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ENHANCING RED CHILI (CAPSICUM ANNUUM) PRODUCTION THROUGH COMBINED SAWDUST AND VERMICOMPOST AMENDMENTS

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ABSTRACT

This research studied the impact of using organic soil amendments to improve the growth and fruiting of Capsicum plants. The approach was to run a comparative experimental design and use qualitative narrative analysis for support. Through the Braun and Clarke (2006) thematic framework, the field data was coded to find the most common themes in the agricultural lifecycle. The analysis unveiled a "spiral" pattern where land preparation, collaborative field maintenance, and fruiting, harvesting phases that are normally considered linear steps are in fact an integrated system. Quantitatively, vermicompost was identified as the single best treatment leading to early vegetative vigor. It significantly helped in increasing plant height and number of leaves compared to both sawdust and the control group, most likely because of its high concentration of Nitrogen (N), Phosphorus (P) and Potassium (K) and presence of beneficial microorganisms. Nevertheless, at the reproductive phase, there was a change in the trend; vermicompost markedly enhanced flower production (p = 0. 00$), however, sawdust brought about greater total fruit yields over the nine, week period probably due to its nutrient release being more gradual. In fact, although these particular benefits were exhibited, growth in terms of plant structures between the treatment and control groups did not differ significantly in a statistical sense, thus it can be inferred that organic amendments mainly affected the timing of reproduction rather than the overall plant biomass. Farmers can maximize their yields by implementing integrated soil management where vermicompost application is focused on the seedling stage for building up plant structure followed by use of sawdust mulch during the fruiting.

Keywords: Red Chili (Capsicum annuum), Sawdust and Vermicompost

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INTRODUCTION

The Red Chili is valued for its bright red color, crunchy flesh, and strong flavor. It is the fruit of the Capsicum species, most often Capsicum annuum (but additional types include Capsicum frutescens and Capsicum chinense). Combining sawdust and vermicomposting can help plants flourish; the issue is often the fluctuating cost of chilies. Chili peppers (Capsicum annuum L.), as the second most economically important Solanaceous crop, play a prominent role in global cooking traditions and food security. However, their yield is getting limited by pests, diseases, and nutrient availability (Analisa et al., 2020; Muslimin et al., 2021). Besides the quite diverse content of vitamins and minerals (Hidayat, 2017) in chili, its development depends heavily on the environment and soil conditions (Hirawati, 2025). On top of that, the use of ecological agents like ectoenzymes and vermicompost exhibit a great potential for the improvement of soil fertility and plant resistance to diseases (Lim et al., 2014; Pereira et al., 2014). Vermicompost which contains a lot of macronutrients such as Nitrogen, Phosphorus and Potassium can stimulate the photosynthetic rate and increase the Total Chlorophyll Content (Theunissen et al., 2010). At the same time, organic materials such as sawdust and wood ash contribute to the improvement of soil texture and its water, retaining capacity (Shakir, 2024). The use of these combined organic methods not only provide a safeguard for the yield against the changing seasons but also represent a green substitute for chemical fertilizers ensuring a sustainable agrarian system in the long run (Goldan et al., 2023; Septarena, 2025). This study examines the effectiveness of sawdust and Vermicompost in growth production of (Capsicum annuum L.) red chili. Organic fertilizers for Capsicum annuum (red chili), sawdust and vermicompost helps improve soil structure and is rich in nitrogen, phosphorus, and potassium, which nourishes the soil, which will result in healthier plants and more. fruit. It helps the farmer because it is organic fertilizer it is safe because there is no chemical and for the plants to grow faster.

RESEARCH PROBLEM

The researchers aimed to determine the effectiveness of sawdust and Vermicompost on the production of red chili. Specifically, this study sought answers to the following questions:

OBJECTIVES:

1. How may the effectiveness of the sawdust, vermicompost, and control group on the red chili growth production be described in terms of: height; number of leaves; number of flowers; and umber of fruits?
2. Is there a significant difference between the sawdust, vermicompost, and control group chili growth production according to height, number of leaves, number of flowers and fruit weight?

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3. How are the overall effectiveness and success of the crop production cycle affected by students' methodical coordination of labor and agricultural tasks?

HYPOTHESIS

There is no significant difference between the sawdust, vermicompost, and control group chili growth production according to height, number of leaves, number of flowers and fruit?

MATERIAL AND METHODS

The study was conducted from July to September 2025 at San Pedro 2, Magalang, Pampanga. The experimental site was prepared according to standard horticultural practices suitable for *Capsicum annuum* (Red chili) cultivation. There was a fertilizer application Vermicompost and Sawdust. Notably, the composted Vermicompost and sawdust, was made using Hoe, rake, and spade, watering can measure tape, weighing scale such. The Vermicompost and Sawdust had a composition of the resting time 7 to 14 days after basal application of fertilizer especially organic fertilizers like vermicompost and sawdust compost is important for several reasons, avoids root burn, allows decomposition and nutrient release, and reduces harmful pathogens and weed seeds. Additional topdressing was done at 20 days after transplanting using the same respective organic fertilizers for each treatment fertilizer was applied using Vermicompost and Sawdust

Three treatments were used in the trial which were employed a randomized complete block design and repeat six times. These treatments include: T0 (Control), Vermicompost at rate of 1 kilo: T1, Sawdust at a rate of 1 kilo. When the plants were harvested, the following metrics were measured: leaf area (LA), leaf area index (LAI), net assimilation rate (NAR), crop growth rate (CGR), and fruit weight per plot. Each allotment was 100 x 500 cm and contains 20 plants. There was a 50 × 40 cm gap between and within each row.

STATISTICAL TREATMENT AND DATA ANALYSIS

The data collected were analyzed using Microsoft Excel. The average heigh and weight of red chili plants in each treatment group was computed using the mean formula. A one-way Analysis of Variance (ANOVA) was used to determine if there were significant differences among the groups. The results were interpreted at a 0.05 level of significance. The statistical treatments used this study were the Bonferroni, and the analysis of variants known as ANOVA, for testing the differences between the three treatments. The Mean was used to get the native chicken's average intake of the sample feeds. and Pearson's correlation was used to examine the statistical data interpretation. The observation narrative from preparation to harvest was analyze using the Braun and Clark 2006, thematic analysis model.

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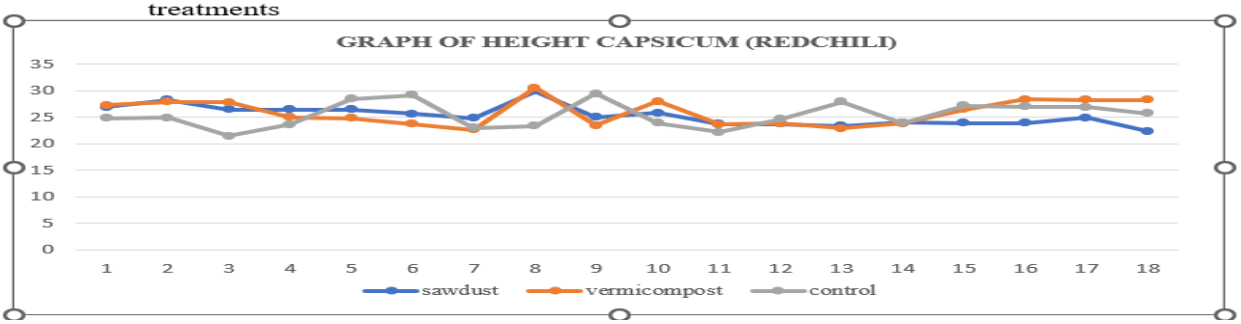
RESULTS

The graph shows the height of Capsicum (red pepper) in three treatments: sawdust, vermicompost, and control. Overall, vermicompost showed the highest growth because it is richer in nutrients and helps in fast and healthy growth of the plant, the plant size was about 25 inches. The plant grown in sawdust was lower in height because it is low in nutrients and therefore not very large. The control group, which did not receive any fertilizer, also showed low growth. This result shows that Vermicompost is the most effective fertilizer for growing red chili because it has a higher nutrient content and dissolves faster in the soil, making it easier for the plant to absorb nutrients. The results show that vermicompost is the most effective treatment for increasing the growth of Capsicum. The presence of heavy metals (Iron, Zinc, Manganese and Copper) and nutrients (Nitrogen, Phosphorus, Potassium) in the compost, vermicompost and soil were analyzed. The nutrients present in the vermicompost were found to be higher than that of compost and soil. Almost all the plant growth, yield and nutrient parameters increased significantly in vermicompost and compost when compared to that of soil or control. (Dey et al.,2019)

Graph 1: Height of capsicum Anuum (red chili) under sawdust, Vermicompost and control treatments



The graph shows the number of red chilies leaves over 40 inches using Sawdust, Vermicompost, and Control. In general, vermicompost showed the highest and most nutrients so the leaves contain higher and more balanced nutrients such as nitrogen, phosphorus, and potassium which are important for leaf growth and overall plant vitality. It also has beneficial microorganisms that help red chili absorb nutrients faster and more effectively. Sawdust is low in available nutrients and can cause nitrogen deficiency because it uses nitrogen as it decomposes, so growth is slower and fewer leaves are formed. The control group without fertilizer had the lowest number of leaves, which shows the importance of applying organic fertilizer. Therefore, vermicompost is more effective in increasing red chili leaves compared to sawdust and control. Plant height, leaf length, number of leaves per plant, chlorophyll content in leaves, fresh weight, dry weight etc. were measured. Significant increase in plant height, leaf length and fruit yield of pepper plants was observed in plots treated with vermicompost. (Narkhede., et al 2011). the results obtained were that organic phosphate fertilizer treatment affected leaf color, weight and length of fruit per plant. The vermicompost dose showed an effect on plant height, number of leaves, and fruit weight per plant. The interaction of organic phosphate fertilizer and vermicompost affected the number

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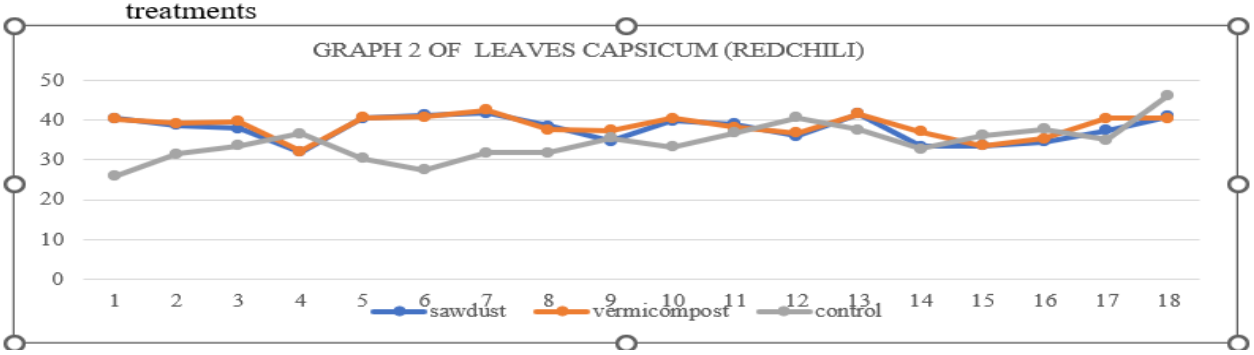
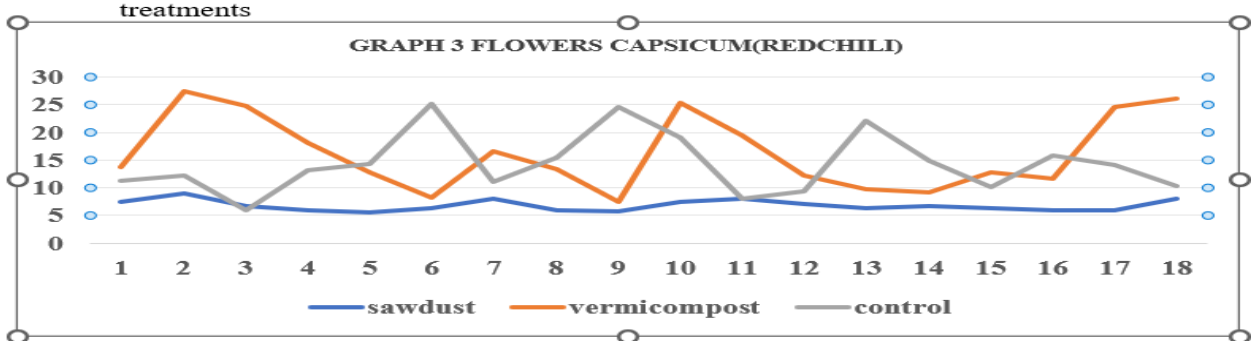
of fruits and fruit weight per plant. (Pamunkeys., et al)

Graph 2: leaves of capsicum Anuum (red chili) under sawdust, Vermicompost and control treatments



The graph shows three forms of soil treatment they are Sawdust, Vermicompost, and Control. Vermicompost reached its highest peaks at around 1, 6, 10 and 18, thus following correspondingly similar patterns. Control, on the other hand, showed spikes almost regularly at around 3, 7 and 11, while Sawdust was mostly at a low level with very little change. Higher peaks refer to nutrient flushes and biological activity. Variation is typical because living compost does not release nutrients instantaneously or uniformly. It tells that these plants had their normal response at the plants. The result indicates that red chili flowering maturity is the best fertilizer that is efficient and effective. This is because besides it makes the soil better, it provides a lot of essential nutrients such as Nitrogen (N), Phosphorus (P) and Potassium (K) as well as micronutrients. The finding in this article reveals that vermicompost tremendously enhances the growth of a plant. In this article, the author discusses how Vermicompost application determines soil health and fertility through the framework of sustainable agriculture. Vermicompost, essentially a naturally produced by earthworms, is abundantly packed with macronutrients and micronutrients, humic substances and beneficial microorganisms. Studies have suggested that its usage can improve the physical (example: aggregate stability, water retention), chemical (e.g. nutrient availability, pH balance), and biological (e.g. microbial).

Graph 3: flowers of capsicum Anuum (red chili) under sawdust, Vermicompost and control treatments



Over the course of 9 weeks, the line graph showed the of fruits red chili treated with sawdust, vermicompost, and control group. the sawdust outgrew the vermicompost, despite the vermicompost growing quickly in the first 4 weeks. accordingly, sawdust slower rate of decomposition offers sustained

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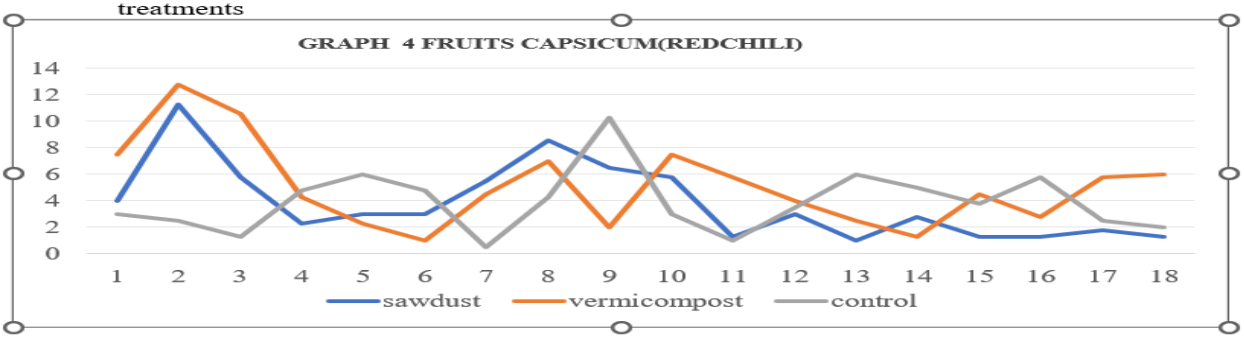
nutrition during the fruiting stages, while vermicompost releases nutrients more quickly, promoting early vegetative growth. the control group continuously fell behind, fruits lighting the importance of increasing crop productivity and soil fertility. These results are consistent with studies that highlight sawdust, vermicompost, and control group availability over the long term (Patel et al. 2020).

Graph 4: Fruits of capsicum Anuum (red chili) under sawdust, Vermicompost and control treatments



The analysis reveals that only a handful of differences among the treatments are statistically significant as per the p, values at the threshold of p<0. 05. In the comparison between Control and Sawdust, no significant differences in height, leaves, flowers, and fruits were detected since all the p, values were above 0. 05. Likewise, the results of the comparison between Control and Vermicompost show no significant differences as the p, values for height, leaves, flowers, and fruits were not at the level of significance. On the other hand, the comparison between Vermicompost and Sawdust reveals that only the p, value for flowers (p = 0. 00) displayed a significant difference, indicating that the treatment had a definite effect on this feature. As for the other traits such as height, leaves, and fruits, no significant differences were found. In fact, the only significant effect of the treatments was in the number of flowers between Vermicompost and Sawdust, whereas the other plant traits did not present statistical differences within the given threshold.

Significant difference between the sawdust, vermicompost, and control group chili growth production

	P-Value			
Treatment	**Height**	**Leaves**	**wers**	**ruit**
Control group vs Vermicompost	0.52	0.00*	.59	).21
Control group vs Sawdust	0.13	0.00*	.59	).29
Vermicompost vs Sawdust	0.48	0.70	00*	).80

*Significant

The overall effectiveness and success of the crop production

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Theme 1: land preparation/farm preparation

The garden project was planned and executed on the basis of three main steps: planting, clearing the area, and monitoring the growth. Through deep soil cultivation and removal of recyclable materials they not only ensured an environment that would be conducive to the plants' healthy growth but they also had a clean green space. In addition, the regular nose was a good way of judging the condition of the plants, that is, when they need feeding and also to detecting pests at an early stage. The students' teamwork and a wisely planned schedule of activities resulted in the completion of all these crucial tasks, and therefore the primary focus was on the plant health, so a high crop yield was guaranteed.

Theme 2: Planting /established of crops

The collaborated in carrying out various agricultural tasks which were mainly centered on the care of plants and the maintenance of the fields. And growth observation and fertilizer application were their activities, making sure that the plants were given the right nutrients. They concentrated on monitoring the growth of plants, at the same time, the field was kept in good condition by removing the weeds and the debris. Among the tasks were also the removal of weeds and watering so as to maintain the health of the plants. Furthermore, they also witnessed the fruiting stage as the plants grew mature. As a whole, the group demonstrated teamwork by sharing their duties in the different stages of crop care.

Theme 3: Crop maintenance/plant care

The change of roles indicates that the members of the household work together efficiently and that the management of the farm is very systematic. Removal of weeds is necessary for rejuvenating the soil while watering and fertilizing the plants help to make them strong, observing the plants will help to detect diseases and pests early, fruiting or flowering care thus ensures a good quality of the harvest. Besides, these complementary activities underscore the crucial roles of teamwork and continuous monitoring in farming success.

Theme 4: Reproductive stage/harvesting

The plant is subjected to a process which can be divided into three major stages: growth, fruiting, and harvesting. At first, the plant's growth is checked to make sure that it is still healthy. When the growth is ample, fruiting sets in and as the plant grows, flowers and fruits come out. Also, fruiting and harvesting may be performed at the same time, as it is possible to pick the already mature fruits while the others are still getting ready. Actually, this is a spiral process where growth, fruiting, and harvesting are connected and continue until the yield.

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DISCUSSION

Vermicompost was the organic amendment that most noticeably changed the vegetative growth of Capsicum as per the experiment. The plants grown with the help of vermicompost showed the highest growth level of 25 inches together with the maximum leaf yield. The successful use of vermicompost is believed to be related to its abundance in macronutrients, micronutrients (N, P, K, Fe, Zn), and beneficial microbes that a synergistic manner increases the nutrient availability of the soil. Without a doubt, vermicompost did help the plants get started but over the 9 weeks of fruiting, sawdust produced more fruits. Simply putting, vermicompost and sawdust have their own strengths and limitations. While vermicompost offers a quick dosage of nutrients that are perfect for the early growth stage of the plant, sawdust decomposes slowly and hence, can provide nutrition for the whole reproductive or fruiting stage. That said, data analysis reveals a significant outlier to this. Visually, most of the differences in plant growth were quite noticeable but mathematically, they were not significant at a probability level of greater than 0. 05 except for the number of flowers between the plants grown with the help of vermicompost.

CONCLUSION

Vermicompost is an excellent fertilizer to promote early vegetative growth and flowering in red chili plants since it has a high nutrient content and microbial activity. On the other hand, sawdust delivered the best results for continuous fruiting while the control group emphasized the need for fertilization. However, the lack of statistically significant differences in most cases indicates that soil amendments may not necessarily cause changes in all phenotypic traits within 9 weeks. In general, an effective crop production system should be a blending of the right land preparation method and its maintenance along with the use of organic fertilizers. Most importantly, vermicompost is a truly sustainable agriculture option since it significantly increases flowering and helps maintain soil fertility in the long run.

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