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Effect of Different Organic Fertilizers in Growth and Fruit Yield of Tomato in Khandbari, Sankhuwasabha, Nepal.

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Abstract

A field experiment was conducted to determine the effects of different organic fertilizers on the growth and yield of tomatoes at Khadbari-3, Maruwa, Sankhuwasabha from February 2023 to May 2023. The experiment was carried out in a randomized complete block design with five treatments (oil cake, bone meal, goat manure, pig manure, and control) and four replicates. The experimental results revealed that the highest yield was obtained from plots treated with Oilcake (5.17 kg/plant), followed by bone meal (5.29 kg/plant) and pig manure (4.93 kg/plant). The minimum plant yield was obtained from the control plot (4.13 kg/plant), followed by goat manure (4.48 kg/plant). The maximum vegetative parameters, plant height (103.40 cm), number of branches (10), and number of leaves (55.60), were recorded in the plot treated with oilcake, and the corresponding minimum values, plant height (69.05 cm), number of branches (6.55), and number of leaves (41.70), were found in the control plot. The experiment suggests that the application of oilcake as a fertilizer in tomatoes has increased fruit yield.

Keywords: Organic fertilizers • Performance • Tomato • Yield

1. Introduction

Tomato (*Solanum lycopersicum*), belongs to the family Solanaceae and is one of the most important vegetable crops in the world. The Spanish discovered a herbaceous plant with edible fruit in the Americas, named "tomatl", which was translated to Spanish as tomato (Saavedra et al., 2016). In Nepal, tomatoes rank third after Cauliflower and Cabbage in terms of area and production, with 22,911 ha and 422,703 tons, respectively (Government of Nepal, Ministry of Agriculture and Livestock Development, 2023). They are versatile foods for cooking and can be used as a base for savoury dishes, pulps, juices, sauces, and jams. The Horticulture Research Division (HRD) developed the Srijana variety, Nepal's first hybrid, which is superior in terms

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of productivity and resistant to bacterial wilt and late blight (Horticulture Research Division (HRD), 2015). After the development of Srijana variety, studies have shown that the popularity and demand of the Srijana variety has been increasing among farmers (Magar et al., 2016).

Inorganic fertilizers were not available on time, and their cost is increasing rapidly to the extent that they are out of reach of small and marginal farmers. It was found that the farmers had the false concept that the excessive use of any chemical fertilizer would increase the yield. Many farmers are unaware of the scientifically suggested fertilizer application rates. Instead, they apply fertilizers when and where they feel they are needed, frequently in quantities and with constituents depending on what is available and inexpensive in the markets (Kishore et al., 2021). Excessive inorganic fertilizer use has caused several environmental problems, such as soil acidification degradation and water eutrophication (Tian et al., 2017).

Organic manures such as cow, goat, and pig manure and oilcake are easily available locally. Organic fertilizers are the best potential sources of different macro-and micronutrients which improve soil characteristics and fertility. Most of the research and training performed there was conducted to achieve the highest increase in the success rate, but very few studies focused on the efficiency of the input being used. The farmers were unaware of the technical efficiency of the inputs used. This research aims to help farmers with lower socioeconomic conditions to practice farming by utilizing locally available input resources.

2. Materials and Methods

The experiment was conducted at Khandbari-3 Maruwa, Sankhuwasabha. The area is at 27° 24' 25.0" N latitude & 87° 12' 03.9" E longitude and elevation of about 100 masl. The climate of the experimental area was subtropical. The Randomized Complete Block Design (RCBD) was used. The Srijana variety of tomato was used in this study. There were five treatments and four replications, and treatments within the block were allocated randomly. The experimental plots were divided into four blocks, each consisting of five plots. Thus, the total number of plots was 20. Individual plots of 2 m in length and 2 m in breadth were prepared. Row-to-row spacing of 75 cm and plant-to-plant spacing of 45 cm were maintained. Each plot consisted of three rows with four plants each and accommodated 12 plants per plot. The total number of plants was 240 from 20 plots. The experimental area was prepared by ploughing and cross ploughing with a power tiller, followed by harrowing and levelling. Four types of fertilizers were used: T1= Bone meal, T2= Oilcake, T3= Goat manure, T4= Pig manure, and T5 was the control treatment. Cow, goat, and pig manure were applied at a rate of 20t/ha (6 kg/plot), mustard oil cake was used at a rate of 1.5t/ha (450gm/plot), and bone meal was used at 1t/ha (300gm/plot). Bone meal was used as a treatment because it was easily available, as farmers applied it as fertilizer in citrus-growing areas. One-month-old healthy seedlings were transplanted at a spacing of 75 cm × 45 cm in the experimental plots on 1 April 2023. Irrigation was performed twice a week. Tomato plants were subjected to pinching, and the lateral shoots were pinched to improve bushy growth. Frequent shallow hoeing was performed to improve yield and reduce weed growth. Two to three weeing's were performed before flowering. Staking was provided 3 weeks after planting. Two parameters were recorded: growth parameters (plant height, number of branches per plant, and number of leaves per plant) and yield parameters (number of flowers per plant, number of fruits per plant, yield of fruits per plant, and average yield of fruits). The means of all treatments were calculated, and analysis of variance for each of the characters under study was performed using the F test. The differences among the treatment means were evaluated using Duncan's Multiple Range Test (DMRT) (Gomez and Gomez, 1984).

3. Result and Discussion

3.1 Plant Height

There was a significant variation in plant height among the different organic fertilizers. According to the data collected at 35 DAT, the maximum plant height was found in the plot treated with oilcake (103.40 cm), followed by bone meal (86.25 cm), pig manure (83.55 cm), goat manure (72.45 cm), and control (69.05 cm).

3.2 Number of Branches

There was a significant difference in the number of branches among the treatments. The maximum number of branches per plant was observed in plots treated with oilcake (10), followed by plots treated with bone meal (8), pig manure (8), goat manure (7), and the control plot (6).

3.3 Number of leaves

A significant variation was found in the number of leaves among the treatments. The maximum number of leaves was observed in the plot treated with oilcake (55), followed by bone meal (50), pig manure (49), goat manure (47), and the control plot (41).

Table 1: Effect of different organic fertilizers on vegetative parameters at 35 DAT

Treatments	Plant height (cm)	Number of branches	Number of leaves
Oilcake	103.40^{a}	10.00^{a}	55.60^{a}
Bone meal	86.25^{b}	8.90^{b}	50.65^{ab}
Pig manure	83.55^{b}	8.25^{b}	49.70^{b}
Goat manure	72.45^{c}	7.50^{c}	47.60^{b}
Control	69.05^{d}	6.55^{d}	41.70^{c}
SE(m)	0.39	0.09	0.78
F-value	***	***	**
CV(%)	2.12	5.12	7.16
Grand mean	82.94	8.24	49.05

Note: *** represents significant at 0.1%; ** significant at 1%.

3.4 Number of flowers

The number of flowers was not significantly different ($p<0.01$) among the treatments. The maximum number of flowers was found in the plot treated with oilcake (84.45), followed by bone meal (68), pig manure (66.21), goat manure (62.21), and control (50.50).

3.5 Number of fruits

Number of fruits were significantly different ($p<0.01$) among treatments. The maximum number of fruits was found in the plot treated with oilcake (22.25), followed by bone meal (16), pig manure (14.25), goat manure (13.25), and the control plot (10.50).

Table 2: Effect of different organic fertilizers on yield attributing parameters at 50 DAT

Treatments	Number of flowers	Number of fruits
Oilcake	84.45^{a}	22.25^{a}
Bone meal	68.00^{b}	16.00^{b}
Pig manure	66.21^{b}	14.25^{c}
Goat manure	62.21^{c}	13.25^{c}
Control	50.50^{d}	10.50^{d}
SE(m)	0.62	0.17
F-value	***	***
CV(%)	4.17	5.04
Grand mean	66.38	15.25

Note: Means followed by different superscript letters differ significantly; *** significant at 0.1% level.

3.6 Number of flowers

There was a significant difference in the number of flowers among the treatments. The maximum number of flowers was found in the plot treated with oilcake (21), followed by bone meal (18), pig manure (16), goat manure (15), and control (13).

3.7 Number of fruits

A significant difference was found in the number of fruits among the treatments. The maximum number of fruits was found in the plot treated with oilcake (43.25), followed by bone

meal (39.50), pig manure (37), goat manure (35.75), and control (30.75).

3.8 Yield

There was a significant difference in the yield per plant among the treatments. The maximum yield per plant was recorded in the plot treated with oilcake (4.19 kg/plant), followed by those treated with bone meal (3.63 kg/plant), pig manure (3.30 kg/plant), goat manure (3.03 kg/plant), and the control (2.77 kg/plant).

Table 3: Effect of different organic fertilizers on yield attributing parameters at 80 DAT

Treatments	Number of flower	Number of fruit	Yield/plant
Oilcake	21.00^a	43.25^a	4.19^a
Bone meal	18.50^b	39.50^b	3.63^b
Pig manure	16.75^c	37.00^c	3.30^c
Goat manure	15.00^d	35.75^c	3.03^d
Control	13.00^e	30.75^d	2.77^e
SE(m)	0.21	0.24	0.02
F-value	***	***	***
CV(%)	5.63	2.88	3.59
Grand mean	16.85	37.25	3.39

Note: Means followed by different superscript letters differ significantly; *** significant at 0.1% level.

4. Conclusion

The results showed that different types of organic fertilizers caused significant differences in growth and yield among the treatments. The maximum yield per plant (5.17 kg), maximum number of fruits per plant (45.5), and maximum number of flowers (84.45) were found in plots treated with oilcake, while the corresponding minimum values, with a yield of (3.5 kg), 32 fruits, and 50.5 flowers, respectively, were recorded in the control plot. Significant differences were observed in the vegetative parameters between the two groups. The maximum average plant height (103.4 cm), maximum average number of branches (10), and maximum number of leaves (55.6) were found in the plots treated with oilcake, while the corresponding minimum values, that is, plant height (69.05 cm), number of branches (6.55), and number of leaves (41.7), were obtained from the control plot. Our research shows that it is possible to obtain a better yield of tomatoes using locally available organic fertilizers. In particular, the use of oilcake as a fertilizer was found to be very satisfactory.

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