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Inventory of Chili Pests and Diseases in Kabandungan Sub-District, Sukabumi Regency

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Abstract

Kabandungan Sub-district, Sukabumi District is one of the chilli producing areas in West Java, however plant pests and diseases constraints still occur in Kabandungan Subdistrict. Chili crop yield losses due to pest and disease attacks can be said to be quite high. This research was conducted in Kabandungan District, Sukabumi Regency, West Java Province, Indonesia. Observations were made on 930 chili plants with an area of 106,500 m2. The chili plants observed consisted of local varieties of cayenne pepper, curly red chili, TM 999 variety of curly red chili, Darmais F1 large red chili, and OR Twist 42 curly red chili. The research was carried out by observing pest attacks and plant diseases in each village from at 07.00 AM or 05.00 PM. The parameters observed in this study include the inventory of dominant pests, the incidence of chili pest attacks in the vegetative and generative phases, the incidence of chili plant pathogen attacks in the vegetative and generative phases, the incidence of pest attacks per village, and the incidence of pathogen attacks in each village. The results of the study stated that the incidence of pest attacks was dominated by Spodoptera litura attacks 26.40%, and Colletotrichum capsici 25.60% in the vegetative phase, as well as Spodoptera litura 27.21%, and gemini virus 47.35% in the generative phase. Spodoptera litura attacks are reported to dominate all villages in Kabandungan District, while Mekarjaya Village is dominated by Polyphagotarsonemus sp.

Keywords: Chili, Observation, Pathogens, Pests, Stocktaking

1. Introduction

Kabandungan Sub-district, Sukabumi District is one of the chilli producing areas in West Java. Kabandungan District produced 3.35 tons of red chili in 2019 and increased significantly in 2020 to 50.54 tons (Central Bureau of Statistics, 2021). Intensification of chili cultivation in Kabandungan Subdistrict is carried out based on the potential of the area that supports chili cultivation activities, however plant pests and diseases constraints still occur in Kabandungan Subdistrict.

Pest and disease attacks are one of the main obstacles in chili cultivation, both in the vegetative phase and in the generative phase (Prabaningrum & Moekasan, 2014). Karyani et al. (2020) stated that pest and disease attacks on chili commodities were the main problem in chili cultivation. Chili crop yield losses due to pest and disease attacks can be said to be quite high. Some pests that often attack chili plants include *Thrips*, *Myzus persicae*, *Bemicia tabacii* (Nasrin et al., 2021), *Bactrocera* sp., *Aphis* sp., *Spodoptera litura*, *Agrotis ipsilon*, *Helicoperva armigera* (Nurbaeti & Mindarti, 2014), *Fusarium* sp., *Pseudomonas solanacearum*, *Colletotrichum capsici*, *gemini virus*, and *Cercospora capsici* (Hidayat et al., 2022; Meilin, 2014). Some incidental pests that only attack at certain times and do not become major pests such as caterpillars (*Calliteara* sp.) and grasshoppers (*Caryanda spuria*) (Amalia et al., 2023)

Maish (2019) stated that the yield loss of chili plants due to attacks by *Scirtothrips dorsalis* could reach 90% and attacks by *Polyphagotarsonemus latus* could reach 34%. Taufik et al. (2012) stated that yield losses in chili plants attacked by Chili Veinal Mottle Virus could reach 98.6%. Mariana et al. (2021) stated the attack of *Colletotrichum* sp. in chili plants it can result in yield losses ranging between 50%-100% in the rainy season.

Identifying pest and disease attacks on chili plants is important as a basis for the control strategy that will be implemented. Low knowledge about the pests and diseases faced can result in ineffective control strategies (Islam et al., 2020). Information about the types and attacks of pests on chili plants needs to be known as a basis for control and as an anticipatory measure of pest attacks on chili plants. Kabandungan sub-district as one of the chili production centers can be used as a reference to study the presence and intensity of chili pest attacks in general. Based on this, information about pest attacks can be used as a basis for control that can be applied in Kabandungan District and in other locations that have similar characteristics.

2. Materials and Methods

This research was conducted in Kabandungan Subdistrict, Sukabumi District, West Java Province, Indonesia. The study was conducted from November 2021 to March 2022. Kabandungan sub-district is located in the northern part of Sukabumi district with undulating and hilly topography. Kabandungan sub-district has an altitude of 700-900 meters above sea level with an average annual rainfall of 279 mm/year and has an air temperature ranging from 18^{o}C to 25^{o}C.

The tools used in this research include notebooks, documentation tools, and microsoft excel software. Observations were made from morning to evening starting at 07.00 or in the afternoon at 17.00 WIB. The number of chili plants observed was 930 plants divided into 61 observation points spread across 6 villages with an observed area of 106,500 m^2 (table 1).

Table 1. Observation locations and number of plant samples observed

Village	Observation point (location)	Number of samples (plants)	Area(m^2)
Cianaga	10	110	10,500
Cihamerang	11	230	30,000
Cipeuteuy	10	170	22,000
Kabandungan	10	150	17,000
Mekarjaya	10	120	12,000
Tugubandung	10	150	15,000
Total	61	930	106,500

The chili plants observed consisted of cayenne red chili local variety, cayenne red chili , curly red chili variety TM 999, large red chili Darmais F1, and curly red chili OR Twist 42. The parameters observed in this study include the inventory of dominant pests, the incidence of chili pest attacks in the vegetative and generative phases, the incidence of chili plant pathogen attacks in the vegetative and generative phases, the incidence of pest attacks by village, and the incidence of pathogen attacks in each village. The calculation of pest attack incidence is calculated using the attack incidence formula as follows:

$$K = \frac{a}{a+b}\ x\ 100\%$$

Description:
K: Occurrence of attack by the nth type of pest
a: Number of plants attacked by the nth type of pest
b: Number of plants attacked by the nth type of pest
(Amalia et al., 2023)

3. Results and Discussion

Inventory of dominant pests

The results of observations of attack incidence are divided into two groups, namely the vegetative phase and the generative phase. The results of observations of pest attack incidence in the vegetative and generative phases were dominated by caterpillar attacks with a percentage of infested plants as much as 26.40% in the vegetative phase and as much as 27.21% in the generative phase (Table 2). Caterpillar attacks generally occur at various phases in chili plants, both in the vegetative phase and in the generative phase. In the early vegetative phase, caterpillar pest attacks are generally caused by Agrotis ipsilon which attacks the base of the stem of young chili plants (Hidayat et al., 2022). The Spodoptera litura caterpillar attack can occur in the vegetative phase or in the generative phase (Ramadhan & Dono, 2019). In the generative phase, caterpillar attacks that are often reported are Helicoperva armigera attacks that damage by making holes in chili fruit (Prabaningrum & Moekasan, 2016).

The high population of various caterpillars in the agroecosystem at the time of the study is thought to be related to climate and weather anomalies that occur globally. Climate anomalies can affect insect population fluctuations, encourage pest population explosions, and affect the status of important pests in an agroecosystem (Wardani, 2015). In addition to affecting the intensity of pest attacks, climate anomalies also affect the incidence of attacks caused by various pathogens that cause diseases in chili plants. As many as 5 types of pathogens were recorded attack chili plants in Kabandungan sub-district. Pathogen attacks in the vegetative phase are dominated by leaf spot (Cercospora capsici) with a percentage of plants attacked as much as 25.60% and gemini virus with a percentage of plants attacked as much as 22.80%. In the generative phase of pathogen attack. The C. capsici fungus attacks the leaves, showing symptoms of tissue death (necrosis) on the brownish leaves. Gemini virus attacks show symptoms in the form of leaf malformation, becoming stunted and causing the leaf color to become chlorotic. Both C. capsici and gemini virus attacks cause damage to the leaves, so that plants cannot photosynthesize according to their potential.

Table 2: Pest attacks of chili plants in the vegetative and generative phases in Kabandungan subdistrict.

Pest Type	Vegetative (<60 DAP)		Generative (>60 DAP)	
	Number of insects	Percentage of attack (%)	Number of insects	Percentage of attack (%)
Valanga sp.	4	1.60	0	0.00
Brachytrupes sp.	2	0.80	0	0.00
Aphis sp.	3	1.20	42	6.18
Bemisia tabaci	6	2.40	29	4.26
Bactrocera sp.	3	1.20	6	0.88
Polyphagotarsonemus sp.	9	3.60	66	9.71
Spodoptera litura	66	26.40	185	27.21
Pathogen Type	Vegetative (<60 DAP)		Generative (>60 DAP)	
	Number of symtomps	Percentage of attack (%)	Number of symtomps	Percentage of attack (%)
Colletotrichum capsici	0	0.00	289	42.50
Cercospora capsici	64	25.60	238	35.00

Ralstonia solanacearum	4	1.60	45	6.62
Fusarium oxysporum	0	0.00	14	0.21
Gemini virus	57	22.80	322	47.35

Description: Vegetative phase plant samples = 250 plants, generative phase plant samples = 680 plants. Some sample plants suffered from attacks from two or more pathogens. DAP: Days after planting

Dominated by anthracnose attack (Colletotrichum capsici) with a percentage of plants attacked as much as 42.50%, gemini virus with a percentage of plants attacked as much as 47.35%, and leaf spot (Cercospora capsici) with a percentage of plants attacked as much as 35.00% (table 2). This is in line with research (Renfiyeni et al., 2023) which states that there are Anthracnose, leaf spot and gemini virus attacks on chili plants grown in Nagari Paninggahan, Junjung Sirih District, Solok Regency.

The main pests that attack red chili plants in Kabandungan District are caterpillar pests consisting of Spodoptera litura, Agrotis ipsilon, and Helicoperva armigera. The highest caterpillar attack found in the field is S. litura attack on chili leaves. S. litura infestation was reported as the highest pest infestation in all villages in Kabandungan Subdistrict, except in Mekarjaya Village (Figure 1a). The highest incidence of S. litura infestation was in Cihameang and Cipeuteuy villages with a value of 6.13% (Table 3). Polyphagotarsonemus sp. infestation was highest in Mekarjaya village at 3.41% (Table 3).

The pest attack found on chili plants in Kerinjing Village, North Dempo Subdistrict, Pagar Alam, South Sumatra Province is Spodoptera litura, the effect of attack intensity and mite infestation on the chili plants (Arsi & Kemal, 2021). Samples obtained from several observation locations, stated that there are 2 species of mites, namely Polyphagotarsonemus latus or yellow mite, and Tetranychus urticae or red mite associated with chili (Suhada et al., 2022).

The main pathogens that attacked red chili plants in Kabandungan District were Colletotrichum capsici, Gemini virus, and Cercospora capsici. The most widespread pathogen attack reported was Gemini Virus attack (Figure 1b). The highest incidence of pathogen attack was in Cihameang Village with a Colletotrichum capsici attack value of 10.00% (Table 3). Pathogens that attack chili plants in Waihatu Village are Anthracnose with 3.97% damage intensity. and yellow virus disease with 9.01% damage intensity (Arniati et al., 2022). Chili plants in Paingan Village, Maguwoharjo, Depok District, Sleman Regency, Yogyakarta, have an incidence of Cercospora capsici pathogen attack of 30.22% SDR (Summed Dominance Ratio) (Nugraha et al., 2023).

Pest and disease attacks on chili plants in Kabandungan District can certainly affect the production of chili plants. Spodoptera litura, Cercospora capsici and gemini virus are the main pests and diseases that attack chili plants in Kabandungan District. The Gemini virus attack is transmitted through vectors, namely Polyphagotarsonemus sp.(Maftuchah et al., 2019), Aphis sp. (Tricahyati et al., 2022), and Bemisia tabaci (Sudiono & Yasin, 2006). The attack of the gemini virus pathogen cannot be controlled, so what needs to be considered is the appropriate control method for the vector that helps spread the gemini virus. Control of S. litura and gemini virus vectors can use biological control agents such as Beauveria bassiana and Metarhizium anisopliae (Zulfitri et al., 2020). Other controls that can also be applied include using botanical insecticides (Manikome & Handayani, 2019) or by using synthetic insecticides with various active ingredients. Control of the C. capsici pathogen can be done by arranging planting distances so that the spread of the pathogen can be reduced, using biological control agents such as Trichoderma spp. (Salam et al., 2022), and use of botanical pesticides neem seed extract (Hartati et al., 2019).

Table 3. Incidence of pest attack by village in Kabandungan sub-district

Pest Type	Pest infestation incidence by village (%)					
	Cinaga	Cihamerang	Cipeuteuy	Kabandungan	Mekarjaya	Tugubandung
Valanga sp.	0.00	0.00	0.32	0.00	0.11	0.00
Brachytrupes sp.	0.00	0.11	0.22	0.00	0.00	0.00
Aphis sp.	0.22	1.51	0.43	0.22	1.08	1.40
Bemisia tabaci	1.08	1.83	0.00	0.00	0.86	0.00
Bactrocera sp.	0.00	0.11	0.54	0.00	0.00	0.00
Polyphagotarsonemus sp.	1.61	0.11	0.32	2.26	3.12	0.86
Spodoptera litura	4.09	6.13	6.13	4.73	3.01	2.90

Pathogen Type	Diseases infection incidence by village (%)					
	Cinaga	Cihamerang	Cipeuteuy	Kabandungan	Mekarjaya	Tugubandung
Colletotrichum capsici	5.27	4.19	10.00	3.01	2.04	3.76
Cercospora capsici	6.77	4.19	5.59	8.49	8.28	3.33
Ralstonia solanacearum	0.43	2.15	0.32	0.75	0.75	0.54
Fusarium oxysporum	0.22	1.08	0.00	0.22	0.00	0.00
Gemini virus	6.34	9.14	7.42	3.66	3.01	8.82

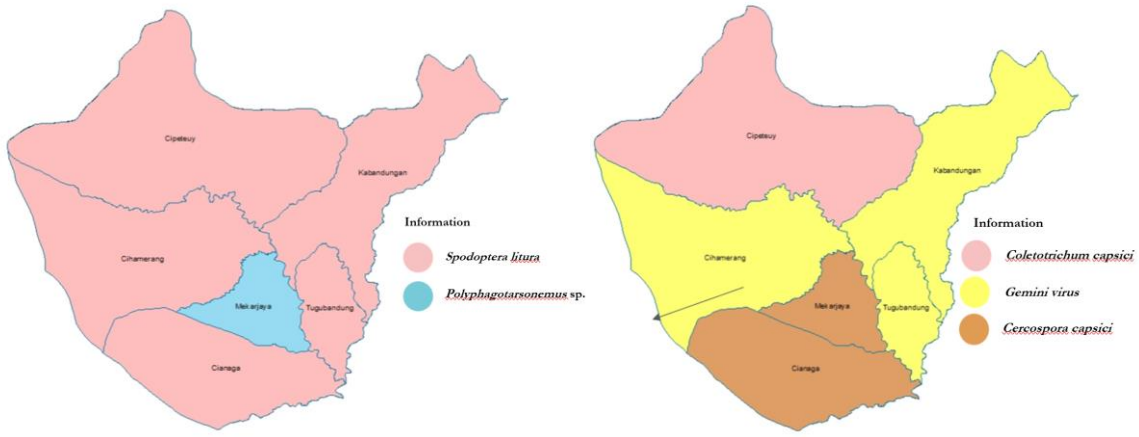

Figure 1. (a) pest distribution in Kabandungan sub-district; (b) pathogen distribution in Kabandungan sub-district.

4. Conclusion

The results of the research that has been carried out, it can be concluded that the incidence of pest attacks is dominated by *Spodoptera litura* 26.40%, and *Cercospora capsici* 25.60% in the vegetative phase, and *Spodoptera litura* 27.21%, and *Gemini virus* 47.35% in the generative phase. *S. litura* was reported to dominate in all villages in Kabandungan Subdistrict, except Mekarjaya Village. The highest incidence of *S. litura* attack was found in Cihameang and Cipeuteuy villages at 6.13%. *Polyphagotarsonemus* sp. infestation was highest in Mekarjaya village at 3.41%.

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