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GROWTH AND YIELD OF PECHAY (*Brassica rapa* L.) WITH VARYING LEVELS OF GOLDEN SNAILS AMINO ACID

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Abstract

This study was conducted to determine the growth and yield of pechay with varying levels of golden snails amino acid (GSAA) on a farm lot within the school premises of Alangalang Agro-Industrial School, Alangalang, Leyte. The research was laid out using Randomized Complete Block Design (RCBD) for a single factor experiment with five (5) treatments and three (3) replications. T_1 (100% chicken manure) which serves as the control, T_2 (75% chicken manure and 25% GSAA), T_3 (50% chicken manure and 50% GSAA), T_4 (25% chicken manure and 75% GSAA) and T_5 (100% GSAA).

Results showed that after ten (10) days from transplanting no significant differences were observed on plant height, width of leaves, length of leaves and number of leaves. Similar observations were noted after 20 days from transplanting. However, after 30 days from transplanting or at harvest time, it was recorded that except for the number of leaves, pechay applied with the 100% percent chicken manure produced the highest mean in terms of plant height, width of leaves, and length of leaves. Significant differences were also recorded in the yield of pechay.

These findings revealed that replacement or substituting the recommended rate of chicken manure with varying levels or quantities of GSAA has resulted in a significant deviation on most of the growth and yield parameters tested. The result is suggesting that perhaps the amount of GSAA and the frequency of application be increased to compensate the nutritional requirements of the plants and be comparable with the 100% chicken manure.

Keywords: Pechay, Golden Snails Amino Acid (GSAA), Growth and Yield, Randomized Complete Block Design (RCBD).

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1. Introduction

Pechay (*Brassica rapa* L.) is an erect, biennial herb, cultivated as an annual about 15-30 cm tall in vegetative stage. Ovate leaves are arranged spirally and spreading. The petioles are enlarged and grow upright forming subcylindrical bundle. With proper management practices, pechay can be grown in several localities across the country. The types and levels of fertilizer applied to this crop is very important in its production.

It cannot be denied that many farmers rely heavily on inorganic or chemical fertilizers as an important factor in meeting the food requirements of a growing population. This is because these are easy to use, quickly absorbed and utilized by crops. However, these fertilizers are believed to contribute substantially to human, animal food intoxication and environmental instability or degradation (Masarirambi, et al.,2010).

The current practice in agriculture is basically chemical-based farming that makes a considerable contribution to the degradation of our natural resources especially soils. Heavy application of fertilizers has polluted surface and groundwater resources (dela Cruz, et al.,2006). In recent years there is a growing trend to reduce the use of mineral fertilizers, especially soil applied nutrients such as nitrogen (N), phosphorus (P) and potassium (K) and their use had decreased by seven times. Moreover, there is also increasing demand for organically-grown farm products. These create preconditions to recognize the importance of foliar fertilization and the use of organic fertilizers as an alternative to meet plant nutrient demand during the growing season (Kerin & Berova, 2003 as cited Bander, 2020).

One of the possible areas for study is the utilization of golden snails or kuhol in the preparation of concoction that can be used as foliar fertilizer to vegetable crops like pechay. Kuhol is considered an invasive pest to rice plants, but it can be a source or material to make organic fertilizer. Mask and shell meat of golden snail has many contents such as vitamins, proteins, fats, carbohydrates, lime and other nutrients that can be absorbed by our plantation so it is suitable for the manufacture of liquid organic fertilizer called LOF (Siregar & Tulus. 2017).

The idea that liquid organic fertilizer from snails would improve crop production, that the nutrient content in organic liquid fertilizer is quickly absorbed by the plants, that it would improve the quality of growth in plants, and it is environmentally friendly has prompted the researcher to explore this investigation on how golden snails' amino acid as cheaper alternative and more efficient organic fertilizer would affect the growth and yield of pechay.

Literature Review

Pechay (*Brassica rapa* L.) is an erect, biennial herb, cultivated annually about 15-30 cm tall in the vegetative stage. Ovate leaves are arranged spirally and spread. It is composed

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of enlarged petioles and grows upright, forming a sub-cylindrical bundle. Its inflorescence is a raceme with pale yellow flower having seeds 1 mm in diameter and red to blackish brown (BDPH 2016). The succulent petioles are often the most preferred main ingredient for soup and stir-fried dishes using the immature but fully expanded tender leaves. Chinese cuisine uses green petioles and leaves as garnish (Gonzales, Caraldre & Aban, 2015). Aside from that, Pechay is a good source of nutrients-calcium, phosphorus, iron and vitamin B. and a healing ingredient for hemoptysis and coughs (Marvin,2010).

Study conducted by Gonzales et al. (2015) showcased the benefits of using organic fertilizer. Specifically, the response of Pechay (*Brassica napus* L.) to the varied levels of compost fertilizer combining 75% Pure Garden Soil and 25% Pure Compost proved to generate a remarkable growth and yield performance of Pechay in the leaf area and fresh weight. It has greatly enhanced the growth and yield performance of Pechay. Similarly, a study by Natshen and Mousa (2014) showed that the application of compost improved soil characteristics and increased soil productivity and organic matter content. The result of the experiment confirmed that using organic fertilizers increased crop productivity in cucumber.

Gonzales, Caralde and Aban (2015) study evaluated the growth and yield performance of pechay with varied levels of compost as organic fertilizer and determined the effects of organic fertilizer in terms of the plant height, number of leaves per plant, fresh weight per plant, and leaf area. The result suggests that compost application significantly increased or influenced the growth and development of pechay plant.

Study of Siregar et al. shows the effectivity of using Golden snail, Pomaceae canaliculata as an organic fertilizer. This organisms were turned into liquid organic fertilizer called (LOF) or and microorganisms local (MOL). The golden snail is obtained from a livestock that is still alive and then washed, boiled and removed from its shell. The golden snail meat is cut into small pieces, separated from the intestine and other visceral organs. The use of mashed LOF can be sprayed on the surface of the soil or all parts of the plant. For fertilization in rice plants the recommended dose of 250 ml/15 liters of water is sprayed on the rice age 10 days after planting and repeated again at interval distance of 15 days. Fertilization on the plant recommended 200ml /15 liters of water sprayed on leaves and soil for 7 days after planting and repeated every 7 days. This study revealed that the used of the golden snail as an organic fertilizer is feasible.

Conceptual Framework

This study made use of the input-process-output model (Fig. 1). In this research, the independent variable included the treatments of this research such as the following: T1=100% chicken manure, T2=75% chicken manure and 25% of the volume of GSAA, T3=50% chicken manure and 50% of the volume of GSAA, T4=25% chicken manure and 75% of the volume of

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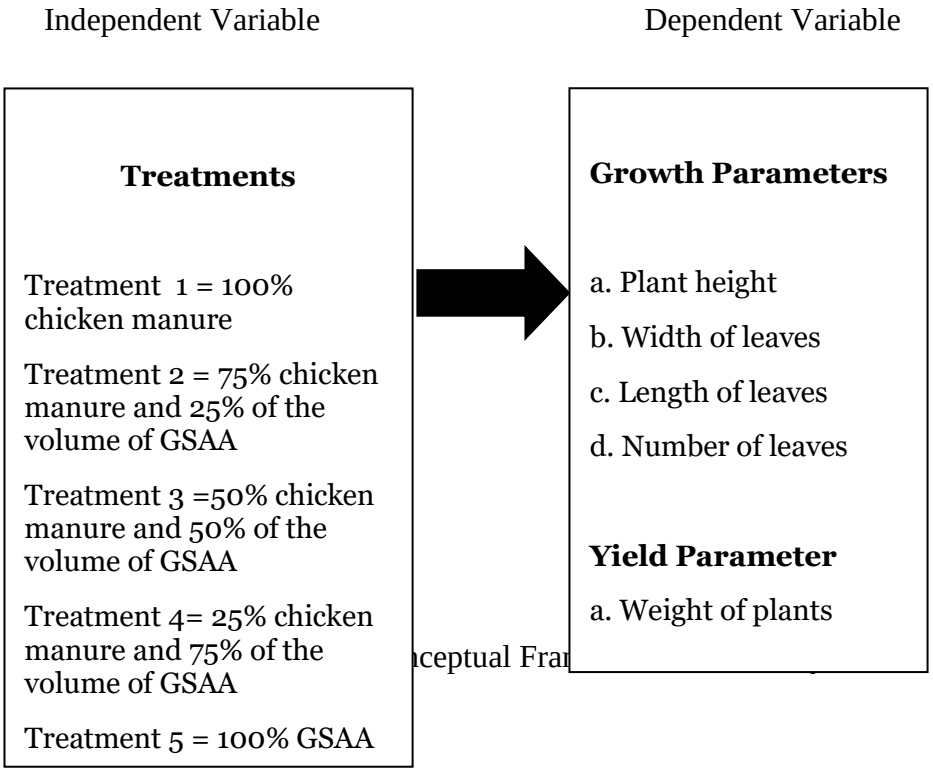
GSAA, T5=100% GSAA. These was conducted in Alangalang Agro-Industrial School, Alangalang, Leyte.

The effect of the varying levels of golden snails amino acid was measured using the following growth and yield parameters.

Growth included plant height, width of leaves, length of leaves and number of leaves. Yield parameter was measured in terms of the weight of pechay plants.



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Statement of the Problem

This study was conducted to determine the effects of the different levels of golden snails amino acid as foliar fertilizer on the growth and yield of pechay under Alangalang, Leyte soil and climatic conditions. Specifically, this was conducted to answer the following questions:

1. What is the growth of pechay sprayed with varying levels of golden snails amino acid in terms of:
    a. Plant height;
    b. Width of leaves;
    c. Length of leaves;
    d. Number of leaves?

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2. What is the yield of pechay due to varying levels of golden snails' amino acid as indicated by the weight of the plants?
3. Is there a significant difference on the growth of pechay sprayed with varying levels of golden snails' amino acid?
4. Is there significant difference on the yield of pechay sprayed with varying levels of golden snails' amino acid?

5. What information and communication technology (ICT) materials can be developed from the findings of the study?

Hypotheses

Based from the specific problems formulated, the research advanced the following hypotheses.

1. There is no significant difference in the growth performance of pechay sprayed with varying levels of golden snails' amino acid.
2. There is no significant difference in the yield performance of pechay sprayed with varying levels of golden snails' amino acid.

2. Methodology

This chapter presents and discusses the materials needed in the study, the different methods employed and the cultural management practices in the conduct of the study.

Materials

The following materials were needed in this experiment.

Pechay. Black Behi variety of pechay was used in this research. Seeds were procured from Pacifica Agrivet Supply, Tacloban City.

Fertilizer. The golden snail's amino acid was manufactured locally by the researcher prior to the start of the experiment. Golden snails or cohol is so much abundant in the rice paddies of Leyte, thus, it was accessible for the researcher to collect the raw materials for the production of amino acid foliar fertilizer. On the other hand, the chicken manure was purchased from the poultry farm in the municipality of Alangalang, Leyte .

Meterstick. This was used to lay out the experimental site as well as to obtain precise measurement of the different experimental plots.

Ruler. This was used to approximately measure the planting distance between plants. Likewise, this was used to determine the length and width of the leaves of the test plants.

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Shovel. This was used in preparing the experimental plots.

Dull bolo. It was used to remove weeds in the experimental area.

Sprinkler. This was used to water the pechay plants.

Weighing scale. A digital weighing scale was used to measure the amount of organic fertilizer to be applied to each plant. This was also utilized in determining the weight of the plants upon harvesting.

Black net. This was used to control or regulate the amount of sunlight and rains which may affect the growth of the plant.

Seedling tray. This was used in sowing the seeds.

Knife. This was used for cutting or harvesting matured pechay plants.

Sprayer. This was used for the foliar application of fertilizer directly to the leaves of pechay.

Flesh of Golden Snails, Coconut Water, Brown Sugar and EM4. These were used as raw materials in the production of amino acid fertilizer.

Research Design

This study followed the procedure for experimental research. Specifically, it employed Randomized Complete Block Design (RCBD). As described by Gomez and Gomez (1984), this is a type of experimental design characterized by blocks and all treatments are randomly assigned in each block. In this study, five treatments were set up and this was replicated three (3) times in order to ensure precision or accuracy of collected data.

Experimental Layout

This experiment was characterized by blocks to conform to the layout suitable for a randomized complete block design (RCBD). The experimental area measured 65 sq. m. which was divided into 3 blocks or replications. It was provided with 0.5-meter alleyway between blocks. Each block was likewise divided into 5 plots with 0.5-meter distance as passage or alleyway. Plots measured 2 meters x 1 meter. Pechay plants were spaced at 20 cm between rows and 20 cm between hills. Each row comprised 10 plants or a total of 50 plants/plot.

Randomization of Treatments

The five (5) treatments of this study were randomly assigned using drawn-by-lot technique. Small pieces of paper were labeled as T_1, T_2, T_3, T_4 and T_5. These were rolled and

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placed in a container or box. Subsequently, these were drawn one at a time and represented the treatment assignment for each plot. The same random technique was followed in the random distribution of treatments to replications 2 and 3.

3. RESULTS AND DISCUSSION

The findings of the study are as follows:

Plant Height of Pechay

Plant height as one of the variables of this study was measured to determine the effect of varying levels of chicken manure and golden snail amino acid to the growth and yield parameters of pechay.

Plant Height 10 days from transplanting. It was noted that 10 days from transplanting, the highest mean was observed in T4 with 9.63 cm, followed by T5 with a mean height of 9.50 cm, T2 with 9.48 cm, T1 with 9.25 cm and T3 with 9.19 cm. However, subjecting these treatment means to the analysis of variance has resulted an F value of 1.79, which is lesser than the tabular F value of 3.84 at 5% level of significance. This means that the treatment means being compared were just equal or comparable. It can be deduced that after 10 days from transplanting no significant differences were detected in the height of pechay due to the effect of varying levels of chicken manure and GSAA. Thus, the null hypothesis stating no significant difference in the height of pechay due to variations in the quantity of chicken manure and golden snail amino acid could not be rejected.

In addition, the F value for replication was also not significant but indicative that experimental errors within blocks were minimized while the variations between blocks were maximized. Further, the coefficient of variations (cv) computed from this study was 2.57% which denotes the precision of data gathered since it is within the acceptable values.

Plant Height 20 days from transplanting. After 20 days from transplanting the sample plants were again measured. This time the highest mean was noted in T1 with a mean value of 21.49 cm, followed by T2 with an average height of 19.41 cm, then T3 with mean score of 19.39 cm, T4 with a mean value of 18.79 cm and T5 with a mean height of 16.22 cm.

The analysis of variance has generated an F value of 3.32, which is lower than the tabular value at the 5% level of significance and is indicative of a not significant difference in the height of pechay due to varying levels of chicken manure and GSAA. Hence, the null hypothesis is accepted implying that at 20 days from planting the varying amount of chicken manure and GSAA failed to cause significant variations in the growth of pechay.

The F value of 1.56 for replication was not significant but indicative that experimental errors within blocks were minimized while the variations between blocks were maximized. Further, the coefficient of variations (cv) computed from this study was 9.32% that is indicative that the precision of gathered data was within the acceptable values for fertilizer trials.

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Plant Height 30 days from transplanting. At harvest time or 30 days from transplanting the last measurement on plant height was taken. The highest mean was observed in T1 with a mean value of 26.18 cm, next is T3 with an mean height of 24.34 cm, then T4 with mean value of 23.68 cm, T2 with a mean value of 23.56 cm and T5 with a mean height of 20.18 cm.

Comparing the treatment difference using the analysis of variance resulted an F value of 9.31, which is greater than the tabular value at the 1% level of significance that is indicative of a highly significant difference in the height of pechay due to varying levels of chicken manure and GSAA. Hence, the null hypothesis is rejected implying that significant differences were detected 30 days from transplanting or at harvest time. Further test using the Least Significant Difference (LSD) at 5% showed that T2, T3 and T4 were significantly different from T1, while T5 was significantly different from T1 at 1% level of significance. It can be implied that reduction in the quantity of the recommended rate of chicken manure which was replaced by the GSAA significantly affected the height of pechay.

The F value of 3.66 for replication, which was not significant is indicative that experimental errors within blocks were minimized while the variations between blocks were maximized. Further, the coefficient of variations (cv) computed from this study was 5.52% which is indicative that the precision of gathered data was within the acceptable values for fertilizer trials.

Width of Leaves of Pechay Plants

Width of Leaves 10 days from transplanting. With regards to the width of leaves 10 days from transplanting, the highest mean was observed in T1 with 5.49 cm, followed by T5 with a mean height of 5.45 cm, T4 with 5.36 cm, T2 with 5.07 cm and T3 with 5.00 cm. The F value computed was 2.59 which is lesser than the tabular F value of 3.84 at 5% level of significance. This means that the treatment means being compared are just equal or comparable. It can be deduced that after 10 days from transplanting, the width of the leaves of pechay were statistically equal or comparable regardless of the quantity of chicken manure and GSAA applied. Thus the null hypothesis stating no significant difference in the width of leaves of pechay due to variations in the quantity of chicken manure and GSAA could not be rejected.

Width of Leaves 20 days from transplanting. After 20 days from transplanting the highest mean was observed in T1 with a mean value of 9.27 cm, followed by T4 with an average measurement of 8.90 cm, then T2 with mean score of 8.72 cm, T3 with a mean value of 8.66 cm and T5 with a mean height of 8.18 cm.

When the analysis of variance was computed, an F value of 3.96 which is lower than the tabular value at the 5% level of significance was realized that is indicative of a not significant difference in the width of leaves of pechay due to varying levels of chicken manure

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and GSAA. Hence, the null hypothesis was accepted implying that at 20 days from transplanting the varying amount of chicken manure and GSAA did not cause significant differences in the width of leaves of pechay.

The F value of 2.46 for replication was not significant and is indicative that experimental errors within blocks were minimized while the variations between blocks were maximized. Further, the coefficient of variations (cv) computed from this study was 3.93%, suggestive that the precision of gathered data was within the acceptable values for fertilizer trials.

Width of Leaves 30 days from transplanting. Prior to harvesting or 30 days from transplanting the last measurement on plant height was taken. The highest mean was observed in T1 with a mean value of 12.03 cm, next is T3 with an average width of 10.45 cm, then T3 with mean value of 10.24 cm, T2 with a mean value of 10.11 cm and T5 with a mean height of 9.26 cm.

The treatment difference was analyzed using the analysis of variance that resulted in an F value of 9.27 which is greater than the tabular value at the 1% level of significance that is interpreted as highly significant, thus the width of leaves of pechay were greatly affected due to varying levels of chicken manure and GSAA. Hence, the null hypothesis is rejected implying that significant differences were detected 30 days from transplanting or at harvest time. Further test using the Least Significant Difference (LSD) at 1% showed that T2, T3 and T4 and T5 significantly deviate from T1. It can be deduced that gradual replacement of the recommended rate of chicken manure with GSAA significantly affected the height of pechay.

Length of Leaves of Pechay Plants

Length of Leaves 10 days from transplanting. On the length of leaves 10 days from transplanting, the highest mean was observed in T1 with 6.75 cm, followed by T2 with a mean height of 6.46 cm, T5 with 6.30 cm, T3 with 6.07 cm and T4 with 6.04 cm. These mean values were subjected to analysis of variance which has resulted in an F value of 2.65 which is lesser than the tabular F value of 3.84 at 5% level of significance. This means that the treatment means being compared are just equal or comparable. It can be deduced that after 10 days from transplanting the length of the leaves of pechay were statistically equal or comparable regardless of the quantity of chicken manure and GSAA applied. Thus, the null hypothesis stating no significant difference in the length of leaves of pechay due to variations in the quantity of chicken manure and GSAA could not be rejected.

Length of Leaves 20 days from transplanting. Twenty (20) days from transplanting the highest mean was observed in T2 with a mean value of 11.66 cm, followed by T3 with an average measurement of 11.63 cm, then T1 with mean score of 11.54 cm, T4 with a mean value of 11.30 cm and T5 with a mean height of 9.98 cm.

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When the analysis of variance was computed, an F value equivalent to 2.25 which is lower than the tabular value at the 5% level of significance was realized, which is indicative of a not significant difference in the length of leaves of pechay due to varying levels of chicken manure and GSAA. Hence, the null hypothesis is accepted implying that at 20 days from transplanting the varying amount of chicken manure and GSAA did not cause significant differences in the length of leaves of pechay.

Length of Leaves 30 days from transplanting. Prior to harvesting or 30 days from transplanting the last measurement on the length of leaves was taken. The highest mean was observed in T1 with a mean value of 16.26 cm, next was T3 with an average width of 13.44 cm, then T2 with mean value of 13.38 cm, T4 with a mean value of 12.83 cm and T5 with a mean value of 12.72 cm.

The treatment difference was analyzed using the analysis of variance results and an F value of 11.48 was generated which is greater than the tabular value at the 1% level of significance that is interpreted as highly significant, thus the length of leaves of pechay were greatly affected due to varying levels of chicken manure and GSAA. Hence, the null hypothesis is rejected implying that significant differences were detected 30 days from transplanting or at harvest time. Further test using the Least Significant Difference (LSD) at 1% showed that T2, T3, T4 and T5 significantly deviate from T1. It can be deduced that gradual replacement of the recommended rate of chicken manure with GSAA significantly affected the height of pechay.

Number of Leaves of Pechay Plants

Number of Leaves 10 days from transplanting. With regards to the number of leaves 10 days from transplanting, the highest mean was observed in T5 with 6.33, followed by T2 with a mean height of 6.13, T4 with 5.80, T1 with 5.60 and T3 with 5.57. When these mean values were subjected to analysis of variance, this has resulted in an F value of 2.86 which is lesser than the tabular F value of 3.84 at 5% level of significance. This means that the treatment means being compared are just equal or comparable. It can be deduced that after 10 days from transplanting the length of the leaves of pechay were statistically equal or comparable regardless of the quantity of chicken manure and GSAA applied. Thus, the null hypothesis stating no significant difference in the number of leaves of pechay due to variations in the quantity of chicken manure and GSAA could not be rejected.

Number of Leaves 20 days from transplanting. After 20 days from transplanting the highest mean was observed in T1 with a mean value of 8.03 cm, followed by T2 with an average measurement of 7.74 cm, then T4 with mean score of 7.63 cm, T5 with a mean value of 7.43 cm and T3 with a mean height of 7.00 cm.

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When the analysis of variance was computed, an F value equivalent to 1.41 which is lower than the tabular value at the 5% level of significance was realized, which is indicative of a not significant difference in the number of leaves of pechay due to varying levels of chicken manure and GSAA. Hence, the null hypothesis is accepted implying that at 20 days from planting the varying amount of chicken manure and GSAA did not cause significant differences in the number of leaves of pechay.

Number of Leaves 30 days from transplanting. After 30 days from transplanting the highest mean was observed in T1 with a mean value of 9.28, followed by T2 with an average number of 8.93, then T4 with mean score of 8.87, then T3 and T5 with the same average number of leaves of 8.63.

When the analysis of variance was computed, an F value equivalent to 2.32 which is lower than the tabular value at the 5% level of significance was realized, which is indicative of a not significant difference in the length of leaves of pechay due to varying levels of chicken manure and GSAA. Hence, the null hypothesis is accepted implying that at 30 days from planting the varying amount of chicken manure and GSAA did not cause significant differences in the number of leaves of pechay.

Yield of Pechay Plants

Yield of Pechay. At harvest time which is 30 days from transplanting the yield of pechay was measured. It was observed that the highest mean was observed in T1 with a mean value of 70.23 grams, next is T2 with an average yield of 52.18 grams, then T4 with mean value of 51.93 grams, T3 with a mean value of 50.70 grams and T5 with a mean value of 47.23 grams.

The treatment difference was analyzed using the analysis of variance results and an F value of 8.76 which is greater than the tabular value at the 1% level of significance was generated which is interpreted as highly significant, thus the yield of pechay was greatly affected due to varying levels of chicken manure and GSAA. Hence, the null hypothesis is rejected implying that significant differences were recorded in the yield of pechay at harvest time. Further test using the Least Significant Difference (LSD) at 1% showed that T2, T3, T4 and T5 significantly deviate from T1. It can be deduced that gradual replacement of the recommended rate of chicken manure with GSAA significantly affected the yield of pechay.

The F value of 1.44 for replication was not significant which is indicative that experimental errors within blocks were minimized while the variations between blocks were maximized. Further the coefficient of variations (cv) computed from this study was 9.70%, which is indicative that the precision of gathered data was within the acceptable values for fertilizer trials.

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Conclusion and Recommendations

Conclusions

Based from the findings of the study, the following conclusions are herein formulated.

1. The gradual replacement of the recommended rate of chicken manure with varying levels of golden snail amino acid (GSAA) has significantly affected the growth and yield parameters of pechay specifically on the plant height, width of leaves, length of leaves and the final yield of the crop. These observations were noted on the 30th day from transplanting or at harvest time.
2. It can be implied that the golden snails amino acid did not produce a comparable yield with the 100% chicken manure. Perhaps the quantity of GSAA is not sufficient to compensate the nutrient requirements of the plants.
3. The frequency of foliar application of GSAA could be a significant factor that affected the growth and yield performance of the crop.

Recommendations

The findings of the study lead to the formulation of the following recommendations:

1. Though the effect of golden snails' amino acid is not comparable to chicken manure, it may still be used by farmers who are cultivating pechay for home consumption where chicken manure is not available, most especially if the main focus is to produce an organic vegetable.
2. The same set of experiment maybe pursued by adding the quantity of GSAA that can be applied to the plants. Also, the frequency of the application or spray maybe increased so as to compensate the nutrients needed by the plants.
3. Further research maybe conducted in different areas where soil and environmental characteristics are different. It is likewise suggested that this study maybe conducted in other months other than summer (April and May) wherein a very warm temperature is evident.

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and affection. Above all, the researcher is thankful for the divine guidance bestowed on her as she journeys in this research work.

Policy Note

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NOTE: This study focused to determine the growth and yield of pechay (*Brassica rapa* L.) with varying levels of golden snails amino acid (GSAA) on a farm lot within the school premises of Alangalang Agro-Industrial School, Alangalang, Leyte.

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