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Exploration of Whitefly (*Bemisia tabaci*) (Homoptera: Aleyrodidae) on Tomato (*Solanum lycopersicum* Mill) in Kedisan Village, Kintamani District, Bangli Regency

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ABSTRACT

The main pest of tomato plants is the whitefly *Bemisia tabaci* (Homoptera: Aleyrodidae). This study aims to determine the symptoms of attack, population size and percentage of attack by *B. tabaci* on tomato plants in Kedisan Village, Kintamani District, Bangli Regency, Bali. The research was conducted from January to March 2023 in Kedisan Village, Kintamani District, Bangli Regency. This research was carried out using a direct survey method with direct observation in the field. Sampling was carried out by purposive sampling using the diagonal sampling method with 10 sample points and 3 plant clusters were taken at each sampling point so that a total of 30 plant families were observed. The variables observed were attack symptoms, population size and percentage of *B. tabaci* attack on tomato plants. The data obtained were analyzed and presented in the form of tables and graphs. The results showed that *B. tabaci* was found on tomato plants in the farmers fields in Kedisan village. Symptoms of *B. tabaci* attack on tomato plants are *necrotic* spots and *chlorosis* on leaves, which are caused by damage to leaf cells and tissues due to attack by nymphs and adult insects. Pests began to be found at 14 DAP (Day after Planting) with an average of 0.37 individuals/plant and the highest population was found at 63 DAP with an average of 1.63 individuals/plant on tomato plants. The results of the analysis show that the high percentage of attacks occurred at 63 DAP of 93.33%. In general, the high number of pest populations affects the high pest attacks as evidenced by the high percentage of *B. tabaci* attacks.

Keywords: Attack Percentage, *Bemesia tabaci*, Population, Tomato Plants

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1. INTRODUCTION

Kedisan Village is a village located in the Kintamani sub-district, Bangli Regency, Bali. Wiguna *et al*., (2019) explained that the potential for Kedisan Village is a village that has land suitable for agriculture, especially in the cultivation of tomato plants (*Solanum lycopersicum* Mill). The selling value of tomato plants is influenced by the quality of the yield, especially the visual appearance of the product among vegetable commodities. Tomatoes are vegetables that have high economic potential and the area of tomato cultivation is wide among other crops. One of the factors that must be considered in the Tomato Plant Cultivation business is the handling and control of pests and diseases. Important pests on tomato plants are whitefly

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(*Bemisia tabaci*) (Homoptera: Aleyrodidae) (Setiawati, *et al*., 2011). Kalshoven (1981). discovered the first whitefly pest in Indonesia on tobacco plants. Breeding and spreading of these pests is very fast, within 1 year, these pests can produce 15 generations (Brown, 1994).

Whitefly can cause damage directly and indirectly. Direct damage as a result of feeding activity, namely (1) closing of stomata by honeydew released by nymphs and sooty dew that grows on the honeydew layer, such as *Cladosporium spp*. and *Alternaria spp.* (2) the formation of *chlorotic* spots on the leaves as a result of partial tissue damage due to stylet puncture, (3) the formation of anthocyanin pigments, and (4) the leaves fall and can inhibit plant growth (de Barro 1995, Hoddle 2003). Indirect damage, *B. tabaci* is a yellow virus vector (Byrne and Bellows 1990). Symptoms caused by jaundice are leaves that curl to turn yellow and cause death on the leaves. The *B. tabaci* pest is very fast in spreading the disease in plants because all instars of the pest can become vectors of the yellow disease virus. On this basis, it is necessary to conduct research to determine the symptoms of attack, population size and percentage of *B. tabaci* attack on tomato plants in Kedisan Village, Kintamani District, Bangli Regency. So that later the results of this study will be used as a reference for proper handling and control of *B. tabaci* pests.

2. METHODS

2.1 Time and Place of Research

The research was carried out from January to March 2023. The research was carried out in the tomato planting area of Kedisan Village, Kintamani District, Bangli Regency, Bali.

2.2 Tools and Materials

The tools used in this study were stationery, cameras, calculators, plastic bags, markers, rapia ropes

2.3 Research Design

This research was conducted by means of a survey. The method of determining the research location was determined by purposive sampling with direct observation. Sampling was carried out diagonally in one wide expanse of plants by taking 10 sampling points, then in 1 point taking 3 tomato plant clusters so that a total plant of 30 plant families.

2.4 Observational Variables

The variables observed were the symptoms of attack, the number of pest populations. Observation of pest populations was carried out by counting the number of pests at each sample point based on the type of pest. The population counted was from the juvenile to imago stages of the *B. tabaci* whitefly on the sample plants. While the percentage of attack is measured in reference to the Directorate of Food Crop Protection, Directorate General of Food Crops, Ministry of Agriculture (2018), namely the morphological condition of tomato plants (attack symptoms) (leaves, stems, shoots, etc.) caused by pest activity on tomato plants with the formula:

$$P = \frac{n}{N} \text{ X } 100\%$$

Information:

P : Attack percentage (%),
n : Affected plants
N : Total sample plants

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2.5 Data analysis

The data obtained was analyzed using the 2023 version of the SPSS (Statistical Package for the Social Sciences) software. Then the population data and the percentage of pest attacks are presented in tables and graphs.

3. RESULT AND DISCUSSION

3.1 Symptoms of *B. tabaci* Attack on Tomato Plants

The results of observations on the symptoms of *B. tabaci* attack can be seen in Figure 1. Symptoms of *B. tabaci* attack on tomato plants are necrotic and chlorosis spots on the leaves, caused by damage to leaf cells and tissues due to attack by nymphs and adult insects.

Fig. 1 Symptoms of *B. tabaci* pest attack

Chlorosis or yellowing of leaves in infected plants occurs because chlorophyll formation is inhibited so that the rate of chlorophyll formation is the same or smaller than the rate of chlorophyll degradation (Narendra *et al*., 2017). In high population conditions, whitefly attacks can inhibit the growth of tomato plants. (Setiawati, *et al*., 2006). All stages of *B. tabaci* live on the underside of the leaves so that the honeydew secretions secreted fall and do not contaminate the body. Karami (2012) states that honey dew that appears on the upper surface of the leaves will interfere with the leaf photosynthesis process so that it can reduce the productivity of tomato plants.

3.2 Population of *B. tabaci*

The results of the research on the number of whitefly populations are shown in Table 1 and imago in Figure 2 which shows that *B. tabaci* whitefly pest attacks have been found at 14 DAP (Day after Planting), but the number of populations is still small (average 0,37 individuals/plant) this is evidenced by the presence of attack symptoms found shown in Figure 2.

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Fig 2. Population of *B. tabaci*

Based on the results of observations on the tomato planting area in Kedisan Village, Kintamani District, it was found that the average number of nymphs in each sample plant at the age of 14 (DAP) was 0.37 nymphs and imago per plant. There was an increase in the average number of the dominant population increased at 42 (DAP) to 1.13 nymphs and imago/plants. Observation day 63 (DAP) the average number of nymphs and imago increased by 1.63 individuals/plant (Table 1). It is clear that the number of populations increased at 42 days (DAP) due to the second cycle of development of *B. tabaci* ticks. This is in accordance with Brown's statement (1994) that whitefly breeding in a year produces 15 generations or 1 to 2 months in 1 generation.

TABLE I
The average of the total population and the proportion of attack by *B. tabaci*

Observation	Total Sample (Sample Plant)	Rata-rata Population (Individuals/plants)	Attack Percentage (%)
14 DAP	30	0,37	10,00
21 DAP	30	0,47	16,67
28 DAP	30	0,63	20,00
35 DAP	30	0,83	36,67
42 DAP	30	1,13	46,67
49 DSP	30	1,23	60,00
56 DAP	30	1,30	70,00
63 DAP	30	1,63	93,33

Keterangan : DAP is Day After Planting

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The research results of Narendra *et al*., (2017) showed that the increased activity of the whitefly insect was due to the fact that the whitefly continued to reproduce and was also supported by the availability of food which was always present in plants. Hirano *et al*., (1993), the increase in vector activity is due to the increased amount of available food.

3.3 Percentage of *B. tabaci* Infestation on Tomato Plants

The relationship between the population and the percentage of attacks by *B. tabaci* is shown in Fig. 3.

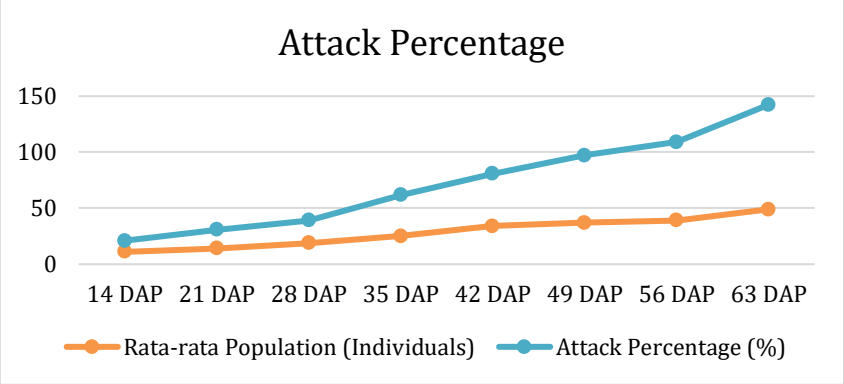

Fig. 3 Attack Percentage Relationship

The results of the analysis show that the more the number of pest populations from instar -1 to instar -3 and imago, the greater the damage it will cause, as evidenced by the increase in population numbers and attack percentage. Pests at 14 – 63 DAP.

The relationship between population and attack percentage is supported by Annisyah's statement (2019) that the total pest population will affect pest attacks on tomato plants. The population relationship with the percentage of attack can be seen in Figure 3, the greater the number of pests, the more leaves are sucked and experience chlorosis, these pest attacks occur because to support the development process of these pests to regenerate and survive. Kundu (2018) states that pests need a lot of nutrients to change developmental phases, survive and maintain offspring of *B. tabaci* pests.

4. CONCLUSIONS

Based on the results of the research that has been done, it can be concluded that:

1. Symptoms of *B. tabaci* attack on tomato plants are *necrotic* spots and *chlorosis* which cause damage to plant leaf cells
2. *B. tabaci* population was found at 14 DAP (average 0.37 individuals/plant) while high populations were found at 63 DAP (average 1.63 individuals/plant).
3. Increasing the number of whitefly (*B. tabaci*) populations on tomato plants has a positive and significant effect with an increase in the percentage of attacks by *B. tabaci* pests

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