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COMBINATION Azadirachta indicca A. Juss and Beauveria bassiana Bals. TO CONTROL Thrips parvispinus Karny on PAPRIKA (Capsicum annum Var.Grossum L.)

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Abstract

Bell pepper is a relatively new vegetable plant known in Indonesia. Bell pepper has a great potential to be developed in Indonesia, this is shown by the high public interest in consuming. However, this high demand has not been fully met by farmers. It's because bell pepper production is determined by several factors, one of which is the attack of plant disturbing organisms (OPT). The most detrimental plant disturbing organisms for bell pepper cultivation is Thrips parvispinus Karny these insect damage caused are widely known as pests on various agricultural commodities and are polyphagous. Damage caused by Thrips parvispinus Karny in pepper plants ranges from 12% -74%. Therefore, it's necessary to carry out environmentally friendly control efforts, one of which is by utilizing a mixture of neem leaves (Azadirachta indicca A. Juss.) and B.bassiana fungus as a vegetable pesticide. This study aims to determine the compatibility of a mixture of neem leaves and B.bassiana

in increasing the mortality of Thrips parvispinus Karny on bell pepper plants. The research was conducted from August to November 2022. The research method used a randomized block design consisting of nine treatments and three repetitions with details of the treatments, namely: F0: control (no treatment), F1: 40 ml/l neem leaves plus 20 grams/l B.bassiana, F2: 50 ml/l neem leaf pesticide plus 30 gram/l B.bassiana, F3: 60 ml/l neem leaf plus 40 gram/l B.bassiana, F4: 70 ml/l neem leaf plus 50 gram /l B.bassiana, F5: 80 ml/l neem leaves plus 60 grams/l B.bassiana. The conclusion obtained is that the application mixture of 80 ml/l neem leaves plus 60 grams/l B.bassiana can increase and accelerate the mortality time of Thrips parvispinus Karny pest.

Keywords

Thrips parvispinus Karny, Azadirachta indicca A. Juss., Beauveria bassiana (Bals.).

Pendahuluan

Paprika has the potential to be developed in Indonesia. this is shown by the high public interest in the consumption of paprika. According to the Central Bureau of Statistics on Indonesia's Seasonal Vegetable and Fruit Crops 2017-2021, Indonesia has several regions suitable for growing peppers, including West Java. West Java makes the largest contribution to domestic pepper production, with some districts of West Java such as West Bandung Regency, producers. West Bandung Regency is the largest pepper growing area in West Java.

Table 1. Harvested Area, Production, and Productivity of West Bandung Regency Paprika in 2017-2021.

Year	Harvest Area (Ha)	Production (Ton)	Productivity (Ton/Ha)
2017	103	4.650	232,83
2018	221	7.953	359,84
2019	231	8.789	380,46
2020	346	7.635	220,67
2021	133	2.019	151,8

Source: Central Bureau of Statistics 2021

Paprika production is determined by several factors, one of which is the attack of insect pests. The pest that causes the most damage to pepper crops is Thrips parvispinus Karney infestation, thrips pests are known pests of various crops and are polyphagous in nature. The resulting damage ranges from severe damage to very severe yield loss (Annas, H., et al., 2021). Damage to pepper plants by the Thrips parvispinus Karney pest ranges from 12 to 74%. Rente, C. and Manengkey, G. (2017).

Based on Wibawa H. research results (2019) Neem (Azadirachta indica A.Juss.) contains azadirachtin (C35H44O16), the main active ingredient in neem leaves, which has the effect of suppressing food intake. can be used as a plant insecticide.

Azadirachtin (C35H44O16) is composed of 17 components with attack mechanisms that affect eclosion and juvenile hormones, affecting metamorphosis, insect reproduction and molting, reducing egg hatchability, chitin formation (Rahmawati, A., 2019). Compounds contained in neem leaves can affect insect behavior, and physiologically, insects exposed to neem leaf pesticides are stressed and cause starvation. Neem leaf extract at a concentration of 10% inhibits thrips development 9 days after application (Kurniawan, 2021). Meanwhile, application of 20% concentration of neem leaf extract resulted in 86.7% mortality of Thrips parvispinus Karney (Sasongko. F, 2021). Based on a study by Yustika, D. et al., (2020), the fungus B.bassiana is an entomopathogen that can infect and kill insects. Applying the biological agent B. Bassiana at a rate of up to 20 ml/L, he was 99.53% effective in preventing Thrips parvispinus Karney against Dewata B cayenne pepper cultivar. According to Gargita et al. (2017), the entomopathogenic fungus B.bassiana can produce the antifungal agent beauvericin (C45H57N3O9), which can cause disruption of hemolymph and nuclear function in host insect cells. There is a nature.

Research Methods

The research was conducted in a greenhouse in Pasirlangu village, Cisarua District, West Bandung Regency. The survey was conducted from August to September 2022. The research method used in this experiment was a randomized block design (RBD) experimental method consisting of 7 treatments and 4 replicates, resulting in 28 research plots with 10 plants per plot. rice field. The seven treatments are:

A : control
B : 50 ml/l neem leaf pesticide +
30 g/l B. bassiana
C : 60 ml/l neem leaf pesticide +
40 g/l B. bassiana
D : 70 ml/l neem leaf pesticide +
50 g/l B. bassiana
E : 80 ml/l neem leaf pesticide +
60 g/l B. bassiana
F : 80 ml/l Neem leaf pesticide
G : 60 g/l B. bassiana

Analysis of experimental data using a linear randomized block design model (RBD) by Gasperz 2005 follows.

$$X_{ij} = \mu + t_i + r_j + e_{ij}$$

Information:
Xij : Observation of the I-th treatment in the j-th group
μ : General average
ti : Effect of the i-th treatment (i = 1,2,….j)
rj : Effect of the j-th group (j = 1,2,…r)
eij : The effect of random factors on the i-th treatment in the j-group

Research Implementation

Neem leaf preliminary test

Preliminary test of pesticide concentration in neem leaves using concentrations of 20mL/L, 30mL/L, 40mL/L, 50mL/L, 60mL/L, 70mL/L, 80mL/L and thrips numbers Pest parvispinus Karny up to 20 For each individual treatment, up to 10 individuals of Thrips parvispinus carnie died during the treatment, treated with a concentration that had a high lethal potency on average, ie a concentration of 80 ml/l. Although results from preliminary studies on pesticide concentrations in neem leaves conducted in vitro showed that several concentration treatments showed high mortality, the concentrations identified as treatments to be tested in the field were: bottom.50mL/L, 60mL/L, 70mL/L, 80mL/L.

Bell peppers were planted in plastic bags in a greenhouse in Pasirlangu village, Ngamprah district, West Bandung province. Plant care includes watering, repotting, and weeding.

Production of neem leaf extract

Up to 25 kg of neem leaves are washed and air dried until dry. Every 5kg of dried neem leaves is mixed with 1.5L of water and ground in a blender, filtered and placed in a container and left for a day.

Preparation of B. bassiana

An inoculum with a spore density of 4.5×10 10 spores/ml at a concentration of 60 g/l was used as B.bassiana. The B.bassiana biopesticide used is in the form of a wettable powder (WP) and has a shelf life of ± 1 year.

Observation Parameters

Mortality of Imago Thrips parvispinus Karny

Mortality of thrips parvispinus Karny was calculated every 7 days 4 days post-application (HSA) using formulas taken from the Department of Agriculture Food and Crops Directorate book (2018) as follows:

$M = \frac{a}{b} \times 100\%$

Information:

M = Percentage of larval morality

a = Number of dead imago

b = Number of imago used

Intensity of Thrips Attacks

Observations of attack intensity were made 1 week after application with an observation interval of 1 week by taking 10 samples from 112 plants. Sampling

was performed by target sampling (determination of sampling points), that is, samples to be collected were determined in advance, and 10 samples were collected in a zigzag pattern to obtain a representative sample. An assessment of the severity of the thrips pest infestation is performed by calculating the damage caused by the Thrips parvispinus Karny using the formula from the Department of Agriculture Food and Crop Directorate book (2018) as follows:

$sI = \frac{\sum(n \times v)}{N \times Z} \times 100\ \%$

I = intensity of leaf attack

n = Number of damaged leaves per category

v = the highest attack category scale value

N = number of leaves observed

Z = The highest attack category scale value

Damage values are as follows:

Table 2. Damage scale values for attack categories

Skala	Damage Percentage	Category
0	Tidak ada kerusakan	Tidak ada kerusakan
1	$> 1 - \leq 20\%$	Ringan
3	$> 20 - \leq 40\%$	Sedang
5	$> 40 - \leq 60\%$	Berat
7	$> 60\% \ \leq 80\%$	Sangat berat
9	$> 80\% - 100\%$	Puso

Source: Director General of Food Crops, Ministry of Agriculture, (2018).

Pepper Plant Height

Plant height measurements were performed to determine the effect of Thrips parvispinus Karny on the growth of hot pepper plants. Measurements are made by measuring in meters from the base of the plant stem to the tallest leaf and are expressed in centimeters (cm). Capsicum plant height measurements were taken when the HST of the plant was 15, 30, 45, and 60.

Bell pepper production kg/plot

Pepper production is calculated by counting the number of healthy or diseased berries and weighing the peppers at the first harvest of HST 80 or 90 year old pepper trees. Harvesting of peppers is done once a week according to the standard for red peppers.

Results and discussion Neem leaf concentration test (Azadirachta indica A.Juss.Blume.) on thrips mortality.

Neem foliage on thrips mortality by thrips performed in vitro by testing concentrations of 20 ml/l, 30 ml/l, 40 ml/l, 50 ml/l and 60 ml/l. The pesticide concentration test results of 70 ml/l and 80 ml/l can be expressed as:

Table 3. Concentration Test Results of Neem Leaf Botanical Pesticides Against Mortality of Thrips parvispinus Karny.

Perlakuan	DAA (Days After Application)			
	7 DAA	14 DAA	21 DAA	28 DAA
20 ml/l	3,50[b]	4,00[a]	3,75[d]	3,88[a]
30 ml/l	4,50[b]	4,38[a]	4,13[d]	4,25[a]
40 ml/l	4,88[b]	4,75[a]	3,79[d]	4,75[a]
50 ml/l	4,90[b]	16,00[a]	5,00[c]	16,00[a]
60 ml/l	4,50[b]	5,25[a]	5,00c	5,25[a]
70 ml/l	6,25[a]	6,63[a]	6,00[b]	6,75[a]
80 ml/l	10,38[a]	7,50[a]	6,75[a]	7,75[a]

Based on observations from the 7-HSA mortality study, the 70 mL/L treatment was not significantly different from the 80 mL/L treatment, but all treatments were significantly different. This is according to Her Hendra W. (2006), who said the most effective neem extract for pest control was her 80g/liter and that both wet and dry extracts are equally effective for pest control. 2019).

Based on the results of a mortality study at concentrations of 20 ml/l, 30 ml/l, 40 ml/l, 50 ml/l, 60 ml/l, 70 ml/l and 80 ml/l in the 14th HSA and the treatments performed by calculating the mortality of 28 HSA-dead thrips pests showed no significant difference between all treatments. This is consistent with the results of a study by Sianipar et al. (2020) It takes him 7–10 days for compounds in neem leaves to directly kill insects.

Based on observations at 21 HSA the 70 ml/l treatment was significantly different from the 80 ml/l treatment where the mortality value in the 80 ml/l treatment was greater than all other treatments, the 20 ml/l treatment was not significantly different from the 30 ml/l treatment, and 40 ml/l, and the 50 ml/l treatment was not significantly different from the 60 ml/l treatment. this is in line with the results of research by Yustiana et al. (2019) the 40 ml/l treatment of neem leaf extract was contact poison and nerve poison with a mortality rate of 47.67% and the 80 ml/l treatment had a mortality value of 93%.

The concentration of neem leaf insecticide on the number of deaths of the Thrips parvispinus Karny in vitro was determined by testing concentrations of 20 g/L, 30 g/L, 40 g/L, 50 g/L, 60 g/L and 70 g/L. Tested results l and 80g/l. For further details, the analysis of mean pre-test concentrations of the plant insecticide B.bassiana on Thrips parvispinus Karny mortality is shown in Table 4 below.

Table 4. Results of B.bassiana Pesticide Concentration Tests on Thrips parvispinus Karny Pest Mortality

Treatment	DAA (Days After Application)			
	7 DAA	14 DAA	21 DAA	28 DAA
20 g/l	2,97[c]	2,97[c]	2,97[c]	2,97[b]
30 g/l	3,44[c]	3,28[c]	3,28[bc]	3,44[b]
40 g/l	4,69[b]	4,53[b]	4,53[b]	4,69[b]
50 g/l	4,38[bc]	4,53[b]	4,22[b]	4,38[b]
60 g/l	7,34[a]	6,72[a]	7,50[a]	7,34[a]
70 g/l	7,03[a]	6,41[a]	7,50[a]	7,03[a]
80 g/l	7,97[a]	7,03[a]	7,97[a]	7,97[a]

Concentrations of 60 g/l, 70 g/l and 80 g/l were not significantly different based on the results of the 7th HSA mortality study used to calculate thrips mortality However, the treatment at 20 g/l made a clear difference. 30 g/l is different. l, 40g/l, and 50g/l. The 40 g/L treatment was not significantly different from the 50 g/L treatment, but the 50 g/L treatment was not significantly different from the 20 g/L and 30 g/L treatments. This is consistent with the work of Salbilah D. et al., Boucias and Pendland (1998). (2019) the higher the dose administered to the target insect, the faster the mortality of infected larvae due to the higher likelihood of contact between the fungus and the insect.

Concentrations of 60 g/l, 70 g/l and 80 g/l were not significantly different based on the results of the 7th HSA mortality study used to calculate thrips mortality However, the treatment at 20 g/l made a clear difference. 30 g/l is different. l, 40g/l, and 50g/l. The 40 g/L treatment was not significantly different from the 50 g/L treatment, but the 50 g/L treatment was not significantly different from the 20 g/L and 30 g/L treatments. This is consistent with the work of Salbilah D. et al., Boucias and Pendland (1998). (2019) The higher the dosage, the more contact B.bassiana has with the target pest, and the faster the process of death of infected larvae.

Based on the results of pest mortality tests at 14 HSA concentrations of 60 g/l, 70 g/l, and 80 g/l, they were not significantly different, while 20 g/l, 30 g/l g/l, which was significantly different from the HSA concentration of 40 g. /l and 50g/l. The 20 g/L treatment was not significantly different from the 30 g/L treatment, but was significantly different from the other treatments. This is consistent with the findings of Zuriyanti et al. (2022) Spraying B.bassiana at a concentration of 60 grams can rapidly reduce the incidence and severity of pest infestations on chili pepper plants.

Based on pre-test results, there was no significant difference in thrips pest mortality at 21 HSA and 28 HSA concentrations of 60 g/l, 70 g/l, and 80 g/l, but 20 g/l and 20 g/l were significantly different. l treatments 1, 30 g/l, 40 g/l and 50 g/l, 40 g/l treatments were not significantly different from the 50 g/l treatment, and the 20 g/l treatment was not significantly different from the At treatment. The results of the 21st HST Mortality Study at the 30 g/L treatment, the 20 g/L treatment were significantly different from the other treatments but not the 30 g/L treatment. bottom. This is consistent with the study of Zuriyanti et al. (2022) uses B.assiana (Blas.) Vuill. Up to 60 grams is very suitable for controlling plant damage by pests. Additionally, the use of 60 grams of B.bassiana was supported by the research results of Nurani R. et al. (2018) found that, using a concentration of 60 grams dissolved in 1 liter of water, the number of fungal spores of B.bassiana .bassiana was contained in a highly concentrated formulation and, due to its high density, the pest population. Proven to increase mortality. infection is established. The 60 g/l, 70 g/l, and 80 g/l treatments did not differ significantly, so the more efficient and economical 60 g/l concentration is used for field testing.

In vivo test results Thrips parvispinus Karny Pest Mortality

Observations of thrips parvispinus carney pest mortality on pepper plants were carried out on HSA 30 year old, HSA 37 year old, HSA 44 year old, HSA 51 year old and HAS 58 year old plants. The aim is to measure weekly mortality. Yield data on mean mortality of thrips parvispinus Karny adults on peppers are shown in Table 5.

Table 5. Results of the Average Mortality Analysis of Thrips parvispinus Karny.

Treatment	Thrips parvispinus Karny Mortality			
	DAA (Days After Application)			
	7 DAA	14 DAA	21 DAA	28 DAA
A	0,29^{d}	0,29^{f}	0,29^{d}	0,29^{d}
B	75,66^{b}	82,62^{c}	78,35^{b}	79,87b
C	84,34^{a}	83,97^{c}	79,50^{b}	83,11b
D	86,49^{a}	87,66^{b}	83,30^{b}	87,66^{a}
E	90,00^{a}	90,00^{a}	90,00^{a}	90,00^{a}
F	55,96^{c}	58,29^{e}	60,12^{c}	57,34^{c}
G	58,91^{c}	61,38^{d}	63,13^{c}	58,27^{c}

information:- Numbers in the same column followed by different letters indicate significant differences based on Duncan's multiple range test at the 5D44 significance level

- A = control. B = 50 ml/l neem leaf extract and 30 g/l B.bassiana. C = 60 ml/l neem leaf extract and 40 g/l B.bassiana. D = 70 ml/l neem leaf extract and 50 g/l B.bassiana. E = 80 ml/l neem leaf extract and 60 g/l B.bassiana. F = 80 ml/l neem leaf extract. G = 60 g/l B.bassiana

Based on observations of mortality in 7 HSA (30 HST), all treatments differed significantly from controls (A). This indicates that the concentration treatment of neem leaves is a mixture of neem leaves and Beauveria bassiana (Bals.) Vuill. Effects on mortality of the pest thrips parvispinus Karny. According to (Wenchao Ge et al, 2020), his LT50 values for B.bassiana and neem leaf extracts from highest to lowest concentrations were 5–12 days and 4–9 days, respectively.

Observation of mortality at 14 HSA showed that all treatments were significantly different from control (A), treatment B, and C were significantly different from other treatments, treatment E was significantly different from all treatments, treatment E (80 ml/l + 60 g/l B.bassiana) has a mortality percentage value of 90% compared to all other treatments, this is in accordance with the research of Prastiwi S. (2021) that factors that affect the time to kill insect pests include resistance levels, host resistance, microenvironmental conditions in the host`s body, and mixing of active ingredients different.

Observations at 21 HAS and 28 HAS showed that all treatments were significantly different from control (A), treatments B, C and D at 21 HAS were not significantly different, respectively, while E was significantly different from all

treatments. significantly different, showing 90% mortality in comparison. No significant difference was found for all other treatments, but no significant difference was found for the F and G treatments. On the other hand, for 28 HAS, treatment D had the same effect as E (80 ml/L + 60 g/L B.bassiana). According to Pratiwi S. (2021), the combination index value for the combination of neem and B.bassiana leaf extracts is < 0.5. This blends neem and B.bassiana leaf extracts for a synergistic effect, allowing the two to be used together.

Attack Intensity of Thrips parvispinus Karny

Observations of thrips attack intensity on hot pepper plants were made on plants aged 7 HSA, 14 HSA, 21 HSA and 28 HSA. The purpose is to determine the intensity of weekly attacks. Based on the analysis of attack intensity data from Thrips parvispinus carney on hot pepper plants, all treatments were significantly different from the control (A), treatment B was significantly different from treatments C, F and G at 7 HSA observations. showed that there was no significant difference. However, C and D were significantly different from other treatments and not significantly different from E. Treatment D was not significantly different from treatment E, but the mean number of thrips attacks in treatment E was lower than in the other treatments. This is because low levels of plant-based pesticides act as repellents and food inhibitors. Therefore, high concentrations are required to be toxic to pests (Saenong, 2017). Yield data on average attack intensity of thrips parvispinus Karny on hot peppers are shown in Table 6. the following:

Table 6. Results of Analysis of the Average Intensity of Attack by Thrips parvispinus Karny.

Treatment	Attack intensity of Thrips parvispinus Karny			
	DAA (Days After Application)			
	7 DAA	14 DAA	21 DAA	28 DAA
A	3,38^{a}	2,43^{a}	2,62a	2,62^{a}
B	2,05^{b}	1,95^{c}	2,10^{bc}	2,10^{b}
C	2,03^{bc}	1,92^{c}	1,80^{bc}	2,10^{b}
D	1,43^{cd}	1,46^{d}	1,70^{bc}	1,70^{bc}
E	1,12^{d}	1,03^{e}	1,38^{c}	1,36^{c}
F	2,37^{b}	2,38^{b}	2,33^{b}	2,33^{b}
G	2,31^{b}	2,30^{bc}	2,18^{b}	2,18^{b}

information:- Numbers in the same column followed by different letters indicate significant differences based on Duncan's multiple range test at the 5% significance level.

- A = control. B = 50 ml/l neem leaf extract and 30 g/l B.bassiana. C = 60 ml/l neem leaf extract and 40 g/l B.bassiana. D = 70 ml/l neem leaf extract and 50 g/l B.bassiana. E = 80 ml/l neem leaf extract and 60 g/l B.bassiana. F = 80 ml/l Neemblattextrakt. G = 60 g/l B. bassiana.

All treatments differed significantly from controls based on the results of 14 HSA observations. Treatment B was not significantly different from treatments C and G, but was significantly different from all treatments, and treatments F and G with margin treatment were not significantly different. Combined treatment had a greater effect on suppression of attack intensity than treatment of single concentrations of neem and B. basiana. Treatment E (80 ml/l + 60 g/l B.bassiana) showed the lowest attack intensity with D. This agrees with Mr Pratiwi S. (2021) The combined treatment of B. bassiana and neem leaf insecticide was more toxic than the single treatment of B. bassiana and neem leaf insecticide.

Based on observations of 21 HAS and 28 HAS, all treatments were significantly different from controls, with treatment E (80 mL/L + 60 g/L B.bassiana) significantly different from all treatments. showed different minimum attack strength values. All treatments differed significantly from controls (A), but treatment E had a lower mean intensity than the other treatments, with a mean aggression intensity value of 1.36, which was included in the mild injury category, and concentration values of obtained from the effect. Mixed application rates of neem leaves and B.bassiana increased by 48%. According to Graduation L. et al. (2019) low concentrations of plant insecticides act as repellents and food inhibitors, so high concentrations are required to be toxic to the target insects.On the other hand, according to Fernandez-Grandon et al. (2020) combined treatment of B.bassiana and neem extract is more toxic than single treatment.

Observe the height of pepper trees

Pepper plant height observations were performed to determine the effect of pest infestation intensity caused by the thrips parvispinus Karny on plant height growth. Observations were made 15 days after planting (HST). Observations he made every 15 days. The analysis showed that neem leaf + B.assiana pesticide treatment observed plant height at 15 HST, 30 HST, 45 HST, and 60 HST affected plant height.

Based on Duncan analysis of data on pepper plant mean height, all treatments were significantly different from the control at 15 HST, except for treatment F (80 mL/L neem leaf extract), which was a single treatment concentration. was shown. It was not significantly different from the control (A). On the other hand, according to Prastiwi S. (2021), each of the other treatments showed a significant difference, and E had a higher average plant height and was clearly different from the other treatments. The higher the applied pesticide concentration, the higher the mortality based on it, and the higher the dead pest mortality, the lower the intensity of pest infestation, leading to the optimization of plant growth. For details, the average height of pepper plants between 15 HST and 60 HST is shown in Table 7.

Table 7. Analytical results of average height of pepper plants

Treatment	plants height			
	15 HST	30 HST	45 HST	60 HST
A	9,71[f]	61,35[e]	61,35[e]	100,32[e]
B	11,83[d]	68,64[c]	68,64[c]	106,70[c]
C	12,60[c]	69,84[c]	69,84[c]	109,80[b]
D	13,51[b]	70,65[b]	70,65[b]	110,94[b]
E	16,58[a]	73,48[a]	73,38[a]	115,69[a]
F	9,98[f]	65,90[d]	65,90[d]	103,10[de]
G	10,48[e]	67,25[d]	67,25[d]	104[d]

information:- Numbers in the same column followed by different letters indicate significant differences based on Duncan's multiple range test at the 5% significance level.

- A = control. B = 50 ml/l neem leaf extract and 30 g/l B.bassiana. C = 60 ml/l neem leaf extract and 40 g/l B.bassiana. D = 70 ml/l neem leaf extract and 50 g/l B.bassiana. E = 80 ml/l neem leaf extract and 60 g/l B.bassiana. F = 80 ml/l Neemblattextrakt. G = 60 g/l B. bassiana.

Observations at HST 30 and DAP 45 differed significantly from the control treatment (A) for all treatments, except that treatments B and C were not significantly different from the control and E still had the highest average plant height. I was. According to Susanti et al. (2017), plant insecticides can act as repellents and antifeedants at low concentrations. Therefore, high concentrations are required to be toxic to pests. Similarly, 60 HST observations showed that treatment E still had a higher average plant height compared to the other treatments. According to Wiratno (2010), according to Zahrawati et al. (2021), botanical insecticides can effectively control the intensity of attack by nematodes, fungal pathogens, bacteria and pests and inhibit plant growth. Contains several bioactive compounds that Based on his Prastiwi S work by Purwar and Sanchan (2006). (2021) found that combinations of B.bassiana and neem leafy vegetable insecticides are compatible and can be applied simultaneously to affect plant growth.

Harvest Peppers

Bell peppers can be harvested 90 days after planting (HST), depending on the variety grown. In this study, pepper plants were harvested at he 90 HST. For test treatments that affect yield, this is indicated by the yield difference between treatments. This was significantly different from the control, with treatment E showing the best results with a yield of 6.64 kg. Data on pepper production are shown in Table 8.

Table 8. Analytical results of average yield of pepper plants

Treatment	Productions (kg/plot)
A Kontrol (Tanpa Perlakuan)	1,27[d]
B Konsentrasi ekstrak nimba 50 ml/l ditambah Beauvaria bassiana 30 g/l	1,34[c]
C Konsentrasi ekstrak nimba 60 ml/l ditambah Beauvaria bassiana 40 g/l	1,37[c]

Treatment	Productions (kg/plot)
D Konsentrasi ekstrak nimba 70 ml/l ditambah Beauvaria bassiana 50 g/l	1,46[b]
E Konsentrasi ekstrak nimba 80 ml/l ditambah Beauvaria bassiana 60 g/l	1,66[a]
F Konsentrasi ekstrak nimba 80 ml/l	1,31[cd]
G Konsentrasi Beauvaria bassiana 60 g/l	1,33[c]

Note:Numbers followed by different letters in different columns are Varies significantly at 5% level according to Duncan's multiple range test

Treatment E in Table 8 showed significantly different results for all Hel treatments, and application of treatment E (neem leaf extract at 80 ml/l concentration + 60 g/l B.bassiana) reduced pepper Proven to increase plant yield. The yield is 1.66 kg per plot. This statement is consistent with the work by Dadang and Prijono (2008) in Prastiwi S. (2021). Herbal pesticides extracted with organic solvents are considered good if the concentration is 1.n or less and the mortality rate of test insects is 80% or more.

Conclusion

The results of research carried out in this area can be summarized as follows.1. Combined spraying of neem leaves (Azadircahta indica A.Jus.Blume) and mixed herbal insecticides with B.bassiana may accelerate thrips mortality and increase thrips mortality .2. A combination of the plant insecticides Azadirachta indica A.Jus.Blume and 60 g/l B.bassiana at a concentration of 80 ml/l effectively reduces the intensity of attack by thrips parvispinus Karny by 48%.

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