Eduvest – Journal of Universal Studies
Volume 3 Number 7, July, 2023
p- ISSN 2775-3735- e-ISSN 2775-3727

THE EFFECT OF ORGANIC INSECTICIDE AND VARIOUS CULTIVARS ON ATTACK INTENSITY OF *SPODOPTERA EXIGUA* AND RESULTS SHALLOTS *(ALLIUM ASCALONICUM L.)*

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ABSTRACT

The use of chemical insecticides to control Spodoptera exigua is currently the main choice for farmers. The continuous use of chemical insecticides will cause many problems including resistance, food safety and environmental damage. alternative use of organic insecticides needs to be applied for the control system of Spodoptera exigua on shallot plants. The experiment was carried out in Playangan Village, Gebang District, Cirebon Regency, in Oktober-Desember 2022. The research method used a randomized block design with 3 replications, consisting of 9 treatment combinations of three cultivars: Bima, Ilokos, Sumenep, organic insecticides: neem seed extract, Bauveria bassiana , Bacillus thuringiensis. The results of the experiment showed that the combination of treatment of 3 cultivars of shallots and organic insecticides had a significant effect on the components of the intensity of the attack of Spodptera exigua pests (plants aged 43, 50 and 57 DAP). The best treatment was obtained, namely the treatment of Ilokos cultivar and neem seed extract insecticide with tuber yields of 6.60 kg / plot or equivalent to 28.57 tonnes / ha.

KEYWORDS *cultivars; organic insecticides; shallots*

How to cite: Rachmawati, et al. (2023). The Effect of Organic Insecticide and Various Cultivars on Attack Intensity of Spodoptera exigua and Results Shallots (*Allium Ascalonicum L.*). *Journal Eduvest. 3* (7): 1340-1346
E-ISSN: 2775-3727
Published by: https://greenpublisher.id/

INTRODUCTION

Shallots (*Allium ascalonicum L*.) are one of the leading vegetable commodities that have long been cultivated by farmers intensively. Efforts to increase the production of shallots have many challenges, for example what often happens is the use of inappropriate seeds and the attack of plant pests (OPT), the main pest on shallots is *Spodoptera exigua* (Tarwotjo et al., 2019). Organic insecticides are insecticides whose active ingredients come from plants or plants, animals and other organic materials that are effective in controlling pests in plants (Soenandar & Tjachjono, 2012). Neem seed plant insecticides are widely used as organic insecticides (Ministry of Agriculture, 2012). In addition to vegetable insecticides, other types of organic insecticides are biological insecticides with active bacterial ingredients that can kill insect pests such as *Bacillus thuringiensis* and *Beauveria bassiana* (Suwahyono, 2009). Neem can affect insect behavior and physiologically the insects become stressed and result in hunger for insects exposed to the plant-based insecticide neem to die (Ministry of Agriculture, 2012). *Bacillus thuringiensis* when eaten by the larvae, the larvae become inactive and tend to seek shelter in hidden places. In addition, he stopped eating, vomited, and experienced diarrhea. After one week, the larvae become mushy and die (Soenandar & Tjachjono, 2012). Larvae that are attacked by the fungus *Beauveria bassiana* will die with a body like a mummy with mycelia or fungus covering the body so that it becomes white (Soenandar & Tjachjono, 2012). Other efforts to anticipate the above problems, one of the efforts is to find and explore shallot cultivars that have superior properties, especially in terms of production and resistance to major pests and diseases (Putrasamedja, 1996). There are three cultivars that are widely used, namely the Bima Brebes cultivar with an average tuber yield of 9.9 tonnes / ha (Directorate General of Horticulture, 2011), Ilokos cultivar average tuber yield ranges from 9.0-24 tonnes/ha (Ministry of Agriculture, 2007) and cultivar Sumenep 14-17 tonnes/ha (Putrasamedja, 1996).

The study aims to determine the combination between several cultivars and various organic insecticides that significantly affect the growth and yield of shallot plants (*Allium ascalonicum* L.). To find out which cultivars and organic insecticides have the best effect on the growth and yield of shallot plants (*Allium ascalonicum* L.).

RESEARCH METHOD

The method used in this research is using an experimental method with a randomized block design (RBD). This study consisted of 9 treatments, each of which was repeated 3 times, so that there would be 27 experimental units. Plot size is 1.4 mx 1.65 m, distance between plots (width of the solokan) is 30 cm, distance between replicates is 50 cm, and uses a spacing of 15 cm x 15 cm. The first treatment is Cultivars (A) and the second treatment is Insecticide (B), the design is as follows:

A1B1 = Bima Brebes cultivar and plant-based insecticide with neem seed extract
A1B2 = Bima Brebes cultivar and the biological insecticide *Beauveria bassiana*

A1B3 = Bima Brebes cultivar and the biological insecticide *Bacillus thuringiensis*
A2B1 = Ilokos cultivar and neem seed extract vegetable insecticide
A2B2 = Ilokos cultivar and the biological insecticide *Beauveria bassiana*
A2B3 = Ilokos cultivar and the biological insecticide *Bacillus thuringiensis*
A3B1 = Sumenep cultivar and plant-based insecticide with neem seed extract
A3B2 = Sumenep Cultivar and Biological Insecticide *Beauveria bassiana*
A3B3 = Sumenep cultivar and the biological insecticide Bacillus thuringiensis

Organic insecticides are applied by spraying them using a formulation according to the recommended concentration stated on the package. Spraying is done on the leaves and done in the afternoon. Spraying was started at the age of 15 days after planting with a frequency of spraying every 1 week and the limit of application at the age of 57 DAP for Bima and Ilokos cultivars, while the application for the Sumenep cultivar until the age of 64 DAP was due to the increase in harvest time. The intensity of the attack was calculated using the formula proposed by Sinaga (2009), while the plant growth and yield data were analyzed using the RBD linear model with a combination pattern (Gaspersz, 1995). If there is a significant difference in the treatment or the F-count value is greater than the F-table at the 5% level, the test is carried out using the Scott-Knott Cluster Test.

RESULT AND DISCUSSION

Spodoptera exigua Pest Attack Intensity (%)

The treatment of several organic and cultivar insecticides had no significant effect on the intensity of *Spodoptera exigua* pests aged 22, 29, and 36 DAP. Suharti *et al.* (2018), that at the age of 7-35 HST the attack rate of *Spodoptera exigua* is still low 0.71-10%.

Table 1. The effect of several organic and cultivar insecticides on the intensity of *Spodoptera exigua* pests aged 22, 29, 36, 43, 50, and 57 DAP (%).

Treatment of Kinds of Organic and Cultivar Insecticides	Average Pest Attack Intensity (%)					
	22 DAP	29 DAP	36 DAP	43 DAP	50 DAP	57 DAP
A1B1 (Bima, Neem)	1.67 a	3.33 a	3.33 a	13.33 a	33.33 b	36.67 b
A1B2 (Bima, Bb)	3.33 a	8.33 a	6.67 a	26.67 b	41.67 b	51.67 c
A1B3 (Bima, Bt)	5.00 a	5.00 a	16.67 a	26.67 b	43.33 b	50.00 c
A2B1 (Ilokos, Neem)	0.00 a	0.00 a	0.00 a	3.33 a	8.33 a	11.67 a
A2I2 (Ilokos, Bb)	1.67 a	3.33 a	3.33 a	10.00 a	26.67 b	40.00 b
A2B3 (Ilokos, Bt)	5.00 a	11.67 a	6.67 a	6.67 a	30.00 b	45.00 c
A3B1 (Sumenep, Neem)	0.00 a	0.00 a	0.00 a	1.67 a	1.67 a	11.67 a
A3B2 (Sumenep, Bb)	0.00 a	6.67 a	8.33 a	15.00 a	18.33 a	16.67 a
A3B3 (Sumenep, Bt)	0.00 a	0.00 a	1.67 a	18.33 b	15.00 a	16.67 a

Note: The average number accompanied by different letters in the same column shows a significant difference according to the Scott-Knot Cluster Test at the 5% level.

At the age of 43 DAP, the treatments A1B1, A2B1, A2B2, A2B3, A3B1, and A3B2 were significantly different from the AIB2 and A1B3 treatments. Meanwhile, at the age of 50 DAP where the treatment of A1B1, A1B2, A1B3, A2B and A2B3 was significantly different from the treatment of A2B1, A3B1, A3B2 and A3B3. Meanwhile, at the age of 57 DAP, the A1B1 and A2B2 treatments were significantly different from the other treatments. In A1B2, A1B3 and A2B3 treatments were significantly different from other treatments. and on treatment A2B1, A3B1, A3B2, and A3B3 were not significantly different but significantly different from other treatments. At the age of 43-57 DAP, the working effect of the insecticides of each treatment has begun and this is also thought to be due to an increase in the pest population due to the rapid vegetative growth of shallots so that the availability of more leaves is different for each cultivar. According to Marsadi (2017), the development of larvae in shallots is influenced by the cultivar and age of the shallot plants. In the observation of 57 DAP, the peak intensity of the pest population attack was up to 51.67% in the A1B2 treatment (Bima, Bb) and 50.00% A1B3 (Bima, Bt). The Bima cultivar produced more leaves than the Ilokos and Sumenep cultivars. Azis (2017) argues that the imago population increases at the beginning of planting until flowers appear. The A1B2 (Bima, Bb) treatment using the insecticide *Beauveria bassiana* and A1B3 (Bima, Bt) using the insecticide *Bacillus thurngiensis* showed a higher attack rate compared to the insecticide treated with the botanical insecticide made from neem seed extract. This is thought to be related to the way each different insecticide works. According to Suharti *et al.* (2018) *Beauveria bassiana* insects will reproduce themselves and produce beauvericin poison first, which will damage cell membranes, weaken immunity and ultimately result in insect death.

Fresh Weight of Bulbs Per Clump (g) and Per Plot (kg)

The treatment of various organic and cultivar insecticides on tuber weight per hill gave a significant effect where the A2B1 (Ilokos, neem) treatment with a tuber weight of 82.67 grams was significantly different from other treatments and the fresh tuber weight per plot also had a significant effect where on treatment A2B1 (Ilokos, neem) with tuber weight7.94 kg significantly different from other treatments. It is assumed that the effectiveness of the use of vegetable insecticides, namely those made from neem seed extract is better, so that plant development is better and can reduce the intensity of the attack of the *Spodoptera exigua* pest on plants, which is characterized by faster plant growth and development than the use of Bb and Bt. One of the increasing and decreasing growth and yield of shallot plants can be influenced by the intensity of *Spodoptera exigua* pest attack, so that indirectly it also affects the tuber yield (tuber weight) of shallots. According to Rosfiyansyah *et al.* (2005), leaf damage in the form of reduced leaves or leaf area will affect tuber yields, due to decreased photosynthesis and translocation of assimilates from leaf to tuber. Superior cultivars can produce tubers with larger tubers because they can maintain tuber yields due to the intensity of *Spodoptera exigua* pests (Rulina, 2010). According to Putrasamedja (1996), if the cultivar selected has a large yield potential, then with the presence of pest and disease attacks, the results obtained are still sufficient to meet needs and do not suffer too

many big losses. As in the Ilokos cultivar which has the largest tuber yield than the Bima and Sumenep cultivars. So with the presence of pests and diseases the results obtained are still sufficient to meet the needs and do not experience too many big losses. As in the Ilokos cultivar which has the largest tuber yield than the Bima and Sumenep cultivars. So with the presence of pests and diseases the results obtained are still sufficient to meet the needs and do not experience too many big losses. As in the Ilokos cultivar which has the largest tuber yield than the Bima and Sumenep cultivars.

Table 2. Effect of various organic and cultivar insecticides on tuber fresh weight per hill (g) and per plot (kg)

Kinds of Insecticide Treatment Organic and Cultivars	Fresh Bulbs Weight per Clump (g)	Fresh Bulbs Weight per Plot (kg)
A1B1 (Bima, Neem)	60.67 b	5.33 c
A1B2 (Bima, Bb)	52.00 b	3.86 b
A1B3 (Bima, Bt)	53.33 b	3.99 b
A2B1 (Ilokos, Neem)	82.67 c	7.94 d
A2I2 (Ilokos, Bb)	55.33 b	4.09 b
A2B3 (Ilokos, Bt)	36.00 a	3.03 a
A3B1 (Sumenep, Neem)	32.67 a	2.00 a
A3B2 (Sumenep, Bb)	29.33 a	1.86 a
A3B3 (Sumenep, Bt)	26.00 a	2.00 a

Note: The average number accompanied by different letters in the same column shows a significant difference according to the Scott-Knot Cluster Test at the 5% level.

Dry Weight of Bulbs per Clump (g) and Per Plot (kg)

Based on the observation, the mean number obtained showed that in the A2B1 treatment, the tuber weight per hill with tuber weight of 67.33 was significantly different from other treatments as well as tuber weight per plot with tuber weight. 6.60 kg. Where A2B1 treatment gave greater tuber yields than other treatments. Based on the table above, the treatment of cultivars combined with neem seed extract insecticides was able to provide the largest tuber weight compared to cultivar treatments combined with Bb and Bt insecticides.

Table 3. Effect of some organic and cultivar insecticides on tuber dry weight per hill (g) and per plot (kg)

Kinds of Insecticide Treatment Organic and Cultivars	Dry Bulbs Weight per Sample (g)	Dry Bulbs Weight per Plot (kg)
A1B1 (Bima, Neem)	44.67 b	4.47 e
A1B2 (Bima, Bb)	43.67 b	3.03 d
A1B3 (Bima, Bt)	39.33 b	2.57 d
A2B1 (Ilokos, Neem)	67.33 c	6.60 f
A2I2 (Ilokos, Bb)	38.00 b	2.77 d
A2B3 (Ilokos, Bt)	36.00 b	2.27 d
A3B1 (Sumenep, Neem)	30.67 a	2.00 c
A3B2 (Sumenep, Bb)	27.53 a	1.27 a
A3B3 (Sumenep, Bt)	24.80 a	1.50 b

Note: The average number accompanied by different letters in the same column shows a significant difference according to the Scott-Knot Cluster Test at the 5% level.

Ilokos cultivar was able to produce the highest tubers, namely 6.60 kg in A2B1 treatment or equivalent to 28.57 ha / ton, this is in accordance with the description of the yield of Ilokos cultivar, namely 24.4 tonnes / ha (attachment 3). Different with Bima and Sumenep cultivars which produce lower tubers. However, in Bima and Sumenep cultivars combined with a plant-based insecticide, neem seed extract was able to produce larger tubers than the cultivar treatment combined with Bb and Bt insecticides. It means that the insecticide treatment of neem seed extract gave the best effect compared to the treatment of Bb and Bt insecticides. Neem seed extract vegetable insecticide is able to defend against pests so that it can maintain faster and better growth and development. According to Sukrasno (2003), that neem seed extract produces a dark, bitter, smelly oil. Neem oil also contains sulfur or sulfur compounds that smell the same as onions (Purnawan et al., 2022). So that the sulfur content in the neem seed extract can add to the sulfur content in shallots. It is different from Bb and Bt insecticides because of several factors that occurred in the field at the time of research such as external factors, one of which was high rain during the study, which caused fungal and bacterial conidia to decrease (Suharti, 2018). So this will be related to the rate of photosynthesis that is taking place. This is in accordance with the opinion of Arifin (2014), if the rate of photosynthesis is going well, which is characterized by rapid growth and development, the resulting photosynthate will be more and more. The amount of tuber weight produced per plant depends on plant growth and the amount of photosynthate produced. The better plant growth and the greater the amount of photosynthate, the greater the weight of the tubers produced.

CONCLUSION

The combination of treatment of several cultivars with various organic insecticides had a significant effect on the intensity of *Spodoptera exigua* pest attack (43, 50 and 57 DAP), plant height (22, 29, 36, 43, 50 and 57 DAP), number of leaves (22, 29, 36, and 57 DAP). The combination of Ilokos cultivar treatment with plant organic insecticide with neem seed extract resulted in the highest dry tuber weight per plot of 6.60 kg / plot or equivalent to 28.57 tonnes/ha.

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