to the genus Glomerella, due to the discovery of sexual reproductive structures in the form of ascospores. Asexually *Colletotrichum* sp. can produce conidiospores/conidia and are sexually capable of producing ascospores. Micromorphologically, the fungus belonging to the species *Colletotrichum* sp. have macroconidia cylindrical with blunt ends, microconidia ovoid and hyaline in nature. Colletotrichum *sp* . have hyaline conidia with 1 cell, ovoid to sickle shaped [15].

This pathogenic fungal attack begins on young fruit in the field without visible significant symptoms. Damage caused by this anthracnose disease will develop further during the storage (postharvest) process, especially in hot and humid conditions which cause the chilies to become dry rot and greatly reduce the economic value of the chilies. Therefore, an effective and safe post-harvest control measure is needed to control diseases caused by the fungus *Colletotrichum capsici* on post-harvest chillies [16]. Efforts to control and prevent anthracnose (*Colletotrichum* spp.) usually use synthetic pesticides, namely anthracol. The use of synthetic fungicides can have negative effects on the environment, excessive use of fungicides in this control effort both in terms of dose and frequency of administration, which can kill non-target microorganisms and pollute the environment.

Early symptoms of soft rot have the following characteristics: the appearance of small spots, wet and white or cream in color. Mid-soft rot symptoms are characterized by small brown spots that develop and give off a foul odor. Advanced symptoms of soft rot are characterized by: the tubers become soft, when split open mucus. [17] stated that soft rot carrot root tissue is very susceptible to infection by microorganisms as agents that cause secondary infection. The association of secondary organisms makes it difficult for pathologists to accurately diagnose the pathogen causing soft rot. This bacterium is a soil-borne pathogen that is difficult to control chemically and spreads very quickly. The above conditions provide an idea for environmentally friendly and sustainable control by utilizing biological agents [18].

Anthracnose Disease in Oranges and Bananas

Figure 2. Diseases of citrus fruits and bananas. a. Oranges attacked by anthracnose, and b. anthracnose on bananas

Many microorganisms, especially fungi that attack citrus fruits, include *Colletotrichum* sp., *Penicillium* sp., and several other fungi. There are different signs of disease seen in citrus fruits, but there are also several diseases that show signs that are almost the same. According to [18], that many citrus rot diseases are caused by green rot, aspergillus rot, and fusarium rot caused by the fungi *Penicillium* sp., *Aspergillus* sp., and *Fusarium* sp., showing different symptoms, while fruit rot disease geotrichum and anthracnose fruit rot caused by the fungus *Geotrichum* sp., and *Colletotrichum* sp., show almost the same symptoms.

Banana (*Musa paradisiaca* L.) is a herbaceous horticultural plant originating from Southeast Asia (including Indonesia). This plant then spread to Africa (Madagascar), South and Central America. Bananas are a source of vitamins, minerals, fiber, which have many health benefits. One of the causes of the decline in the quality of bananas is post-harvest pests and diseases. One of the diseases that usually attack post-harvest and storage bananas is anthracnose disease caused by *Colletotrichum musae*. Anthracnose disease causes infection of the comb fruit through the wound due to the cutting of the comb from the stalk bunches that cause rotting of the stalks fruit and fruits detached [19].

During ripening the fruit undergoes biochemical changes that change the production of essential nutrients for the needs of pathogens, the most important change that occurs during ripening is the conversion of insoluble starch to soluble glucose. It is this glucose content that is associated with the level of host resistance to pathogen colonization. So it can cause postharvest disease which is affected by the high glucose content in the fruit. Fruit ripening has an influence on the level of postharvest pathogen attack. Post-harvest mushrooms produce cell wall decomposing enzymes, namely endo-polygalacturonase and endo-polymethyl galacturonase, whose effects are determined by the level of host resistance. This endo polygalacturonase enzyme has been linked to decomposition by several pathogens, one of which is *C. musae* which causes post-harvest disease [20].

Anthracnose disease of mango and papaya

Figure 3. Diseased mangoes and papayas. a. anthracnose on mangoes, b. on papayas

Mango (*Mangifera indica* L.) is one of the important seasonal tropical fruits in Indonesia. The problem faced by producers in efforts to develop production and quality of mangoes is that there is early damage caused by pathogenic fungal infections in plants and fruit. Anthracnose is a major postharvest disease in mangoes caused by the fungus *Colletotrichum gloeosporioides. C. gloeosporioides* can attack unripe mangoes on the tree, then disease develops during storage. Germinating spores form an appressorium and do not develop until the fruit is harvested and ripe. Symptoms of anthracnose attack during post-harvest are characterized by dark brown, concave and round spots on the surface of the skin. The spots will expand and enter the fruit flesh if the level of attack is getting worse [21]. Microscopic observation showed that the fungus has insulated hyphae, initially hyaline and later darkening, conidia which are cylindrical in shape with rounded or blunt ends, clear in color, and measuring 8 x 5 µm.mycelium of

the *C. gloeosporioides gray* in color and has insulated hyphae.

One of the pathogenic fungi in papaya plants is *Colletotrichum gloeosporioides* which causes anthracnose disease in papaya [22]. The pathogenic fungus causes reddish-brown, wet, small, and round spots to appear on ripe fruit. When the fruit is ripe, the spots enlarge rapidly, forming round, reddish-brown spots that settle somewhat [23]. Furthermore, this pathogenic fungus will continue to grow and decompose the inside of the fruit so that the fruit tissue decomposes, becomes soft, and has a slightly darker color [24]. According to [25] *Colletotrichum* sp. is one of the limiting factors in increasing the production of both the quality and quantity of papaya fruit when the fruit is still being planted or during postharvest. The incidence of anthracnose can reach 70% and is reported to be the main cause of post-harvest yield loss in California papayas.

4. Conclusion

Postharvest diseases found in Indralaya were anthracnose on chilies, anthracnose on bananas, citrus fruit rot, mango fruit rot and papaya rot. This disease is caused by fungal and bacterial pathogens. This is supported by the presence of supporting factors such as environmental conditions, temperature and pH conditions. There are four groups of plant disease symptoms including growth inhibition, discoloration, tissue death and deformation.

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