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PERFORMANCE OF STRING BEANS AS AFFECTED BY DIFFERENT LEVELS OF CHICKEN MANURE TEA

ARVIN BUEMIA TARUMA[1, a], MARY GRACE BROSO BALINQUIT[2, b]

[1, 2] College of Agriculture, Laguna State Polytechnic University – Siniloan (Host) Campus Siniloan, Laguna, Philippines

Email: [a]*arvin.taruma@lspu.edu.ph*, [b]*balingquitgracia@gmail.com*

ARTICLE INFO

Corresponding Author:
ARVIN BUEMIA TARUMA
College of Agriculture, Laguna State Polytechnic University – Siniloan (Host) Campus Siniloan, Laguna, Philippines,
Email: [a]*arvin.taruma@lspu.edu.ph*

ABSTRACT

This study was conducted to look for alternative measures to sustain the profitability of cultivating string beans by using different levels of chicken manure tea. An Experimental Research in Randomized Complete Block Design (RCBD) was used in this study of different levels of chicken manure tea as treatment. The treatments used were as follows: Control (T1), Chicken manure tea at 25%: 75% water dilution (T2), Chicken manure tea at 50%: 50% water dilution (T3) and Pure chicken manure tea (T4). The results show that growth characteristics such as number of days from sowing to flowering, to fruiting, to harvesting, plant height, and yield components includes diameter of pods, weight of pods per harvest area, computed yield per hectare did not show significant difference among treatment means and not affected by different levels of chicken manure tea as fertilizer materials. However, length of pods was affected by different levels of chicken manure tea as treatment used in the study. It can be concluded that different levels of chicken manure tea as fertilizer materials does not significantly affect the growth and yield of string bean. However, concentration of pure chicken manure tea (T4) increased the

production and net income of string beans and replication of the study is recommended and use of other crops may also be considered in this study.

Keywords: Chicken manure tea, Chicken manure, Levels of chicken manure, String beans.

INTRODUCTION

The Philippines is largely dependent on agriculture, with around 70% of the population in villages. However, increased industrial activity in cities has influenced them to remain in metropolitan regions, which have become population centers. An agricultural product that with important impact on the Philippines vegetable supply given the large amount of land that can be produced, it is clear that the Philippines could considerably improve its vegetable production, which would enhance the population's health. This involves of improving a variety of factors, such as irrigation profit opportunities for producers.String beans, also known as Sitao, are a popular vegetable in the Philippines. It is a genuine legume with a botanical resemblance to cowpea. While the skin is still smooth and the seeds haven't matured or expanded, the fragile pods are delicious. Young leaves and stems can be boiled or steamed and eaten as greens. The green pods can contain 2 grams of protein, 8.2 grams of carbs, and a significant quantity of calcium and other minerals per 100 grams of fresh weight. The young leaves are a significant source of protein and vitamin A when boiled. However the optimal months to plant are May to June for wet season planting and October to November for arid areas and season of planting with temperatures ranging from 20 to 35 degrees Celsius, string bean grows in the lowland areas. It can be cultivated in a variety of soil types and is more acid-tolerant than other plants. Also, it is prone to water logging and drought, both of which decreasing yields significantly and it grows well in both low and high elevations (PhilRice, 2010). Different recommended methods should be used efficiently and effectively in order to improved string bean performance and yield. Among weed control, fertilizer management, insect control, and disease management. String bean plants typically require a small quantity of micronutrients and macro- nutrients such as nitrogen, phosphorous, and potassium, the amounts of which vary depending on soil conditions and cropping.

When a gardener uses too much inorganic fertilizer, according to Tomar (2001), difficulties can emerge. Fertilizers contain additional chemicals including salt in addition to the nutrients nitrogen, phosphorus, and potassium. Salts and chemicals that combine with nutrients tend to build up in the soil rather than being absorbed by the roots of plants. If the deposit contaminates the groundwater source, it becomes poisonous and poses a threat to human health. Inorganic fertilizer through excessive application can cause to kills the plants and their roots. Furthermore, large and widely use of inorganic fertilizers has a severe influence on the environment, reduce soil health and fertility over time, as well as reducing farmer profitability due to the high cost of chemical fertilizers (Adediran et al., 2004).

As a result of this circumstance, there is a need to explore for alternative nutrient sources that can also be used as an effective environmental solution. One of them is the use of manure

ARVIN BUEMIA TARUMA, College of Agriculture, Laguna State Polytechnic University – Siniloan (Host) Campus Siniloan, Laguna, Philippines, *Email:* [a]arvin.taruma@lspu.edu.ph.

as a fertilizer. Chicken manure is the organic fertilizer of choice because of its high organic matter content, concentration of plant macro and micro nutrients in an easily absorbable form, and year-round availability in large quantities with a lower cost than soil applied fertilizers. If treated in appropriate quantities, chicken manure could meet the plant's nutrient requirements (Amanullah et al., 2007).

Instead of composting the chicken manure, another method was to make a tea. Chicken manure tea is a liquid extract made by soaking chicken manure material in water to generate a liquid rich in organic and inorganic soluble nutrients, as well as a significant number of microorganisms (ROU, 2007). As a balanced source of nutrients in approachable form in the rhizosphere, growth stimulants, and disease suppressors, using chicken manure tea is becoming a widespread agriculture technique in sustainable crop production of organic farming (Gross et al., 2008). It has positive effects on soil physical and chemical characteristics, as well as soil biodynamic systems.

OBJECTIVES OF THE STUDY

Generally, this study was conducted to evaluate the efficacy of different levels of chicken manure tea on growth and yield of string beans.

MATERIALS AND METHODS

Research Design

A single factor Randomized Complete Block Design (RCBD) was used in this study. Field experimentation covered a total of 483 square meters. Randomization process was employed separately and independently to determine the location of the treatment in each block. The experimental area was divided into 4 blocks with 4 replications and each block will be subdivided into 4 experimental units/plots. A 483 square meter area was divided into four blocks with the total of 16 Experimental Unit. Each blocks was divided into four treatments were randomly assigned. The plot size was 4m wide and 4m length with 1 meter pathway between block and plots. The planting distance and spacing was .75mx .30m thus each plot has 13 hills.

Securing of Seeds

The seeds of pole sitao negro star variety from condor quality seeds of allied botanical corporation was purchased in agricultural store at Sta. Cruz, Laguna.

Preparation of experimental area

The experimental area was cleared with the used Mower cutter grass. Soil samples were taken from ten spots, air dried and pulverized. One kilogram was brought to Office of the Laguna Soil Laboratory (OPAg) for soil analysis.

Planting of String Beans

String bean seeds were planted by direct seeding at the rate of 2-3 seeds per hill. The seeds were covered thinly with fine soil to protect the seeds against insects.

ARVIN BUEMIA TARUMA, College of Agriculture, Laguna State Polytechnic University – Siniloan (Host) Campus Siniloan, Laguna, Philippines, *Email:* [a]arvin.taruma@lspu.edu.ph.

Application of treatments

Treatment 1- Control or no solution applied.

Treatment 2- Using chicken manure tea at 25%: 75% water dilution. 25% (8,250ml) of chicken manure tea will be diluted in 75% (24,750ml) of water.

Treatment 3- Using chicken manure tea at 50%: 50% water dilution. 50% (16,500mL) manure tea will be diluted in 50 % (16,500mL) of water.

Treatment 4- Using pure chicken manure tea .

Vegetative stage of string bean were drenched with 100 ml of assigned treatment each plant and repeated at weekly interval up to 5 weeks after planting.

Flowering and fruiting stage of plant were applied and drenched with 250 ml assigned treatment at weekly interval and applied at exactly 6 weeks up to the time the first harvesting at matured pods was recorded.

Treatments	Vegetative stage (ml)	Flowering/fruiting stage(ml)
Control	---	---
Using chicken manure tea at 25%: 75% water dilution	100	250
Using chicken manure tea at 50%: 50% water dilution	100	250
Using pure chicken manure tea	100	250

Chicken manure tea was prepared as described by Shaheen A.M, et al. (2018) Chicken manure tea preparation was made of 45 days old broiler chicken manure then soaked in water with a ratio of 1: 10 (w/v) in a 200 liter tank, then kept in a shaded area for 2days to allow the nutrients in the chicken manure to leach into the water. Afterwards, the mixture was filtered through cheesecloth before application to remove suspended particles to obtain almost a clear solution of chicken manure tea. Chicken manure tea was freshly prepared for each time of application.

Watering

Watering was done immediately after planting with the use of sprinkler to provide enough moisture for uniform seed germination. Watering of plants was done every morning or when necessary. Drainage canals at the end of the furrow were constructed whenever necessary to avoid flooding.

Pest and Disease Management

There is some insect pest observed in string bean. The insect pests observed in the study were aphids, pod borers, green stink bug and leaf miner which were controlled with the use of oriental herb nutrients and chemical sprayed. The malathaion, was sprayed early morning and late afternoon at the rate of 20ml per 16 liters of water at two weeks interval during flowering stage and stopped one week after harvesting.

ARVIN BUEMIA TARUMA, College of Agriculture, Laguna State Polytechnic University – Siniloan (Host) Campus Siniloan, Laguna, Philippines, *Email:* [a]arvin.taruma@lspu.edu.ph.

Weeding

Weeding was done with the use of bolo two weeks after planting. Weeds growing near the plants were removed by hand pulling to avoid competition of water, space and sunlight.

Trellising

One day after planting trellis using bamboo was constructed to easily identify experimental unit. Network of string was also used to support the upright growth of string beans.

Vine Training

String was used for vine training. The vines were trained to climb the trellis when the tendrils appear to prevent formation of deformed pods.

Harvesting

String bean pods were harvested when the pods were fully developed. Harvesting was done early in the morning by handpicking. It was done at two days interval to prolong the productive life of plants. The harvest pods were kept properly under shade to prevent bruising.

Data Collection Procedure

Number of days from planting to flowering. was determined by counting the number of days from planting up to the time the plants bear the first fully developed flower.

*Number of days from sowing to fruiting.*was determined by counting the number of days from sowing up to the time the plants bear the first fruit with 8 cm length.

Number of days from planting to harvesting.was determined by counting the number of days from planting up to the time the first harvesting at matured pods.

*Plant height.*was determined by measuring the plant from the base up to the tip of the primary stem using string to avoid destruction of stem then measured by the steel tape.

*Diameter of string beans pods.*was taken from the base part of the pod with the use of Vernier Caliper. This was measured from the ten representative sample pods of string bean.

Length of string beans pods (cm),was measured from the tip to the base of ten representative sample pods of string bean.

Fresh weight of string beans(kg). the harvested string bean pods were weighed with the used of digital weighing scale. The weight of string bean pods from first to last harvest are added to determine the total weight of harvest string bean pods in kilograms.

ARVIN BUEMIA TARUMA, College of Agriculture, Laguna State Polytechnic University – Siniloan (Host) Campus Siniloan, Laguna, Philippines, *Email:* [a]arvin.taruma@lspu.edu.ph.

Computed yield per hectare. Computed yield was determined based on the total weight of harvested pod per harvest area multiplied by 10,000m2/ha, divided by 3.375 harvest area.

*Cost and Return.*Cost in the study refers to expenses incurred in this study on string bean seeds and fertilizer materials. It is the total cost incurred in this study. Cost and return of production is the difference between gross return and total expenses for string bean production for one cropping.

Data Analysis

All the data gathered and analysed following the Analysis of Variance (ANOVA) for Randomized Complete Block Design to determine significant differences among treatment means. Significant results were subjected to further statistical analysis using Least Significant Differences (LSD). The collected data were analyzed with the use of Statistical Tool for Agricultural Research (STAR) software.

RESULTS AND DISCUSSION

Number of Days from sowing to flowering

Data on number of days from sowing to flowering presented in table 2. Numerically, treatment means shows that the earliest flowering was observed on string beans plants fertilized with chicken manure tea at 50%: 50% water dilution (T3) with 39.30 average mean while the latest to bear flowers was observed on pure chicken manure tea (T4) plants with 39.95 average mean. However, analysis of variance failed to show significant difference among treatment means. The result indicates that different levels of chicken manure tea used in this study did not affect the number of days from sowing to flowering of plants.

Number of Days from sowing to fruiting

The number of days from sowing to fruiting of string bean plants. Data shows that 43.23 treatment mean from T2 (25% chicken manure tea and 75% water) bear pods earlier while the latest was observed on T1 (Control) plants with 44.00 treatment mean. Analysis of variance failed to show significant differences among treatment means. However, Comparison of mean number of days from sowing to fruiting showed that the response of plants fertilized with the following treatments are closely related to each other.

Number of Days from sowing to harvesting

The number of days from sowing to harvesting of matured pods which shows that the earliest harvesting was conducted on string bean on T2 (25% chicken manure tea and 75% water) and T3 using chicken manure tea at 50%:50% water dilution while the latest was noted on the plants fertilized using T4 (pure chicken manure tea). Analysis of variance failed to show significant differences among treatments. Comparison of treatment means shows that the number of days from sowing to harvesting of string bean with T1 (Control) was comparable with those plants applied with different levels of chicken manure tea as T2, T3 and T4.

ARVIN BUEMIA TARUMA, College of Agriculture, Laguna State Polytechnic University – Siniloan (Host) Campus Siniloan, Laguna, Philippines, *Email:* [a]arvin.taruma@lspu.edu.ph.

Plant Height

The measurement of height of string bean started on the 2nd week of plant due to encountered of storm. Figure 4 below reflected that there is no numerical difference among treatment means on week 2 and 3 of plant height, but it shows high numerical difference on week 4 of plants which T2 shows a highest height among other treatments were increased up to 77.06. There was a big difference among treatment means on week 5 of plants which T4 noted a highest height among other treatments with 213.68 mean and the lowest was noted on T2 with 155.73 mean which was recorded a highest height on previous week. Final plant height was recorded on week 6 of plants which showed that T4 with pure chicken manure tea has shown the highest efficiency and T1 (Control) showed the least efficiency. However, statistical analysis of variance from week 2 to 6 failed to show significant difference among treatment means. The result indicates that the different levels of chicken manure tea used in this study did not affect the height of the plant. This is similar with the findings of Javanmardi and Ghorban (2012) who found that application of chicken manure tea does not gave statistical significant difference on plant height compared to control.

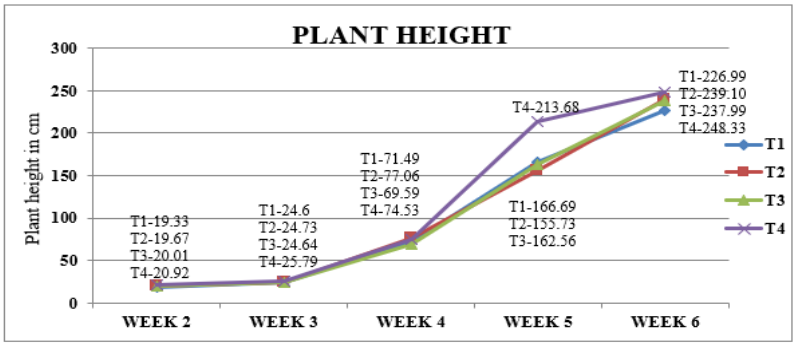

Figure 4. Line graph showing the total mean plant height recorded for each treatment on weekly interval

Length of pods

Data on average length of pods of string bean showed that the treatment that showed the highest response was T3 (50% chicken manure tea and 50% water) which gained a mean of 50.25 while T1gained the least mean of 45.72. This result is opposite to the research findings of Shaneen (2018) which the plants received of chicken manure tea without dilution showed the lowest values of dry pods properties of average pod length in both seasons of the study. Statistical Analysis of variance of the study shows highly significant difference among treatment means. Statistical analysis shows that the effect of using pure chicken manure tea (T4) on length of pods was the same with the effect of using chicken manure tea at 50%: 50%

ARVIN BUEMIA TARUMA, College of Agriculture, Laguna State Polytechnic University – Siniloan (Host) Campus Siniloan, Laguna, Philippines, *Email:* [a]arvin.taruma@lspu.edu.ph.

water dilution (T3) and using chicken manure tea at 25%: 75% water dilution (T2)but significantly different from control.

Diameter of pods

Data on average diameter of pods of string bean pods in mm are presented in table 6. Data shows that T3 using 50% chicken manure tea and 50% water and T4 using pure chicken manure tea gained the highest response and widest diameter of pods up to 6.79 mean while the shortest was noted on control treatment with 6.67 mean. Statistical analysis of variance failed to show significant difference among treatment means. This result shows that the diameter of string bean pods was not affected by fertilizers used in this study.

Fresh weight of pods per harvest area

The total fresh weight of pods per harvest area ($3.375m^2$) in kilograms. Data shows that string bean fertilized with T4 (using pure chicken manure tea) was the heaviest total weight of pod per harvest area while the least was noted on T3 (50% chicken manure tea and 50% water).However, there is no significant difference on analysis of variance among treatment means. Comparison of mean fresh weight shows that the effect of control was the same effect of using chicken manure tea at 25%:75% water dilution (T2).

Computed yield per hectare

Computed yield per hectare ($10,000m^2$/ha). Data shows that string beans fertilized with T4 (pure chicken manure tea) gained the highest response numerically and obtained the heaviest weight of fresh pods per hectare and the lightest was noted on T3 (50% chicken manure tea and 50% water).Analysis of variance showed no significant effect among treatment means. Comparison of mean shows that there is no difference from the effect of T1 (Control) and T2 (25%chicken manure tea and 75% water) but different on T4 (pure chicken manure tea).

Cost and return

The cost and return of producing string bean using different level of chicken manure tea The total fresh weight of string bean pods per harvest area was converted first per hectare into $10,000m^2$/ha basis in kg and finally in peso. The price of string bean pods per kilograms is Php40 based on FAES OPAg Laguna bantaypresyo -November 10, 2021. Data shows that the highest net income was obtained on string bean plants fertilized with T4 (pure chicken manure tea) while the lowest net income were noted on T3 (50% chicken manure tea and 50% water).

Conclusion, limitations and recommendations

Based on the result of this study, different levels of chicken manure tea as fertilizer materials have no significant effects on the growth characteristic and most on yield

ARVIN BUEMIA TARUMA, College of Agriculture, Laguna State Polytechnic University – Siniloan (Host) Campus Siniloan, Laguna, Philippines, *Email:* [a]arvin.taruma@lspu.edu.ph.

components of string bean plant. However, there was a highly significant effect on length of pods of string bean. The most net income was observed on string bean fertilized with pure chicken manure tea (T4).

Based on the results of the study, the following are recommended: 1. In order to increase string bean production and income, the use of concentration of pure chicken manure tea is recommended. 2. Replication of this study using Randomized Complete Block Design (RCBD) and the use of other crops may also be considered in this study.

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ARVIN BUEMIA TARUMA, College of Agriculture, Laguna State Polytechnic University – Siniloan (Host) Campus Siniloan, Laguna, Philippines, *Email:* [a]*arvin.taruma@lspu.edu.ph*.