



INCIDENCE OF LEAF AND FRUIT EATER, *Diaphania indica* (Saunders) IN MELON AT SRI KUNCORO VILLAGE, PONDOK KELAPA SUB-DISTRICT, BENGKULU TENGAH REGENCY

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ABSTRACT

Melon is a fruit plant that has the potential to be developed and can become a superior horticultural product. The demand for melons continuously increases yearly, requiring a large and continuous supply. Fruit must be available at any time in sufficient quantity and quality to be used as an agricultural commodity with high economic value. *Diaphania indica* (Lepidoptera: Crambidae) is a significant pest that attacks the leaves and fruit of the Cucurbitaceae family, including economically important crops such as melon. Studies on *Diaphania* pests that attack melon leaves and fruit have not been widely studied in Indonesia. Also, due to the cases happening of leaf and fruit-eating attacks in Bengkulu, proper pest control efforts are needed. One of the basics for determining how to control is to know the population density and the level of damage caused by these pests. This research was conducted on the farmers' land in Sri Kuncoro Village, Pondok Kelapa Sub-District, Bengkulu Tengah Regency, November 2021-January 2022. The variables observed were the population density of *D. indica*, the percentage of leaf damage, and the percentage of parasitic larvae. The results showed variations in the density of *D. indica* larvae and the percentage of leaf damage. The mean population density of larvae was 1.47 per plant, and the percentage of infected leaves was 29.49%. Parasitoids associated with *D. indica* larvae were found in *Apanteles* spp, with a percentage of parasitized *D. indica* larvae of 46.67%.

Keyword: *melon, Diaphania indica, Apanteles parasitoid*

ABSTRAK

[TINGKAT SERANGAN ULAT PEMAKAN DAUN DAN BUAH, *Diaphania indica* (Saunders) PADA TANAMAN MELON DI DESA SRI KUNCORO, KECAMATAN PONDOK KELAPA KABUPATEN BENGKULU TENGAH]. Melon merupakan tanaman buah yang berpotensi untuk dikembangkan dan dapat menjadi produk hortikultura unggulan. Permintaan melon terus meningkat setiap tahunnya, sehingga membutuhkan pasokan yang besar dan terus menerus. Buah-buahan harus tersedia setiap saat dalam jumlah dan kualitas yang cukup untuk dijadikan komoditas pertanian yang bernilai ekonomi tinggi. *Diaphania indica* (Lepidoptera: Crambidae) merupakan hama penting yang menyerang daun dan buah famili Cucurbitaceae, termasuk tanaman ekonomi penting seperti melon. Kajian tentang hama *Diaphania* yang menyerang daun dan buah melon belum banyak diteliti di Indonesia. Selain itu, dengan adanya kasus serangan pemakan daun dan buah di Bengkulu, diperlukan upaya pengendalian hama yang tepat. Salah satu dasar penentuan cara pengendalian adalah dengan mengetahui kepadatan populasi dan tingkat kerusakan yang ditimbulkan oleh hama tersebut. Penelitian ini dilakukan di lahan petani di Desa Sri Kuncoro, Kecamatan Pondok Kelapa, Kabupaten Bengkulu Tengah bulan November 2021-Januari 2022. Peubah yang diamati adalah kepadatan populasi *D. indica*, persentase kerusakan daun, dan persentase larva parasit. Hasil penelitian menunjukkan variasi kepadatan larva *D. indica* dan persentase kerusakan daun. Kepadatan populasi rata-rata larva adalah 1,47 per tanaman, dan persentase daun yang terinfeksi adalah 29,49%. Parasitoid yang berasosiasi dengan larva *D. indica* ditemukan pada *Apanteles* spp, dengan persentase larva *D. indica* yang terparasit sebesar 46,67%.

Kata kunci: *melon, Diaphania indica, Apanteles parasitoid*

INTRODUCTION

The melon is an annual plant belonging to the fruit category, which possesses the capacity for development and has the potential to emerge as a superior horticultural commodity. The consistent rise in demand for melons necessitates a sustained and substantial supply. It is essential that an ample and superior supply of fruit is consistently accessible to serve as a valuable agricultural commodity with significant economic worth.

The production of melon in Indonesia has exhibited fluctuations. According to data from the Central Bureau of Statistics (BPS) in 2020, there has been a decline in melon production in Bengkulu province. Specifically, the production of melons decreased from 330 tons in 2018 to 256 tons in 2019. Pest infestation is a significant factor contributing to suboptimal melon production. Such attacks can lead to a reduction in both the quantity and quality of melons and, in severe cases, crop failure. This not only jeopardizes the livelihood of farmers but also impacts the country's foreign exchange, given that melons are a vital export commodity.

Diaphania indica (Saunders) (Lepidoptera: Crambidae) is a pest that often attacks plants in the Cucurbitaceae family. Cucumber was one of the plants that was damaged. The caterpillars of *D. indica* eat the leaves, flowers, and young stems. They also eat the fruit. If the caterpillar eat the fruit, that's the worst thing that can happen. The fruit that has been affected has holes on its surface. This makes the fruit rot quickly, which lowers its quality and makes it unsafe to eat or sell (Brown, 2015). This pest attacks cucumbers, melons, bottle gourds, bitter gourds, snake gourds, Luffa, little cucumbers, cotton, etc. Damage to pumpkin plants was around 25-30%, and to pariah 3-4% (Nagaraju *et al.*, 2018), tomato (Sumual *et al.* 2014), and in a rain season in 2002/2003, there was an explosion of *D. indica* pest on bitter gourd plants in tidal swamp land with a level 80-100% damage (Thamrin & Asikin, 2004). Ulina *et al.* (2016) stated that *D. indica* was the species most commonly found on cucumber plants in Bogor, Sukabumi, and Cianjur districts with a density of 1-2.2 per plant, and Prabowo's research results (2009) *D. indica* was also found in cucumber plants in Pacet District, Cianjur District, West Java. In cucumber plants, one larva per leaf of *D. indica* can cause a yield loss of 10% (Schreiner, 1991).

Fitriyana *et al.* (2015) mentioned that *D. indica* is type of insect that has a fast development rate, a high survival rate and a very large reproductive capacity. If proper handling is not carried out in a timely manner, *D. indica* can potentially become a primary pest and cause significant damage in large quantities to economically important crops.

During a field observation conducted on August 16th, 2021, in Bengkulu City, it was observed that melon plants were subjected to damage caused by the leaf and fruit-consuming pest, *D. indica*. Melon plants that have sustained significant damage tend to yield smaller fruits unsuitable for commercial harvesting and sale. Furthermore, in the event of an attack on the fruit, it will decay.

The investigation of pests that target melon leaves and fruit in *D. indica* has not been extensively explored in Indonesia. In light of leaf and fruit consumption incidents in Bengkulu, it is imperative to implement effective pest control measures. A fundamental aspect in devising control measures is ascertaining the prevalence of population density and the extent of harm inflicted by *D. indica*. It is imperative to expeditiously and precisely conduct an assessment of the prevalence of *D. indica* in melons, as the infestation of these crops can rapidly propagate and jeopardize the entirety of agricultural terrain.

The purpose of this study was to study the population density and attack of *D. indica* on melons in Sri Kuncoro Village, Pondok Kelapa Sub-District, Bengkulu Tengah Regency.

MATERIALS AND METHODS

Observational surveys

This study used a survey method in Pak Amrozi's garden, the owner of a melon plantation, Sri Kuncoro Village, Pondok Kelapa Sub-District, Bengkulu Tengah Regency. The plot size is 50 x 50 m with 1000 plants. The plot was divided into seven observation sub-plots, and ten plants were taken from each observation sub-plot as sample plants. The total sample is 70 plants.

Observation of population density of Diaphania indica and its damage to melon plants

The population density of *D. indica* was calculated on the sample plants from 14 to 48 days after planting with an observation interval of once a week. The percentage of infected leaves was observed based on the symptoms of the *D. indica* attack. Each sub-plot was determined by ten melon plants to be observed. The formula used to calculate the percentage of leaf attacks is:

$$P = \frac{n}{N} \times 100\%$$

Descriptions: P = Percentage of infected leaves; n = Number of damaged leaves per plant; N = Number of leaves observed

Parasitoids associated with D. indica larvae (additional variable)

D. indica larvae were collected from non-sample plantations, and then the larvae were reared

individually in plastic caps (base diameter 8 cm, height 9.5 cm) covered with gauze. The larvae are fed with melon leaves. The percentage of parasitized *D. indica* larvae was calculated.

Data analysis

The data pertaining to population density, attack intensity, and parasitoids linked with *D. indica* were subjected to descriptive analysis and subsequently presented through pictorial and graphical means.

RESULTS AND DISCUSSION

Population density of D. indica on melon plants

Observations in the field found that *D. indica* attacked melon plants' leaves, flowers, and fruits. Young larvae eat the leaf mesophyll and leave the epidermis. In old larvae, the larvae eat the leaves so that the leaves become hollow, which causes a reduction in the photosynthesis process. Attacks on flowers cause the flowers to fall, and attacks on fruit cause holes in the fruit (Figure 1).



Figure 1. Symptoms of *Diaphania indica* damage on melon plants
 a. Symptoms of *D. indica* attack on melon leaves
 b. Symptoms of *D. indica* attack on melon flowers
 c. Symptoms of *D. indica* attack on melon fruits

The density of *D. indica* larvae on melon plants in Sri Kuncoro Village, Pondok Kelapa District, aged 14 days after planting (DAP) with an observation interval of once a week, the average density of *D. indica* larvae ranged from 0.4 to 3.56 during six weeks of observation, with an average of 1.47 per plant. The incidence of larvae density was low at the beginning of the observation, increased and peaked at 28 DAP, then decreased again (Figure 2).

The increase in the number of larvae in the third week of observation or the age of the plants at 28 DAP, it is possible that at the age of 28 days, this is the time when the leaves grow the highest. The similar occurrence was also found in melon plants (Tahir *et al.*, 2020), and in gourd plants (Barma & Jha, 2014).

Based on the results of the average density of larvae, the density of *D. indica* larvae was relatively low in melon plantations in the experimental area. This is in line with the study of Schreiner (1991) that the damage threshold for *D. indica* was one per cucumber leaf (Cruciferae), causing a yield loss of 10%, and population density of *D. pulverulentalis* larvae in mulberry was 2.92 per plant, with

infested plant 35.67% (Kumar *et al.*, 2019), while in this study, the average population was 1.47 larvae per plant. The low population of *D. indica* in melons during this study could also be due to the regular spraying by farmers and the presence of *D. indica* larvae parasitoids in the field. Parasitoids are natural enemies that can reduce pest populations. Parasitoids with good fitness will determine their effectiveness in controlling pest populations. Parasitoids that have good fitness will reduce the pest population quickly.

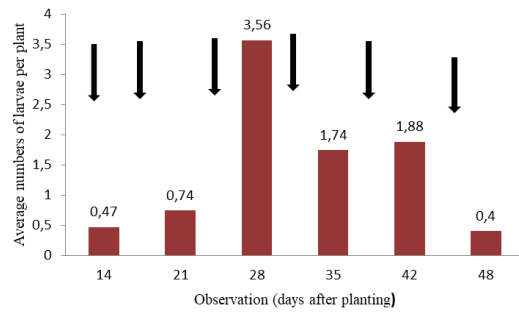


Figure 2. Fluctuations in the presence of *D. indica* larvae per plant. The down arrow indicates when the pesticide was applied by the melon garden owner

Percentage of leaves infected with D. indica on melon plants

The percentage of *D. indica* attacks on melon plant leaves during the observation ranged from 8.81-46.39%, with an average of 29.49%. The fluctuation in the percentage of affected melon leaves is presented in Figure 3.

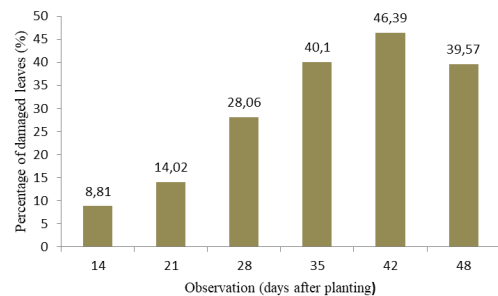


Figure 3. Fluctuations in the percentage of *D. indica* larvae attack per plant

D. indica attack on melon leaves continued to increase until the age of the plants 42 days after planting and decreased at the age of 48 days after planting. This is because it is always found that there are larvae that attack the leaves of melon plants, and with the increasing age of the plants, the infected leaves fall. Mohammed *et al.* (2013) also reported high leaf-eating attacks on melons, namely *Diaphania hyalinata* attacks at 46.6% in Sudan. In this study, the average percentage of *D. indica* attacks on

melons was 29.49%, and monitoring should be carried out periodically to predict the population increases trend. Thamrin and Asikin (2004) mentioned that leaf damage on bitter melon plants caused by *D. indica* could reach 80-100%, and with an intensity of 14.13-17.97% damage to cucumber plants (Arsi *et al.*, 2020).

This study also found *D. indica* larvae attacking flowers and fruit melons. The percentage of fruit melons attacked by *D. indica* was 2.8% in the 70 plant samples observed. This phenomenon can be attributed to the relatively small population size of *D. indica* larvae and the existence of parasitoids that have been observed to parasitize *D. indica* larvae. It contradicts the research conducted by Haldhar *et al.* (2021) which found the attack of *D. indica* on the fruit of several types of cucurbitaceae ranged from 18-71.33%.

Parasitoids associated with D. indica

The third instar larvae collected in the melon garden and reared in the Laboratory showed that the percentage of parasitic larvae was 46.67%. Moreover, the parasitoids associated with *D. indica* larvae after identification were *Apanteles* spp (Figure 4). *Apanteles* spp belongs to the family Braconidae, order Hymenoptera. The high percentage of parasitic *D. indica* larvae will undoubtedly have an impact on the density of *D. indica* larvae. The presence of *D. indica* was influenced by the presence of natural enemies. Peter & David (1991; 1992) reported that the parasitoid of the Braconidae family is one of the parasitoids that has the potential to be used as a control agent for *D. indica*. The parasitoid that can parasitize *D. indica* is *Apanteles taragamae* Viereck (Hymenoptera: Braconidae). *A. taragamae* has the potential to function as a reliable biological control agent given the significant degree of parasitism it exhibits on *D. indica*. Ulina *et al.* (2016) reported that the parasitoid *A. taragamae* was identified as the predominant parasitoid of *D. indica* in field studies. The parasitoid's degree of parasitization in the field can reach a maximum of 7%.



Figure 4. *Apanteles* spp which is a parasite of *D. indica*
 a. *Apanteles* spp larvae that have just left the body of *D. indica* larvae
 b. Pupae in the cocoon of *Apanteles* spp
 c. Imago of *Apanteles* spp

Puspitaningtyas *et al.* (2019) research found that *A. taragamae* demonstrated a capacity to parasitize 96% of *D. indica* larvae in controlled laboratory conditions. Nurkomar *et al.* (2017) reported that the proportion of *D. indica* larvae that were parasitic was 87.27%, which is consistent with the finding of Ganehiarachchi (1997), who reported a lower percentage of 6.4%. The parasitoid's capacity to parasitize *D. indica* is contingent upon the plant's morphology. Also, Peter & David (1990) stated that the leaves of ivy gourd and bitter melon exhibit a

relatively smoother texture in comparison to the leaves of cucumber and muskmelon. This characteristic enables the parasitization of *D. indica* larvae on smoother plant leaves.

CONCLUSION

Based on observations on melon plantations the average larval population density and percentage of attacks caused by *D. indica* on melon plants in Sri Kuncoro Village were 1.47 larvae per plant and 29.49%, respectively. *D. indica* besides attacking the leaves also attacks the flowers and fruit of the melon plant. The parasitoids associated with *D. indica* larvae were *Apanteles* spp with a percentage of parasitized *D. indica* larvae of 46.67%. Also, It is necessary to find solutions to control *D. indica* from an environmental perspective so that they do not have a negative impact on parasitoids.

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