ISSN No:-2456-2165

Effect of Insecticide Management on Yardlong Bean at Por Lors Agricultural Research and Plant Protection Station, Prey Veng Province, Cambodia

Socheat Mang [1*], Mardy Serey [2], Tithya Kang [2]
[1]Office of Plant Protection, Ministry of Agriculture, Forestry and Fisheries, Cambodia
[2]Faculty of Agriculture, Svay Rieng University, Cambodia
*Corresponding author: Socheat Mang;

Abstract:- Farmers have recently expressed concern about an epidemic of numerous pests that have harmed yardlong beans and made them difficult to control due to a lack of understanding about pesticide applications. Combining active components has not proven useful over a long period of time. This research was conducted to manage insecticides on yardlong beans, and aims to: (a) compare the pesticide uses to control pests in flowering stage; (b) limit the pesticide uses to control pests in cultivation stage; and (c) evaluate the pesticide uses to control pests on yardlong bean yields. As a methodology, this was experimental research conducted at Por Lors Agricultural Research and Plant Protection Station in Prey Veng province. According to the findings, yardlong beans were negatively impacted by aphids during the flowering stage, necessitating the usage of Nimbecidine EC by farmers. Bio-power Beauveria bassiana was chosen to use for the pod starting day that is aphid-infested. In conclusion, Aphid and thrip control on yardlong bean yields is unaffected by any impacts of insecticides.

Keywords:- *Insecticides, Pesticides, Yardlong Bean, Plant Protection, Pest Controls.*

I. INTRODUCTION

An essential crop for supporting the rural people of Cambodia's way of life is the production of vegetables (TSTD, 2012). Yardlong beans are one of the staple crops that have been growing on the planet for millions of years. In Cambodia, growing and eating vegetables has a history spanning millions of years. First, this yardlong bean species was often found growing wild in the foothills of eastern India. It is one of the many vegetable crops that provide food for mankind because they are a source of protein, vitamins, and minerals used to nourish the body (Sam, 1996). Although farmers grow yardlong beans every year, sometimes their yields are destroyed by pests due to a lack of technical knowledge, such as seasonal crop selection and poor weed control, insect habitat and improper fertilization, especially the use of pesticides. Pesticides are drugs used to control the harmful components of crops and agricultural products, and the harmful components include pests, diseases, and weeds (General Department of Agriculture, 2013).

The steady increase in population in our world, which has led to an increase in demand for food, has also led to the emergence of new technologies, such as the use of agricultural chemicals or pesticides to protect crops damaged by pests. Yardlong beans are widely grown in the Tonle Sap, Mekong, and other areas of Cambodia. Currently, farmers are worried about the outbreak of many pests that have destroyed the yardlong bean crop and thus made it difficult for them to control due to a lack of knowledge about the use of pesticides (General Department of Agriculture, 2013). For a long time, the active ingredient in the face combination was ineffective. Pest outbreaks on yardlong beans can cause serious crop damage and huge financial losses if farmers do not take the proper precautionary measures. These are reasons which made this study conducted.

This study has three objectives: (a) compare the pesticide uses to control pests in flowering stage; (b) limit the pesticide uses to control pests in cultivation stage; and (c) evaluate the pesticide uses to control pests on yardlong bean yields.

II. LITERATURE REVIEW

A. Overview of yardlong bean crop

Yardlong beans have the scientific name Vigna unguiculata, a subspecies of Sesquipedalis; it is a subspecies of Sequipedalis L. and is called Asparagus bean. These beans are a family-friendly crop, so it is difficult to find any reliable statistics. In general, statistics show that most farmers grow other legumes. Yardlong beans are not recorded in the Food and Agriculture Organization (FAO) statistics, but in 1988, Indonesia had 97,000 hectares of these crops, producing 281,000 tons, and Thailand had 10,000 hectares of cultivated land. Produced 75,000 tons. Yardlong beans are marketed in Southeast Asian countries, where they are grown in family vegetable gardens, planted around rice and along with other crops. This crop is a tropical crop; although they are abundant in some countries, in the international market they are less abundant (Dransfield, & Manokaran, 1994).

B. The situation of yardlong bean cultivation in Cambodia

Yardlong beans are grown by farmers almost year-round in all highlands, plains, and lowlands. Cultivation for household use in vegetable gardens and some for-market production is observed in the main provinces of Kandal, Kampong Chhnang, Battambang, Siem Reap, and Kampot,

ISSN No:-2456-2165

especially in urban areas, because this product cannot be stored for a long time and is not guaranteed for long-distance delivery. According to the statistics of vegetable production land from the Department of Agriculture and Agricultural Land Improvement, there are 37,400 hectares, of which about 2.5–3% are yardlong beans. In many upland areas, this crop is grown by farmers mixed with a variety of crops, especially rice and other fruit crops (Dransfield, & Manokaran, 1994).

C. The importance of yardlong beans in food

Yardlong beans are one of the most widely eaten vegetables in Cambodia. They are classified as a tropical vegetable, contain proteins, vitamins, and minerals, and are very useful for supporting the human body (Prak, 2016). It can be eaten raw or cooked, regardless of our country, and most Cambodians eat it as fresh vegetables with prahok, ketchup, Khmer noodles, and curry. Some other countries, like China, Thailand, Vietnam, the Philippines, etc., also use this vegetable for food. In addition, 100 grams of yardlong beans contain many substances (Prak, 2016), such as:

Table 1. Nutrients in 100 g of yardlong beans

100 g of yardlong beans	quantity of nutrients
Protein	24.33 g / 28%
Carbohydrate	61.91 g / 71%
Fat	1.31 g
Iron	8.61 mg
Calcium	138 mg
Magnesium	338 mg
Phosphorus	559 mg
Sodium	17 mg
Vitamin A	17%

D. The importance of yardlong beans in agriculture

Yardlong beans are a type of crop that can fertilize the soil by capturing atmospheric nitrogen due to the presence of benzodiazepines in the root buds, which enable the beans to capture free nitrogen in the atmosphere through the leaves. In those sprouts, especially during the 100% flowering stage, due to this productivity, yardlong beans are planted on degraded soils in order to improve the soil. In addition to growing pulses to improve the soil, yardlong beans are included in mixed-crop programs and crop diversification. In addition, in the production and livestock sectors, young yardlong bean leaves are used to provide livestock such as cattle, chickens, and ducks with fresh food. Increase protein to provide fast-growing organisms (TSTD, 2012).

E. The importance of yardlong beans in economy

Yardlong beans are one of the most important economic crops in Thailand. The area under yardlong bean cultivation was 18,560 to 20,160 ha, and the yield was 124,002.73 ha. Yardlong beans are mostly eaten locally and exported to Hong Kong, Singapore, Malaysia, Germany, France, Japan, the United States, and other Asian countries (Department of Crop Protection, Sanitation, and Hygiene, 2022). These pulses are crucial for food production and agriculture, but they also contribute to the economy in some ways, particularly the household economy, as farmers can grow them alongside other vegetables without having to invest heavily in pesticides, chemical fertilizers, or sophisticated equipment. However, the farmer can gather his meager resources, including plant waste, manure, and organic fertilizers. As a result, even though these beans are a simple food, their inclusion in a variety of other vegetables obscures the export data. The majority of the beans are grown for the domestic market. On the other side, farmers in Cambodia grow yardlong beans along with other vegetables, notably in the lower Mekong River (Prak, 2016).

F. The use of pesticides and agricultural chemicals

To kill, attract, and repel pests like worms, rats, weeds, lice, and other insects as well as other organisms that ruin crops and food, farmers use pesticides, which are minerals and organic chemicals. fight and prevent various bacterial, fungal, nematode, and viral infections, and even promote crop development. Because they aid in protecting against pests and illnesses, pesticides are essential for increasing crop productivity. Pesticides are disseminated in a variety of methods, so it's important to comprehend its classification before making a decision rather than basing it merely on how well it can control pests (Yang et al., 2007). According to penetration and direct touch, pesticides are categorized. Plants take in toxins through their roots, stems, and leaves. The toxin enters the plant and travels through the veins that supply the interior of the plant. Stemborers, worms, sucking rodents, and nematodes can all be prevented with the use of penetration poisons. Despite not being absorbed by plants, direct contact pesticides persist for a long time on animals and plants that they are sprayed on (Yang et al., 2007).

III. RESEARCH METHODOLOGY

This research experiment was carried out at the Por Lors Agricultural Research and Plant Protection Station, located in Pring village, Kraing Svay commune, Preah Sdach district, Prey Veng province. Experimental materials are yardlong bean seeds, DAP fertilizer, urea fertilizer, and Potassium fertilizer. Some biological and chemical pesticides include Nimbecidine EC, Bio-power Beauveria bassiana, Byter-Beba Beauveria bassiana, Beauveria bassiana, and Imidacloprid. This experiment used a randomized complete block design (RCBD) with 3 replications and 6 treatments equal to 18 plots to apply pesticides and calculate the overall yield of the yardlong bean crop. Each plot size is 12 m2.

All treatments (T) for this experiment are determined as follows:

- T0: control
- T1: use Imidacloprid 10 g mixed with 25 L of water
- T2: use Nimbecidine EC 50 ml mixed with 10 L of water
- T3: use Bio-power Beauveria bassiana 80 g mixed with 10 L of water
- T4: use Byter-Beba Beauveria bassiana 10 ml mixed with 10 L of water
- T5: use Metarhizium anisopliae 25 g mixed with 20 L of water

Data will be analyzed for ANOVA and DMRT (Duncan's Multiple Range Test) at 5%. The results of the data analysis will be presented in the graph.

ISSN No:-2456-2165

IV. RESULTS AND DISCUSSION

A. Comparison of the pesticides used to control pests in the flowering stage

➢ *The number of flowers on the first day and the 100% flowering day*

For comparison of the total number of flowers on the first day of flowering (flower/stem), the results indicated that all treatments differ in meaning by Least Significant Difference (LSD) by 5%, and the first treatment (T1 = 16.27 flowers/stem) had the highest number of flowers/stems. All six treatments differ in meaning in terms of the total number of flowers/stems on the first day of flowering, as determined by the LSD test at a significance level of 5%. Similarly, for comparison of the total number of flowers on the 100% flowering day (flower/stem), the results indicate that all treatments differ in meaning by Least Significant Difference (LSD) by 5%, and the first treatment (T1 = 43.27 flowers/stem) had the highest number of flowers/stems. This means that T1 is statistically different from all other treatments in terms of the total number of flowers/stems on the first day of flowering and 100% flowering day.

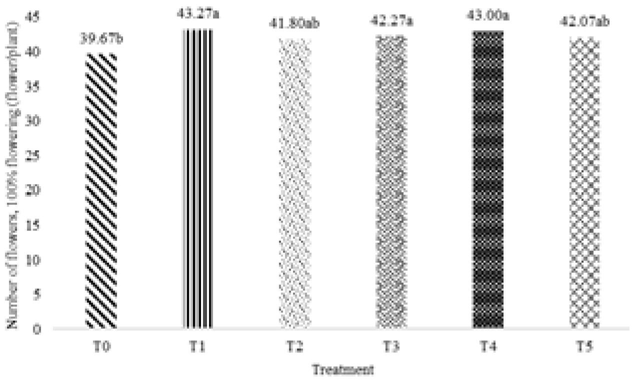

Fig. 1. Number of flowers on the 100% flowering day

➢ *The number of flowers destroyed by aphids on the first day and the 100% flowering day*

Variation analysis (ANOVA) showed that none of the treatments differed in meaning (Fc = ns), with a coefficient of variation of 12.00%. By comparison, the average number of flowers destroyed by aphids on the first day of flowering (flowers/stems) in all six treatments indicated that none of the treatments differ significantly, as defined by Duncan's Multiple Range Test (DMRT) at 5%. Similarly, on the 100% flowering day the result indicated that none of the treatments differ significantly, as defined by Duncan's Multiple Range Test (DMRT) at 5%. Overall, this statement indicates that the six treatments had a similar effect on the number of flowers destroyed by aphids on the first day of flowering as well as on the 100% flowering day.

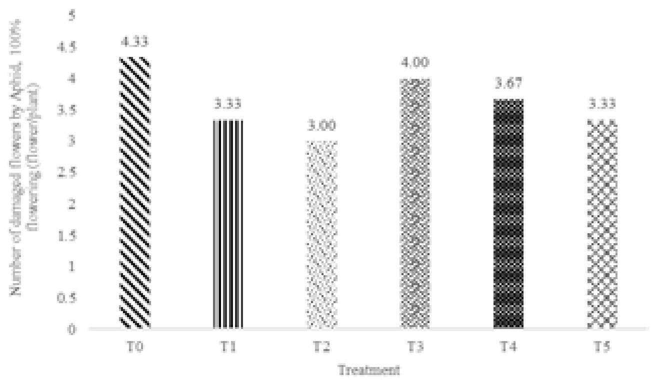

Fig. 2. Number of flowers destroyed by aphids on the 100% flowering day

➢ *The number of flowers destroyed by thrips on the first day and the 100% flowering day*

For comparison of the total number of flowers destroyed by thrips on the first day of flowering (flower/stems), the results indicated that all treatments differ in meaning by Least Significant Difference (LSD) by 5%, and the first treatment (T1 = 14.27 flowers/stems) had the highest number of flowers/stems destroyed by the thrip. All six treatments differ in meaning in terms of the total number of flowers/stems on the first day of flowering, as determined by the LSD test at a significance level of 5%. However, on the 100% flowering day, the result indicated that none of the treatments differ significantly, as defined by Duncan's Multiple Range Test (DMRT) at 5%. This means that all of the flowers/stems destroyed by the thrip.

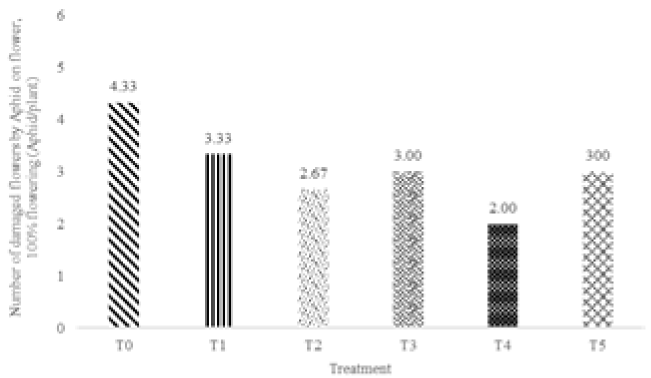

Fig. 3. Number of flowers destroyed by thripts on the 100% flowering day

➢ *The number of aphids on flower on the first day and the 100% flowering day*

For comparison of the number of aphids on the first day of flowering (heads/flowers), the results indicated that all treatments differ in meaning by Least Significant Difference (LSD) by 5%, and the control treatment (T0 = 42.00 heads/flowers) had the highest number of aphids on flower. All six treatments differ in meaning in terms of the number of aphids on flower on the first day of flowering, as determined by the LSD test at a significance level of 5%. However, on the 100% flowering day, the result indicated that none of the treatments differ significantly, as defined by Duncan's

Multiple Range Test (DMRT) at 5%. This means that all of the stems have many aphids on the flowers.

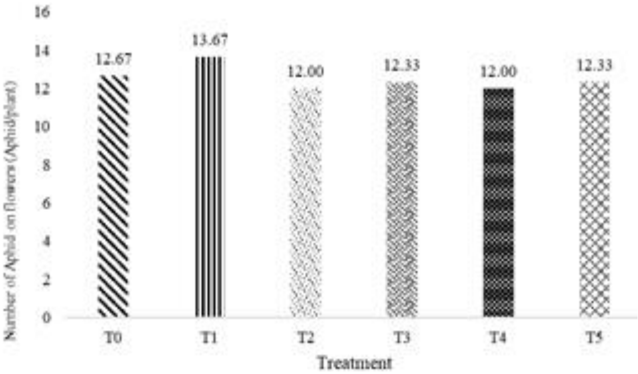

Fig. 4. Number of aphids on flowers on the 100% flowering day

➢ *The number of thrips on flower on the first day and the 100% flowering day*

For comparison of the number of thrips on the first day of flowering (heads/flowers), the results indicated that all treatments differ in meaning by Least Significant Difference (LSD) by 5%, and the control treatment (T0 = 54.33 heads/flowers) had the highest number of thrips on flower. All six treatments differ in meaning in terms of the number of thrips on flower on the first day of flowering, as determined by the LSD test at a significance level of 5%. Similarly, for comparison of the number of thrips on flower on the 100% flowering day (heads/flowers), the results indicate that all treatments differ in meaning by Least Significant Difference (LSD) by 5%, and the control treatment (T0 = 22.67 heads/flowers) had the highest number of thrips on flowers. All six treatments differ significantly in terms of the number of thrips on the flowers on both the first day of flowering and the 100% flowering day. This information is useful for plant breeders and other scientists who are interested in developing new varieties of plants that are resistant to thrips damage.

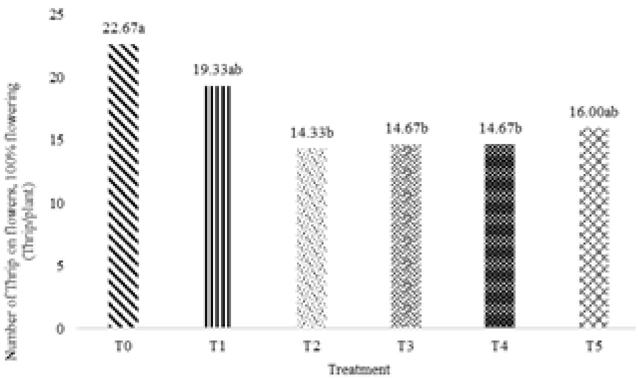

Fig. 5. Number of thrips on flowers on the 100% flowering day

B. The limits of the pesticides used to control pests in the cultivation stage

➢ *The number of pods on the first day and the 100% pod starting day*

Variation analysis (ANOVA) showed that none of the treatments differed in meaning (Fc = ns), with a coefficient of variation of 6.00%. By comparison, the average number of pods on the first day of pod starting day (pods/stems) in all six treatments indicated that none of the treatments differ significantly, as defined by Duncan's Multiple Range Test (DMRT) at 5%. However, on the 100% pod starting day the result indicated that all six treatments differ in meaning in terms of the number of pods on the 100% pod starting day, as determined by the LSD test at a significance level of 5%, and the control treatment (T0 = 41.67 pods/flowers) had the highest number of pods. Overall, this statement indicates that the six treatments had a different effect on the number of pods produced by the plants on the 100% pod starting day, but not on the first day of pod starting day.

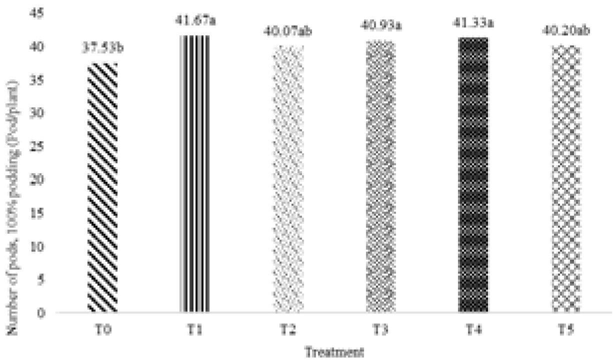

Fig. 6. Number of pods on the 100% pod starting day

➢ *The number of pods destroyed by aphids on the first day and the 100% pod starting day*

Variation analysis (ANOVA) showed that none of the treatments differed in meaning (Fc = ns), with a coefficient of variation of 14.00%. By comparison, the average number of pods destroyed by aphids on the first day of pod starting day (pods/stems) in all six treatments indicated that none of the treatments differ significantly, as defined by Duncan's Multiple Range Test (DMRT) at 5%. However, on the 100% pod starting day the result indicated that all six treatments differ in meaning in terms of the number of pods on the first day of flowering, as determined by the LSD test at a significance level of 5%, and the control treatment (T0 = 4.67 pods/flowers) had the highest number of destroyed by aphids. Overall, this statement indicates that the six treatments had a different effect on the number of pods destroyed by aphids on the 100% pod starting day, but not on the first day of pod starting day.

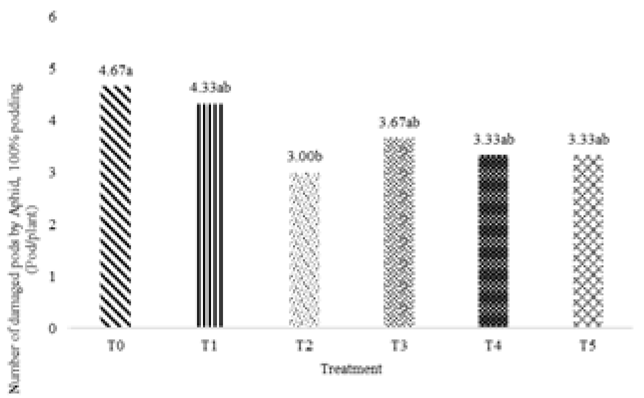

Fig. 7. Number of pods destroyed by aphids on the 100% pod starting day

- *The number of aphids on the first day and the 100% pod starting day*

Variation analysis (ANOVA) showed that none of the treatments differed in meaning (Fc = ns), with a coefficient of variation of 14.00%. By comparison, the average number of aphids on the first day of pod starting day (heads/pods) in all six treatments indicated that none of the treatments differ significantly, as defined by Duncan's Multiple Range Test (DMRT) at 5%. However, on the 100% pod starting day the result indicated that all six treatments differ in meaning in terms of the number of aphids on the 100% pod starting day, as determined by the LSD test at a significance level of 5%, and the treatment 1 (T1=12.00 heads/pods) had the highest number of aphids. Overall, this statement indicates that the six treatments had a different effect on the number of aphids on the 100% pod starting day, but not on the first day of pod starting day.

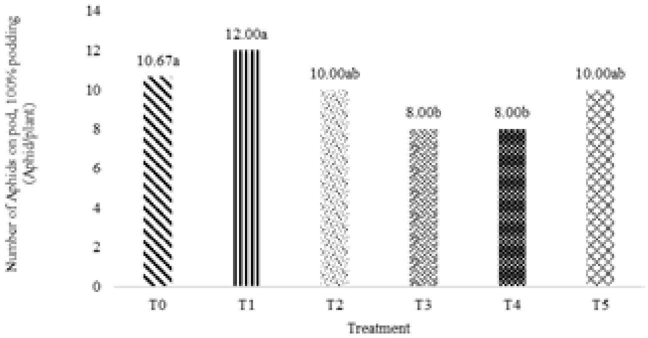

Fig. 8. Number of aphids on the 100% pod starting day

C. Evaluation of the pesticides used to control pests on yardlong bean yields

- *Total yields of yardlong bean (ton/hectares)*

Variation analysis (ANOVA) showed that none of the treatments differed in meaning (Fc = ns), with a coefficient of variation of 10.00%. By comparison, the average total yields of yardlong bean (ton/hectares) in all six treatments indicated that none of the treatments differ significantly, as defined by Duncan's Multiple Range Test (DMRT) at 5%. The average total yields of yardlong bean are from 13.56 to 17.05 ton/hectares.

- *Marketable yields of yardlong bean (ton/hectares)*

Variation analysis (ANOVA) showed that none of the treatments differed in meaning (Fc = ns), with a coefficient of variation of 10.00%. By comparison, the average marketable yields of yardlong bean (ton/hectares) in all six treatments indicated that none of the treatments differ significantly, as defined by Duncan's Multiple Range Test (DMRT) at 5%. The average marketable yields of yardlong bean are from 12.72 to 16.19 ton/hectares.

- *Non-marketable yields of yardlong bean (ton/hectares)*

For comparison of the non-marketable yields of yardlong bean (ton/hectares), the results indicated that all treatments differ in meaning by Least Significant Difference (LSD) by 5%, and the control treatment (T0 = 1.33 ton/hectares) had the highest number of non-marketable yields of yardlong bean. All six treatments differ in meaning in terms of the non-marketable yields of yardlong bean, as determined by the LSD test at a significance level of 5%.

D. Discussion

- *The use of Byter-Beta Beauveria bassiana*

According to the results, the second treatment (T0) was effective in controlling the lowest thrip, destroying the most 4.33 flowers/stem with 22.67 thrip/flower in the flowering stage of the pod crop. The fourth treatment (T4) using Byter-Beba Beauveria bassiana had the highest thrip control effect, destroying the least 2.00 flowers/stem with 14.67 thrip/flower. The results were better than the 5.90 heads per bloom found by Duff et al. (2015).

- *The use of Nimbecidine EC*

The control treatment (T0) was the least effective at controlling aphids, destroying 4.33 flowers per stem with 12.67 aphids per flower in the flowering stage. The second treatment (T2) using Nimbecidine EC had the highest aphid control effect, destroying at least 3.00 flowers per stem with 12.00 aphids per flower. There are 24.00 aphids or blooms, which is more than this finding according to Amin et al. (2017) research.

- *Non-effectiveness of pesticides on aphid and thrips management*

The management of aphids and thrips on yardlong bean yields was unaffected by any pesticide side effects, with treatment 1 (T1) having an average minimum yield of 12.73 ton per hectares. The maximum overall output, 16.19 ton per hectares, is seen in treatment 4 (T4). This result is less than the average yield of 14.05 ton per hectares when compared to Prak (2016).

V. CONCLUSIONS AND RECOMMENDATIONS

We can draw the following conclusions from the experimental study comparing the usage of insecticides to manage pests that yardlong beans were negatively impacted by aphids during the flowering stage, necessitating the usage of Nimbecidine EC by farmers. Bio-power Beauveria bassiana was chosen to use for the pod starting day that is aphid-infested. In conclusion, Aphid and thrip control on yardlong bean yields is unaffected by any impacts of insecticides.

Base on the experimental results, the following suggestions can be made:

- Farmers should apply Nimbecidine EC because it causes the least harm at the flowering stage and is the most hazardous type of pesticide for dealing with thrip problems.
- During the aphid-infested pod development stage, we selected Bio Power Beauveria bassiana because it has the fewest negative effects.

FURTHER STUDY

Due to the time and limitations of the study and resources, this study is not in-depth, so further research can continue to study the destruction of insects and other harmful factors in different seasons and study the effects of other pesticides in controlling aphid and thrip on yardlong bean production.

ACKNOWLEDGMENT

I would like to express my sincere gratitude to my supervisor, Assoc. Prof. Dr. Serey Mardy, who assisted me and provided good advice on this study, and to Por Lors Agricultural Research and Plant Protection Station for financial support during my study and research.

REFERENCES

[1]. Amin, M., Tarif, A., Rahman, M., Hossain, M., & Ge, F. (2017). Sequential application of bio-pesticide, botanical and chemical insecticide to manage aphid and pod borer attacking yard long bean. Bangladesh Journal of Agricultural Research, 42(3), 531–538. https://doi.org/10.3329/ bjar.v42i3.34512
[2]. Department of Crop Protection, Sanitation, and Hygiene (2022). Yardlong bean crop and pests. Ministry of Agriculture, Forestry and Fisheries, Phnom Penh, Cambodia.
[3]. Department of Crop Protection, Sanitation, and Hygiene (2022). Yardlong bean crop and pests. Ministry of Agriculture, Forestry and Fisheries, Phnom Penh, Cambodia.
[4]. Dransfield, J. & Manokaran, N. (1994). Plant Resources of South-East Asia (PROSEA). Bogor, Indonesia.
[5]. Duff, J. D., Church, C. E., Healey, M. A. & Senior, L. J. (2015). Thrips incidence in green beans and the degree of damage caused. Acta Horticulturae, 1105, 19-26. http://dx.doi.org/10.17660/ActaHortic.2015.1105.3
[6]. General Department of Agriculture (2013). Vegetable cultivation techniques. Ministry of Agriculture, Forestry and Fisheries, Phnom Penh, Cambodia.
[7]. Prak, S. (2016). Comparison of the efficacy of BT abametin and neem oil in the control of fruit borer on yardlong bean crops [Bachelor’s thesis, Royal University of Agriculture].
[8]. Sam, S. (1996). Yardlong bean cultivation techniques. Phnom Penh, Cambodia.
[9]. TSTD. (2012). Vegetable production techniques. Tonle Sap Technology Demontration for Productivitie Enhancement, Phnom Penh, Cambodia.
[10]. Yang, S. K., Lang, S., & Keam, M. D. (2007). Plant protection pesticides and its problems. Cambodian Centre for Study and Development in Agriculture, Phnom Penh, Cambodia.