JUATIKA
JURNAL AGRONOMI TANAMAN TROPIKA
VOL. 7 NO. 2 May 2025

DOI :https://doi.org/10.36378/juatika.v7i2.426
eissn 2656-1727
pissn 2684-785X
pages : 387 – 392

RESEARCH ARTICLE Open Access

Identifying Insect Pests of Glutinous Corn Plants (*Zea mays* ceratina Kulesh) with Various Organic Fertilizer Treatments

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Abstract

Glutinous corn (*Zea mays* ceratina Kulesh) is a variety of corn that holds significant economic value. However, the productivity of this plant is frequently compromised by insect pest infestations. This study aims to investigate the effects of organic fertilizer on the insect pest population and identify the types of insect pests affecting glutinous corn plants. The objectives of this research are to assess the abundance of insect pests in glutinous corn plants under three treatments: (1) no organic fertilizer, (2) liquid organic fertilizer, (3) solid organic fertilizer, and (4) a combination of liquid and solid organic fertilizers. The research methods include field observations, insect sampling, and laboratory analyses for pest identification based on morphological characteristics. This study employed a non-factorial Randomized Block Design (RBD) with four treatments and six replications, resulting in 24 experimental plots. The results indicated that insect pests were highest in the treatment that did not utilize organic fertilizer. The types of insect pests found on glutinous corn plants belong to the orders Orthoptera, Coleoptera, Hemiptera, and Lepidoptera and were observed from the vegetative to the generative periods. Applying solid organic fertilizer from chicken manure proved the most effective treatment for enhancing corn production, yielding a production weight of 1.36 kg per plot, equivalent to 9.07 tons per hectare.

Keywords: *Glutinous Corn, Insect Pests, Organic Fertilizer, Production*

1. Introduction

Glutinous corn (*Zea mays* ceratina) is a corn variety of significant economic value, widely cultivated for food and animal feed. However, during the cultivation process, corn plants frequently encounter various insect pests that can diminish productivity and the harvest quality (Melhanah and Saraswati, 2018). Control methods—particularly chemical controls—can be misapplied without proper identification. Farmers may use insecticides indiscriminately, inadvertently eliminating natural pest enemies, including predators, parasitoids, and beneficial pathogens in the planting area. Losing these natural enemies can lead to resistance, resurgence, and outbreaks of secondary pests. Furthermore, undetected or improperly managed pest infestations can cause significant damage to plants, crops, or products, ultimately reducing the yield and income of farmers and business operators. Common insect pests that frequently attack corn plants include Ostrinia furnacalis (the stem borer), Helicoverpa armigera (the corn cob caterpillar), and aphids (Rhopalosiphum maidis), which can act as vectors for viral diseases in plants.

In conventional cultivation, increasing crop productivity only focuses on inorganic (chemical) fertilizers. However, the continuous use of inorganic fertilizers has many negative impacts, including Pests in the use of inorganic fertilizers tend to be higher compared to other treatment methods. This is because plants that are continuously applied with chemical fertilizers will show more fertile plant conditions, greener leaf color, leaves become larger, and stems will become soft so that they are more attractive and susceptible to pests and affect natural enemies (Imgaagro, 2014; Fitriani, 2016).

One approach that is widely applied in sustainable pest management is the use of organic fertilizers. Organic fertilizers function as a source of nutrients for plants and contribute to improving soil structure and increasing the

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activity of soil microorganisms that can help reduce pest attacks (Prasetya and Marheni, 2022). Several studies have shown that plants given organic fertilizers tend to have better resistance to pest attacks compared to plants that only rely on inorganic fertilizers (Putri and Widiyanto, 2023). According to research by Suharjo et al. (2015), applying organic fertilizers and biological control agents significantly reduces pest populations. Guna et al. (2018) also added that organic fertilizers used in the long term can increase land productivity, prevent land degradation, and improve the physical properties of the soil. It is known that silicon dioxide (Si), potassium (K), and calcium (Ca) contained in organic fertilizers can increase plant resistance to various pests.

However, research on the relationship between organic fertilizer application and insect pest population in glutinous corn plants is still limited. Therefore, this study was conducted to identify the types of insect pests that attack glutinous corn plants and analyze the effect of organic fertilizer application on the presence of these insect pests. The results of this study are expected to provide helpful information for farmers in developing more environmentally friendly and sustainable pest control strategies.

2. Material and Methods

Study has been implemented in land farmer Jl Voluntary KM 7 City Palembang from September 2024 until January 2025. The research location is at latitude -2.9220826, longitude 104.7297061 and an altitude of 5.5 meters above sea level. Tools used are hoe, meter, scales digital, bucket, nail, the boat wood, nameplate, machete, sprayer, raffia rope, pit full trap, and stationery. While the materials used that is seed corn, sticky rice, lime dolomite, fertilizer chicken manure, 16:16:16 compound NPK fertilizer, dolomite lime, and liquid organic fertilizer (POC).

This study used a non-factorial Randomized Block Design (RAK) consisting of 4 treatments with 6 replications. The treatments used were without organic fertilizer, solid organic fertilizer, liquid organic fertilizer, and a combination of solid and liquid organic fertilizers.

process involved several essential stages. First, land preparation was carried out by making 27 plots measuring 1 m x 1.5 m, with a planting distance of 50 cm x 50 cm. The distance between plots was 50 cm, while the distance between replications was 1 m. After that, fertilization was carried out by providing organic chicken manure fertilizer two weeks before planting with a dose of 30 tons/ha, and after that dolomite lime was given 1 ton/hectare. Furthermore, liquid organic fertilizer from plant waste was provided twice, namely in the 1st and 4th weeks after planting with a dose of 20ml / L).

Before planting, first, make a hole in the ground using a dibble; the size of the planting hole is -+ 5 cm with a distance between holes of around 75 x 30 cm with the number of glutinous corn seeds per planting hole being 2 seeds, then cover it with a bit of soil until the corn seeds are covered. Maintenance activities include watering, weeding, pest and disease control, and harvesting. Yellowing leaves, wilting leaf bases, compact tubers in the soil, fallen plants, and purplish red tubers indicate they are ready to be harvested. The variables observed were crown pest insects, soil pest insects, level of damage, and production.

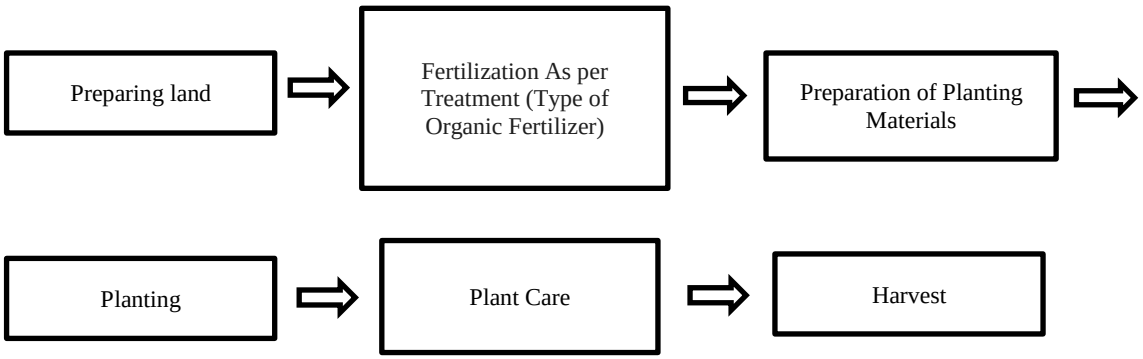

Figure 1. Research flow diagram

3. Results and Discussion

3.1. Types and Populations of Crown Insects

Based on the results of observations conducted on the canopies of glutinous corn plants treated with liquid organic fertilizer (POC). Vegetable waste, solid organic fertilizer, chicken manure, and the absence of organic fertilizer resulted in identifying four arthropod orders: Orthoptera, Coleoptera, Hemiptera, and Lepidoptera. These comprised six families and six species (see Table 1).

The research results in Table 1 show that the use of various types of organic fertilizers on the insect pests on the canopy of sticky corn plants has different population levels in each treatment. (Adnan et al., 2019). The dominant insect pest population in the canopy of glutinous corn plants comes from the Delphacidae family, Peregrinus maidis, commonly known as corn leafhoppers. Pests from this species begin to be found in corn plants aged 10-14

HST and can attack from the vegetative phase to the generative phase. (Sumiati et al., 2023) ; (Purnomo et al., 2023) . Pests of this type damage plants by sucking the liquid from leaves and stems, causing the plants to have abnormal leaf shapes, which cause the plants to dry out. This can happen if corn planthoppers attack in large groups. The impact is damage to young seedlings; plants become stunted and can reduce production.

Table 1. Crown insects on pulut corn plants

Taxonomy of Insects			Population
Order	**Family**	**Species**	
Coleoptera	*Scarabidae*	*Protaetia (Heteroprotaetia) fusca*	*1*
Hemiptera	*Delphacidae*	*Peregrinus maidis*	*625*
	Pentatomidae	*Nezara viridula*	*12*
Lepidoptera	*Noctuidae*	*Spodoptera frugiperda*	*11*
	Lymantriidae	*Lymantria dispar (L. dispar)*	*1*
Orthoptera	*Blattelidae*	*Periplaneta americana*	*1*

From the observation results of insect pest populations on sticky corn plants, each observation experienced an increase and decrease. In observations of 10HST 20HST, insect pests from the Delphacidae family, the Peregrinus maidis species, experienced an increase both from treatments without the use of organic fertilizers, or using liquid organic fertilizers and solid organic fertilizers of chicken manure. However, in observations of 30HST, 40HST, and 50HST, there was a drastic decrease, this condition occurs because sticky corn plants in the vegetative phase are more susceptible to pest attacks where corn plants in this phase have optimal environmental conditions for pest development, in addition, in the vegetative phase sticky corn plants have high nutrients for growth so that they are following the needs of the Peregrinus maidis pest.

3.2. Types and Populations of Soil Insects

Based on the results of observations that have been carried out on the canopy of sticky corn plants that were applied with liquid organic fertilizer (POC) from vegetable waste, solid organic fertilizer from chicken manure, and without the use of organic fertilizer, it was found that there were 4 orders of arthropods, namely Orthoptera, Coleoptera, Hemiptera and Lepidoptera consisting of 6 families and 6 species (Table 2).

Table 2. Crown insects on pulut corn plants that have been applied with organic fertilizer

Taxonomy of Insects			Population
Order	**Family**	**Species**	
Coleoptera	*Scarabidae*	*Protaetia (Heteroprotaetia) fusca*	*1*
Hemiptera	*Delphacidae*	*Peregrinus maidis*	*625*
	Pentatomidae	*Nezara viridula*	*12*
Lepidoptera	*Noctuidae*	*Spodoptera frugiperda*	*11*
	Lymantriidae	*Lymantria dispar (L. dispar)*	*1*
Orthoptera	*Blattelidae*	*Periplaneta americana*	*1*

The research results in Table 1 show that the use of various types of organic fertilizers on the insect pests on the canopy of sticky corn plants has different population levels in each treatment. (Adnan and Wagiyana, 2020) . The dominant insect pest population in the canopy of glutinous corn plants comes from the Delphacidae family, Peregrinus maidis, commonly known as corn leafhoppers. Pests from this species begin to be found in corn plants aged 10-14 HST and can attack from the vegetative phase to the generative phase. Pests of this type damage plants by sucking the liquid from the leaves and stems, causing the plants to have abnormal leaf shapes, which cause the plants to dry out. This can happen if corn leafhoppers attack in large groups. The impact is damage to young seedlings; plants become stunted and can reduce production.

From the results of observations of the population of insect pests on sticky corn plants, each time there was an increase and decrease, in observations 10HST and 20HST, insect pests from the Delphacidae family, the species Peregrinus maidis, experienced an increase both from the treatment without the use of organic fertilizer, or using liquid organic fertilizer and solid organic fertilizer from chicken manure.

However, there was a drastic decline in observations of 3 0HST, 4 0HST, and 5 0HST. This condition occurs because glutinous corn plants in the vegetative phase are more susceptible to pest attacks, whereas corn plants in this phase have optimal environmental conditions for pest development; besides that, in the vegetative phase, glutinous corn plants have high nutrients for growth, so that they are following the needs of the Peregrinus maidis pest. (Balikai et al., 2017) .

Based on the results of observations that have been carried out on the surface of the soil of glutinous corn

plants that were applied with liquid organic fertilizer (POC) from vegetable waste, organic chicken manure fertilizer, and without the use of organic fertilizer, 6 Orders were found, including Coleoptera, Hemiptera, Orthoptera, Spirobolida, Squamata and Orthoptera (Table 3).

Table 3. Insects on the soil surface of sticky corn plants

Taxonomy of Insects			Role
Order	**Family**	**Species**	
Coleoptera	*Scirtidae*	*Scirtes hemisphaericus*	Pest
Hemiptera	*Delphacidae*	*Peregrinus maidis*	Pest
Orthoptera	*Pyrgomor pjoidea*	*Atractomorpha crenulata*	Pest
	Acrididae	*Oxya serville*	Pest
	Blattelidae	*Periplaneta americana*	Pest
Spirobolide	*Trigoniulidae*	*Trigoniulus coralinus*	Pest
Squamata	*Paradoxoso matida*	*Orthomorpha coarctata*	Pest
Orthoptera	*Grylludae*	*Gryllus miratus*	Pest

The population of insect pests on the crown and surface of the soil was found in the treatment without organic fertilizer, while the lowest population of insect pests on the crown was in the treatment of organic chicken manure fertilizer. The population of insect pests on the surface of the soil was lowest in the treatment of liquid organic fertilizer, and this is because plants that are given liquid organic fertilizer support a conducive land environment so that they invite many predators and parasitoids, which are natural enemies of insect pests. In contrast, the treatment without the use of organic fertilizer has the lowest population of insect predators, which has an impact on the number of insect pest populations compared to the treatment of liquid organic fertilizer and chicken manure organic fertilizer, following (Melhanah et al., 2018), that the use of organic fertilizer can increase arthropods that act as predatory and parasitoid insects (natural enemies).

3.3. Percentage of damage to glutinous corn plants

The highest percentage of damage to glutinous corn plants was found in the treatment Without Using Organic Fertilizer, with an average damage percentage value of 39.15%. The second was by Using Liquid Organic Fertilizer (POC) Vegetable Waste with an average value of 29.1%, while the lowest was in the treatment of Solid Organic Fertilizer Chicken Manure with an average value of 24.33%, as can be seen in Figure 2.

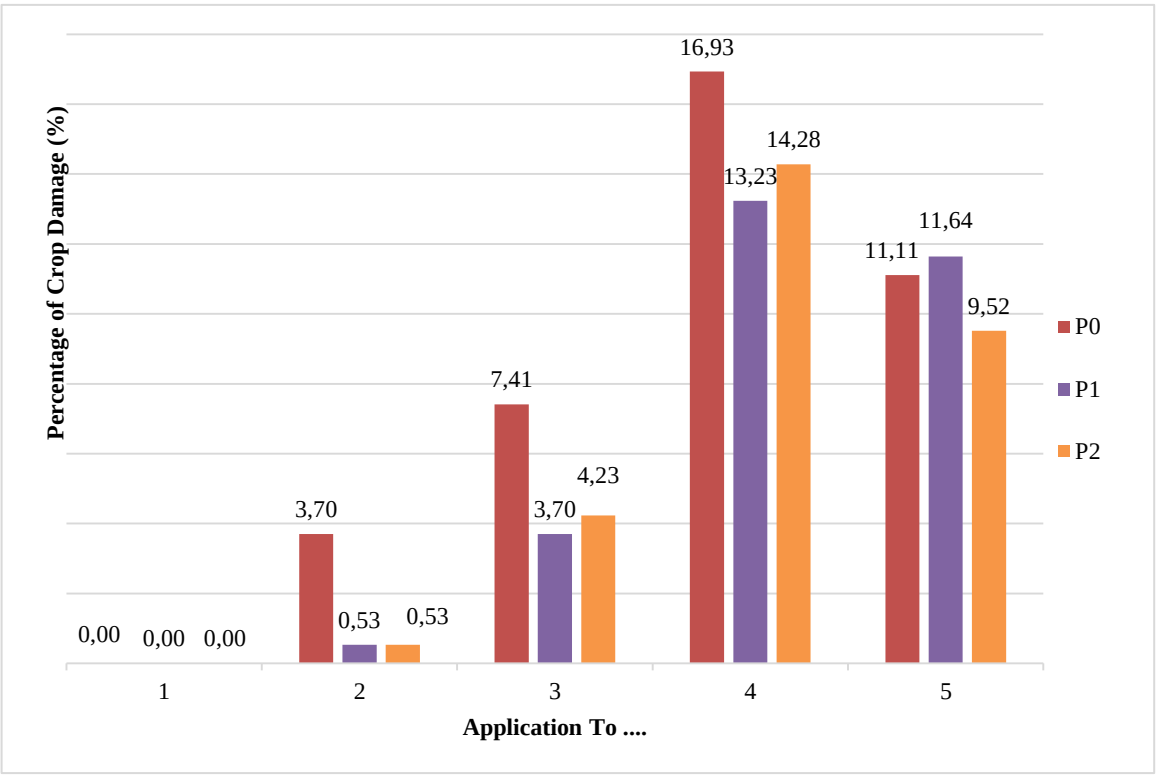

Figure 2. Effect of various organic fertilizers on the percentage of damage corn plant

Based on the study Figure 2, the level of damage to glutinous corn plants obtained after conducting observations varies from a score of 1, namely light attacks, to 7 severe attacks. The greatest plant damage was in the treatment Without Using Organic Fertilizer, with an average percentage value of damage of 39.15%. The second was using liquid organic fertilizer (POC), which is vegetable waste with an average value of 29.1%, while the lowest was in the treatment of solid organic chicken manure fertilizer with an average value of 24.33%. The percentage at each observation increased, but in the 5th observation, 0HST, it decreased due to glutinous corn plants in the generative phase of the leaves of glutinous corn plants, which continued to experience an increase in leaf width so that the number of trichomes (fine hairs on the leaves) also increased so that insect pests had difficulty eating and damaging the leaves of the plant (Prastya.

The percentage of damage in the treatment without the use of organic fertilizer showed the highest damage rate because the number of insect pests influenced it during the vegetative period; in addition, there were new insect pests in the generative phase whose population was greater than the treatment of liquid organic fertilizer of vegetable waste and solid organic fertilizer of chicken manure so that the damage could be greater, while the lowest level of damage was found in the treatment of Solid Organic Fertilizer of Chicken Manure because of the large population of predators which are natural enemies of insect pests so that the damage was lower.

3.4. Production

For production results, the analysis of variance showed that the application of solid organic fertilizer in the form of chicken manure had significant differences in the weight variables of glutinous corn production per plot and per plant.

Table 4. Results Analysis of the Diversity of the Influence of Several Types of Organic Fertilizers on Production Weight Per Plot and Per Plant.

Variable Which in observe	Several types		Coefficient
	Organic	fertilizer	Diversity (%)
Heavy Production Per Square	*		1.26
Heavy Production Planting	**		0.15

The research results show that the application of solid organic fertilizer in the form of chicken manure has a real to very real effect on the weight variables of corn production. per contact and per plant, with average heavy production per plot, which is highest in organic fertilizer treatment on chicken manure with an average value of 1.36 kg and the lowest in the treatment without organic fertilizer with an average of 1.11 kg. Meanwhile, the highest production per plant was treated with solid organic chicken manure fertilizer, weighing 259.66 grams. The lowest was in treatment without giving organic fertilizer, with an average weight of 202.15 grams.

The research results show that by using solid organic fertilizer chicken manure, the production of glutinous corn is higher because the nutrient content in the plant is sufficient. According to the opinion, b solid chicken manure fertilizer contains the nutrient P, which is high and easily absorbed by corn plants so that it helps plants absorb nutrients well during the generative period, namely when corn is in the process of perfecting seed filling so that it can be filled fully and has a substance that affects the weight of corn cobs. While for treatment without organic fertilizer and the liquid organic fertilizer treatment of vegetable waste had no real effect, this was due to the high number of pest populations compared to the organic fertilizer treatment. Congested dirt chicken. As for constraints in spraying, First, Where absorption of nutrients is less than optimal due to weather factors, rain falls after fertilization, which causes the fertilizer sprayed on the plants to be washed away, impacting corn plants that lack nutrients during the vegetative period. According to (Mahdiannoor et al., 2016), corn plants grow and produce optimal production must receive sufficient nutrient supply during their growth period; balanced fertilization is a determining factor in the success of corn plants.

4. Conclusion

From the research results, it can be concluded that the application of solid organic fertilizer derived from chicken manure is the most effective treatment for improving the production of sticky rice corn. The production weight per plot is 1.36 kg, with an average plant production weight of 259.66 grams. Additionally, this treatment can suppress the population of insect pests while maintaining the diversity of beneficial insects.

Acknowledgments

The authors would like to thank LPPM UM Palembang for funding this research and the entire team in the field so that the study was carried out smoothly.

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