BIOEDUSCIENCE
ISSN: 2614-1558
http://journal.uhamka.ac.id/index.php/bioeduscience

Population and Level of Noctuidae Pest Attack on Sweet Corn (*Zea Mays Saccharata* Sturt.)

Eva Tri Agustin [1], Noni Rahmadhini[1*], Ramadhani Mahendra Kusuma [1]

[1] Faculty of Agriculture, University of Pembangunan Nasional "Veteran" Jawa Timur, Surabaya-60294, East Java, Indonesia
[*] Correspondence: nonirahmadhini.agrotek@upnjatim.ac.id

Abstract

Background: Sweet corn (*Zea mays saccharata* Sturt.) is a food plant from the family grass, and cultivating sweet corn is more profitable because it has high economic value on the market. The growth phase of sweet corn plants often experiences a decrease in production yields, even crop failure due to pest attacks. This research aims to determine the pest population and the level of Noctudiae pest attacks that attack sweet corn plants. **Methods:** The study was conducted on moorland in Pilanggot Hamlet, Wonokromo Village, Tikung District, Lamongan Regency, East Java, from May to July 2023. This research used a selected random sampling survey method, namely observations on five plots, and each plot contained 48 observed plants. Observations began when the sweet corn plants were 14 HST and carried out once a week, 10 observations with 7-day intervals, namely in the vegetative phase (14, 21, 28, 35, 42) and generative phase (49, 56, 63, 70 and 77 HST). **Results:** The research results show that the highest population of Noctuidae pests is the armyworm (*Spodoptera frugiperda*), with as many as 63 individuals with a relative abundance of 54%. The Noctuidae pests found were the armyworm (*Spodoptera frugiperda*), moth (*Spodoptera litura*), and cob borer (*Helicoverpa armigera*). The highest attack percentage is 25%, but it is still mild. **Conclusions:** This research concludes that the highest population of Noctuidae pests is the armyworm (*S. frugiperda*)

Keywords: Attack rate; Noctuidae Pests; Population; Sweet Corn Plants

Check for updates

Article history
Received: 22 Jun 2024
Accepted: 24 Dec 2024
Published: 31 Dec 2024

Publisher's Note:
BIOEDUSCIENCE stays neutral with regard to jurisdictional claims in published maps and institutional affiliations.

Citation:
Agustin et al., 2024. Population and Level of Noctuidae Pest Attack on Sweet Corn (*Zea Mays Saccharata* Sturt.). BIOEDUSCIENCE, 8(3), 41-47. doi: 10.22236/jbes/15349

©2024 by authors. Licence Bioeduscience, UHAMKA, Jakarta. This article is open-access distributed under the terms and conditions of the Creative Commons Attribution (CC-BY) license.

Introduction

Sweet corn (*Zea mays saccharata* Sturt) is a food plant from the family grass, and cultivating sweet corn is more profitable because the product has high economic value on the market. According to the Central Statistics Agency, sweet corn production in Indonesia in 2021 has increased to 31.633 million tons compared to the previous year of 30.141 million tons. Even though it experienced an increase in 2021, sweet corn plants experienced problems such as the presence of attacks by Plant Pest Organisms (OPT), which was relatively high, namely 78.14 percent, while the remaining 21.86 percent were not affected by OPT attacks (BPS, 2022). Yield losses due to pest attacks can reach 80% (Nurmaisah & Purwati, 2021). The growth phase of corn plants can experience a decrease in production yields and even experience crop failure due to pest attacks (Millatinassilmi & Winaya, 2014).

Noctuidae pests that attack sweet corn plants in the vegetative and generative phases are *S. frugiperda* and *S. litura*. Other pests that attack the generative phase are *H. armigera, Helicoverpa assulta,* and *Mythimna loreyi* (Leonardo *et al*., 2021). Losses due to pests can reach 15-73% when young corn plants are still curled (Nonci *et al*., 2019). A population is

a group of living things of the same species in the same area during the same period. The population of insect pests in nature is not constant but experiences fluctuations influenced by abiotic and biotic factors, namely environmental and internal factors (Priscilla, 2021; Utama *et al*., 2017).

The level of pest attack can be categorized from mild to severe. Plant damage caused by insects is done by biting, sucking, eating, injuring roots, laying eggs, observing other insects, and introducing disease (Untung, 2010). Plant damage can be complete, such as dying or rotting, or only part of the plant, such as damaging the leaves, stems, fruit, and roots.

A population can be determined by counting the number of larvae found at the research location, while the level of pest attacks on plants is by counting the parts of the plant that are attacked based on the collection location (Rifai, 2017). The level of attack and population of pests that attack sweet corn plants can be determined by calculating the pest population on the plant and the level of pest attacks by observing symptoms of plant damage due to pest attacks (Leonardo *et al*., 2021). Based on the background, it is necessary to research the population and level of Noctudiae pest attacks that attack sweet corn plants. This research aims to determine the type of Noctuidae pests on sweet corn plants and the population and level of Noctuidae pest attacks that attack sweet corn plants.

Methods

Place and time

The research was conducted on moorland in Pilanggot Hamlet, Wonokromo Village, Tikung District, Lamongan Regency, East Java. The land area used for research is 200 m2. Research observations were carried out from May to July 2023. Further identification was carried out at the Plant Health Laboratory, Faculty of Agriculture, University of Pembangunan Nasional "Veteran" Jawa Timur.

Tools and materials

The tools used in this research were wood, basins, lamps *light trap*, plastic, preserved bottles, digital microscopes, laptops, cameras *cell phones* (5760x4312), a nameplate, a name label, an observation book, an insect collection box and introduction to arthropod study book Borror's work (Triplehorn & Johnson, 2005), The Insects: an Outline of Entomology (Gullan & Cranston, 2014). The materials used in this research were sweet corn plants, soapy water, 70% alcohol, and insect pests on sweet corn varieties *Sweet boy*

Research methods

This research used a selected random sampling survey method: observations on five plots; each plot contained 48 observed plants. Observations began when the sweet corn plants were 14 HST and carried out once a week, 10 observations with 7-day intervals, namely in the vegetative phase (14, 21, 28, 35, 42) and generative phase (49, 56, 63, 70 and 77 HST).). The land area is 200 m^2.

Data sampling on land uses a survey method by directly observing plants attacked by pests and observing pests trapped in their *Light trap*. *A light trap* is used to catch or attract insects that are attracted to light at night (nocturnal) to determine the existence of insect populations on agricultural land. *Light traps are* starting to be lit at 18.00-06.00 WIB at the age of the plant from 14 HST to 77 HST (harvest). Observations were carried out every 2 days in 1 week for 10 weeks.

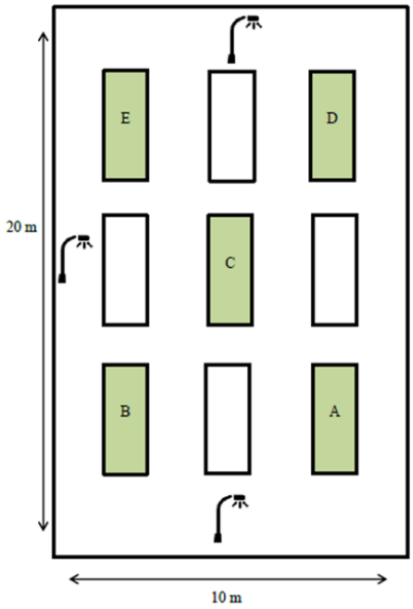

Figure1. Experimental floor plan

Information :

: Sample plot of observed sweet corn plants

: Land for sweet corn crops

: *Light trap*

Data collection

The observation parameters in this research are the population and type of Noctuidae pests, symptoms of Noctuidae pest attacks, absolute damage calculations, and the relative abundance of Noctuidae pests found.

This formula calculates absolute damage (Sudewi *et al*., 2020).

$$I = \frac{n}{N} X\ 100\%$$

Information :
I: attack intensity (%),
n: many examples that are damaged (leaves, stems, shoots),
N: many examples are observed.

This formula calculates relative abundance (Magurran, 2005).

$$Di = \frac{ni}{N} x\ 100\%$$

Information :
Di: Relative abundance
ni: Number of individuals of type i
N: The total number of all individuals

Data analysis

The data obtained was then tabulated using Microsoft Excel, and the results were presented in tables and graphs.

Result and Discussion

Noctuidae Pest Population

The results of observations were carried out for 10 weeks and found three species of pests in sweet corn plantations. The pests found were armyworms (*Spodoptera frugiperda*), armyworms (*Spodoptera litura*), and the corn cob borer (*Helicoverpa armigera*).

Table 1. Number of Noctuidae Pest Populations

No	Species	Population (tail)	
		Vegetative	Generative
1.	Armyworm (*Spodoptera frugiperda*)	50	13
2.	Armyworm (*Spodoptera litura*)	-	40
3.	Pod borer (*Helicoverpa armigera*)	-	14

A population is a group of living things of the same species in the same area over the same period. Insect populations can be determined by counting the number of larvae found at the research location (Priscilla, 2021). Table 1. shows data regarding the number of noctuidae pest populations on sweet corn plants. Some of the pests found were armyworms (*S. frugiperda*). This pest was found on the leaves of 63 sweet corn plants. *S. frugiperda* is one of the main pests of corn plants. The armyworm (S. litura) pest was found in 40 individual sweet corn plants. *S. litura* is a polyphagous pest with a holometabolous (perfect) life cycle and belongs to Lepidoptera (Fattah & Ilyas, 2016). The pest is H. armigera, found in sweet corn plants in as many as 14 individuals. *H. armigera* is a polyphagous pest and attacks corn, cotton, beans, sorghum, sunflowers, soybeans, and peanuts (Tay *et al*., 2013).

Spodoptera frugiperda

Armyworm (*S. frugiperda*) is found in sweet corn plants' leaves. *S. frugiperda* is one of the main pests on corn plants, with a distinctive characteristic on the top of the head, namely the 'Y'. This pest has white to yellowish lines on the lateral parts and four black spots, (Bhavani *et al*., 2019) state that *S. frugiperda* has the distinctive characteristic of the letter 'Y' upside down on the head, and there are black spots that are different from the color of the body. According to Ali *et al.* (2018), This pest has white to yellowish lines on the lateral parts and four square black spots on the eighth segment. Attacks generally start from the vegetative phase to the generative phase of the plant, with the highest level of damage seen in the vegetative phase (Trisyono *et al*., 2019). Temperature for developing armyworm larvae *S. frugiperda* from egg to imago ranges from 26-32°C (Du Plessis *et al*., 2020).

Spodoptera litura

Armyworm (*S. litura*) found on the *light trap* in sweet corn plants. This pest has black antennae on its head and a dark brown moth body. The front wings have black spots with white and yellow stripes. This statement is supported by Nonci *et al.* (2019), who state that moths S. litura Have a dark brown color for the front wings and a grayish-white color for the back wings, and there are pale lines along the veins. *S. litura* is a polyphagous pest with a holometabolous (perfect) life cycle and belongs to Lepidoptera (Fattah & Ilyas, 2016). *S. litura* can reproduce for 24-34 days at a temperature of 20-24^{0}C.

Helicoverpa armigera

Corn cob borer (*H. armigera*) is found in sweet corn plants. The color of this pest's caterpillars found is green. This agrees with the research results from Putri *et al.* (2010) that the color of the caterpillars consisted of several colors, namely yellowish white, yellow, and green. The larval body consists of several segments and is covered with short hairs, a biting mouth type. *H. armigera* is a polyphagous pest and attacks corn, cotton, beans, sorghum, sunflowers, soybeans, and peanuts (Tay *et al.*, 2013).

Symptoms of Noctuidae Pest Damage to Sweet Corn Plants

The results of observations at the fall armyworm research location (*S. frugiperda*) begin to show symptoms at the age of 14 HST. Initial damage symptoms include larvae found on the young leaves of corn plants the presence of irregular leaf cut marks caused by eating, and dirt such as sawdust on the leaves (Figure 2.). The larvae make holes in the leaves and eat the leaves from the edge to the inside. The presence of larval crack marks usually marks damage to plants, namely, coarse powder, such as sawdust, on the upper surface of the leaves or around the top of the corn plant. According to Trisyono *et al.* (2019), Attacks generally start from the vegetative phase to the plant's generative phase, with the highest level of damage seen in the vegetative phase.

Figure 2. Symptoms *S. frugiperda* attacks corn leaves in the vegetative phase

Figure 3. Symptoms *H. armigera* attacks corn in the generative phase

Attack observation results *in H. armigera* began to be observed in sweet corn plants aged 49 HST. At this age, sweet corn plants experience damage symptoms, characterized by larvae entering the cob and eating the developing corn kernels (Figure 3). This pest attacks the cobs, shoots, and panicles, resulting in male flowers not forming, which reduces plant yields. This pest infestation also reduces the quality and quantity of corn cobs. According to Sembiring (2022), this pest attack on plants begins to bear fruit or young corn at 42 HST and reaches its peak at 62 HST.

Absolute Damage

The results of observations in sweet corn fields showed that the pests that damaged the plants were Noctuidae pests.

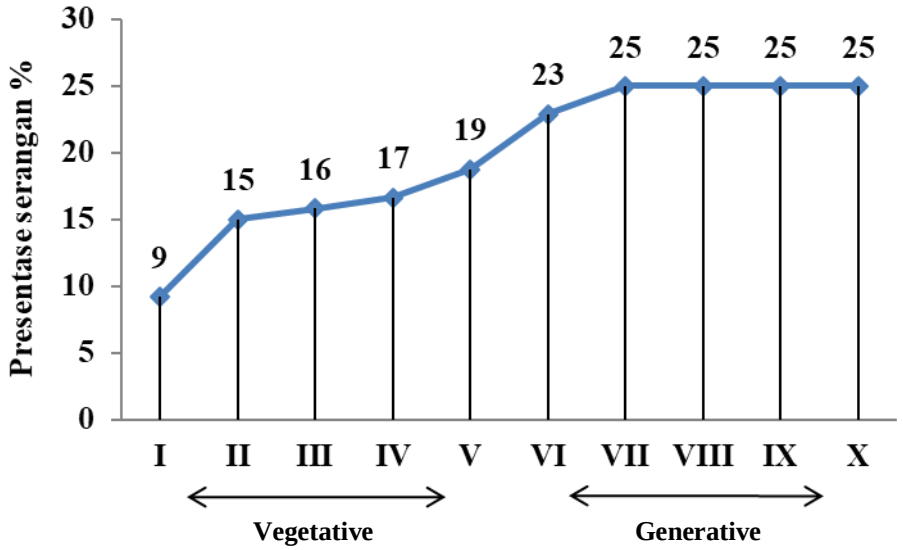

Figure 4. Graph of the percentage of Noctuidae pest attacks on plants

Figure 4. shows the intensity of damage caused by pests S. frugiperda and H. armigera, which have increased weekly. In the vegetative phase, armyworm pest attacks (*S. frugiperda*). This statement is supported by Trisyono *et al.* (2019). This pest attack generally starts from the vegetative phase to the generative phase of the plant, with the highest level of damage seen in the vegetative phase. Meanwhile, in the generative phase, many corncob borer attacks (*H. armigera*). The attack intensity reached 25% during 10 observations. During the 7th to 10th weeks of observation, there was an increase in damage compared to the previous week's observations, namely 25%. This is because the larvae are mature enough, so they have a high ability to eat and cause a high intensity of damage to corn plants. Apart from that, another factor that influences the weekly increase is not spraying pesticides to suppress the pest population. The percentage of damage at weeks 7, 8, 9, and 10 of observation was the same, namely 25%. The increase in the rate of attacks every week is followed by the pest life cycle development. This pest's life cycle phases include complete metamorphosis, including egg, larva, pupa, and imago. In weeks 7 to 10, it has the exact percentage value. It is thought that this has entered the pupa phase, where the pupa phase is resting before continuing to become an image. So, increasing plant age is followed by phases of the pest life cycle. Apart from that, farmers also spray chemical pesticides.

Pest populations can also influence the intensity of plant damage. This statement is supported by Rondonuwu (2007), who states that the intensity of plant damage usually follows the pest population that causes damage. Therefore, the pest population has a significant influence on plant damage. The high level of damage to plants is influenced by pests that damage the plants. Apart from that, another factor that influences the weekly increase is not spraying pesticides to suppress the pest population.

Relative Abundance

The results of observations of Noctuidae insect pests in sweet corn fields are shown in Figure 8, namely the relative abundance of pests.

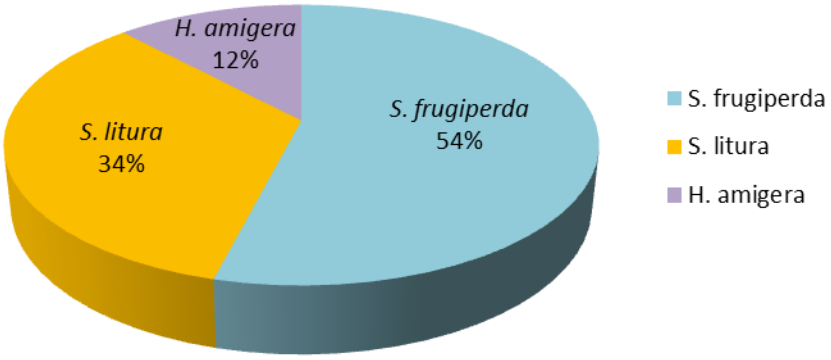

Figure 5. Relative abundance percentage

Relative abundance is used to determine the number of insects that frequently come to land and describes the distribution of these insects (Suin, 2012). The relative abundance of armyworm pests (*S. frugiperda*) in the vegetative to generative phase is 54%, and Armyworm pests (*S. litura*) have a relative abundance of 34%. Pest *H. armigera*'s relative abundance is 12% (Figure 5).

The high relative abundance of *S. frugiperda,* is its distribution. *S. frugiperda* is an invasive pest on corn plants in various countries, including Indonesia. Cases of attacks by this pest have been reported since May 2019 in Lampung Province (Trisyono *et al*., 2019). The intensity of larval damage of *S. frugiperda* in the Lamongan district ranges between 45-71%, with the percentage of attacks reaching 100% (Damayanti *et al*., 2023). Apart from that, it can also be influenced by several other biotic and abiotic factors. The temperature is suitable for developing armyworm larvae *S. frugiperda* from egg to imago ranges from 26-32°C (Du Plessis *et al*., 2020). Sweet corn cultivation was carried out in this research on observation land using a monoculture planting pattern where only one type of plant is planted. Monoculture is a cultivation method on agricultural land that involves planting one kind of plant in one area (Zulfahmi *et al*., 2016). So, implementing this planting pattern will provide sufficient feed for developing S. frugiperda. According to Irawan *et al.* (2022), the nutritional suitability of feed influences the growth and development of insects. According to Rahmatilah *et al.* (2023), synthetic pesticides hurt pest resistance and resurgence problems.

Conclusions

This research concludes that the highest population of Noctuidae pests is the armyworm (*S. frugiperda*), with as many as 63 individuals with a relative abundance of 54%. The Noctuidae pests found were armyworms (*S. frugiperda*), moths (*S. litura*), and cob borer (*H. armigera*). The highest attack percentage is 25%, but it is still mild.

Declaration statement

The authors reported no potential conflict of interest.

References

Ali, S., Masroor, Z., & Masroor, M. D. (2018). The first record of the fall armyworm, Spodoptera frugiperda (J. E. Smith, 1797) (Lepidoptera: Noctuidae), an evil attack on paddy in Magadh, Bihar (India). *Journal of Emerging Technologies and Innovative Research.*, *5*(12).

Bhavani, B., V, C. S., P, K. V., M, B. L., P, J., & Bhavani, S. (2019). Morphological and molecular identification of an invasive insect pest, fall armyworm, *Spodoptera frugiperda,* occurring on sugarcane in Andhra Pradesh, India. *Journal of Entomology and Zoology Studies*, *7*, 12–18.

Damayanti, D. R., Megasari, D., & Khoiri, S. (2023). Serangan *Spodoptera frugiperda* (Lepidoptera: Noctuidae) pada Pertanaman Jagung di Kabupaten Lamongan. *Agropross: National Conference Proceedings of Agriculture*, 274–280. https://doi.org/10.25047/agropross.2023.468

Du Plessis, H., Schlemmer, M.-L., & Van Den Berg, J. (2020). The Effect of Temperature on the Development of *Spodoptera frugiperda* (Lepidoptera: Noctuidae). *Insects*, *11*(4), 228. https://doi.org/10.3390/insects11040228

Fattah, A., & Ilyas, A. (2016). Siklus Hidup Ulat Grayak (*Spodoptera litura*, F) dan Tingkat Serangan pada Beberapa Varietas Unggul Kedelai di Sulawesi Selatan. *Prosiding Seminar Nasional Inovasi Teknologi Pertanian Banjarbaru.*

Ginting, S., Santoso, T., Munara, Y., Anwar, R., & Sudirman, L. (2019). PATOGENISITAS CENDAWAN Lecanicillium sp. PTN01 Terhadap Penggerek Tongkol Jagung *Helicoverpa armigera* (HUBNER) (LEPIDOPTERA: NOCTUIDAE). *BERITA BIOLOGI*, *18*(1). https://doi.org/10.14203/beritabiologi.v18i1.3378

Irawan, F. P., Afifah, L., Surjana, T., Irfan, B., Prabowo, D. P., & Widiawan, A. B. (2022). Morfologi dan Aktifitas Makan Larva S*podoptera frugiperda* (Lepidoptera: Noctuidae) Pada Beberapa Inang Tanaman Pangan dan Hortikultura. *Jurnal Agroplasma*, *8*(2), 170–182.

Leonardo, F., Ramadhan, T. H., & Syahputra, E. (2021). Populasi dan Tingkat Serangan Hama Noctuidae pada Tanaman Jagung Manis di Kecamatan Rasau Jaya, Kabupaten Kubu Raya, Kalimantan Barat. *Jurnal Sains Pertanian, 10*(2), 1–18.

Magurran, A. E. (2005). *Measuring Biological Diversity.* Blackwell Publishing. Oxford, UK.

Millatinassilmi, A., & Winaya, I. W. (2014). *Perkembangan Populasi Tiga Hama Utama pada Tanaman Jagung (Zea mays L.).* Institut Pertanian Bogor. Bogor.

Nonci, N., Kalqutny, S. H., Mirsam, H., Muis, A., Azrai, M., & Aqil, M. (2019). *Pengenalan Fall Armyworm (Spodoptera frigiperda J. E. Smith) Hama Baru pada Tanaman Jagung di Indonesia.* Balai Penelitian Tanaman Serealia.

Priscilla, S. p. (2021). *Populasi dan Intensitas Kerusakan akibat Serangan Spodoptera frugiperda pada Tanaman Jagung di Kelurahan Lewoleba Timur, Kecamatan Nubatukan, Kabupaten Lembata.* Universitas Nusa Cendana. Kupang.

Purwati, N. (2021). *Identifikasi jenis serangga hama pada tanaman jagung (Zea mays) di Kota Tarakan*.

Putri, V. A., Jasmin, & E., S. (2010). *Kepadatan Populasi Ulat Penggerek Tongkol (Helicoverpa armigera Hubner) pada Tanaman Jagung di Keluruhan Pisang Kecamatan Pauh Padang.* [Laporan Penelitian]. Program Studi Pendidikan Biologi Sekolah Tinggi Keguruan dan Ilmu Pendidikan (STKIP) PGRI. Sumatra Barat.

Rahmatilah, C., Ramadhan, R. A. M., & Nasrudin, N. (2023). Pengaruh Pemberian Ekstrak Aqueous Daun Pepaya Terhadap Pembentukan Imago, Fekunditas Dan Fertilitas *Spodoptera frugiperda* J. E. SMITH. *Agrivet*, *29*(2), 105-111. https://doi.org/10.31315/agrivet.v29i2.10126

Rifai, B. (2017). *Identifikasi dan Pengelolaan Tumbuhan di Kampus III Universitas Muhammadiyah Malang dengan Aplikasi Android Berbasis QR (Quick Response) Code.* University of Muhammadiyah Malang.

Rondonuwu, S. L. (2007). *Ekologi Serangga. Bahan Jar Program Semi-Que.* Fakultas Pertanian, Universitas Sam Ratulangi, Manado.

Sembiring, J. (2022). Pola Distribusi dan Intensitas Serangan Hama Utama *Ostrinia furnacalis Guenee* dan *Helicoperva armigera* Hubner pada Tanaman Jagung (*Zea mays* L.) di Kabupaten Merauke. *Bioscientist : Jurnal Ilmiah Biologi*, *10*(1), 25-34. https://doi.org/10.33394/bioscientist.v10i1.4719

Sudewi, S., Ala, A., Baharuddin, B., & Bdr, M. F. (2020). Keragaman Organisme Pengganggu Tanaman (OPT) pada Tanaman Padi Varietas Unggul Baru (VUB) dan Varietas Lokal pada Percobaan Semi Lapangan. *Agrikultura*, *31*(1), 15-24. https://doi.org/10.24198/agrikultura.v31i1.25046

Suin, N. M. (2012). *Ekologi Hewan Tanah, Cetakan IV.* Bumi Aksara & Pusat Antar Universitas Ilmu Hayati ITB. Jakarta.

Tay, W. T., Soria, M. F., Walsh, T., Thomazoni, D., Silvie, P., Behere, G. T., Anderson, C., & Downes, S. (2013). A Brave New World for an Old World Pest: Helicoverpa armigera (Lepidoptera: Noctuidae) in Brazil. *PLoS ONE*, *8*(11), e80134. https://doi.org/10.1371/journal.pone.0080134

Trisyono, Y. A., Suputa, S., Aryuwandari, V. E. F., Hartaman, M., & Jumari, J. (2019). Occurrence of Heavy Infestation by the Fall Armyworm *Spodoptera frugiperda*, a New Alien Invasive Pest, in Corn Lampung Indonesia. *Jurnal Perlindungan Tanaman Indonesia*, *23*(1), 156-160. https://doi.org/10.22146/jpti.46455

Untung, K. (2010). *Diktat Dasar-Dasar Ilmu Hama Tanaman*. Jurusan Hama dan Penyakit Tumbuhan UGM.

Utama, I. W. E. K., Sunari, A. S., & Supartha, I. wayan. (2017). Kelimpahan Populasi dan Tingkat Serangan Kutu Daun (Mysuz persicae Sulzer) (Homoptera: Aphididae) pada Tanaman Cabai Merah (*Capsicum annuum* L.). *Jurnal Agroekoteknologi Tropika.*, *6*(4), 397–404.

Zulfahmi, R., Safrida, & Sofyan. (2016). Analisis perbandingan pendapatan petani pola tanam monokultur dan polikultur di Kecamatan Meureudu, Kabupaten Pidie Jaya. *J. Ilmiah Mahasiswa Pertanian Unsyiah*, *1*(1), 305–315.