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Utilization Combination of Saliara Stem Extract (Lantana camara L.) and Takokak Fruit Extract (Solanum torvum) as a Botanical Pesticide for Fixing Pest and Diseases on Horticultural Crops in Kutai Kartanegara District

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Abstract. Horticulture is cultivated of vegetable crops, fruits, and various ornamental plants. Long beans are one of the horticultural plants which are cultivated. However, there was a decrease in production due to pest attacks. This research aimed to determine the effect of giving Saliara stem extract (Lantana amara L) and Takokak fruit extract (Solanum torvum) as a botanical pesticide for fixing pests and diseases on horticultural crops in Kabupaten Kutai Kartanegara. This researchwas conducted for 3 months, starting from May to July 2020, and implemented in Samarinda. Research with Randomized Block Design (RDB), consisted of five treatments including control with five replications, T0 is the control, T1 is a mixture of water and detergent, T2 is the administration of Saliara stem extract (Lantana camara L.) with a concentration of 50%, T3 is the administration of takokak fruit extract (Solanumtorvum) with a concentration of 50% and T4 is the provision of a combination of extract and stem Saliara (Lantana camara) with 50% concentration of takokak (Solanumtorvum) fruit. Then data from observations and calculations are analyzed using Analysis of Variance (ANAVA) and treatment tested with Least Significant Differences (LSD) at the 5% level. This study indicated a mixture of Saliara stem extract and Takokak fruit extract is a very significant effect in reducing pests in long bean plants with the most effective concentration of 50%.

Keywords: Saliara stem, Takokak fruit, botanical pesticide, Horticulture.

INTRODUCTION

Horticulture from Latin is hortus (garden) and colere (grow). Horticulture means the study of garden cultivation.Horticulture is a branch of agriculture that deals with the intensive cultivation of plants proposed for human foodstuffs, medicines, and fulfillment of satisfaction. (Zulkarnain, 2009).Horticulture is a combination of science, art, and technology in managing vegetables, fruit, ornament, spices, and medicinal plants. Horticulture is the cultivation of vegetables, fruits, and various plants. One of them is the long bean plant. Long bean plant (Vigna sinensis L.) is a type of vegetable crop that is widely cultivated in Indonesia. Two main types of pests attack long bean plants, namely aphids (Aphids croccivora), often attack black long bean plants. These lice cluster behind the leaves, so that the leaves harden and roll inward, accompanied by the appearance of sooty dew. Bean pod borer (Maruca restualis), this caterpillar is green, a color of caterpillar gradually turns blackish brown. This pest attack pods by punching holes in pod skin, then eat the pulp and young seeds that are in it (Apriliyanto and Bondan, 2014). botanical pesticides are pesticides whose basic ingredients come from plants, contain active ingredients that can control insect pests. History has recorded that use botanical pesticide has been practiced since three centuries ago (Setiawan, Heery., Aulia, Ajizah., dan Sri, Amintarti, 2016).

Many types of plants can be used as botanical pesticides because it contains saponins, flavonoids, polyphenols, alkaloids, and essential oils which affect the muscular nervous system, hormonal balance, reproduction, anti-food

behavior and the respiratory system of insects (Ndakemi, B., Kelvin Mtei, Patrick A., 2016). Examples are plants Saliara (*Lantana camara L.*) which utilization is the stem and fruit Takokak (*Solanum torvum*) utilization found in the fruit.

The saliara (*Lantana camara* L.) is a plant from the genus Verbenaceae with 600 species in this genus. This plant is a herbaceous plant with an average height of about 2 m. The trunk is boxy on the outside, a space with fine hairs when green, and has thorns. This plant has a strong root system, the leaves are arranged, simple has a long petiole, is in the shape of a rough oval knife, and has jagged edges and a stinging arrangement. The flowers are small, vary in color, and change in color on the flowers indicates stages of pollination. The saliara plant on its leaves contains steroid, tannin, and saponin compounds (Lumowa, 2018).

Takokak fruit (*Solanum torvum*) is also used by the community as a mixture of vegetables and herbal medicinal ingredients. This plant has a spicy, cool, slightly poisonous taste. The use of this plant is fresh fruit that can be eaten directly or used in cooking. The part of the plant that can be used as a material for making vegetable insecticides is the fruit. According to Susilo(2016), takokak fruit (*Solanum torvum*) contains alkaloids, phenols, flavonoids, tannins, and saponins. According to Sirait (2009), this medicinal plant has chemical content found in leaves, roots, and fruit. The chemical content of fruit and leaves contains alkaloid steroids, namely solasodine 0.84%, while yellow fruit contains 0.1% solasonin, raw fruit contains chlorogenin, sisologenenone, torvogenin, vitamin A, and contains neo-chlorogenine, panicolugenine, and the roots contain jurubine. This study aimed to determine the effect of the saliara stem extract (*Lantana amara* L.) and takokak fruit extract (*Solanum torvum*) as a botanical pesticide for fixing pests and diseases on horticultural crops in Kutai Kartanegara district.

METHOD

This study was conducted for 3 months starting from May 2020 to July 2020 and was carried out in Samarinda, precisely on Perjuangan street 2, South Sempaja Village, North Samarinda District. In this study, the researcher making the extraction of takokak fruit (*Solanum torvum*), making extraction of saliara stems (*Lantana camara*), combining extracts takokak and saliara stems, and giving plant insecticides of saliara stem extract and takokak fruit on long bean plants.

The research design used was a randomized block design (RBD), which consisted of 5 treatments including control with 5 replications. The data obtained from observations and calculations were then analyzed using Analysis of Variance (ANOVA) and the treatment was tested by the Least Significant Difference (LSD) test at the 5% level.

Preparation of Takokak Fruit Extraction (*Solanum torvum*), namely, the fruit that has been cleaned, selected in good condition and weighed 2000 grams, then dried for 7 days, after drying, the dried fruit is blended until smooth. Then the powder is taken from 500 grams of dried takokak fruit powder, put into a container with 5 liters of 96% ethanol solution, then macerated and stirred for 30 minutes to make it homogeneous. After that, the soaking results are filtered with filter paper to obtain 100% takokak fruit extract. Then the extract is put into a hand sprayer and ready to be applied to long bean plants.

Preparation of Saliara Stem Extraction (*Lantana camara*), namely saliara stems that have been cleaned, selected in good condition and weighed as much as 2000 grams, then add 1000 ml of water and mashed in a blender. After blending, the saliara stalks are mixe with 7 grams of detergent, stirred until evenly distributed, then covered and allowed to stand (shifted) for 24 hours. The use of detergent will not be dangerous because it is used relatively little. After that, the soaking product was filtered with filter paper to obtain 100% saliara stem extract. The dilution procedure of saliara stem extract aims to obtain the desired extract concentration. Then the extract is put into a hand sprayer and ready to be applied to long bean plants.

The combination of Takokak Fruit Extracts and Saliara Stems have several stages of making a combination of takokak fruit extracts and saliara stems, namely, T0 which functions as a control, namely the addition of distilled water without the addition of extracts. T1 is the first treatment with a concentration of 10%. The manufacturing process is mixing 10 ml from takokak fruit extract and saliara stem and 90 ml of distilled water. T2 as the second treatment with a concentration of 20%. The manufacturing process involves mixing 20 ml from takokak fruit extract and saliara stem and 80 ml of distilled water. T3 as the third treatment with a concentration of 30%. The manufacturing process involves mixing 30 ml from takokak fruit extract and saliara stem and 70 ml of distilled water. T4 as the fourth treatment with a concentration of40%. The manufacturing process involves mixing 40 ml from takokak fruit extract and saliara stem and 60 ml of distilled water.

Land preparation, planting, and maintenance of long bean plants before planting, the soil is processed first and treatment plots or beds are made. This land management includes cleaning from grasses, tilling beds, providing dry and liquid manure. After the land is ready, the long bean seeds are soaked in warm water (45°C) for 3 hours, then dry and spread on the prepared beds for seeding. Planting was done in a shady place and kept moist for 7 days or the seedlings have 3-4 leaves.

Seedlings that were 7 days old were then selected and arranged on a research plot with a spacing of 30 cm x 30 cm.Maintenance of long bean plants in the form of watering and weeding activities. Watering was done twice a day, namely in the morning and evening. Weeding was intended to clean weeds around long bean plants by removing regularly them 1-2 times a week.

Application of Saliara Stem Extract and Takokak Fruit Vegetable Insecticide to Long Bean Plants. The application of vegetable insecticides begins at the age of 7 days after planting (Days after planting) in the wraps. Furthermore, the application of botanical insecticides was carried out on days 10, 13, 17, 20, 24, 27, 31, and 34 days after planting. Spraying was conducted by spraying all parts of the plant, including the back of the leaves in the afternoon. Long bean plants were ready to be harvested simultaneously after about 40 days of age for each treatment.

RESULT AND DISCUSSION

The data obtained from the observations of 125 samples were averaged with each group then analyzed using the ANOVA method which was then tested using the Least Significant Difference (LSD) with a significance level of 5%. The following were the results of the differences between the five treatments on the research parameters.

The results of these calculations indicate that the highest insect pest attack intensity of 57.6% (severe pest attack) is found in the To control treatment (long bean plants are not given plant extracts) and the lowest insect pest attack intensity is 29% (mild pest attack). on T4 (long bean plants given a combination of extracts of kirinyuh and saliara stems with a concentration of 50%). The difference in results for each treatment can be seen in figure 1.

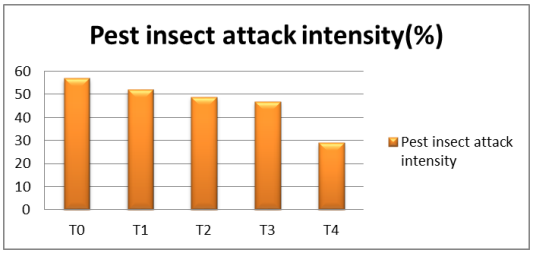

Figure 1. Graph of Pest Insect Attack Intensity 14 Days After Planting

Based on the results of the calculation of the intensity of insect pests' attack on string beans (*Vigna sinensis* L.) in figure 1, the data were analyzed using Analysis of Variance (ANOVA). The test results for the group showed the value of F count (3.31)> F_{table} (3.01) at the 5% significance level. This proves that the grouping was successful in controlling for the diversity of data. Then, the test results of the treatment obtained the value of F_{count} (70.48)> F_{table} (4.77) at the 1% significance level. From these data, it could be seen the difference between the treatments given and there is effect of saliara stem extract (*Lantana camara L.*) and takokak fruit (*Solanum torvum*) on the intensity of insect pest attack on string beans (*Vigna sinensis L.*). Furthermore, the LSD test was carried out to determine the level of real difference from each treatment which can be seen in figure 2.

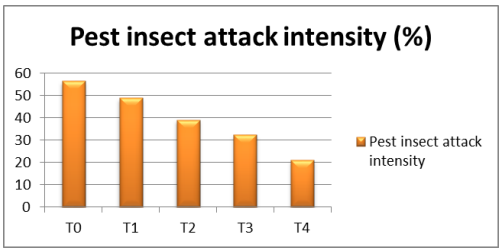

Figure 2. Graph of Pest Insect Attack Intensity at 21 Days After Planting (%)

Based on the results of the calculation of the intensity of insect pests on string beans (Vigna sinensis L.) in figure 2, the data were analyzed using Analysis of Variance (ANOVA). Group data that show the value of F count (3.18)> F table (3.01) at the 5% significance level. This proves that the grouping was successful in controlling for the diversity of data. Then, the test results on the treatment obtained the value of F count (72.64)> F table (4.77) at the 1% significance level, so it is known that there are differences between the treatments given and there was an effect of saliara stem extract (Lantana camara L.) and takokak fruit (Solanum torvum). against the intensity of insect pests on long bean (Vigna sinensis L.) plants. Furthermore, the LSD test was carried out to determine the level of significant differences from each treatment.

Based on the results of the LSD test at the 5% significance level, the T2, T3, and T4 treatments were significantly different in the T0 and T1 treatments. The most influential treatment was T4 when viewed the result and compared with other treatments. Then, to find out more about the effect of saliara stem extract (*Lantana camara* L.) and takokak fruit (*Solanum torvum*) on the intensity of insect pest attack on long bean (*Vigna sinensis* L.) plants at the age of 28 days after planting, again measuring the intensity of insect pests on long bean plant (*Vigna sinensis L.*).

After 28 days after planting long beans (*Vigna sinensis L.*) with the application of vegetable insecticides from the extraction of saliara stems (*Lantana camara L.*), takokak (*Solanum torvum)* fruit and the combination of the two plants resulted in average leaf damage due to insect pests. successively with T0, T1, T2, T3 and T4 treatments were 61% (severe pest attack); 51.2% (serious pests); 44% (moderate pest attack); 35.6% (moderate pest attack) and 19% (mild pest attack). On the 28th day after planting, each plant treatment had an average number of leaf blades of 18 for each treatment.

The results of these calculations indicate that the highest insect pest attack intensity of 61% (severe pest attack) was found in the T0 control treatment where long bean plants were not given extracts and the lowest insect pest attack intensity was 19.8% (mild pest attack). The length gave a combination of kirinyuh stem extract and takokak fruit with a concentration of 50%). The difference in results for each treatment could be seen in figure 3.

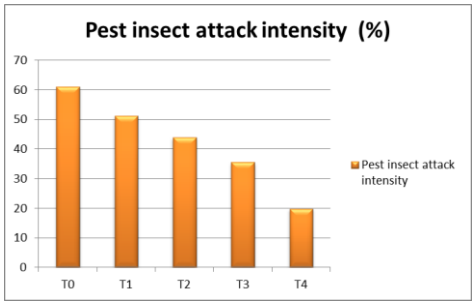

Figure 3. Graph of Pest Insect Attack Intensity at 28 Days After Planting (%)

Based on the calculation of the intensity of insect pests' attacks on long beans (*Vigna sinensis* L.), the data were analyzed using Analysis of Variance (ANOVA). The test results for the group showed the value of F_{count} (3.65)> F_{table} (3.01) at the 5% significance level. This data, explains that the treatment was successful in controlling the diversity of data. Then, the test results of the treatment obtained the value of F_{count} (111.09)> F_{table} (4.77) at the 1% significance level, so that it is known that there are differences between the treatments given and there was an effect of saliara stem extract (*Lantana camara L*) and takokak fruit (*Solanum torvum*) on the intensity of insect pests attack string beans (*Vigna sinensis L.*). Furthermore, the LSD test was carried out to determine the level of significant differences from each treatment.

Based on the results of the LSD test at the 5% significance level, the T2, T3, and T4 treatments were significantly different in the T0 and T1 treatments, which were controlled treatments. In addition, among the T2, T3, and T4 treatments it was found that the most influential treatment was T4. Furthermore, to find out more about the effect of saliara stem extract (*Lantana camara L.*) and takokak fruit (*Solanum torvum*) on the intensity of insect pests on long bean (*Vigna sinensis L.*) plants at the age of 35 DAP long bean plants (V*igna sinensis L.*).

It was known that for 35 days after planting long beans (*Vigna sinensis L.*) with the application of vegetable insecticides from saliara stems (*Lantana camara L.*), takokak fruit (*Solanum torvum*) and the combination of the two plants resulted in average leaf damage due to attacks. insect pests respectively with T0, T1, T2, T3 and T4 treatments were 63.2% (severe pest attack); 51.8% (moderate pest attack); 44.4% (moderate pest attack); 37.6%

(moderate pest attack) and 19% (mild pest attack). On the 35th day after planting, each plant treatment had an average number of leaves, 22 for each treatment.

The results of these calculations indicate that the highest insect pest attack intensity of 63.2% (severe pest attack) was found in the T_0 control treatment (green beans are not given plant extracts) and the lowest insect pest attack intensity is 19% (mild pest attack). A long bean plant was given a combination of takokak fruit extract and saliara stem with a concentration of 50%). The difference in results for each treatment could be seen in figure 4.

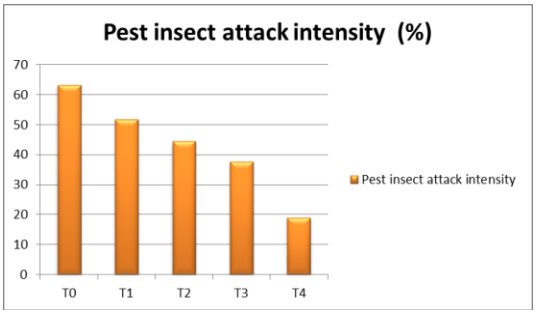

Figure 4. Graph of Pest Insect Attack Intensity 35 Days After Planting (%)

The test results for the group showed the value of F_{count} (3.15)> F_{table} (3.01) at the 5% significance level. This proves that the grouping was successful in controlling for the or diversity of data. Then, the test results of the treatment obtained the value of F count (263.86)>F_{table} (4.77) at the 1% significance level, so that it is known that there were differences between the treatments given and there was an effect of saliara stem extract (*Lantana camara L.*) and takokak fruit (*Solanum torvum*) on the intensity of insect pests attack string beans (*Vigna sinensis L.*). Furthermore, the LSD test was carried out to determine the level of significant differences from each treatment.

Based on the results of the LSD test at the 5% significance level, the T2, T3, and T4 treatments were significantly different in the T0 and T1 treatments, which were controlled treatments. In addition, among the T2, T3, and T4 treatments it was found that the most influential treatment was T4.

Observations during the study were carried out to the leaves of the long bean plant (*Vigna sinensis L*) once a week. The focus of the observations was aimed at obtaining data regarding the presence of insect pests, damage caused by insect pests, and plant parts that are attacked by insect pests. The data obtained during the study, especially on the 14th, 21st, 28th, 35th day after planting showed the intensity of insect pests on long bean (*Vigna sinensis L.*) plants which were given extracts of takokak fruit (*Solanum torvum*) and saliara stem (*Lantana camara L.*) experienced lower insect pest attacks than long bean plants (*Vigna sinensis L.*) which were given takokak fruit extract (*Solanum torvum*) only or saliara stem extract (*Lantana camara L.*), especially long bean plants (*Vigna sinensis L.*) which were not given extract at all (control). This could occur because the chemical content in takokak fruit (*Solanum torvum*) and saliara stem (*Lantana camara L.*) works synergistically to reduce the intensity of insect pest attacks on the panpang bean *(Vigna sinensis L.)*. As is known, according to Lumowa (2018), takokak fruit contains anti-nutritional substances that act as plant-based insecticides such as tannins, phenols, flavonoids, saponins, and steroids. Whereas the saliara plant containssteroid, tannin, and saponin compounds.

Types of plants that can be used as vegetable pesticides, because these plants contain saponins, flavonoids, polyphenols, alkaloids, and essential oils that affect the muscular nervous system, hormonal balance, reproduction, anti-eating behavior, and the respiratory system in insects (Ndakemi, B., Kelvin Mtei, Patrick A., 2016). So that the extractofsaliara stem (*Lantana camara* L.) andtakoka fruit (*Solanumtorvum*) can be used as a vegetable pesticide that effectively eliminates pests.

CONCLUSION

Based on this research, the most effective results in eliminating pests on saplings were the T4 treatment, namely the combination treatment of saliara stem (Lantana camara L.)and takokak fruit(Solanum torvum) extract. This is because, on the results of research and data analysis, it could be concluded that the chemical compounds contained in the extract of takokak fruit (Solanum torvum) and saliara stem (Lantana camara L.), namely tannins, phenols, flavonoids, saponins, steroids and essential oils, which in their application can act as a vegetable pesticide that suppresses insect pests and disease incidence in string beans (Vigna sinensis L.).

REFERENCES

1. Apriliyanto E. dan Bondan, H.S. 2014. Perkembangan Hama Dan Musuh Alami Pada Tumpangsari Tanaman Kacang Panjang Dan Pakcoy. Agritech. 16 (2). https://media.neliti.com. Diakses pada Januari 2020
2. Haryanto, E., T. Suhartini, dan E. Rahayu. 2007. Budidaya Kacang Panjang. Penebar Swadaya. Jakarta.
3. Lumowa, Sonja Vt. dkk. 2018. Manfaat Ekstrak Daun Kirinyuh dan Saliara Sebagai Pestisida Nabati. R.A.De Rozarie: Surabaya.
4. Ndakemi, B., Kelvin Mtei, Patrick A. 2016. Impact of Synthethic and Botanical Pesticides on Benefical Insects. Agriculture Science Journal: 365.
5. Novitasari P., dkk. 2016. Efek Intervensi Buah Takokak (Solanum torvum Swartz) terhadap Kadar Superoksida Dismutase Eritrosit dan 8-Isoprostan Serum pada Wanita Dewasa Gemuk. Jurnal Gizi Pangan. 11(2): 108.
6. Setiawan, Heery., Aulia, Ajizah., dan Sri, Amintarti. 2016. Uji Daya Anti Bakteri Infusa Buah Kweni (Mangifera odorata) terhadap Pertumbuhan Escheria coli sebagai Pengayaan pada Subkonsep Gangguan Sistem Pencernaan Manusia dalam Bentuk Handout. Journal of Biological Science Education (JBSE)
7. Sirait, Nursalam. 2009. Terong Cepoka (Solanum torvum) Herbal yang Berkhasiat Sebagai Obat. Warta Penelitian dan Pengembangan Tanaman Industri. Vol. 15, No. 3
8. Sunarjono, Hendro. 2014. Bertanam 36 Jenis Sayur. Penebar Swadaya: Jakarta
9. Susilo dan Akbar. 2016. Pengaruh Ekstrak Buah Takokak (Solanum torvum S.) Terhadap Jumlah dan Motilitas Spermatozoa Tikus Putih (Rattus norvegicus L.) Galur Sprague Dawley. BOMEDIKA. Vol. 9, No.2
10. Zulkarnain. 2009. Dasar-dasar Holtikultural. Bumi Aksara: Jambi.