Productivity Of Eggplant Applied With Vermi Tea At Different Spraying Frequencies

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Abstract
This study was conducted at the Research Experimental Station of Cagayan State University-Piat Campus from August 2020 to November 2020 to determine the productivity of eggplant as affected by the application of vermi tea at different spraying frequencies. Specifically, to determine the yield and agronomic characteristics of eggplant as affected by the application of vermi tea at different spraying frequencies; and to determine which of the different treatments would give the highest income and return of investment. The Randomized Complete Block (RCB) design was used to test the following treatment formulations: Treatment 1 (once a week application), Treatment 2 (twice a week application), Treatment 3(thrice a week application) and Treatment 4 (control).

Based on the findings, plants applied with vermi tea thrice a week recorded the greatest number of fruits, heaviest weight of fruit/plant, and the yield in tons/ha. However, the application of vermi tea delays the production of flowers for 5 days compared to control plants. Economic wise, thrice a week application of vermi tea outranked other treatments with 186.78% and with return of investment of 101%. The application of vermi tea up to thrice a week can increase the productivity and profitability of eggplant growers.

Introduction
Vegetables are sources of vitamins, minerals, antioxidants, and other trace elements that could help in boosting the immune system and growth of a certain individual. During the peak season of vegetable production, crops have been processed to lengthen the shelf life and maintain the availability of the different vegetable products in the worldwide market. The production of fresh vegetables is still lower compared to the actual produced in the farms. Hence, majority of researchers are looking into strategies to fill the lacking needs of these fresh and processed products in the market.

Eggplant (*Solanum melongena*) belongs to the family *Solanaceae* or the nightshade family. The said crop is considered is a perennial herb with woody stem and its fruits are large purple egg-shaped fruits. It is widely cultivated in South-East Asia where China and India are the top producers. This crop is not only grown for its nutritional composition but also for the production of flour and as a substitute for koala nut specifically on the special occasions of Nigerians. In the Philippines, eggplant is a primary indispensable component of the native Ilocano dish called “pinakbet.” Hence, it is identified as high-value crop produced in the country because of its high market demand.

Nowadays, fertilizers are indispensable in crop production as crops can no longer attain their potential yields without the application of fertilizer either organic or inorganic. Nutrients must be made available during the different growth stages of plants and must be in their absorbable form in order for such nutrients to be utilized. This is one of the unique characteristics of inorganic fertilizers, thus making it the most in-demand agrochemical used in farming.

Undeniably, some local farmers rely mostly on the use of inorganic fertilizers as a source of nutrients for their plants. Most do not have knowledge of the actual fertilizer requirement of their soil leading to excess or insufficient nutrient application. Excess amounts of fertilizer is a wastage and contribute to higher cost of production aside from the harm that it would inflict on the plants and the environment. Moreover, continuous use of commercial fertilizer especially ammoniacal fertilizers destroys the natural fertility of the soil and will also contribute to the development of soil acidity.

Today, organic agriculture is becoming popular which mandates the use of organic-based fertilizer and pesticides in the production system. Organic agriculture also contributes to medium and long-term effects on agricultural resources as it aims to produce food while establishing ecological balance in the agroecosystem. It takes a proactive approach as opposed to treating problems after they emerge. The impact of organic products on natural resources favors interaction within the agro-ecosystem that is vital for both agricultural and nature conservation.

Many researchers claim that the continuous application of both soil and liquid organic fertilizer enhances the chance for the soil to reclaim its natural fertility. Furthermore, the long-term effect of organic fertilizer also supports the proliferation of good soil microbes that help in the degradation of organic materials in the soil. Today, the implementation of Republic Act 10068 is not yet fully felt because of the low adoption of the technology by farmers. Experiments using concoctions in the production of organic crops in the country showed great potentials as alternatives to synthetic or organic fertilizer.

The use of vermi compost as an alternative to inorganic fertilizers also contributes significantly to the organic crop production system in the country. However, the nutrient produced in the final product of vermicomposting is always affected by the kind and quality of raw materials used. Nitrogen is one of the most important major elements that must be present in vermicast, hence, the researcher used the herbage yield of leguminous crops in addition to the other farm by-products.

Many researchers also claim that the use of vermi tea in the production of organic vegetables encourages the proliferation of beneficial microorganisms and helps in the growth and development of crops. However, the determination of the optimum amount and application frequency of vermi tea specifically on eggplant is imperative; hence, this study.

Objectives of the Study

Generally, the study aimed to determine the productivity of eggplant applied with vermi tea at different spraying frequencies.

Specifically, it aimed to:

1. Determine the agronomic characteristics of eggplant as affected by the application of vermi tea at different spraying frequencies;
2. Know the effects of the different treatments to the yield and yield component parameters of eggplant; and
3. Provide benchmark data on the economics of the different treatments using partial budget analysis.

Scope and Delimitation

This study was conducted at the Crops Experimental Farm of Cagayan State University, Piat campus from August 2020 to November 2020 to determine the agronomic characteristics, yield, and yield component parameters of eggplant as affected by the application vermi tea at different spraying frequencies.

METHODOLOGY

Preparation of Materials for Vermitea Production

The following materials were used in the production of vermi tea: molasses or brown sugar, vermi tea aerator, tap water, and vermi cast.

Process of Making Vermi Tea

The collected vermi cast (1 kilo) was placed inside the hose of the vermi aerator. An equal amount of molasses or sugar (1 kilogram) was added per hose. 10 liters of water outside the mixture was also added. Then, all hose of the aerator were connected and the motor was plugged into the socket for the aeration.

Harvesting of Vermi Tea

After 24-48 hours, the vermi tea was harvested by using a plastic sieve. Harvested material was placed in a clean container and was kept in a clean, cool, and dry place.

Preparation of Soil Media and Seed Sowing

Growing media composed of one (1) part carbonized rice hull, compost, and garden soil were thoroughly mixed and were placed in germinating trays. Seeds were sown in germinating trays at one seed per hole of the seedling tray to avoid competition.

Land Preparation

A total area of 2040 square meters was thoroughly prepared by plowing and harrowing twice at one (1) week interval to ensure that weeds and other stubbles were incorporated and decomposed in the soil.

Experimental Design and Procedures

The Randomized Complete Block (RCB) design was used with the following treatment formulations:

Treatment 1- once a week application
Treatment 2- twice a week application
Treatment 3- thrice a week application
Treatment 4- no application

The experimental area was subdivided into four equal blocks measuring 16 meters x 5 meters to represent the main plot. Each block was further subdivided equally into four (4) equal subplots. An alleyway of one (1) meter between main plots and one (1) meter between sub-plots was provided. All other treatment combinations were replicated four (4) times.

Transplanting

Seedlings were transplanted after three (3) weeks at a distance of 75 cm between furrows and 50 cm between hills at one seedling per hill.

Fertilization and Treatment Application
An equal amount of commercial fertilizer was applied across all plots where the amount was based on the result of the soil analysis. The application of Vermi tea was also based on the above-mentioned treatments. A dilution rate of 172ml concentrated vermi tea per 16 liters of water was use throughout the study. The application of vermi tea started a day after transplanting, thereafter based on the frequency specified in each treatment. The application of vermitea ended after the first priming.

Water management
An equal amount of water was applied to the plants early in the morning or late in the afternoon was applied. Water was made available when needed.

Weeding
To avoid crop-weed competition, weeds were removed through hand pulling. This was done every after 2 (two) weeks or as the need arises.

Pests and Diseases control
Pest such as shoot borer were controlled with the use of bare hands. This was practiced everyday to avoid the pest outbreak in the area.

Priming
Harvesting was done as fruits get matured by cutting the fruit peduncle. The harvested fruits per treatment were recorded regularly and was added cumulatively at the termination of the study for yield determination and economic analysis.

Statistical Tool
The data were analyzed using the Statistical Tool for Agricultural Research (STAR). Analysis of Variance (ANOVA) was used and the Least Significant Difference (LSD) was used to determine the differences between the treatments tested.

Data Gathered
1. Theoretical NPK per treatment- this was computed after getting the nutrient analysis of the vermin tea from DA CVIAL. The total amount of NPK contributed by vermi tea applied was computed based on the number or frequency of application using ratio and proportion.
2. Number of days to flowering- this was obtained by counting the total number of days from sowing up to when 80% of the plant per plot bore flower.
3. Number of fruits per plant- this data was taken by counting the total number of fruits of all representative sample (RS) plants from first priming up to the termination of the study. The number of fruits per priming was added cumulatively and was divided into the total number of representative samples per plot.
4. Weight of fruit per plant- this was taken by weighing the fruits of eggplant per priming period and was added cumulatively until the termination of the study. The average weight of fruits per plant was attained by getting the mean of the total number of representative samples per plot.
5. Yield in tons/ha- this was computed by getting the total weight of fruits of all RS plants per plot from first priming up to the termination of the study. Yield taken per plot was projected to ton/ha using the principle of ratio and proportion.
6. Percent pest infestation- this was determined by getting the total number of infected per plot during the production period. The percent of pest infestation was computed by dividing the weight of infested fruit to the total weight of the harvested fruits.
7. Cost and Return per treatment- this was done by getting the total production cost per treatment and was subtracted to the gross income to get the net income.

RESULTS AND DISCUSSION
Number of Days to Flower
The average number of days for the eggplant to bear flower as affected by different frequency of vermi tea application is presented in figure 1. The earliest to bear flowers were noted in plants drenched with vermi tea at once a week application (T1) and control plants with corresponding means of 50.67 and 50.25 days. Plants applied with vermi tea three times a week showed delay the production of flowers up to 55 days. This could due to the higher theoretical amount of nitrogen-based fertilizer which may lengthen the vegetative phase of the crops. This result conforms with the findings of Zhang et al., (2021) reported that the higher amount of nitrogen applied to plants would cause possible delay in the formation and production of flowers.

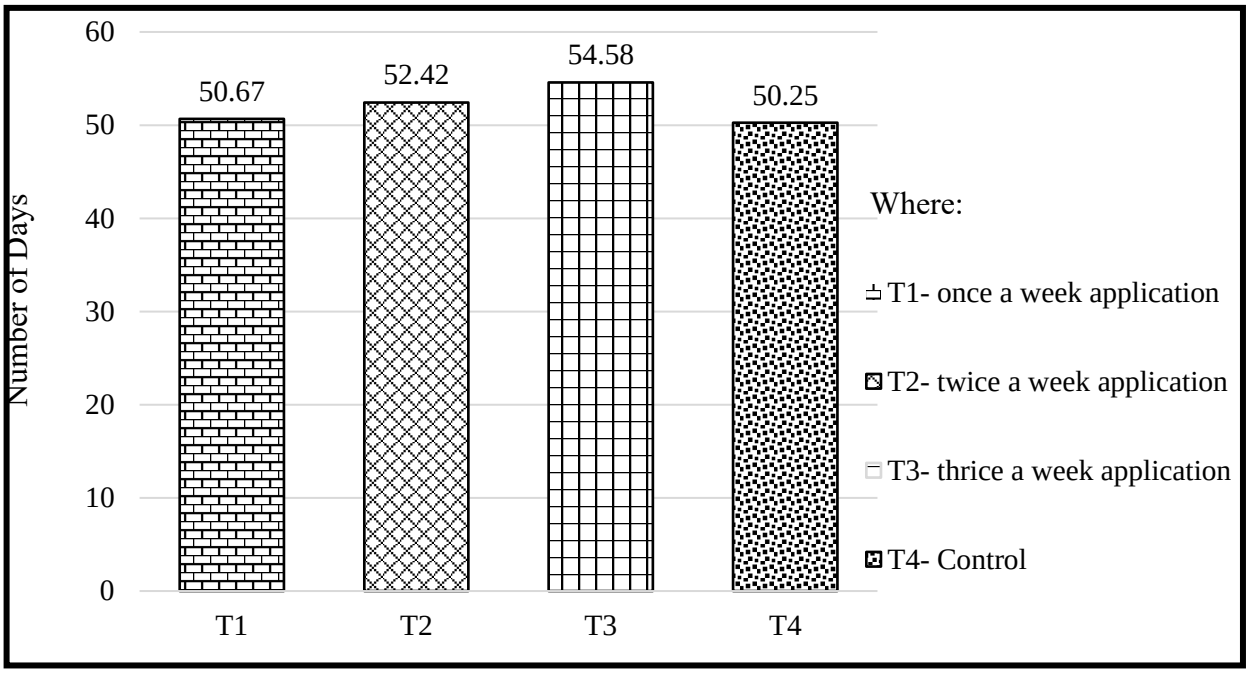

Figure 1. Average number of days for eggplant to bear flower as affected by the application of vermi tea at different spraying frequencies

Number of Lateral Brach

The average number of lateral branches produced by eggplant as affected by the application of vermi tea at different frequencies is presented in Figure 2. It was observed that twice a week application recorded the highest number of lateral brach with a mean of 3; while all other treatments had and average of two (2) with no significant difference between treatment. The result could be attributed to the agronomic characteristics of the eggplant cultivar tested.

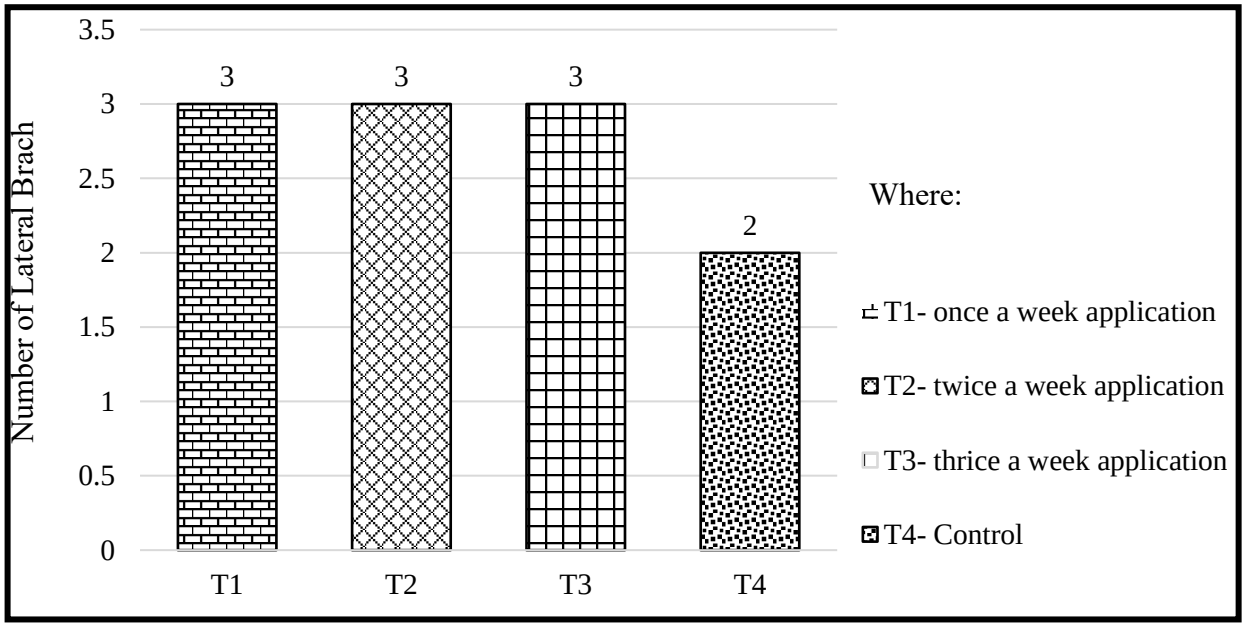

Figure 2. Average number of lateral branch produced by eggplant as affected by the application of vermi tea at different spraying frequencies

Average number of Fruit/Plant

Figure 3 shows the effect of the vermi tea application on eggplant at different frequencies. Thrice application per week (T3) of vermi tea recorded the highest number of fruit per plant with a mean of 19 followed by plants applied with vermi tea for twice a week which produced 15 fruit per plant. Plants with no vermi tea application and those applied once a week produce an identical number of fruit per plant of 10. The result of the study conforms with the Baniya and Vaidya, (2011) who claimed that vermi tea increases crop production due to its high macro and micro nutrient. In addition vermi tea also increases the number of fruit per plant (Selvaraj, 2011).

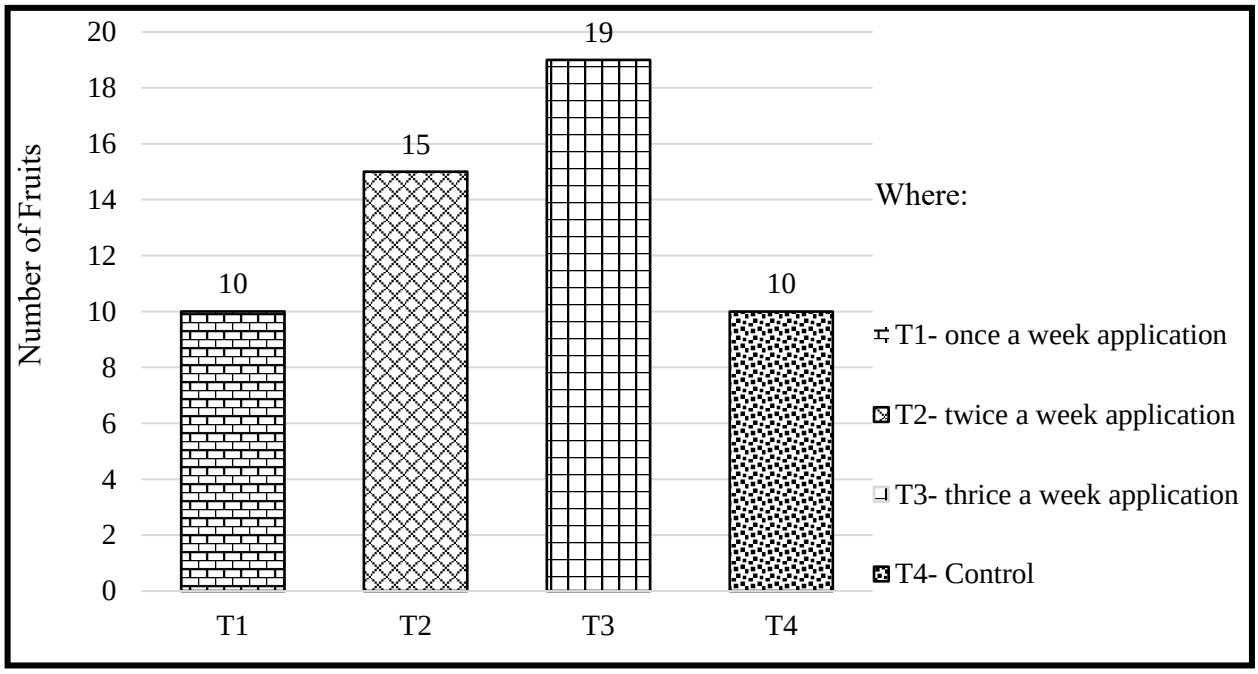

Figure 3. Average number of fruits per plant as affected by the application of vermi tea at different spraying frequencies

Weight of Fruit per plant

Figure 4 shows the effect of different frequencies of vermi tea application on the weight of eggplant fruits. The heaviest weight was observed from those plants applied thrice a week with vermi tea with a mean of 1779.63 g per plant. Plants applied with vermi tea twice a week recorded 1368.00 g while plants applied once a week produced 905.95 g per plant. The lowest weight of fruits was observed from the control treatment. Significant result was observed when thrice a week application was compared to once a week application and control but not significantly different when compared to twice a week application. The significant difference of the study could be supported by the study conducted by Abou El- Goud (2020) who reported a positive effect of vermi tea on the production of eggplant.

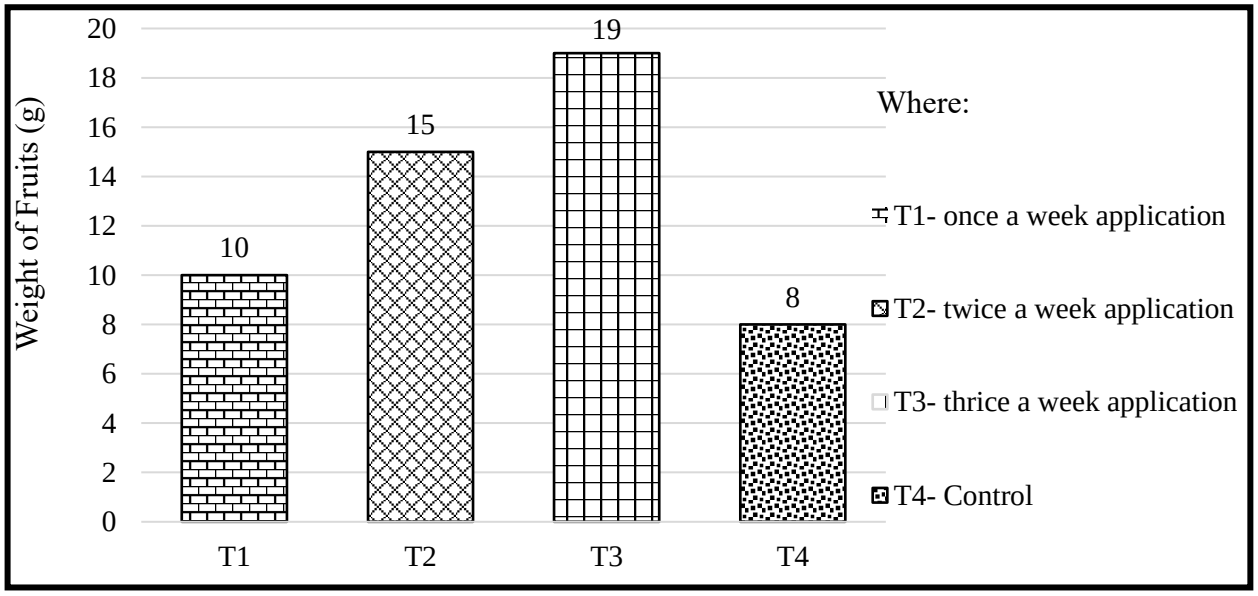

Figure 4. Average weight of fruit per plant as affected by the application of vermi tea at different frequencies

Yield in tons/ha

Figure 5 shows the average yield of eggplant as affected by the application of vermi tea applied at different frequencies. Plants applied with vermi tea at three (3) times a week recorded the highest yield with 8.90 tons/ha followed by twice a week application with an average yield of 6.84 tons/ha. The lowest yield was registered by control plants with 4.42 tons/ha. This means that there is an increase in weight and number of fruits if the application of vermi tea will be increased. The result of the study could be explained by Adeleke et al., 2015 and Chaulagain et al., 2017 that the increase in yield was due to the high available amount of macro and micro elements in vermi tea thus increasing amount would also increase the yield of crops.

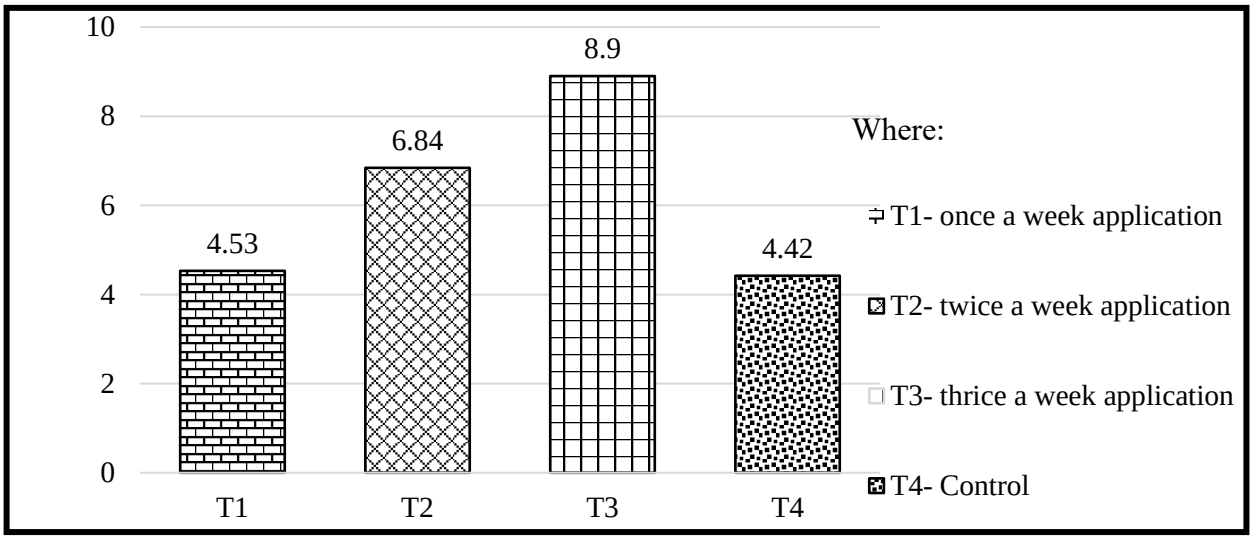

Figure 5. Average yield in tons/ha as affected by the application of vermi tea at different spraying frequencies

Partial Budget Analysis

Table 1 shows the partial budget analysis of the different substrates and frequencies of vermi tea application. The highest cost of production of P86,201.04 was recorded under thrice a week application since the amount of vermi tea and labor is an additional input. Lowest cost of production was also observed under control plants.

In terms of return of investment, the highest turn over of 186.78% was observed in thrice a week application because of the promising impact of vermi tea in the economic yield of crops. Plants applied with vermi tea at twice a week frequency recorded next with 139.01% return of investment. However, once a week application has a lower ROI compared to control plants.

Table 1. Partial Budget Analysis using Different Frequency of Vermi Tea Application

Particulars	Treatments			
A. Materials	Treatment 1	Treatment 2	Treatment 3	Treatment 4
Seeds	5400	5400	5400	5400
Fertilizer				
46-0-0	2556.52	2556.52	2556.52	2556.52
Vermi Tea (1.36 Liters/Ha)	2448	4896	7344	0
Irrigation	3000	3000	3000	3000
Compost	8000	8000	8000	8000
Sub Total	21404.52	23852.52	26300.52	18956.52
B. Labor (400) (MD)				
Plowing (3500@2)	7000	7000	7000	7000
Harrowing (3500@2)	7000	7000	7000	7000
Planting (8MD) (2)	6400	6400	6400	6400
Application of Fertilizer (5 MD)	2000	2000	2000	2000
Vermi Tea application	4800	9600	14400	0
Weeding (5MD) (2)	4000	4000	4000	4000
Harvesting (5MD) (8)	16000	16000	16000	16000
Sub Total	47200	52000	56800	42400
C. Miscellaneous	20000	20000	20000	20000
D. Total Production Cost (A+B+C)	157209.04	171705.04	186201.04	142713.04
E. Gross Income (60 FGP)	271800	410400	534000	265200
F. Net Income	114590.96	238694.96	347798.96	122486.96
ROI	72.89	139.01	186.78	85.82

SUMMARY, CONCLUSION, AND RECOMMENDATION

Summary

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Conclusion

Based on the result of the study, it could be concluded that the application of vermi tea up to thrice a week can increase the productivity and profitability of eggplant.

Recommendation

The application of vermi tea at a frequency of three times a week is recommended to increase productivity of eggplant and income of farmers.

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