

Applying Chicken Manure On Various Planting Spacing On The Growth And Yield Of Chili Pepper (*Capsicum Frutescens* L.)

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Abstract

The Experiment was carried out In Batu-Vei, Guisu Village, Liquisa Municipality from July to November 2022, to determine the effect of the application of chicken manure and planting spacing on the growth and yield of Chili. The agronomic trials were arranged in a split-plot design, where the main plot consisted of three treatments of planting spacing (R): 60 cm x 70 cm (R1), 60 cm x 80 cm (R2), 60 cm x 90 cm (R3), and a subplot consisting of three treatments of Chicken manure fertilizer (C) were: without apply Chicken manure (C0), Chicken manure fertilizer 5-ton ha⁻¹ (C1) and chicken manure fertilizer 10-ton ha⁻¹ (C2). The treatment was replicated on three blocks with a total plot were 27 plots. The parameters observed were the plant height, diameter of the stem, number of leaves, number of fruits per plant, weight of fruit per plant, weight of fruit plot¹, and weight of fruit h⁻¹. The result showed that the organic fertilizer of chicken manure did not significantly affect all of the growth parameters except the weight of dry biological yield and all yield and yield components. On the other side, planting spacing significantly affected plant height, diameter of the stem, and number of leaves. However, did not influence all yield and yield components. However, no indicated interaction between organic fertilizer and planting spacing was observed at the growth and yield parameters. The yield per hectare of chili showed that the highest in chicken manure treatment was 10 t h⁻¹ about 1.71 t h⁻¹ and the lowest was without chicken manure about 1.42 t h⁻¹. On the other hand, the higher yield per hectare on planting spacing is 60 cm x 90 cm about 1.58 t h⁻¹, and for lower yield is 1.54 t h⁻¹ on planting spacing 60 cm x 70 cm.

Keywords: Chicken Manure; Planting spacing; Chili pepper

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I. Introduction

Red chili pepper (*Capsicum frutescens* L.) is one type of plant Commercially cultivated in horticulture. Chili plants also have economic value for producers and consumers in Timor Leste with content fairly complete nutrition. Generally, in Timor Leste, the productivity of chili plants is quite low. This is due to climatic factors, and farming techniques such as spacing, and fertilization of organic fertilizer as chicken manure, there are still a few varieties that have high yields, as well as attacks from pests and diseases. The Statistics Centre and Director General of Horticulture Timor Leste in 2022 revealed that the chili production achieved 18,865 tons per area cultivated with a harvest area of 4,367 ha and productivity of 4.32 t h⁻¹ (MAF, 2022). According to the results obtained red chili production in Timor Leste has stagnated from time to time. One of the causes of the decline in production is due to an increase in crop area, and lack of technology application as an application of chicken manure and utilization of proper space So, it is necessary to carry out intensive land use of proper technology in increasing crop yields and it is necessary to add chicken manure fertilizer as a nutrient intake for plants. Improvement of physical and chemical properties in soils can be done by adding organic matter in the form of chicken manure fertilizer in the soil.

The application of chicken manure is expected to improve the physical properties of soils in increasing the growth and yield of chili and allowing for a good growth process but to obtain optimal results, it is necessary to add sufficient nutrients to increase its yield. To meet the nutrient needs of these plants, additional fertilizers are given, namely inorganic fertilizers, such as chicken manure to add nutrients to the soil.

Objectives

This study aimed to determine the interaction between chicken manure and planting spacing on the growth and yield of chili pepper and to determine the best dose of chicken manure and the right planting spacing for the growth and yield of chili pepper.

II. Research Methodology

The research was carried out in Guisu village, Liquisa Municipality, from July to October 2022, at an altitude of 22 meters of sea level. This field trial used a split-plot design of a 3 x 3 factorial group with three treatments with a total of 27 plots. The first factor is planting spacing as a main plot with 3 levels of treatment, namely: 60 cm x 70 cm (D1), 60 cm x 80 cm (D2), and 60 cm x 90 cm (D3) The second factor is Chicken manure, consisting of 3 treatments levels: Without apply chicken manure (C0), Chicken manure doze 5 tones h⁻¹ (C1), chicken manure doze 10 t h⁻¹ (C2) as sub plot. The parameters measured in this research are plant height, diameter stem, number of leaves, yield per plant, yield per plot, and yield per hectare. The materials, tools, and equipment used in this study for tillage, Planting, maintenance, harvest, and measurements consisting of Chili seeds, chicken manure fertilizer, GPS, altimeter, calipers, pH meters, thermometers, roll meters, pen, papers, rulers, whiteboard marker, water hose, sprayer, ovens, tape meters, analytical balance, scale, hoe, plywood, nail, machete, herbicides. The treatments of soil preparation, planting, maintenance, crop care, and management were similar to common farming practices of Guisu Farmers Village.

Table 1. Combinations of 2 factors in the study

Planting Spacing (R)/ Main Plot	Chicken manure fertilizer (C)/ Sub Plot		
	C0	C1	C2
R1		R2	R3
R2		R3	R1
R3		R1	R2

Justification:

R1C0: Planting spacing 60 cm x 70 cm and without applying chicken manure fertilizer

R1C1: Planting spacing 60 cm x 70 cm and apply chicken manure fertilizer 5 tones h⁻¹

R1C2: Planting spacing 60 cm x 70 cm and apply chicken manure fertilizer 10 tones h⁻¹

R2C0: Planting spacing 60 cm x 80 cm and without chicken manure organic fertilizer

R2C1: Planting spacing 60 cm x 80 cm and apply chicken manure fertilizer 5 tones h⁻¹

R2C2: Planting spacing 60 cm x 80 cm and apply chicken manure fertilizer 10 tones h⁻¹

R3C0: Row spacing 60 cm x 90 cm and without chicken manure organic fertilizer

R3C1: Row spacing 60 cm x 90 cm and apply chicken manure fertilizer 5 tones h⁻¹

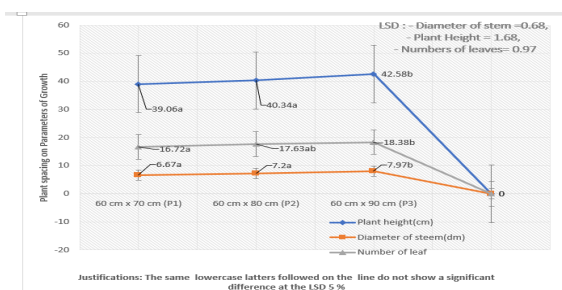
R3C2: Row spacing 60 cm x 90 cm and apply chicken manure fertilizer 10 tones h⁻¹

Data analysis was subjected to Analysis of variance (ANOVA) using the statistical program STAR 2.1. Treatment means were compared using the least significant difference (LSD) at the 5% level.

III. Results And Discussion

Growth components

The result of the analysis of variance show did not detect any interaction between plant spacing and chicken manure fertilizer on all of the growth parameters. However, both planting spacing and chicken manure factors show a significant influence on all growth parameters. The results of the 5% LSD test in Figure 1 showed that there was a different influence between planting spacing of 60 cm x 90 cm and 60 cm x 70 cm as well as 60 cm x 80 cm, however, did not show a difference between planting spacing of 60 cm x 80 cm and 60 cm x 70 cm on growth components. The use of a planting spacing of 60 cm x 90 cm provides better growth in the parameters of plant height 42.58 cm, stem diameter 7.97 dm, and number of leaves 18.38 (figure 1). The difference in influence is due to the use of wider distance to provide space for plants to more maximum freely utilize environmental factors so that competition between plants in the absorption of nutrients, water, and light can be suppressed. Adhikari et al. (2022), reveal that the wider distance between plants decreases, competition for light, nutrients, and space results in higher development of growth.



Picture 1. Effect of planting spacing on growth parameters

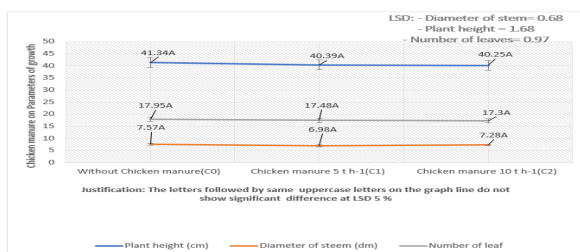


Figure 2. Effect of Chicken manure on Growth parameters

Picture 2 shows that did not indicate any effect of chicken manure on growth parameters. However, the application of chicken manure 10 t h⁻¹ represents the lower number of leaves were 17.3 sheets, stem diameter of 7.28 dm, and plant height of 40.25 cm. On the other hand, the higher value showed without adding chicken manure at all growth parameters (picture 2).

From these results, it could be said that the addition of chicken manure in the soil did not affect plant growth due to nutrient absorption by plants depending on the time of decomposition process by soil microorganisms and soil environment condition. Applying chicken manure at an appropriate time and environment, the soil's physical, chemical, and biological properties become better and improve the soil's physical structure. Improvement in soil structurization causes the roots of the plant to develop perfectly. Rizal and Halim (2020), added that the physical properties of the soil are proper, and the roots will develop deeper so that the absorption of nutrients and water needed by plants is also better which in turn will increase plant growth. Applying chicken manure could improve soil structure and increase nutrient availability and the growth of microorganisms.

Yield and Yield Components

Analysis of variance did not detect any interaction between Planting spacing and Chicken manure fertilizer on all parameters of yield and yield components. Table 2 shows that planting spacing did not significantly affect all yield and yield components. However, the highest value obtained by each parameter was a planting distance treatment of 60 cm x 70 cm for the number of fruits, while 60 cm x 90 cm on fruit weight per plant, and yield per hectare.

Table 2. Effect of planting spacing on yield and yield components

Planting Spacing	Parameters of yield			
	Number of fruits Per plant (gr)	Weight of fruit per plant	Weight of fruit per plot (kg)	weight of fruit h ⁻¹ (tone)
60 cm x 70 cm	57.78a	106.72a	0.96a	1.54a
60 cm x 80 cm	55.78a	107.76a	0.97a	1.55a
60 cm x 90 cm	51.11a	109.80a	0.99a	1.57a

LSD=14.40

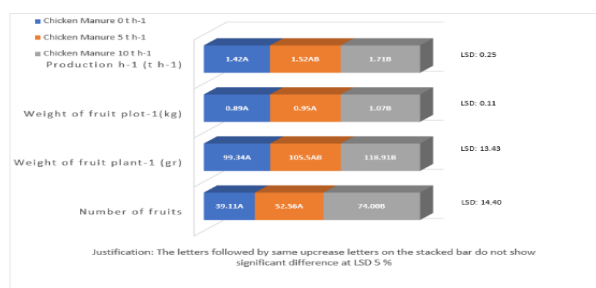
LSD=13.43

LSD= 0.11

LSD=0.25%

Justification: The letters followed by the same lowercase on the column do not show significant influence at the LSD 5 %

The results in Table 2 show a linear relationship between parameters in yield and yield components, except for the number of fruits per plant, where the use of wider planting distances provides higher yields than those with narrower planting spacing. Conversely, the use of narrower planting spacing leads to higher population numbers and the implication is that there is an increase in the number of fruits, however opposite decreases in weight per fruit on wider spacing as well as lower population. Akondo and Hossain (2019) reported that yield and yield component attributes were significantly affected by wider spacing. Furthermore, reveals that closer spacing reduced the yield per plant, due to the high competition in environmental factors.



Picture 3. Effect of chicken manure fertilizer on growth parameters

Oppositely shown in picture 3 that applying chicken manure reduced the yield and yield component of chili peppers respectively number of fruits was 39.11 fruits, the weight of fruit per plant was 99.34 gr, the weight of fruits per plot was 0.89 kg, the weight of fruit was per hectare was 1.42 t h⁻¹. Lower yield of production is caused by low nutrients in the soil, therefore applying material organics is important to increase the yield and yield component. The results of earlier studies carried out by Gangadhar et al. (2020) that plant growth and development are important for greater final dry matter and yields. To achieve this, sufficient amounts of nutrients should be applied to the soil through organic sources. Chicken manure an organic source of plant nutrients, contains a higher percentage of macro and micro nutrients for plant growth and yield.

IV. Conclusion

Transplanting at wider spacing produced significantly higher yield per plant, per plot, and per hectare. The spacing of 60 cm × 90 cm produced significantly higher yields per hectare. Applying chicken manure 10 t h⁻¹ obtained a significant yield per hectare of chili pepper and therefore we recommended this dose to apply.

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