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Effects of Different Mulching Materials on the Growth and Yield of String beans *(Phaseolus vulgaris)*

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Abstract— *Mulching provide benefits in crop production. This study was carried out to determine the effect of different mulching materials on the growth and yield of string beans (Phaseolus vulgaris). It was conducted at Western Mindanao State University Poblacion, Alicia, Zamboanga Sibugay. The study aims to determine which mulching material promotes optimal growth and yield. To evaluate the effect of mulching materials on the growth and yields. To determine the significant difference on the growth and yield as affected by different mulching materials. The experiment was done using a Randomized Complete Block Design (RCBD) with four treatments replicated three times. In plant height of string beans measured in centimeters as influence by different mulching materials. The blue plastic mulch obtained the highest mean of 60.27 cm. The lowest plant height with the mean of 26.74 cm was observed in yellow plastic mulch (T_4). In number of leaves, no mulch (control) (T_1) obtained the highest number of leaves with the mean of 14.1 leaves. The lowest number of leaves was obtained in yellow plastic mulch (T_4) with the mean of 11.17. Blue plastic mulch (T_3) has the highest average weight of fruits with the mean of 264.98 grams. The lowest average weight of fruits was obtained in yellow plastic mulch (T_4) with the mean 129.53 grams. Blue plastic mulch (T_3) has the highest average number of fruits with the mean of 14.89. The lowest average number of fruits was obtained in yellow plastic mulch (T_4) with the mean 8.22. The result can be summarized as follows; the plant height, average number of leaves, average weight of fruits and the average number of fruits shows no significant difference, suggesting that the different mulching materials did not influence the growth of string beans. The performance of the different mulches was similar to that of control.*

Keywords— *Growth, Mulching, RCBD, Yield.*

I. INTRODUCTION

Green beans (*Phaseolus vulgaris*), popularly known as string beans, have long edible pods and tiny inside seeds. Green beans as a major vegetable legume farmed by farmers. Legumes tolerate heat and drought and thrive on marginal soils. They are known for their ability of nitrogen in the soil, similar other legumes (Amanueletal,2000). In Swaziland, green beans are farmed on a limited scale, spanning wide range of climatic zones, yet it is possible to produce considerable quantities of green beans every year (VanSchoonhovenandVoysest1,993). Due to their high protein content and lower cost when compared to meat, which is a primary source of protein, beans are a crucial and competitive staple in the diets of the underprivileged. Legumes can be eaten as dried beans or as fresh green beans. When picked when the young, soft pods are still unripe, they are also commonly used as a vegetable.

In different locations, these immature pods are referred to as string beans, snap beans, French beans or green beans. They are rich in protein and iron and contain essential nutrients such as ascorbic acid, Vitamin A, Vitamin B and calcium (KellyandScott1992; Ndegwaetal.,2006). Green beans are very valuable crop when cultivated for the fresh market and area means by which local farmers can diversify their agricultural production. Green beans, grown for their tender pods require between 50-75 days, depending upon variety and planting season. An important first step in the production of high yielding green beans is the selection of the appropriate varieties, since some varieties are more suited to other climate and soil conditions.

Although green beans can perform well in many kinds of soils, best yields are obtained in well-drained, clay loam soil, rich in organic matter and with pH ranging from 5.5 to 7.5. String beans require a constant supply of moisture during the growing season and water deficiency or stress, especially during the blossom to pod set period, has been demonstrated to caused blossoms and pods drop, resulting in poor-quality crop and reduced yields. Also excess water at any time during growth has been shown to increase the plant's susceptibility to root rot infection, which also can reduce yields. Soil water management is therefore very critical to achieving commercially acceptable high yields in green beans cultivation (Tamu et al.,2021).

By cultivating the appropriate varieties, local farmers can become leading producers of this specialty crop. The evaluation and selection of high yielding, disease tolerant varieties with quality characteristics acceptable to the local market are essential to the improvement of local production (Kelly and Scott, 1992; Ndegwa et al., 2006). Total world production exceeds 17 million tones, with China, Indonesia, India and

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Turkey among the largest producers and consumers of this crop (FAOSTAT, 2010).

II. Materials and Methods

Time and place of the study

The study was conducted at Western Mindanao State University, Alicia Campus, Zamboanga Sibugay Province from September 14, 2025 to November 17, 2025.

Materials

The materials used in the study were the following: string beans seed, tape measure, sprinkler, notebook, Ball pen, digital weighing scale, fertilizer (Urea and complete fertilizer) pole, yellow and blue plastic mulch, organic mulch, straw rope twine, nylon rope, and pesticide.

Methods

The design of the experimental field was Randomized Complete Block Design (RCBD) with four (4) treatments replicated three (3) times.

The following treatments were.

T1- No Mulch (Control)
T2- Organic mulch
T3- Blue plastic mulch
T4- Yellow plastic mulch

Land Preparation and Field layout

Weeds and unnecessary materials were removed from the area. After cleaning, it was divided into three blocks with four treatment areas in each block.

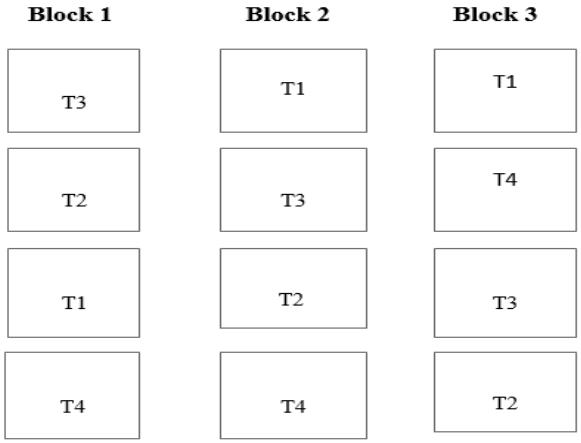

Figure1. Field layout

Total Experimental Area = 6 × 7 m^2
Dimension per Plot = 1.5 × 1.3 m
Distance between Blocks = 50 cm
Distance between Treatment = 100 cm
Number of Plots = 12

Legends:

T1– No Mulching (Control)
T2– Organic mulch
T3- Blue plastic mulch
T4- Yellow plastic mulch

Planting

The seeds were directly sowed into each hole. Water was sprayed to keep the soil sufficiently moist.

Mulching

The plots were covered with yellow plastic mulch before the seeds were sown in each planting hole. Based on the planting distance, planting holes were determined. Also the blue plastic mulch was spread before sowing the seeds.

The organic mulch was placed between the plants, at least two inches thick. The organic mulch was spread equally around the crop.

Watering

Watering of plants was done early morning and late afternoon from planting to harvesting using a sprinkler. Watering the plants also keep the soil consistently moist.

Harvesting

Harvesting was done in early morning if the fruit is matured and ready to pick.

III. Results

Height of the Plants

TABLE 1. Transform data on plant height (cm) of string beans influenced by the different mulching materials.

Treatment				Total	Mean
1	33.17	34.25	35.38	102.8	34.27
2	38.79	30.67	32.04	101.5	33.83
3	120.5	30.84	29.46	180.8	60.27
4	19.34	29.38	31.5	80.22	26.74
Block total	211.8	125.14	128.38		
Grand total				465.32	

Table 1 shows the plant height of string beans measured in centimeters as influenced by different mulching materials. As noted in the data, blue plastic mulch (T_3), obtained the highest mean of 60.27 cm. This was followed by no mulching (control) (T_1) with the mean of 34.27 cm and organic mulch (T_2) with the mean of 33.83 cm respectively. The lowest plant height with the mean of 26.74 cm was observed in yellow plastic mulch (T_4).

Number of Leaves

TABLE 2. Transformed data on average number of leaves of string beans influenced by the different mulching materials.

Treatment				Total	Mean
1	15	14.46	12.84	42.3	14.1
2	13.79	13.46	9.25	36.5	12.17
3	16.25	12.63	9.79	38.67	12.89
4	10.13	11.92	11.46	33.51	11.17
Block total	55.17	52.47	43.34		
Grand total				150.98	
Grand mean					12.58

Table 2 shows the average number of leaves per plant of string beans as influenced by the different mulching materials. As shown in the table, no mulch (control) (T_1) obtained the highest number of leaves with the mean of 14.1 leaves. This was followed by blue plastic mulch (T_3) with the mean of 12.89 leaves and organic mulch (T_2) with the mean of 12.17 leaves respectively. The lowest number of leaves was obtained in yellow plastic mulch (T_4) with the mean of 11.17.

Weight of the Fruits

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TABLE 3. Transformed data on average weight (grams) of string beans influenced by the different mulching materials.

Treatment				Total	Mean
1	191.67	353.67	155	700.34	233.45
2	459.3	78	57	594.3	198.1
3	394.3	244	156.64	794.94	264.98
4	113.3	90.3	185	388.6	129.53
Block total	1158.57	765.97	553.64		
Grand total				2478.18	
Grand mean					206.52

Table 3 shows the average weight of fruits of string beans as influenced by the different mulching materials. As shown in the table, blue plastic mulch (T_3) has the highest average weight of fruits with the mean of 264.98 grams. This was followed by no mulch (T_1) with the mean of 233.45 grams and organic mulch (T_2) with the mean of 198.1 grams. The lowest average weight of fruits was obtained in yellow plastic mulch (T_4) with the mean 129.53 grams.

Number of Fruits

TABLE 4. Transformed data on average number of fruits of string beans influenced by the different mulching materials.

Treatment				Total	Mean
1	10.3	21.3	10	41.6	13.87
2	23.3	6.3	4.3	33.9	11.3
3	18.67	15	11	44.67	14.89
4	7	6	11.67	24.67	8.22
Block total	59.27	48.6	36.97		
Grand total				144.84	
Grand mean					12.07

Table 4 shows the average number of fruits of string beans as influenced by the different mulching materials. As shown in the table, blue plastic mulch (T_3) has the highest average number of fruits with the mean of 14.89. This was followed by no mulch (T_1) with the mean of 13.87 and organic mulch (T_2) with the mean of 11.3. The lowest average number of fruits was obtained in yellow plastic mulch (T_4) with the mean 8.22.

Appendix 1. ANOVA. Plant height

					F tab	
SV	DF	SS	MS	F value	5%	1%
Block	2	1206.61	603.31	0.83		
Treatment	3	1954.43	651.48	0.90	4.76	9.78
Error	6	4361.04	726.84			
Total	11	7522.09				

CV=69%
Ns=non-significant

The non-significant result of the plant height of string beans may be due to the variety of string beans used which was Bongga. Bongga variety of string beans has a good tolerance to heat and dry seasons that are genetically engineered to grow in the harsh climate of the country. This variety of string beans can grow vigorously by providing its essential needs without the help of mulching.

Appendix 2. ANOVA. Number of leaves

SV	DF	SS	MS	F value	5%	1%
Block	2	62.19	31.09	0.65		
Treatment	3	79.71	26.57	0.56	4.76	9.78
Error	6	286.48	47.75			
Total	11	428.39				

CV=14%
Ns= non-significant

The result shows no significant difference among the treatments as shown by the analysis of variance. The result indicates that the different mulching materials had no variation to influence the number of leaves of string beans.

Appendix 3. ANOVA. Weight of fruits

SV	DF	SS	MS	F value	F tab
Block	2	47096.59	23548.30	1.27	
Treatment	3	30421.38	10140.46	0.55	
Error	6	111595.59	18599.27		
Total	11	189113.56			

CV=66%
Ns=non-significant

However, the results showed that there is no significant difference between the control and the other treatments in the parameter measured. It indicates that the different mulching materials did not influence the weight of fruits of stringing beans.

Appendix 4. ANOVA. Number of fruits

SV	DF	SS	MS	F value	5%	1%
Block	2	19.22	9.61	3.06		
Treatment	3	13.70	4.57	1.46	4.67	9,78
Error	6	18.82	3.14			
Total	11	51.73				

CV= 57%
Ns=non-significant

The result shows no significant difference within the treatment. It indicates the failure of the experiment to detect any difference among the treatment.

IV. Summary and Conclusion

The study entitled "Effect of different mulching materials on the growth and yield of string beans (*Phaseolus vulgaris*) was conducted at the Western Mindanao State University, Poblacion, Alicia Campus, Zamboanga Sibugay from September 14, 2025 to November 17, 2025. The objectives of the study were: To determine which mulching material promotes optimal growth and yield, providing insights for farmers to enhance their cultivation practices. To evaluate the effect of mulching materials on the growth and yield. To determine the significant difference on the growth and yield as affected by different mulching materials.

The study was carried out in Complete Randomized Block Design (RCBD) with four treatments and replicated three times. Treatments were as follows: T_1- no mulch (control), T_2- Organic mulch, T_3- Blue plastic mulch and T_4- Yellow plastic mulch.

The parameters used to determine the effect of the different treatments were; plant height, average number of leaves, average weight of fruits, and average number of fruits.

The result can be summarized as follows; the plant height, average number of leaves, average weight of fruits and the average number of fruits shows no significant difference, suggesting that the different mulching materials did not

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influence the growth of string beans. The performance of the different mulches was similar to that of control.

V. RECOMMENDATION

With the result it is recommended to the farmers to use mulching as one of their farming practices however, the use of mulching materials will depend on the purpose of the farmer. To the researcher, it is also suggested that further research should carried out to the following: Try other crops that has longer life span should also be research on the different mulching materials to determine its influence on the growth and yield of the crop. Choose other kind of crops that are suitable for specific mulching materials.

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