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THE PRESENCE OF GRAYAK CATERPILLAR (*Spodoptera litura* F.) AND ITS PREDATORS ON DIFFERENT POTATO (*Solanum tuberosum* L.) VARIETIES IN SEMBALUN VILLAGE

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Abstract
Potato (*Solanum tuberosum* L.) is an important horticultural commodity that serves as an alternative source of carbohydrates. However, its productivity often declines due to pest attacks, particularly the common cutworm (*Spodoptera litura* F.). This study aimed to determine the population and intensity of S. litura infestation, the presence of its natural predators, and the resistance of several potato varieties in Sembalun Village, East Lombok Regency. The research was conducted from July to September 2024 using a Randomized Block Design (RBD) with three potato varieties (Citra, Titan, and Granola) and six replications, resulting in 18 experimental plots. Observed parameters included the population and intensity of S. litura, predator abundance, specific leaf weight, trichome density, number of stem nodes, plant height, and tuber yield. The results showed that the Granola variety had the highest pest population and infestation intensity (2.02 individuals; 24.63%), while the Titan variety had the lowest (0.21 individuals; 0%). Identified predators included *Pardosa pseudoannulata, Oxyopes* sp., and *Coccinella arcuata*, with the highest abundance found in the Titan variety (5.71 individuals). Titan also exhibited the highest trichome density and specific leaf weight, as well as the greatest tuber yield (31.17 tubers; 1.23 kg). Therefore, Titan is more resistant to *S. litura* attacks compared to other varieties and is recommended for potato cultivation in the Sembalun area.

Keywords: Potato, Spodoptera litura F., Potato Varieties, Sembalun.

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1. Introduction

Agriculture is a strategic sector that plays an important role in supporting national food security. Food security is not only determined by the availability of rice as a staple food, but also by the diversification of other carbohydrate sources. One horticultural commodity that has great potential as an alternative source of carbohydrates is the potato (*Solanum tuberosum* L.). Potatoes are known to be highly nutritious, especially in terms of carbohydrates, protein, vitamins, minerals, and a relatively low glycemic index, which is good for health. Therefore, potatoes are in high demand and have high economic value in both domestic and international markets.

Based on data from the Central Statistics Agency (BPS), potato production in Indonesia in 2021 reached 1,361,064 tons, then increased to 1,503,998 tons in 2022 with a growth of 10.52%. This data shows the potential for increased potato productivity. One of the potato production centers in Indonesia is Sembalun Village, East Lombok Regency, West Nusa Tenggara. This area is known as a region with agroclimatic conditions that support potato growth, as it is located on the slopes of Mount Rinjani at an altitude of 1,200-1,600 meters above sea level with cool temperatures and fertile soil. However, despite its potential, potato production in Sembalun from 2017 to 2021 still experienced significant fluctuations. This was influenced by climate, land conditions, and most importantly, attacks by plant pests (OPT).

One of the pests that often causes serious damage to potato crops is the armyworm (*Spodoptera litura* F.). This pest is known to be polyphagous, meaning it can attack various types of food and horticultural crops. In the larval stage, S. litura is very voracious and can devour plant leaves in a short time. Severe armyworm attacks can cause severe damage to leaves, leaving only leaf veins, which ultimately inhibits photosynthesis and reduces crop yields. Losses due to armyworm attacks can reach 80%, and often cause crop failure if control measures are not taken.

Until now, potato farmers in Sembalun have tended to rely on chemical pesticides to control pests. Although effective in the short term, excessive use of pesticides causes various problems, including pest resistance, the killing of natural enemies, environmental pollution, and chemical residues on agricultural products. Therefore, a more environmentally friendly pest control strategy is needed, one of which is through the use of natural enemies (predators). Natural predators such as *Oxyopes* sp. and *Pardosa pseudoannulata* spiders, as well as coccinellidae beetles, are known to play an important role in naturally suppressing the population of *S. litura*.

In addition to the role of predators, the resistance of potato varieties is also key to pest control. Varieties with certain morphological characteristics, such as thicker leaves and higher trichome (leaf hair) density, are usually more resistant to armyworm attacks. The varieties commonly cultivated by farmers in Sembalun Village are Citra, Titan, and Granola. However, the level of resistance of these three varieties to *S. litura* pests and their relationship with the presence of predators has not been extensively studied scientifically. This information is very important for the development of a productive and sustainable potato cultivation system. Therefore, research has been conducted on "The Presence of Grayak Caterpillars and Their Predators in Various Potato Varieties in Sembalun Village."

2. Materials and Methods

This study was conducted using an experimental method with direct data collection techniques in the field at a number of observation points. This method was used to determine the population level, damage intensity, and predator population in several potato varieties due to armyworm pests that occurred at the study site. The design used was a Randomized Block Design (RBD) using three varieties (Citra, Titan, and Granola) as treatments. Each treatment was repeated 6 times, resulting in 18 experimental units.

2.1. Observations

Observations were conducted eight times at weekly intervals, namely at 3 MST, 4 MST, 5 MST, 6 MST, 7 MST, 8 MST, 9 MST, and 10 MST. The potato plants were observed for armyworm pests by counting the pest population in all parts of the plant, such as the leaves, stems, flowers, and stalks. Each observation was conducted in the morning between 7:00 and 9:00 a.m. WITA. The pests collected were then placed in Eppendorf tubes filled with 70% alcohol. The pests were identified using a microscope in the laboratory, and the pests and their numbers were recorded.

2.2. Parameters

The parameters observed in this study were pest population, pest attack intensity, predator population, number of stems, plant height, specific leaf weight, leaf hair density (trichomes), number of tubers, and potato tuber weight.

2.3. Data Analysis

Using ANOVA at a 5% significance level, if the prediction is achieved, the analysis will be continued with a BNJ follow-up test or a Significant Difference Test at a 5% significance level and a Regression Test to determine the relationship between population size and pest attack intensity, the relationship between attack intensity and specific leaf weight, the relationship between attack intensity and trichomes in several potato (*Solanum tuberosum* L.) varieties.

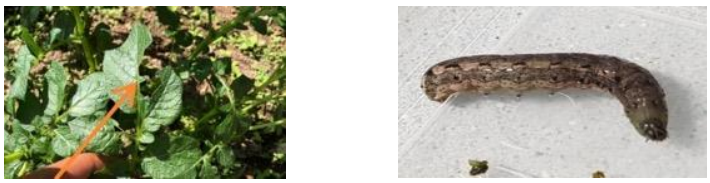
3. Results and Discussions

3.1 Environmental Conditions at the Test Site

Environmental conditions in Sembalun Village (±1,150 m above sea level) with daily temperatures of 18–23°C and humidity of 75–85% affect the population dynamics of Spodoptera litura and its natural predators. Temperatures lower than the optimal range for armyworm development (25–30°C) slow down the life cycle and reduce reproduction (Hakim et al., 2019), while high humidity supports the activity of predators such as spiders and coccinella beetles (Sopialena, 2018). Rainfall from July to September 2024 ranged from 20 to 150 mm/month (BMKG NTB, 2024), which is classified as low to moderate, so it did not cause the washing away of larval eggs or the death of predators. The presence of refugia plants (kenikir, sunflowers, marigolds, etc.) also increases the population of natural enemies by up to 30% (Prayogo, 2020; Sari et al., 2021). The combination of climate factors and refugia supports ecosystem stability and suppresses the armyworm population, especially in varieties with supportive leaf morphology, such as Titan.

3.2 Morphological Characteristics and Symptoms of *Spodoptera litura* F. Larvae Attacks

The results showed that Spodoptera litura F. pests were found in the potato (*Solanum tuberosum* L.) research field in the Sembalun highlands. Based on observations of *Spodoptera litura* F. pests, identification was carried out to determine their general morphological characteristics. The characteristics of *Spodoptera litura* F. pests can be seen in Figure 1.



(a) (b)

Figure 1 Symptoms of Damage and Pests *Spodoptera litura* F.
Description: a. Damage Symptoms, b. *Spodoptera litura* F. Pests.
(Source: Personal Documents, 2024).

The larvae of the armyworm (*Spodoptera litura* F.) are pale green with a dark black head and two black spots on the abdominal segments. The instar I larval stage lasts two to three days. Instar I and II larvae feed on the epidermis of the leaves, causing the leaf lamina to become thin. Each larva then spreads to other parts of the plant. The larval phase consists of five instars, with instars III, IV, and V being active feeders that consume the entire leaf, leaving only the leaf veins. The caterpillar phase lasts for 12-15 days, after which it enters the pupal phase (Fattah et al., 2016).

Symptoms of *Spodoptera litura* F. caterpillar infestation on potato plants at the research site can be seen in Figure 1. The damage begins with third instar larvae eating the edges of the leaves, leaving only the leaf veins and veins. In the next instar, the larvae eat the potato leaves, leaving irregular holes. Severe attacks can cause the entire affected leaf to be reduced to its veins. This can interfere with the photosynthesis process in potato plants, resulting in suboptimal growth. In addition, the presence of this pest can also be detected by looking for black fecal marks on the leaves of potato plants.

3.3 Population Development of *Spodoptera litura* F. Pests

Based on observations of the *Spodoptera litura* F. pest population for each treatment and eight observations on three potato varieties, the population numbers are shown in Figure 2.

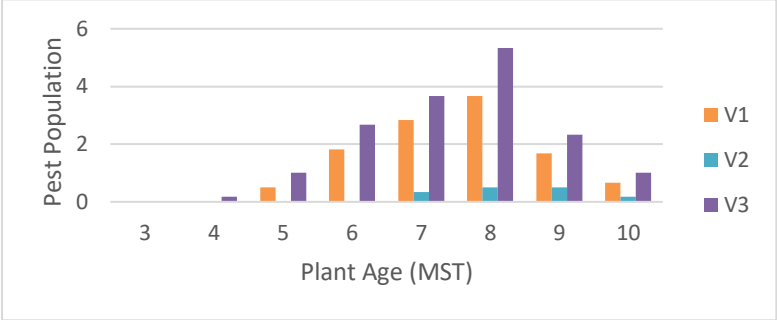


Figure 2 Graph showing the development of the average population of *Spodoptera litura* F. pests on potato plants at each observation time.

Figure 2 above shows the population of *Spodoptera litura* F. pests in each observation and treatment. It can be seen that at 4 weeks after planting (WAP), the pest population was still very low and was only found in the Citra and Granola varieties. This was because there was already a food source available for the armyworms. Meanwhile, there was no pest population in the Titan variety because the early development of the seedlings and the emergence of shoots on the soil surface were slower than in the Citra and Granola varieties. The population then increased in the Granola and Citra varieties until the potato plants were 8 MST old, while in Titan the population increased until the plants were 9 MST old. The increase in population occurred due to internal factors, namely the pests themselves, and external factors consisting of environmental factors and the availability of food for the pests. The increase in the armyworm population occurred because the potato plants were in the vegetative phase, with the peak vegetative period for the Granola and Citra varieties at 8 MST and for the Titan variety at 9 MST. In this phase, the plants undergo growth and development, becoming taller and forming more leaves, which indirectly provide food for the armyworms. This provides an environment suitable for the armyworms to continue reproducing. The increase in pest population in each variety occurred when the plants entered the rapid vegetative phase, which means that the plants underwent growth and

development, resulting in more upper vegetative organs. Tampubolon (2013) states that pests attack potato plants in the vegetative phase, which is when the plants have undergone good development, with leaves that are not yet old and a maximum number of leaves, thus attracting pests to eat the young leaves. The pest population then declines at 9 MST to 10 MST in potato plants. This occurs because the plants have entered the generative phase, which affects plant growth and causes the leaves to age, as indicated by many potato leaves turning yellow and wilting until they fall off. This causes the pests to migrate to other host plants (migrate to new places) that are more beneficial because armyworms are polyphagous.

3.4 Development of Attack Intensity and Predators of *Spodoptera litura* F.

Mulching is done during the day when the sun is hot to make it easier to pull the mulch to its maximum extent. This is followed by making planting holes 30 x 50 cm apart.

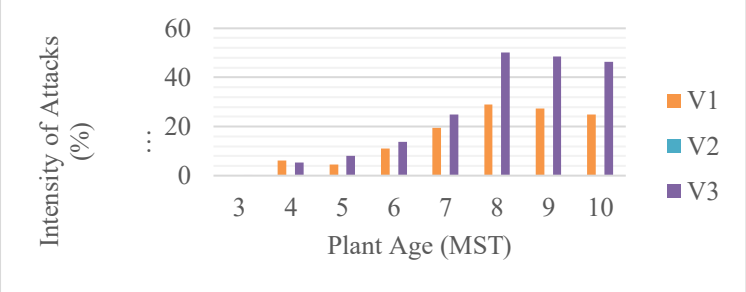


Figure 3 Graph of Pest Attack Intensity Development *Spodoptera litura* F.

Based on Figure 3, it can be seen that the intensity of *Spodoptera litura* F. pest attacks on potato plants in each treatment increased at 4 weeks after planting (WAP) and peaked at 8 WAP, with the highest attack intensity of 50.02% found in treatment 3 (Granola variety). This is because the greater the pest population, the higher the intensity of pest attacks. A similar result was found in a study conducted by Palit et al. (2016), which stated that the higher the population, the higher the intensity of attacks caused by *Spodoptera litura* F. larvae. Based on the results of research by Tampubolon (2013), insect pests attack potato plants in the vegetative phase, which is when the plants have undergone good development, the number of leaves is sufficient to provide nutrients to the potato plants, and attracts insect pests to eat the young leaves. The increase in pest attack intensity is influenced by the population, causing a reduction in leaf area and disrupting the photosynthesis process, which ultimately reduces yield and productivity. However, it can be seen that in treatment 3 (Titan variety), there was no intensity of *Spodoptera litura* F. pest attacks. This is because treatment 3 (Titan variety) has thick, broad leaves that are resistant to armyworm attacks. The intensity of pest attacks in treatment 1 (Citra variety) and treatment 2 (Granola variety) decreased in the 9mst to 10mst observation period. This was due to a reduction in food availability, as indicated by yellowing and falling leaves. According to Martini et al. (2005), the decrease in attack intensity in crops entering the generative phase is due to the fact that during the generative phase, the nutrient content in the leaves is still high, but after that it will decrease. When plants have entered the generative phase, the protein content of the leaves decreases because it has been transferred to the flowers, making it less suitable for the growth and development of larvae.

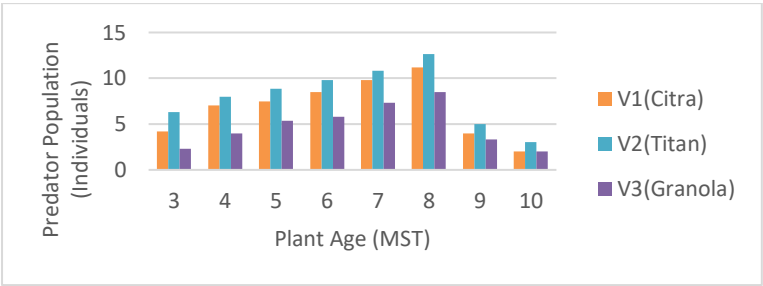


Figure 4 Graph of Pest Predator Population Development *Spodoptera litura* F.

Based on Figure 4 above, the predator population of *Spodoptera litura* F. pests can be seen to increase from 3 months of age to 8 months of age. This is due to the abundant availability of prey and a supportive environment, such as the presence of refugia plants, diverse flora for shelter, a pesticide-free environment, and alternative food sources. Gurr et al. (2017) showed that increased habitat complexity can prolong the presence of predators in the field even when pest populations are low, so that biological control functions continue to work effectively. At 9 to 10 months after planting, the predator population declined. This occurred because the plants had entered the generative phase, which affected plant growth and caused the leaves to age, as

indicated by the yellowing and wilting of many potato leaves until they fell off and the pest population continued to decline. As a result, the *Spodoptera litura* F. pest predators migrated to more favorable places.

Spodoptera litura F. is one of the main pests of potato plants that can cause significant damage, especially during the vegetative to generative phases. In the field, the presence of natural enemies such as predators plays an important role in suppressing the population of this pest. Some predators found during direct observation and in the laboratory include *Pardosa pseudoannulata, Oxyopes* sp., and ladybugs (*Coccinella arcuate*). *Pardosa pseudoannulata* and *Oxyopes* sp. most often prey on early to middle instar larvae of *S. litura*. Larvae at this stage are still small to medium in size and move actively on the surface of leaves or lower stems, making them easy for these spiders to reach and control. Masturina (2015) showed that P. pseudoannulata is capable of preying on *S. litura* larvae at various stages, with the highest predation rate occurring on second and third instar larvae. This predator actively hunts on the soil surface and leaves without making webs, thereby effectively limiting the movement of larvae that have just moved between plants. According to Shivakumar et al. (2010), *Oxyopes* sp. was found to actively hunt at the tops of plants and leaf canopies, with the ability to quickly prey on young *S. litura* larvae. Daily consumption rates indicate that this spider has the potential to significantly reduce pest populations, especially in the early larval instar phase, which tends to be on the leaf surface. Meanwhile, *Coccinella* arcuata is most effective at attacking the egg stage and early instar larvae of *S. litura* (instars 1–2). Eggs are the primary target because they are immobile, making them easy to find and consume, while small larvae are more vulnerable to attack due to their thin skin and lack of strong physical defenses.

3.5 The Effect of Potato Varieties on Observed Parameters

Average Population and Attack Intensity of *Spodoptera litura* F. Larvae

Further testing of the population and intensity of armyworm attacks yielded significantly different results for each variety. The results of the analysis of variance (ANOVA) are shown in Table 1.

Table 1. Average Population and Intensity of Armyworm Attacks

Treatment	Population of *Spodoptera litura* F. (larvae)	Intensity (%)
V1 (Citra)	1,4b	15,35b
V2 (Titan)	0,15c	0c
V3 (Granola)	2,02a	24,63a
BNJ 5%	0,33	3,04

Note: Figures followed by the same letter in the same column are not significantly different based on the BNJ test at the 5% level

Based on Table 4.1, the average population and intensity of armyworm attacks on three different varieties, namely Citra Variety (V1), Titan Variety (V2), and Granola Variety (V3), showed significant differences. The analysis shows that the highest armyworm population was found in Granola variety, with an average of 2.02 individuals and an attack intensity of 24.63%. The high results obtained were due to the fact that Granola variety was more preferred by the community. Granola variety potatoes are usually used for vegetables and are often cultivated, making them more susceptible to pest attacks because they provide a stable and consistent food source for armyworm pests. This variety is widely cultivated in the Sembalun area, so it is possible that armyworm pests have already adapted to potato plants. Meanwhile, the lowest average population and attack intensity were found in the Titan variety, with an average of 0.15 individuals and an attack intensity of 0%. The low yield obtained was due to the Titan variety having genetic traits that support leaf tissue formation, higher leaf weight, and more leaf hairs, making it more difficult for armyworms to attack. In line with Rosero et al. (2019), potato varieties with higher leaf thickness show lower pest attack rates. In addition, the Titan variety has not been widely cultivated in the Sembalun area because it is relatively new, so seeds are still limited, and armyworms also need to adapt to new host plants. The population in the Citra variety was 1.4 individuals and the attack intensity was 15.35%. The Citra variety has better resistance than the Granola variety, but the Citra variety has lower resistance than the Titan variety, so armyworm pests can still attack but not as much as in the Granola variety. Although the Citra and Granola varieties are widely cultivated in the Sembalun area, the Granola variety has a thinner and softer leaf structure, making it more attractive and easier for armyworms to attack. This indicates that the Granola variety is more susceptible to armyworm attacks than the Citra and Titan varieties, which show better resistance to armyworms.

Average Specific Leaf Weight and Trichomes (Leaf Hair) of Potato Plants

The results of further testing on the thickness of potato leaves and trichomes (leaf hairs) are shown in Table 2.

Table 2. Average Specific Leaf Weight and Trichomes (Leaf Hairs) of Potato Plants

Treatment	Specific Leaf Weight (g/cm^2)	Trichome Density ($trichome/cm^2$)
V1 (Citra)	0,09ab	432,21b
V2 (Titan)	0,10a	661,12a
V3 (Granola)	0,05c	284,78c
BNJ 5%	0,02	99,67

Note: Figures followed by the same letter in the same column are not significantly different based on the BNJ test at the 5% level.

Based on the results in Table 2, it shows that the specific leaf weight and trichomes (leaf hairs) of the three varieties tested for morphological resistance were significantly different, indicating significant differences between each variety. However, the specific leaf weight values of the Citra and Titan varieties were not significantly different, but these two varieties were significantly different from the Granola variety. The Titan variety treatment obtained the highest average results, with an average specific leaf weight of 0.10 g/cm^2 and an average trichome (leaf hair) of 661.12. The high results obtained were due to the Titan variety having a stronger and thicker protective tissue layer, which could inhibit Spodoptera litura F. from reaching and attacking the leaf surface. In addition, the length and density of the trichomes (leaf hairs) of the Titan variety can inhibit the movement of *Spodoptera litura* F. larvae on the leaf surface, making it more difficult for them to find food and shelter. Meanwhile, the Granola variety had the lowest value with an average specific leaf weight of 0.05 g/cm^2 and an average trichome length of 284.78 because the Granola variety has thinner leaves and fewer trichomes (leaf hairs) than the Citra and Titan varieties, making it more susceptible to attack by Spodoptera litura F. This is because the Granola variety has a thin leaf surface structure that is more easily penetrated by the mouthparts of the *Spodoptera litura* F. pest. In the Citra variety, the specific leaf weight is 0.09 g/cm^2 and the trichomes (leaf hairs) are 432.21. The Citra variety has better resistance than the Granola variety, but the Citra variety has lower resistance than the Titan variety, so the attacks by the Spodoptera litura F. pest are not as numerous as in the Granola variety.

The higher the specific leaf weight, the lower the incidence of pest attacks (Haryo, 2006). The physical characteristics of potato plants, such as the length and thickness of the trichomes (leaf hairs) found in each potato variety, can influence the incidence of attacks caused by armyworm pests. According to Adie et al. (2013), leaf hairs are a form of antisenosis defense and are a potential defense characteristic for plants.

Average Number of Stems and Plant Height of Potatoes

The results of further testing on the number of stems and height of potato plants are shown in Table 3.

Table 3. Average Number of Stems and Height of Potato Plants

Treatment	Batang Section (section)	Plant Height (cm)
V1 (Citra)	$8,27^a$	$25,19^b$
V2 (Titan)	$5,62^b$	$38,40^a$
V3 (Granola)	$8,27^a$	$14,41^c$
BNJ 5%	0,43	0,62

Note: Figures followed by the same letter in the same column are not significantly different based on the BNJ test at the 5% level.

Based on the results in Table 3, it shows that the number of stem nodes and plant height of the three potato varieties tested to determine morphological resistance in each variety are significantly different, indicating significant differences in each variety. However, the number of stem nodes in the Citra and Granola varieties are not significantly different, but these two varieties are significantly different from the Titan variety. The Citra and Granola varieties have the same average number of stem nodes, namely 8.27 nodes, while the Titan variety has an average number of nodes of 5.62. However, in terms of plant height, the Titan variety is superior to the Citra and Granola varieties. The Titan variety has an average plant height of 15.37 cm, while the Citra variety has an average height of 14.12 cm and the Granola variety has the lowest average height of 11.91 cm. This is because plant height is not determined by the number of stem nodes, but is more dominantly determined by the length of the nodes (internodes) that are formed. The results show that the Titan variety has a greater plant height even though it has fewer nodes than the Citra and Granola varieties. This indicates that the Titan variety has longer internodes, while Citra and Granola have shorter nodes but in greater numbers. According to Kloosterman et al. (2007), variations in plant height in potatoes are mainly influenced by differences in internode length rather than the number of nodes formed. Thus, the greater plant height in Titan is not caused by the number of nodes, but by the more dominant elongation of the nodes.

Average Potato Tuber Yield (*Solanum tuberosum* L.)

Based on the results of further testing on the number and weight of potato tubers, the results can be seen in Table 4.

Table 4. Average Potato Tuber Yield

Treatment	Number of Tubers Per Plant (Tubers)	Tuber Weight per Plant (kg)
V1 (Citra)	24^{ab}	0,97^{b}
V2 (Titan)	29,5^{a}	1,23^{a}
V3 (Granola)	16,83^{b}	0,47^{c}
BNJ 5%	6,25	0,21

Note: Figures followed by the same letter in the same column are not significantly different based on the BNJ test at the 5% level

Based on the results in Table 4, the number and weight of tubers for the three potato varieties are shown. The number of tubers for the Titan and Granola varieties showed significant differences. However, the Citra variety did not differ significantly from the Titan and Granola varieties. The Titan variety (V2) treatment produced the highest number of tubers, namely 29.5 tubers, while the Granola variety (V3) treatment produced the lowest average number of tubers, namely 16.83 tubers. Meanwhile, the tuber weight in the Titan variety (V2) treatment also showed the best result, namely 1.23 kg, and the lowest was found in the Granola variety (V3) treatment, namely 0.47 kg. The Titan variety (V2) treatment was significantly different from the Citra and Granola variety treatments, indicating that the differences between each variety were quite significant in affecting the number and weight of tubers. This shows that the Titan variety has better yield potential than the other two varieties. The high potato tuber yield is thought to be due to the low intensity of attacks by armyworm pests. In line with Mutmainah (2023), the low level of damage by pests means that the potato tuber yield tends to be high, ranging from 0.68 kg/plant. Apart from genetic factors, the advantages of the Titan variety, such as high leaf thickness and dense trichome count, also support optimal plant physiological processes. The low tuber yield in the Granola variety is due to the high level of attack caused by the Spodoptera litura F pest. The leaves of the Granola variety are thin and soft, making this variety more attractive to pests. According to Aulia et al. (2014), the intensity of attacks on potato plants is influenced by the interaction between the attacked plants and the number of tubers, tuber weight, and volume produced by each variety, because intensity has a significant effect on the observed variables of average number of tubers per plant and tuber weight per plant. The higher the attack by pests, the lower the tuber yield will be.

3.6 Regression Analysis

Relationship Between Population and Intensity of Grayak Caterpillar Pest Attacks

The relationship between population size and attack intensity was analyzed using regression analysis with Excel, and the following results were obtained

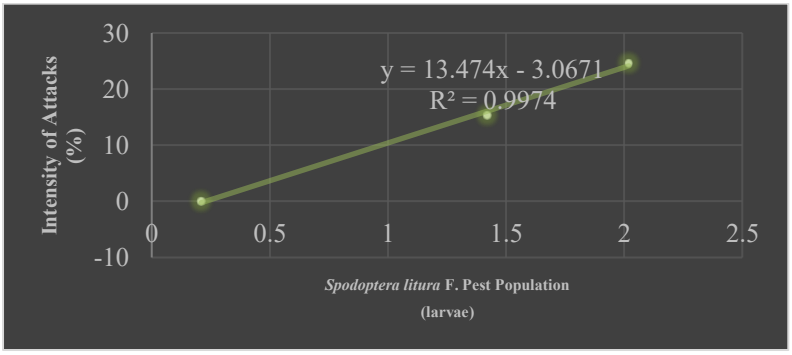


Figure 5 Relationship Between Population and Intensity of *Spodoptera litura* F Pest Attacks.

The regression analysis graph between the population and the intensity of attacks yielded the equation Y= 13.474x – 3.0671, which means that for every increase of one pest population, the intensity of attacks caused by pests increases by 13.474 with a coefficient of determination of 0.99, meaning that the relationship between the pest population and the intensity of attacks is 99% caused by pests and 1% caused by other factors, indicating a very strong relationship. This shows that the relationship between population and attack intensity is very strong. This is in line with the statement by Heryanto et al. (2007) that pest population is related to the intensity of its attacks.

Relationship Between Potato Leaf Weight and Grayak Caterpillar Pest Attack Intensity

The relationship between leaf weight and attack intensity was analyzed using regression analysis with Excel, and the following results were obtained

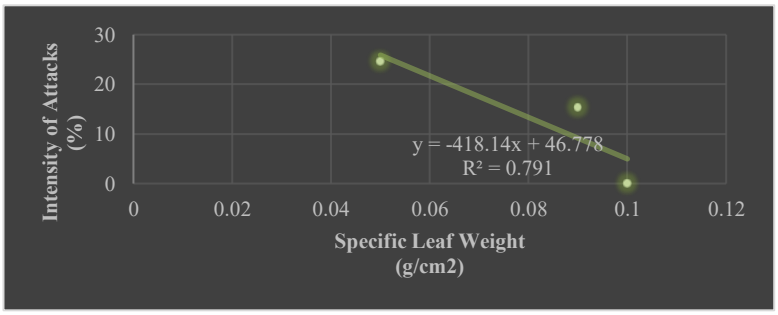


Figure 6 Relationship between Attack Intensity and Specific Leaf Weight

Based on Figure 6, the regression analysis graph of pest attack intensity and specific leaf weight of potato plants shows a negative correlation between the two with the equation Y = -418.14x + 46.778 and a coefficient value of 0.79. This means that when the specific leaf weight value is high, the pest attack intensity value is low. This shows that the level of relationship between pest attack intensity and the specific leaf weight of potato plants is strong and that the relationship between attack intensity and specific leaf weight is interrelated. The specific leaf weight of potato plants is a limiting factor for wireworm pests to attack. This means that the higher the specific leaf weight of potato plants, the more difficult it is for pests to penetrate plant tissue.

Relationship Between the Number of Trichomes (Leaf Hairs) on Potato Plants and the Intensity of Grayak Caterpillar Attacks

The relationship between the number of leaf hairs (trichomes) and the intensity of attack was analyzed using regression analysis with Excel, and the following results were obtained

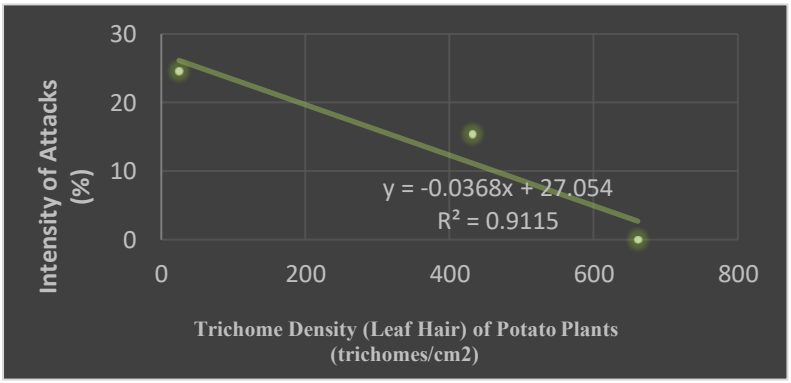


Figure 7 Relationship between Attack Intensity and Trichomes (Leaf Hair) on Potato Plants

Based on Figure 7, the regression analysis graph of intensity and trichomes (leaf hairs) of potato plants shows a negative correlation between the two with the equation Y = -0.0368x + 27.054 and a coefficient value of 0.91. This means that when the trichome (leaf hair) value is high, the pest attack intensity value is low. This shows that the level of relationship between pest attack intensity and potato plant leaf hairs is very strong and that the relationship between attack intensity and trichomes (leaf hairs) is interrelated. This means that the higher the density of leaf hairs, the more difficult it is for pests to reach the leaf surface to eat the plant because the pests' mouthparts are blocked.

Relationship Between Potato Plant Predator Populations and the Intensity of Grayak Caterpillar Pest Attacks

The relationship between plant height and attack intensity was analyzed using regression analysis with Excel, and the following results were obtained

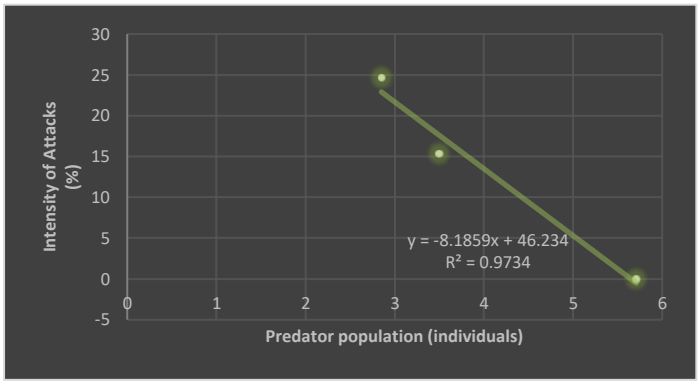


Figure 8 Relationship between Attack Intensity and Predator Population of Potato Plants

Based on Figure 8, there is a negative correlation between the two with the equation Y = -8.1859 + 46.234 and a coefficient value of 0.97. This means that when the predator population is high, the attack intensity is low. This shows that the relationship between attack intensity and predator population is very strong and interrelated. This is in line with the statement by Ranga et al. (2011) that the higher the predator abundance, the lower the survival rate of Spodoptera litura F. larvae, thereby reducing attack intensity.

Relationship Between Predator Populations and *Spodoptera litura* F. Pest Populations

The relationship between plant height and attack intensity was analyzed using regression analysis with Excel, and the results are shown in Figure 9.

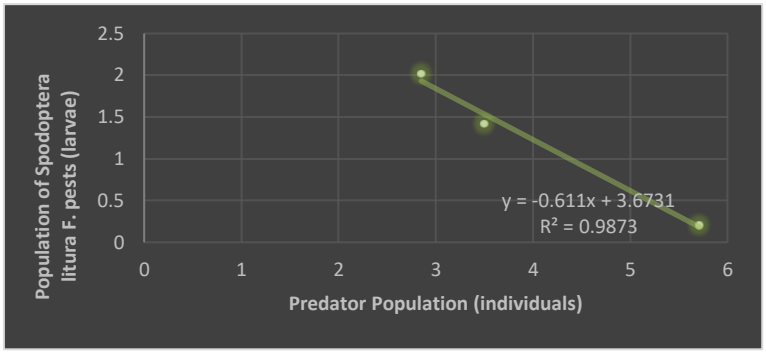


Figure 9 Relationship between predator population and *Spodoptera litura* F. pest population.

The graph shows a very strong negative relationship between the predator population and the *Spodoptera litura* F. pest population on potato plants, with a regression equation of y = -0.611x + 3.6731 and an R^2 value of 0.9873. This means that an increase in the number of predators directly reduces the pest population significantly. Predators such as Oxyopes sp., Pardosa pseudoannulata, Coccinellidae, and Rhynocoris kumarii have been proven to be effective in preying on armyworms in the field. The Titan variety had the highest number of predators and the lowest caterpillar population, indicating the lowest level of attack. Environmental conditions in Sembalun, such as low temperature, high humidity, and the presence of refuge plants, also supported predator activity, resulting in natural pest control.

4. Conclusion

Based on the research conducted, the following conclusions can be drawn:

1. The highest population of *Spodoptera litura* F. pests was found on Granola potato plants, with 2.02 individuals and an average intensity of 24.63%. followed by the Citra variety with a population of 1.42 individuals and an average attack intensity of 15.355%, and the lowest population was found in the Titan variety with a population of 0.15 individuals and an attack intensity of 0%.
2. The highest population of Spodoptera litura F. predators was found in Titan variety plants with a population of 5.71 individuals, followed by Citra variety with a population of 3.50 individuals, and the lowest population was found in Granola

variety with a population of 2.86 individuals. The types of predators found at the research site were Pardosa pseudoannulata, Oxyopes sp., and coccinella beetles (Coccinella arcuate).

3. The most resistant potato variety was Titan, followed by Citra, while the most susceptible variety was Granola.

5. Saran

Based on the results of the research that has been conducted, it is recommended to plant Titan varieties that are more resistant to armyworm attacks in order to increase yields. Further research is also needed to identify other factors that may affect the resistance of potato varieties to armyworms.

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Not applicable

Conflict of Interest (not compulsory)

The authors declare no conflicts of interest

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