Injuruty: Interdiciplinary Journal and Humanity
Volume 2, Number 10, October 2023
e-ISSN: 2963-4113 and p-ISSN: 2963-3397

THE EFFECT OF VARIOUS INSECTICIDE ACTIVE INGREDIENTS AGAINST THE INTENSITY OF *SPODOPTERA EXIGUA* ATTACKS ON SHALLOT (*ALLIUM ASCALONICUM* L.) BIMA BREBES VARIETIES

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Abstract
Shallots (*Allium ascalonicum* L.) are one of the leading commodities in agriculture. Shallots are commonly used as a seasoning for cooking, besides that shallots are also useful as traditional medicine because they have antiseptic substances contained in them. The productivity of Shallot plants often decreases as a result of pest attacks. Armyworm (Spodoptera exigua) is one of the obstacles in the cultivation of Shallot plants (Allium ascalonicum L.), high caterpillar attack rates can reduce Shallot productivity, even causing crop failure. One way to control this pest is to control by using insecticides with certain active ingredients. This study aims to determine the effectiveness of various insecticide active ingredients to control armyworm pests (*Spodoptera exigua*) on Shallot plants (*Allium ascalonicum* L.). The design in this study was a Randomized Group Design (RGD) with 4 treatments of insecticide active ingredients and controls, namely A (*Profenofos*), B (*Emamectin benzoate*), C (*Metomil*), D (*Sipermethrin*) and E (Control). Each treatment was repeated 5 times so that there were 25 experimental units. The research was conducted in Gagasari Village, Gebang District, Cirebon Regency, West Java. The trial research time starts from June - September 2023. The results showed that the application of insecticides active ingredients *Profenofos, Emamectin benzoate, Metomil* and *Sipermethrin* did not cause phytotoxicity to Shallot plants. Insecticide, Profenofos has a relatively gentle attack and low when compared to other active ingredients. In general, it is seen that all active ingredients of insecticides tested are able to play a role in controlling pests well. Insecticide treatment has a significant effect on the yield of dry weight of shallots per plot when compared to treatment without insecticide control (control). Profenofos active ingredient insecticide treatment was seen to produce a higher dry tuber weight than other treatments even when compared to all insecticide active ingredients tested, reaching 24.92 kg or equivalent to 24.9 tons per hectare.

Keywords: Bawang Merah; Spodoptera exigua; Profenofos; Emamektin benzoat; Metomil; Sipermetrin

INTRODUCTION

Shallots are one of the commodities in agriculture that has the potential as a source of income for farmers, and to fulfill domestic consumption. This commodity is not only a seasoning for cooking, but also efficacious for humans, shallots contain enzymes that play a role in improving body health because they contain anti-bacterial substances and anti-inflammatory substances (Istina, 2016). According to NELLY et al., (2015), one of the limits of Shallot productivity is pest and disease attacks. According to NELLY et al., (2015), there are several important pests on Shallot plants, namely Spodoptera exigua, Thrips tabaci, leaf slitting flies (Liriomyza chinensis), and earthworms (Agrotis ipsilon). Armyworm (Spodoptera exigua) is one of the pests that causes Shallot productivity to decrease, the larvae of this caterpillar damage the leaves of Shallot plants causing damage to the leaves of the plant. If not handled effectively, losses due to these caterpillars will be even greater (Rahmawati et al., 2016). The damage caused by armyworms can reach 57% or even up to 100% which causes farmers to experience crop failure if not controlled (Adibah et al., 2023).

According to Rahmawati et al., (2016), control using insecticides is widely carried out because it is considered capable of reducing armyworm populations in a fast time. Profenofos is an orghanoposfat class insecticide and is one of the widely used insecticides (Pratiwi & Asri, 2022). This insecticide has the properties of stomach poison and contact poison against its target (Pratiwi & Asri, 2022). This insecticide is more biodegradable in nature and is widely found as an active ingredient in insecticides (Pratiwi & Asri, 2022; Umar & Liadi, 2022). Sipermethrin is an active ingredient of insecticides that fall into the pyrethroid group, a class of insecticides that have distinctive properties for insect pest control, namely: high effectiveness (as a contact and stomach poison), less toxic to mammals, and relatively rapid loss of effectiveness (Dirgayana et al., 2017). Emamectin benzoate is an insecticide active ingredient that is contact toxic, in granular form, and can be dispersed in water (PT. Nufarm Indonsia, 2016 in (Lestariningsih et al., 2020). Methomil is a carbamate pesticide that has a mechanism of action to inhibit the activity of the enzyme acetylcholinesterase, the symptoms caused are reversible, effects that do not last long because they are easily decomposed (Hidayati & Ciptono, 2022). Methomil is also known to have high solubility in water so that it is easily decomposed and insoluble in fat tissue, so that the impact caused when it enters the organism's body will not last long or be quickly restored (Hidayati & Ciptono, 2022; Kumar et al., 2017). Therefore, this study was conducted to determine the effectiveness of several insecticide active ingredients such as profenofos, emamectin benzoate, methomyl, and cypermethrin in controlling the population and intensity of damage to Shallot plants by armyworm larvae.

RESEARCH METHOD

The experiment was conducted in Gagasari Village, Gebang District, Cirebon Regency, West Java. The trial research time starts from June - September 2023. The experiment was conducted using the RGD (Random Group Design) method. This study consisted of treatments that were each repeated 5 times so that there were 25 experimental plots. The plot size is 1 m x 10 m, the distance between plots is 50 cm, the length between repetitions is 50 cm, and uses a planting distance of 15 cm x 20 cm. Treatment with several active ingredients of insecticides of different types. The treatment design is as follows:

A = Active ingredient *profenofos* 500g/l
B = Active ingredient *sipermetrin* 100g/l
C = Active ingredient *emamektin benzoat* 20g/l
D = Active ingredient *methomyl 40%*
E = Control

Insecticides are applied by spraying using formulations in accordance with the recommendations listed on each insecticide packaging. Spraying is carried out on the leaves and carried out in the afternoon. Spraying is carried out 5 times starting at the age of 15 days after planting (DAP) with a frequency of spraying every 1 week and the last application limit at the age of 49 DAP. The concentration used is 2 ml/liter (average recommendation on the packaging). Observations are made weekly after application.

RESULT AND DISCUSSION

Phytotoxicity of Shallot plants

In Table 1, the effective treatment of various insecticide active ingredients at all observation ages did not show any symptoms of poisoning (phytotoxicity) in Shallot plants.

Table 1. The effect of a wide variety of insecticide active ingredients against phytotoxicity in Shallot plants

Various Treatment of Insecticide Active Ingredients	Average Phytotoxicity (%)				
	21 DAP	28 DAP	35 DAP	42 DAP	49 DAP
A (*Profenophos)*	0.00 a	0.00 a	0.00 a	0.00 a	0.00 a
B *(Cypermethrin)*	0.00 a	0.00 a	0.00 a	0.00 a	0.00 a
C *(Emamectin benzoate)*	0.00 a	0.00 a	0.00 a	0.00 a	0.00 a
D *(Methomyl)*	0.00 a	0.00 a	0.00 a	0.00 a	0.00 a
E (Control)	0.00 a	0.00 a	0.00 a	0.00 a	0.00 a

Remarks : The average value followed by the same letter on the factor and the same column shows an unnoticeable difference in the Duncan test.

Based on the observations in Table 1, it can be seen that all insecticide active ingredients applied observed from the age of 21 to 49 DAP showed no symptoms of poisoning for Shallot plants. It is suspected that the active ingredients of insecticides used only play a role in pest control and have no effect on the growth of shallots. Hartati, (2013) states that phytotoxicity is a property that shows the potential for pesticides to cause poisoning effects on plants characterized by abnormal growth after pesticide application. According to Putra et al., (2013), the absence of phytotoxic symptoms of a plant due to preparation treatment on test plants can be caused by the strong toxic properties of mixed compounds without reducing their insecticidal activity (antagonism).

Armyworm Pest Intensity *S. Exigua (%)*

In Table 2, it can be seen that insecticide treatment with various active ingredients has a real effect compared to treatment E (control) can be seen in (table 2).

Table 2 The effect of various kinds of insecticide active ingredients against the intensity of armyworm pest attacks on Shallot plants

Various Treatment of Insecticide Active Ingredients	Average Armyworm Pest Attack Intensity (%)				
	21 DAP	28 DAP	35 DAP	42 DAP	49 DAP
A (*Profenophos)*	0.28 a	0.58 a	1.54 ab	0.66 a	0.19 a
B *(Cypermethrin)*	1.55 b	1.78 b	1.19 ab	0.41 a	1.13 ab
C *(Emamectin benzoate)*	0.56 a	1.25 ab	0.55 a	0.55 a	0.97 a
D *(Methomyl)*	1.02 ab	0.65 a	1.79 b	0.63 a	1.44 b
E (Control)	2.72 c	3.23 c	2.84 c	2.14 b	1.48 b

Remarks : The average value followed by the same letter on the factor and the same column shows an unnoticeable difference in the Duncan test.

Based on the table above, that in general treatment using insecticides has a real difference, it can be seen that the intensity of armyworm pest attack S. *exigua* is lower when compared to control treatment. When viewed from the results of analysis between insecticide active ingredients, *Profenofos* has a relatively gentle and low attack when compared to other active ingredients. It can be concluded that the active ingredient *Profenofos is* better able to suppress the attack of the armyworm pest *S. exigua* than all active ingredients of the insecticide tested. This insecticide with the active ingredient *profenofos* has stomach poison and contact poison properties against its target (Pratiwi & Asri, 2022). This insecticide is more biodegradable in nature and is widely found as an active ingredient in insecticides (Gill & Garg, 2014; Pratiwi & Asri, 2022)

Intensity of Other Pest Attacks (%)

In Table 3 it can be seen that insecticide treatment with various active ingredients has a significant effect on other pest attacks observed among thrips *(Thysanoptera)*, orong-orong (*Gryllotalpidae)* and others that attack Shallot plants, significantly different when compared to control treatment.

Table 3. The effect of a wide range of insecticide active ingredients against attacks of other pests on Shallot plants

Various Treatment of Insecticide Active Ingredients	Average Other Pest Attacks (%)				
	21 DAP	28 DAP	35 DAP	42 DAP	49 DAP
A (*Profenophos)*	0.46 a	0.55 a	0.08 a	0.42 a	0.39 a
B *(Cypermethrin)*	0.37 a	0.54 a	0.15 a	0.40 a	0.45 a
C *(Emamectin benzoate)*	0.10 a	0.16 a	0.53 a	0.17 a	0.26 a
D *(Methomyl)*	0.71 a	0.37 a	0.54 a	0.50 a	0.28 a
E (Control)	1.47 b	0.77 b	1.05 b	0.22 a	1.42 b

Remarks : The average value followed by the same letter on the factor and the same column shows an unnoticeable difference in the Duncan test.

Based on the table above, it is generally seen that all active ingredients of insecticides tested are able to play a good role in controlling pests. One of the other pests that attacked many Shallot plants in this experiment was trips. Thrips attack the leaves by damaging the lower tissues of the leaves and sucking the fluid of plant cells. Symptoms that can be seen on affected leaves are irregular spots on the lower surface of the leaves, silvery white and shiny like bronze, then the leaves turn curly / wrinkled because the liquid in the leaves is sucked. This pest attack can cause stunting in plants because their growth is stunted. Heavy attacks occur in the dry season (Mardiyaningsih et al., 2021; NELLY et al., 2015; Ratonamo, 2021) stated that TRIPS is one of the important pests in Shallot cultivation.

Intensity of Shallot Plant Disease (%)

In Table 4. It can be seen that insecticide treatment with a variety of active ingredients does not have a noticeable effect on diseases in Shallot plants. The disease that appears in experimental plants is purple spot caused by the fungus *Alternaria porri*.

Table 4 The effect of a wide range of insecticide active ingredients against other diseases of Shallot plants

Various Treatment of Insecticide Active Ingredients	Average Intensity of Disease Attacks (%)					
	14 DAP	21 DAP	28 DAP	35 DAP	42 DAP	49 DAP
A (*Profenophos)*	0.49 a	0.61 a	0.53 a	0.57 a	0.23 a	0.24 a
B *(Cypermethrin)*	0.66 a	0.46 a	0.53 a	0.20 a	0.21 a	0.36 a
C *(Emamectin benzoate)*	0.31 a	0.63 a	0.46 a	0.35 a	0.44 a	0.37 a
D *(Methomyl)*	0.66 a	0.90 b	0.53 a	1.41 a	1.40 a	1.07 a
E (Control)	0.75 a	1.00 a	1.90 a	1.38 a	1.72 a	1.26 a

Remarks : The average value followed by the same letter on the factor and the same column shows an unnoticeable difference in the Duncan test.

Purple spots attack shallots in the early stages of attack, characterized by white or gray curved spots, when the attack is getting bigger the spots get bigger and form brownish-black root-like spots (Yanti et al., 2023). All insecticide treatments given, do not make a noticeable difference to the attack of Shallot disease. This is suspected because according to the nature of the poison, that insecticides only play a role in poison for insect pests.

Shallot Dry Weight (kg/plot)

In Table 5 the effectiveness of various kinds of active ingredients insecticides providing real results on crop yields can be seen in (Table 5)

Table 5 The effect of various insecticide active ingredients on the yield of dry

weight of shallots per plot (kg).

Various Treatment of Insecticide Active Ingredients	Dry weight of shallots (kg)
A (Profenophos)	24.92 c
B (Cypermethrin)	24.46 b
C (Emamectin benzoate)	23.99 ab
D (Methomyl)	23.98 ab
E (Control)	21.92 a

Remarks : The average value followed by the same letter on the factor and the same column shows an unnoticeable difference in the Duncan test.

Insecticide treatment showed a significant effect on thedry weight of shallots per plot when compared to treatment without insecticide control (control). This is influenced by insecticide active ingredients that can suppress pest attacks so that Shallot yields can be maximized. This insecticide with the active ingredient *profenofos* has stomach poison and contact poison properties against its target (Pratiwi & Asri, 2022). This insecticide is more biodegradable in nature and is widely found as an active ingredient in insecticides (Pratiwi & Asri, 2022).

Profenofos active *ingredient insecticide treatment* was seen to produce a higher dry tuber weight than other treatments even when compared to all insecticide active ingredients tested, reaching 24.92 kg or equivalent to 24.9 tons per hectare. Insecticides with the active ingredient *profenofos* in treatment A are most effective in reducing the intensity of armyworm attacks so that the attack rate is lowest when compared to other active ingredient treatments or with control treatments. The decrease in armyworm attack intensity can also be caused by increasing plant age, high concentration and frequent treatment intensity (Bagariang et al., 2020; Subagja et al., 2023)

CONCLUSION

Insecticidal application of active ingredients Profenofos, Emamectin benzoate, Metomil and Sipermethrin does not cause phytotoxicity to Shallot plants. Treatment using insecticides has a noticeable difference, the intensity of attack by armyworm pests S. exigua is lower when compared to control treatment. Insecticide, *Profenofos* has a relatively gentle attack and low when compared to other active ingredients. In general, it is seen that all active ingredients of insecticides tested are able to play a role in controlling pests well. Insecticide treatment has a significant effect on the yield of dry weight of shallots per plot when compared to treatment without insecticide control (control). The insecticide treatment of Profenofos active ingredients was seen to produce a higher weight of dry tubers than other treatments even when compared to all insecticide active ingredients tested, reaching 24.92 kg or equivalent to 24.9 tons per hectare.

REFERENCES

Adibah, F., Fauzi, M. T., & Haryanto, H. (2023). Uji Konsentrasi Pestisida Nabati Ekstrak Daun Jarak Pagar Terhadap Hama Ulat Bawang Merah Spodoptera Exigua Hubn. Jurnal Ilmiah Mahasiswa Agrokomplek, 2(1), 91–99.

Bagariang, W., Tauruslina, E., Kulsum, U., PL, T. M., Suyanto, H., Surono, S., Cahyana, N. A., & Mahmuda, D. (2020). Efektifitas Insektisida Berbahan Aktif Klorantraniliprol Terhadap Larva Spodoptera Frugiperda (JE Smith). Jpt: Jurnal Proteksi Tanaman (Journal Of Plant Protection), 4(1), 29–37.

Dirgayana, I. W., Sumiartha, I. K., & Adnyana, I. M. M. (2017). Efikasi Insektisida Berbahan Aktif (Klorpirifos 540 G/L Dan Sipermetrin 60 G/L) Terhadap Perkembangan Populasi Dan Serangan Hama Penggulung Daun Lamprosema Indicata Fabricius (Lepidoptera: Pyralidae) Pada Tanaman Kedelai. J. Agroekoteknol. Trop, 6(4), 378–388.

Gill, H. K., & Garg, H. (2014). Pesticide: Environmental Impacts And Management Strategies. Pesticides-Toxic Aspects, 8(187), 10–5772.

Hartati, S. (2013). Manajemen Keuangan Untuk Usaha Mikro, Kecil Dan Menengah. Jurnal Akutansi Dan Investasi, 2(2), 1.

Hidayati, W. N., & Ciptono, C. (2022). Pengaruh Pemberian Insektisida Metomil Terhadap Pertumbuhan Cacing Tanah (Eisenia Foetida). Kingdom (The Journal Of Biological Studies), 8(2), 160–171.

Istina, I. N. (2016). Increasing Shallot Production Through NPK Fertilization Techniques. Journal Of Agro, 3(1).

Kumar, A., Alam, A., Rani, M., Ehtesham, N. Z., & Hasnain, S. E. (2017). Biofilms: Survival And Defense Strategy For Pathogens. International Journal Of Medical Microbiology, 307(8), 481–489.

Lestariningsih, S. N. W., Sofyadi, E., & Gunawan, T. (2020). Efektivitas Insektisida Emamektin Benzoat Terhadap Hama Plutella Xylostella L. Dan Hasil Tanaman Sawi Putih (Brassica Pekinensis) Di Lapangan. Agroscience, 10(2), 169–175.

Mardiyaningsih, E., Purwaningsih, H., & Widodo, G. G. (2021). Breastfeeding Self Efficacy Ibu Post Seksio Saesarea. Journal Of Holistic Nursing Science, 8(1), 54–60.

Nelly, N., Reflinaldon, R., & Amelia, K. (2015). Diversity Of Predators And Parasitoids On Shallot Cultivation: A Case Study In The Alahan Panjang Region, West Sumatra. Prosiding Seminar Nasional Masyarakat Biodiversitas Indonesia, 1(5), 1005–1010.

Pratiwi, W. M., & Asri, M. T. (2022). Isolasi Dan Identifikasi Bakteri Indigenous Pendegradasi Pestisida Profenofos Dan Klorantraniliprol Di Jombang Jawa Timur. Lenterabio: Berkala Ilmiah Biologi, 11(2), 300–309.

Putra, R. S., Ohkawa, Y., & Tanaka, S. (2013). Application Of EAPR System On The Removal Of Lead From Sandy Soil And Uptake By Kentucky Bluegrass (Poa Pratensis L.). Separation And Purification Technology, 102, 34–42.

Rahmawati, A. F., Ikawati, S., & Himawan, T. (2016). Evaluasi Berbagai Insektisida Terhadap Hama Ulat Bawang (Spodoptera Exigua Hubner)(Lepidoptera: Noctuidae) Pada Tanaman Bawang Merah. Jurnal Hama Dan Penyakit Tumbuhan, 4(2).

Ratonamo, R. (2021). Sistem Pakar Diagnosa Hama Dan Penyakit Bawang Putih Menggunakan Metode Dempster Shafer. Seminar Nasional & Konferensi Ilmiah Sistem Informasi, Informatika & Komunikasi, 36–42.

Subagja, R. A., Agustiani, T., Hidayati, L. N., Yudi, J., Deden, D., & Dukat, D. (2023). Effect Of Concentration And Application Interval Of Chlorantraniliprole Active Ingredient Insecticide On Attack Intensity Of Spodoptera Frugiperda JE Smith (Lepidoptera: Noctuidae) And Yield Of Sweet Corn (Zea Mays Saccaharata Sturt) Plants. Eduvest-Journal Of Universal Studies, 3(9).

Umar, L., & Liadi, Y. M. (2022). Surmounting The Environmental Impact Of Insecticides; Adopting A Sustainable Approach In The Fight Against Malaria-A Review. UMYU Journal Of Pure And Industrial Chemical Research, 2(1), 1–21.

Yanti, Y., Hamid, H., Dzulfahmi, M. D., Selviana, S., & Putra, I. R. (2023). Exploration Of Indigenous Actinomycetes As Biocontrol Agents Of Purple Blotch Diseases At Onion. IOP Conference Series: Earth And Environmental Science, 1228(1), 12022.