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PEST AND DISEASE MONITORING WITH CONTROL MEASURES ON CHILI (*Capsicum frutescens* L.) PLANTATION IN TURI, SLEMAN, YOGYAKARTA

(*PEMANTAUAN HAMA DAN PENYAKIT SERTA TINDAKAN PENGENDALIANNYA PADA LAHAN CABAI (Capsicum frustescens L.) DI TURI, SLEMAN, YOGYAKARTA*)

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Abstract

Red bird's eye chili (*Capsicum frutescens* L.) is an important horticultural crop in Indonesia, whose productivity is often affected by pest and disease infestations. This study aimed to identify the types of pests and diseases present in chili plantations in Turi, Sleman, Yogyakarta, and to assess their incidence and intensity. The research was conducted from October to November 2025 using a diagonal sampling method at five observation points, with ten plants randomly selected at each point. The observations indicated that the main pests found were armyworms (*Spodoptera litura*) and thrips (*Thrips* sp.). The incidence of *S. litura* increased from 70% to 100%, while thrips ranged from 85% to 95% during the observation period. The intensity of pest attacks also showed an increasing trend, with *S. litura* ranging from 19.50% to 48% and thrips from 29% to 45%. The diseases identified included Geminivirus and anthracnose. Geminivirus incidence remained high (90–97.5%), with intensity increasing from 47.50% to 81.75%. Anthracnose incidence increased from 17.50% to 62.50%, while its intensity reached a peak of 32.5% before slightly declining. Overall, the results suggest that pest and disease occurrence tended to increase during the generative stage of the plants. These findings may serve as preliminary information to support the implementation of appropriate pest and disease management strategies in chili cultivation.

Keywords: *Chili cultivation, Disease incidence, Integrated pest management*, *Pest intensity*.

Introduction

Red Bird's eye chili (*Capsicum frustescens* L.) are a horticultural commodity with high economic value and market demand. This horticultural commodity plays an important role in Indonesia, both in terms of consumption and trade. In Indonesian culture, Bird's eye chili have become an integral part of the cuisine, as almost every dish uses Bird's eye chili, even if only in small amounts. In addition to providing a spicy flavor, Bird's eye chili contains vitamin C, beta-carotene (provitamin A). In addition, it also contains minerals such as phosphorus and calcium. The spicy taste of bird's eye chili comes from a compound called capsaicin (Mitra Agro Sejati, 2017). Bird's eye chili productivity often fluctuates due to plant pests and diseases. Pest attacks can result in a decrease in the quantity and quality of the harvest, causing economic losses for farmers.

The Turi region in Sleman, Yogyakarta, is known as one of the chili production centers that supplies local and regional markets. However, the humid environmental conditions in this region are conducive to the development of various types of pests and plant disease pathogens. The main pests found on chili plants include *Spodoptera* spp. (armyworm) and *Thrips parvispinus*. Yield loss in bird's eye chili due to thrips can reach 22.8% (Sarrani, 2023), armyworm can cause yield loss 40%-50% (Vijayalakshmi *et al*., 2016). While the diseases commonly found are anthracnose (*Colletotrichum capsici*) and *Geminivirus*. Anthracnose can cause yield losses ranging from 10% to 100%, depending

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on environmental conditions (Widodo and Hidayat, 2017), *Geminivirus* can cause yield losses of up to 98.6% (Suhita *et al*., 2025). These pests and diseases cause tissue damage to plants and can reduce chili production if not properly controlled. This is further exacerbated by suboptimal cultivation practices, leading to increased attack intensity each growing season, excessive use of pesticides can lead to pest and disease resistance. (Jamin *et al*., 2024). Therefore, monitoring and control activities must be carried out routinely to prevent more detrimental impacts.

Monitoring aims to identify pest and disease attacks early, determine attack patterns, and understand the factors that influence the distribution and intensity of attacks. In addition, pest and disease monitoring is carried out to determine whether control measures are necessary to secure yields. The objective of pest and disease control is to prevent losses through effective, economical, and safe control methods. This is done to maintain high production (profitability), preserve the health and quality of the environment (safety), and ensure the durability of control measures (Muliasari and Trilaksono, 2020).

The limited availability of information regarding the intensity of pest and disease infestations in chili crops in Turi, Sleman, has encouraged the author to conduct and publish this study. This study aims to monitor pests and diseases in chili plants in Turi, Sleman, to identify the types, intensity, and patterns of infestation. The results are expected to provide recommendations for effective and environmentally friendly control measures as a reference for farmers and local governments in improving chili productivity in a sustainable manner.

Materials and Methods

This study was conducted on chili farms owned by Maharani with an area of 264 m^2 and a total population of 400 plants in Turi, Sleman, Yogyakarta, at an altitude of 418 m above sea level in October 2025. The tools used during the study were paper, pen, and camera. The materials used were chili plants showing symptoms of pest attack (armyworm and thrips) and disease (*Geminivirus* and anthracnose). This study was conducted on chili farms in Turi, Sleman, Yogyakarta. Samples were collected diagonally (Figure 1) at five observation points. Samples were collected from each point. The population per unit was 40 samples.

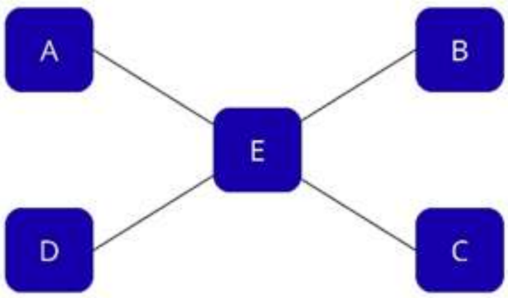

Figure 1. Pattern Sampling

1. Interval of Monitoring

   Monitoring was conducted once a week on 21 October 2025 (90 DAP), 28 October 2025 (97 DAP), 4 November 2025 (104 DAP), and 11 November 2025 (111 DAP). The selected interval represents the generative phase of chili plants, during which flowering and fruiting occur. This stage is considered critical because pest populations (armyworms and thrips) and disease incidence (*Geminivirus* and anthracnose) tend to increase and significantly affect yield quantity and quality. Weekly observations were chosen to capture the dynamics of pest and disease development over time.

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2. Observing Symptoms of Pest and Disease Attacks

Observations were conducted through direct visual inspection in the field by examining morphological symptoms on plant organs, including leaves, stems, and fruits. The observations were grouped based on pest and disease symptoms. Armyworm attacks were indicated by irregular holes and defoliation on leaves, while thrips attacks were characterized by silvery streaks, leaf curling, and distortion. *Geminivirus* infection showed symptoms of chlorosis, mosaic patterns, leaf curling, and stunted growth, whereas anthracnose was identified by dark, sunken lesions on fruits.

3. Incidence and Intensity Observation

The formula for calculating damage intensity is divided into two, which is absolute and non-absolute damage.

a. Absolute Damage

Absolute damage is permanent damage to the plant to be harvested, such as the death of all plant tissue and wilting. Furthermore, damage considered absolute includes rotting or partial destruction of plant tissue, rendering the plant or part of the plant unproductive (Lahati and Saifuddin, 2022). To calculate absolute damage, use the following formula:

$I = \frac{n}{N} \times 100\%$ Description:

I = Incidence of attack (%)
n = Number of affected offspring
N = Number of offspring observed

b. Non-Absolute Damage

Non-absolute damage is damage to parts of the plant, such as leaves, flowers, fruit, twigs, branches, and stems (Lahati and Saifuddin, 2022). To calculate non-absolute damage, use the following formula:

$IP = \frac{\Sigma (n \times v)}{Z \times N} \times 100\%$ Description:

IP = Attack Intensity (%)
n = Number of leaves attacked
N = Number of leaves observed
Z = Highest damage score scale value

The score for plant attacks by pests used is:
Score 0 = No attack
Score 1 = Very light attack (percentage of affected organs 1–20%);
Score 2 = Light attack (percentage of affected plant organs 21–40%);
Score 3 = Moderate attack (percentage of affected plant organs 41–60%);
Score 4 = Severe attack (percentage of affected plant organs 61–80%);
Score 5 = Very heavy attack (percentage of affected plant organs 81–100%) (Nurfadhilah *et al*., 2024).

Scale of disease intensity damage on chili plants:
Score 0 = Not infected
Score 1 = if the damage to the plant reaches 0 - < 25%;
Score 2 = if the damage to the plant reaches > 25%;
Score 3 = if the damage to the plant reaches > 50- <75%;
Score 4 = if the damage to the plant reaches 76 - < 100% (Nurfadhilah *et al*., 2024).

According to the Directorate General of Horticulture (2023), the disease severity assessment categories (y) are as follows:

Pest Damage Intensity Assessment Categories (x):
Light : x < 25% (less than or equal to 25%)
Moderate : 25% < x < 50% (greater than 25% up to 50%)
Severe : 50% < x < 85% (greater than 50% up to 85%)
Crop Failure : x > 85% (greater than 85%)

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Disease Severity Assessment Categories (y):
Light : y < 11% (less than or equal to 11%)
Moderate : 11% < y < 25% (greater than 11% up to 25%)
Severe : 25% < y < 85% (greater than 25% up to 85%)
Crop Failure : y > 85% (greater than 85%)

Results and Discussion

Table 1. Incidence of Pest Attacks on Chili Plants

Pest	Observation Week			
	1	2	3	4
Spodoptera litura	70%	95%	100%	100%
Thrips Sp.	85%	92.50%	92.50%	95%

Based on Table 1, the incidence of armyworms (*Spodoptera litura*) increased sharply from week 1 to week 4 of observation. It rose from 70% in week 1 to 95% in week 2 and reached 100% in weeks 3 and 4. Meanwhile, thrips (*Thrips* sp.) also showed consistently high incidence throughout the observation period. Their incidence started at 85% in week 1, increased to 92.5% in weeks 2–3, and reached 95% in week 4.

The high incidence of armyworm infestation related to the biological characteristics of *S. litura*, which is a polyphagous pest capable of attacking plants at various growth stages. Young larvae feed on leaves by scraping the epidermis and leaving transparent patches and leaf veins, while older instars consume larger leaf portions, often causing near-total defoliation (Khamid and Siriyah, 2018). In the generative stage, larvae also damage chili fruits (Gustianingtyas *et al*., 2020).

The high incidence of thrips infestation observed in this study indicates that environmental conditions and host plant suitability strongly supported their population development. Thrips damage plant tissues by piercing and sucking leaves and shoots, causing silvering, brownish patches, upward leaf curling, and stunted growth, and they also act as vectors of Tobacco Streak Virus (Saranani, 2023). Thrips attack chili plants during both vegetative and generative stages, with higher infestations occurring during flowering (Sari and Sulfiani, 2022). Environmental conditions further support these pest developments, the average temperature in Turi during October–November was around 26°C, which falls within the optimal thermal range that accelerates the development and activity of *S. litura* and *Thrips* sp. (Uge *et al*., 2021; Ngilamele and Pinaria, 2020).

Table 2. Intensity of Pest Attack on Chili Plants

Pest	Observation Week			
	1	2	3	4
Spodoptera litura	19.50% (light)	29.50% (Moderate)	49% (Moderate)	48% (Moderate)
Thrips Sp.	29% (Moderate)	32.50% (Moderate)	42% (Moderate)	45% (Moderate)

Based on Table 2, the intensity of pest attacks on chili plants showed a progressive increase during the four week observation period. Two pest species were recorded, namely armyworm (*Spodoptera litura*) and thrips (*Thrips* sp.). The intensity of *S. litura* infestation began at 19.50% in the first week, then increased to 29.50% in the second week, followed by a sharp rise to 49% in the third week, before experiencing a slight decline to 48% in the final week. Similarly, thrips attack intensity consistently increased over time, with values of 29% in week one, 32.50% in week two, 42% in week three, and reaching 45% in week four.

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This trend indicates the feeding behavior of *S. litura* larvae, which damage leaves and developing fruits as the plant transitions to the generative phase. *S. litura* is a polyphagous pest capable of causing severe leaf damage due to the feeding capacity of advanced larval instars, leading to suppressed plant growth and reduced yield potential (Cahyamurti and Purwanto, 2021). Thrips predominantly attack young tissues by puncturing cell surfaces and extracting cell sap, resulting in silvery discoloration, leaf deformation, and growth reduction. Thrips populations tend to increase as chili plants enter the flowering stage due to their preference for nutrient-rich and tender plant tissues (Sugiyono *et al*., 2017). Environmental conditions during the monitoring period including an average temperature of approximately 26°C and relatively high humidity likely supported the development of both pest species. *S. litura* intensity increases under warm and humid environments that favor egg hatchability and larval growth. Similarly, the development of thrips populations is accelerated under warm conditions, allowing rapid reproduction cycles (Sugiyono *et al*., 2017).

Control of armyworms can be achieved through crop rotation and intercropping as technical control measures, the use of natural enemies such as *Telenomus remus* and *Trichogramma* sp. as biological control measures, the use of light traps as physical control measures, and mechanical control by collecting and destroying Spodoptera eggs in the field (Prabaningrum and Moekasan, 2022). Meanwhile, thrips control is carried out using trap plants like yellow kenikir, installing silver mulch, sanitizing and cutting off affected parts of the plant, and installing yellow traps from 2 weeks of age. Biological control can be supported by natural enemies such as Coccinellidae, predatory mites, Chrysopidae, Anthocoridae, and the pathogen *Entomophthora* sp. (Meilin, 2014).

Table 3. Incidence of Disease Attacks on Chili Plants

Disease	Observation Week			
	1	2	3	4
Gemini	90% (Crop Failure)	97,50% (Crop Failure)	97,50% (Crop Failure)	97,50% (Crop Failure)
Anthracnose	17,50% (Moderate)	55% (Severe)	57,50% (Severe)	62,50% (Severe)

Based on Table 3, the incidence of Gemini virus disease showed an increase in the second week of observation (97 DAP), but thereafter the incidence remained stagnant. The incidence of anthracnose disease showed an increase in each observation week. Gemini viruses are transmitted by the whitefly vector *Bemisia tabaci*. he high incidence of Gemini virus is caused by the high population of whiteflies. The symptoms include vein clearing, leaf curling, leaf cupping, and yellow mosaic patterns. As the disease progresses, all young leaves turn bright yellow. Indonesia is a tropical country where chili is cultivated continuously throughout the year, allowing whiteflies to persist and continuously transmit the virus (Ali and Aprilia, 2018). Anthracnose is caused by the fungus *Colletotrichum capsici*, which induces brown lesions on the fruit surface, eventually leading to fruit rot (Sondakh *et al*., 2021). The increase in anthracnose incidence is associated with the rainy season, which creates a humid environment. Humid conditions favor fungal development, thereby increasing the incidence of anthracnose disease (Sarianti and Subandar, 2022).

Table 4. Intensity of Disease Attacks on Chili Plants

Disease	Observation Week

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	1	2	3	4
Gemini	47,50%	67,50%	78,75%	81,75%
Anthracnose	6,25%	16,88%	32,5%	30,63%

Based on Table 4, the intensity of Gemini virus infection on chili plants increased steadily from 47.50% in the first week to 81.75% in the fourth week, indicating a continuous spread of the disease. This increase is likely associated with the high population of whiteflies, which act as vectors and facilitate rapid transmission among plants. In contrast, anthracnose disease intensity rose from 6.25% in the first week to a peak of 32.5% in the third week, showing a more gradual development pattern. However, in the fourth week, the intensity slightly decreased to 30.63%

The increasing intensity of the Gemini virus can be a serious threat that causes loss of chili crop yields because it is the main cause of leaf curling in chili plants, which can affect chili production (Malado *et al*., 2024). Gemini disease is transmitted by the whitefly vector (*Bemisia tabaci*). Environmental factors greatly influence the intensity and spread of this disease. Warm temperatures and high humidity increase whitefly activity and population, accelerating the spread of the gemini virus. In addition, the whitefly population is influenced by the abundance of available food sources. Whiteflies obtain food from chili plants that are entering the vegetative phase, where the plants experience rapid growth, characterized by an increase in height and number of leaves (Agustini *et al*., 2023).

The increase in anthracnose intensity is likely influenced by favorable environmental conditions, particularly temperature and humidity, which support the development and spread of the pathogen. Anthracnose is caused by the fungus *Colletotrichum capsici*, which induces brown lesions on the fruit surface that subsequently develop into fruit rot. This disease has a significant impact on red chili production, as higher infection levels are directly associated with reduced yield and, in severe cases, can result in losses of up to 100%. Moreover, anthracnose can infect almost all parts of the plant, including twigs, branches, leaves, and fruits, thereby intensifying its overall impact on crop performance. Environmental factors, especially high humidity and optimal temperature, play a crucial role in promoting spore germination and fungal growth (Agustini *et al*., 2023). However, the slight decrease in anthracnose intensity observed at the later stage may be attributed to the implementation of sanitation practices, such as the removal of infected plant parts, which helps reduce the source of inoculum and limits further disease spread in the field.

Control of the gemini virus can be achieved through several main methods, such as using virus-free seeds or seedlings, controlling the whitefly vector population using insecticides and natural nanopesticides appropriately, using mulch, and early monitoring of symptoms (Fitriani *et al*., 2025). Anthracnose can be controlled by using resistant varieties, as well as by utilizing biological agents such as endophytic bacteria that can inhibit pathogen growth, using organic fertilizers such as bokashi and controlling microorganisms such as *Trichoderma* sp. and PGPR. Land sanitation and planting distance management also help suppress the spread of anthracnose (Syafira *et al*., 2024).

Conclusion

Pest and disease attack on Red Bird's eye chili plants (*Capsicum frutescens* L.) exhibited distinct patterns of increase. The incidence and intensity of attacks by the armyworm (*Spodoptera litura*) and thrips (*Thrips* sp.) tended to increase as the plants progressed toward the generative phase, although the intensity of *S. litura* declined slightly toward the end of the observation period. Regarding diseases, *Geminivirus* infection showed a significant and sustained increase in intensity, indicating rapid

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spread associated with the activity of the vector *Bemisia tabaci*. Meanwhile, anthracnose increased until the third week, then decreased slightly in the fourth week. Overall, the dynamics of pest and pathogen attacks are influenced by the plant's growth stage and environmental conditions that support the development of pests and pathogens. These results underscore the importance of implementing integrated pest management through routine monitoring, vector control, and sanitation to reduce pest infestations and yield losses.

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