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Inventory of insect pests in Edamame soybean plant in Kebonsari, Jember

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Abstract:
Edamame, *Glycine max* (L.) Merrill, a high-value commodity with significant economic potential in Indonesia both domestic and international markets. One of the main issues limiting the productivity of edamame soybean plants is attacked by plant pests. This was field experiment aimed at an inventory of important pest on edamame soybean plant in Kebonsari Jember. This research was conducted on edamame soybean cultivation in Kebonsari village, Sumbesari District, Jember, East java. The method used is a purpose survey at a specific sample point. A sampling of insect pest is done by direct observation, yellow traps, sweep nets and pitfall traps. The pests found were put in a killing bottle or 70% alcohol, collected and identified. The pests identified on edamame soybean plants are grasshoppers, whiteflies, armyworms, and leaf-rolling caterpillars and include on the five ordos are Hemiptera, Coleoptera, Diptera, Orthoptera, and Thysanoptera.

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INTRODUCTION

Edamame soybeans (*Glycine max* L.) are one of the leading commodities that have high economic value, both in domestic and international markets. Edamame soybeans are harvested in the form of fresh pods that are processed into snacks (Mahendra and Oktarina, 2017). This plant is increasingly in demand because edamame soybeans are known as premium soybean products due to their larger size, sweeter taste, and higher nutritional content compared to ordinary soybeans. Jember Regency, especially in Kebonsari Village, is an area with superior commodities in the form of edamame. Edamame soybeans have advantages such as productivity and protein content 36% higher than soybeans in general. In addition, edamame has an early harvest time (SESKAB-RI, 2014).

The problem that causes low productivity of edamame soybean plants is the attack of Plant Pest Organisms. Organisms are said to be when they interfere with the physiological processes of plants, eat certain parts of the plant, or produce toxins that can damage plant production. For this reason, it is necessary to identify the diversity of pests and diseases of edamame soybean plants so that it can provide useful information for farmers in efforts to effectively manage pests and diseases, so that edamame productivity can increase.

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METHOD

This research was carried out on edamame soybean cultivation in Sumbersari, Jember. The research was carried out using a purposive sampling survey method; in each selected location, several sample points were selected. A sampling of insect pests is done by direct observation, yellow traps, sweep nets, and pitfall traps. Identification of the pest specimens obtained was carried out at the Plant Protection Laboratory, Politeknik Negeri Jember.

RESULT

Lemuru Fish Amino Acid Application

In the application of Lemuru Fish Amino Acids, it is compared with potato cultivation without the addition of amino acids (owned by farmers). Which obtained very significant results, which are shown in the table below.

Table 1. Observation Data on Total Number of Bulbs

Observation Variables	Lemuru Fish Amino Acid Application	No Treatment (Farmer Owned)
Total Number of Bulbs (seeds)	83	52

Based on the results of the research that has been done, there are 4 types of traps in the research area (Table 1).

Table 1. Type of arthropods on edamame soybean at observation locations

Class	Family	Amount	Status	Trap
Diptera	*Dolichopodidae*	78	Parasitoid	Yellow trap
Coleoptera	*Coccinellidae*	25	Parasitoid	
Hemiptera	*Aleyrodidae*	551	Pest	
Coleoptera	*Staphylinidae*	8	Predator	
Coleoptera	*Elataridae*	83	Pest	
Diptera	*Calliphoridae*	64	Pest	
Hymenoptera	*Formicidae*	28	Predator	
Diptera	*Culicidae*	8	Pest	
Diptera	*Tipulidae*	25	Pest	
Thysanoptera	*Thripidae*	55	Pest	
Hymenoptera	*Vespidae*	6	Predator	
Thysanoptera	*Thripidae*	179	Pest	
Hymenoptera	*Formicidae*	28	Detrivitor	Pitfall trap
Diptera	*Culicidae*	55	Pest	
Gryllidae	*Gryllidae*	3	Pest	
Coleoptera	*Hydrophilidae*	63	Pest	
Hemiptera	Hemiptera	18	Pest	Sweep net
Coleoptera	Coleoptera	15	Parasitoid	
Orthoptera	Orthoptera	15	Pest	

DISCUSSION

The results of the observation showed that the highest number of arthropods caught in the yellow trap was Aleyrodidae, 551, followed by Thripidae, 179, while the lowest was Vespidae, with

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6. In line with the research of Indahsari (2024) that the yellow ticky trap using thick yellow plastic is the most effective and efficient way to catch Aleyrodidae. In the yellow trap, the total number of arthropods caught was 1110, consisting of 7 types of pest attacks, 3 types of predators, and 2 types of parasitoids. This shows that the yellow trap is very selective and effective in attracting and catching certain arthropods, especially from the Aleyrodidae family, which is one of the main pests of soybean plants. According to Pramaisshela et al. (2023), the Aleyrodidae group is more attracted to the color yellow because the wavelength of light is attractive to many insects. A total of 1110 arthropods were caught with 7 types of pests, 3 types of predators, and 2 types of parasitoids, indicating the effectiveness of this trap not only in catching pests but also types of natural enemies. This provides an important picture of the diversity and potential impact of yellow trap use on the agroecosystem as a whole, according to Jiang et al. (2021).

There is a pitfall trap with the highest number of arthropods, Hydrophilidae, 63, and the lowest number of Gryllidae, 3. Based on Jaya's research (2020), the use of pitfall traps contained various types of pests that were trapped, including Hydrophilidae. In the pitfall trap, the total number of arthropods caught was 149, consisting of 4 types of pest attacks and 1 type of detritivore. Showing the effectiveness of pitfall traps in catching various types of arthropods.

The last trap is the sweep net; the highest number of arthropods was Aleyrodidae, 18, followed by Coccinellidae and Acrididae, 15 each. Based on research by Putra et al. (2022), one of the pests trapped in the sweep net was Aleyrodidae. The total number of arthropods caught was 48, consisting of 2 types of pests and 1 parasitoid. In addition, the presence of parasitoids in certain numbers indicates ecological interactions that can affect the dynamics of arthropod populations in the environment.

In the results of the research that has been conducted, there are 4 types of plant pests that attack the research land. Pests that attack edamame soybean plants include grasshoppers, whiteflies, armyworms, and roller caterpillars.

In the observation results of the study, there were pests that attacked edamame soybean plants, one of which was grasshoppers. Grasshopper pests are quite detrimental because they eat leaves and young stems, so that soybean production can decrease by up to 70%. The initial symptoms of the attack that appeared in the research area were irregularly perforated leaves. This finding is in line with Maryani's research (2013) that attacks on grasshoppers will cause leaves to become perforated. Plants that are heavily attacked by grasshoppers will lose most of their leaves, which can interfere with the photosynthesis process. In addition to leaves, according to Siwi et al. (2005), grasshoppers are species that attack plants such as leaves, stems, fruits, and seeds. Loss of leaves can cause plants to become thin, stressed, and less productive, according to Larcher (2003). This pest attacks in the vegetative to generative phases, the result is due to abiotic factors. These factors include the physical and chemical conditions of the environment that form a habitat for organisms. The characteristics of this grasshopper pest are green, have pointed straight front wings (rather thick) and have short antennae, and a triangular head, with large compound eyes. Based on research by Saragi et al. (2019), grasshoppers have short antennae and a light green body color.

Furthermore, there are whitefly pests, which are a type of leaf-sucking pest; this pest generally attacks edamame soybean plants. The initial symptoms of an attack that appeared in the research area on edamame soybean plants were that the leaves turned curly or wrinkled, and there were swarms of whiteflies under the leaves. According to Hidayat et al. (2023), whitefly attacks are like necrotic spots on the surface of the leaves due to damage to leaf tissue and cells, so that the leaves become curly. Attacks from this pest cause problems, namely as parasites that can take food from

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their host plants. The process of taking food begins with the whitefly pest piercing the phloem or leaf surface using its mouth so that it sucks nutrients from the plant According to Kurniawan and Fitria, (2021). The characteristics of the whitefly pest are small in size, pale yellow or cream in color, with white wings coated with a layer of wax-like flour, and have two pairs of wide, triangular wings. According to research by Magai (2023), whiteflies are small, have white wings, are shaped like pears, and usually live in colonies. Plants that are severely attacked show a drastic decrease in yield. B. tabaci is known to act as a vector for various viruses that can cause plant diseases (Legg et al. 2002) in (Hidayat et al. 2018). Yield losses due to attacks by this pest can reach 80% or even crop failure. According to Marwotodan and Inayati (2011). Efforts have been made to improve the quality and quantity of the harvest. These plant pests must be handled in an alternative way so that they can overcome these problems, with better and more environmentally friendly handling. This pest is active during the day and at night is under the surface of the leaves. The entire life cycle of the whitefly occurs on the underside of the leaf. Like leafhoppers, the imago of the whitefly has full wings with a sexual reproductive system. According to Ludji (2011), the presence of *B. tabaci* imago tends to reproduce sexually compared to parthenogenesis.

In the next pest attack, there are armyworms. This pest is called *Spodoptera litura* (Lepidoptera: Noctuidae), also known as armyworms, which are important pests of soybean plants and several types of important plants in Indonesia. *S. litura* attacks can cause damage, even loss of yield in soybean plants. The initial symptoms of an attack in the field on the affected leaves are transparent holes like a net, and only the leaf veins remain. Armyworm attacks by eating leaves on young plants until only the leaf veins remain (Budi et al., 2013). The attack of armyworms disrupts the photosynthesis process of plants because many leaf tissues are damaged. In addition to leaves, armyworms also attack flowers and young pods, which reduces the harvest. Late control in the generative phase of the plant will cause a loss of production. The characteristics of the armyworm pest include three lines on the back, followed by a black line. This pest has four black dots that form a square in the second segment of the last segment of its body, according to Visser (2017). Some known host plants of armyworms are legumes, tobacco, castor oil plants, chilies, tomatoes, cotton, sunflowers, spinach, sugar cane, cabbage, soybeans, peanuts, corn, beans, eggplant, kale, bananas, and ornamental plants (Marwoto and Suharsono, 2008; Yadav et al. 2012), mulberries, okra, cowpeas, and sweet potatoes (Narvekar et al. 2018).

The last pest is the leaf roller caterpillar, which belongs to the Pyralidae family and the Lepidoptera order. The leaf roller caterpillar *L. indicata* is an important pest that can cause severe damage to soybean plants. According to Prasetyo et al. (2021). Symptoms of attacks in the research area were curled leaves, and the edges were perforated. This caterpillar forms leaf rolls by gluing one leaf to another from the inside with the adhesive it produces. This statement is in line with research (Balitkabi, 2015) when the roll is opened, caterpillars or their droppings will be found, which are black and brown in color.

CONCLUSION

The result showed that there were five pests or orders that interacted with the edamame soybean plant in Kebonsari, Jember. The five ordos are Hemiptera, Coleoptera, Diptera, Orthoptera, and Thysanoptera. And the common names are grasshoppers, whiteflies, armyworms, and leaf-rolling caterpillars.

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