

Effect of Different Organic Manure on Growth and Yield of Radish in Deukhuri, Dang, Nepal

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Abstract

A field trial was conducted during winter season in radish of variety Mino Early at the farm of Prithu Technical college to know the effect of different organic manure. The experimental plot was plotted in the completely randomized block design with 7 treatments and 3 replications; the treatments were FYM 20 ton/ha, poultry manure 20ton/ha, mustard cake 5 ton/ha, 50% FYM + Mustard cake, 50% FYM and 50% poultry manure, 33% FYM + 33% poultry manure + 33% Mustard cake and control plot with no fertilizer. This experiment results maximum plant height (48 cm) in mustard cake application followed by FYM+ Mustard Cake Application, maximum number of leaves (19.02) at 65 days was obtained in Mustard cake application followed by Poultry manure application. There is significantly higher root yield (59.89 t/ha), shoot weight (24.97 t/ha) and total weight (98.58) with application of mustard cake.

Keywords: Mino Early; Poultry Manure; Mustard Cake; Farm Yard Manure; Root Yield; Shoot Weight

Abbreviations

FYM: Farm Yard Manure; RCBD: Randomized Complete Block Design; DMRT: Duncan's Multiple Range Test; ANOVA: Analysis of Variance; DAS: Days After Sowing; CD: Critical Difference; CV: Coefficient of Variation; Sem: Standard Error of Mean.

Introduction

Radish the most important root crop is grown widely all over the country. It is annual and biennial crop which botanical name is *Raphanus sativus*, originated in Europe and Asia. It is mainly cool season crop which is popular in both tropical and temperate regions. The fleshy edible portion of the root develops from both primary root as well as the hypocotyl. Roots vary greatly in size, shape and other external characteristics as well as in the length of time they remain edible. Radish is a cool season vegetable but can tolerate high temperature. The best quality roots are produced at temperature between 10 to 15.5°C. Roots may acquire a repulsive flavour and become more fibrous and mature early at higher temperature. Radish contains glucose as the major sugar and smaller quantities of fructose and sucrose. It is also good source of vitamin- A and C and also rich source of minerals like calcium, potassium and phosphorus. Pink-skinned radishes are generally richer in ascorbic acid than white-skinned ones. The vitamin C content of radish roots is greatly influenced by light conditions and fertil-

izer [1]. Leaves and pods of some cultivars can be boiled and eaten as a vegetable. It has refreshing, diuretic and cooling properties. It is also used for neurological headache, sleeplessness and chronic diarrhea. The leaves of radish are good source for extraction of protein on a commercial scale and radish seeds are potential source of nondrying fatty oil suitable for soap making illuminating and edible purposes. Being a short duration and quick growing crop, the root growth should be rapid and uninterrupted. Radish is the highest value nutritive root crop containing per 100 g edible portion as 94.4 g moisture, 3.4 g carbohydrate, 0.1g fat, 0.8g fiber, 0.6g mineral and 0.7g protein. Radish is rich in vitamin C (ascorbic acid) and contain 15-40 mg of edible portion as well as a variety of minerals. It consists of glucose as the major sugar and smaller quantities of fructose and sucrose. The characteristic pungent flavor of radish is due to the presence of volatile isothiocyanate (trans-4-methyl thiobutenyl isothioyanate). Bible and Chong [2] reported that accumulation of thiocyanate yielding components is altered by nutrients. With increasing sulphur level thiocyanate increase linearly. In commercial scale Radish are a good source for extraction of proteins [3-5] and the seeds of radish are good source of a non-drying fatty oil that are suitable for making soap illuminating and edible purpose. Radish are mainly grown for its young tuberous roots that are eaten raw as salad or cooked as vegetable radish is known as appetizer and relished for its pungent flavors. Young leaves can be

cooked as vegetable. Radish consist of refreshing and depurative properties. Radish is used as medicine in liver and gall bladder troubles. pod leaves roots flower are active against gram positive bacteria. Specially roots are useful in urinary complaints, piles as well as gastrodynia.

A salt extracted from roots, dried and burnt to white ash is said to be used in stomach troubles. Due to increasing population, the demand is increasing day by day so the production systems using chemicals and fertilizers were adopted that has dramatic effect on the enhancement of production and productivity, but not without a cost. Land degradation, decline in factor productivity and all health hazards, attracted the attention calling for organic farming for sustainable production. The recent condition with various environment pollution is detrimental to the sustainability so there is an urgent need for adoption of farming practice which ensures health of soil, human, animal and environment. Nowadays, people are focusing to organic.

Materials and Methods

The field experiment was conducted at Prithu Technical College, Lamahai-1, Deukhuri, Dang from October 2018 to January 2019. The latitude, longitude and altitude of experimental site is 27.99' N, 82.30' E of 567.29 masl. The experimental design was RCBD design with 7 treatments that are Control, FYM 20 t/ha, Poultry manure 20ton/ha, Mustard cake 5 t/ha, 1:1 FYM + Mustard Cake t/ha, FYM + Poultry Manure and FYM+ Poultry Manure + Mustard Cake with 3 replications. The variety used in the experiment was Mino Early. The size of plot is 2m * 1.6 m and spacing 20 cm* 20 cm and plant population is 80 plants per plot and 5 plants are taken as sample plants. Before the experiment conducted ph, Carbon % and Organic manure percentage and cropping history is also recorded. The interaction with farmers to understand the effect of manure and fertilizer was also done. All the agronomic practices like thinning and gap filling, irrigation, weeding and intercultural operation was done.

Figure a: Weather data recorded at Research Field during research period (19 November 2018 to 24 January 2019) at Lamahi, Dang. (Source: NASA Power).

Organic fertilizers were incorporated into the soil two weeks before planting. The parameters were recorded at 10 days' interval from 5 sample plant from each plot. Fresh and dry mass was

determined at harvesting. Root diameter, root length, shoot length, root weight, shoot weight and total weight were measured at harvesting. After harvesting, soil analysis and plant analysis were done. The vegetative data recorded are plant height, and number of leaves at 10 days and interval and reproductive data recorded are root length, root diameter and dry matter, root weight with top and root weight without top at the time of harvesting and benefits cost ratio was also recorded.

After collection of data, recorded data during the study were processed to fit into R studio software for analysis, Microsoft excel program was used for data tabulation, and Duncan's multiple range test (DMRT) was carried out at 5% level of significance. The data entry was done to develop ANOVA table. Correlation and regression analysis were done for group comparison and to test the main and interaction effects.

Results and Discussions

Effects of organic fertilizer on vegetative parameter

Maximum plant height (48.766 cm) and maximum number of leaves (19.266) was obtained from plot where Mustard cake is applied. There is significant high plant height was obtained in plot where poultry manure, mustard cake, FYM + Mustard cake, FYM + poultry Manure and FYM + Poultry Manure + Mustard Cake than Control and FYM applied plot. The maximum number of leaves per plant was obtained in a plot where Mustard cake is applied followed by poultry manure.

Treatments	Plant Height 65 DAS	Number of Leaves per plant
Control	27.166 b	13.333 d
Farm Yard Manure	28.400 b	13.666 d
Poultry Manure	41.300 a	18.733 ab
Mustard Cake	48.766 a	19.266 a
FYM + Mustard Cake	42.866 a	17.266 bc
FYM + Poultry Manure	39.366 a	16.333 c
FYM + Poultry Manure + Mustard Cake	43.400 a	16.066 c
Grand Mean	34.87	16.38
F test	***	***
CD	10.50	1.68
CV %	15.23	5.78
SEm	34.87	0.89

Table 1: Effect of different organic manure on vegetative trait.

Note: FYM: Farm Yard Manure; CD: Critical Difference; CV: Coefficient of Variation; Sem- Standard Error of Mean.

Effect of different organic manure in different reproductive trail

There is no significant variation in root length (65 DAS) among the different organic fertilizer and highest shoot length (65 DAS), Root diameter (65 DAS), root weight (65 DAS), shoot weight (65 DAS) was obtained with application of mustard cake treatment.

Maximum root yield (59.89 t/ha) was obtained in mustard cake applied plot followed by FYM + Poultry Manure + Mustard Cake, i.e. 46.344 t/ha and least root yield (22.75 ton/ha) in control plot. Zhou-Dongmei, *et al.* [6] reported that the effect of application of livestock and poultry manures on growth of radish (*Raphanus sativus* L.) and pakchoi (*Brassica chinensis* L.) as well as their Cu and Zn uptake [7-25].

Relationship between root length (cm) and root weight (t/ha)

A linear positive correlation between root length and root weight was observed in experiment. The root weight was found significantly positive correlation ($r = 0.56$) with root length of radish. The equation $y = 4.9162 X - 72.983$ and R^2 gives best fit (Figure 1). The contribution of root length (cm for increase in maximum root weight was 31.52%.

Treatments	Root length (65 DAS)	Shoot Length (65 DAS)	Root Diameter	Root weight (65 DAS)	Shoot weight (65 DAS)	Total weight (65 DAS)
Control	20.333 a	19.008 b	2.663 b	22.750 f	10.295 d	33.045 e
Farm Yard Manure	23.033 a	18.528 b	2.686 b	29.787 de	13.960 cd	43.747 de
Poultry Manure	20.23 a	27.440 a	2.943 b	27.181 e	30.505 ab	57.686 bc
Mustard Cake	22.860 a	29.763 a	3.633 a	59.896 a	39.061 a	98.958 a
FYM + Mustard Cake	23.63 a	27.683 a	3.076 b	40.055 c	26.888 b	66.944 bc
FYM + Poultry Manure	23.513 a	24.893 ab	2.980 b	33.485 d	21.763 bc	55.248 cd
FYM + Poultry Manure + Mustard Cake	23.100 a	28.270 a	2.926 b	46.344 b	24.252 bc	70.596 b
Grand Mean	22.38	25.08	2.98	37.071	23.81	60.88
F test	Ns	***	*	***	**	***
CD	6.28	6.41	0.54	4.03	10.72	12.69
CV %	15.90	14.49	10.4	6.12	25.30	11.71
SEm	12.68	13.21	0.096	5.15	36.34	50.90

Table 2: Effect of different organic manure in different reproductive trait.

Note: FYM: Farm Yard Manure; CD: Critical difference; CV: Coefficient of variation; Sem- Standard Error of Mean.

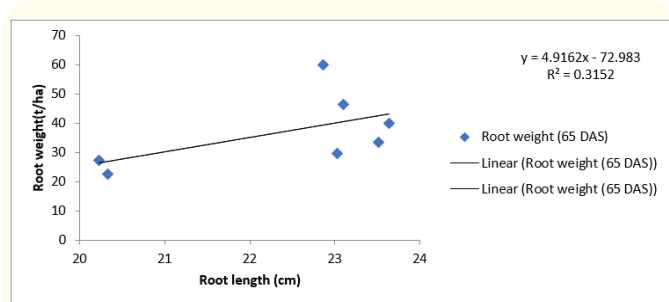


Figure 1: Estimated linear relationship between Root length (cm) and root weight (t/ha) in radish

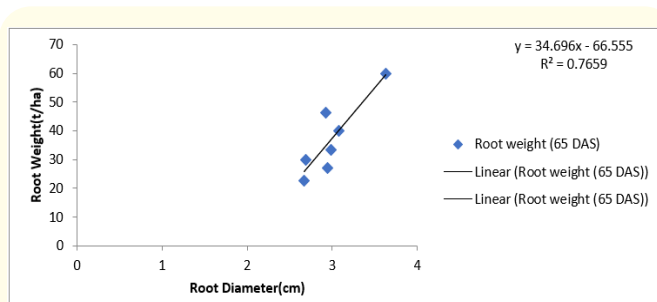


Figure 2: Estimated linear relationship between Root Diameter (cm) and root weight (t/ha).

A strong linear positive correlation was obtained between root diameter and root weight. The radish root yield was found significantly positive correlation ($r = 0.87$) with root diameter. A unit increase in diameter of root of radish would increase the root weight by 34.69 times.

Economic analysis

From the above experiment highest benefits cost ratio (2.85:1) was obtained from plot where Mustard cake was applied followed by plot where FYM + Poultry manure+ Mustard cake was applied. Low benefit cost ratio was obtained from control plot.

Treatments	Root yield (t ha ⁻¹)	Gross income (Rs ha ⁻¹)*	Expenditure (Rs ha ⁻¹)	Net income (Rs ha ⁻¹)	B:C ratio
T1 (control)	18.401	23921.3	18450	5471.3	1.20:1
T2 (FYM)	23.641	30733.3	22450	8283.3	1.36:1
T3 (Poultry Manure)	20.698	26907.4	22450	4457.4	1.19:1
T4 (Mustard Cake)	43.318	56313.4	19750	36563.4	2.85:1
T5 (FYM+ Mustard cake)	32.214	41878.2	21100	20778.2	1.98:1
T6 (FYM+ Poultry Manure)	26.664	34632	22450	12182	1.54:1
T7 (FYM+ Poultry manure +Mustard Cake)	36.973	48064.9	21519	26545.9	2.23:1

Table 3: Economic analysis of different treatment.

Note: Sale rate of produce Rs. 1300/t.

Conclusion

On the basis of present investigation, it is concluded that the radish variety Mino Early responded well in terms of growth and yield parameters with the application of different organic manure.

The application of Mustard cake 5ton/ha(T4) was found significantly superior as compared to other organic manures and recorded maximum growth (viz., plant height, number of leaves plant-1, yield parameters (i.e. root length, root diameter, root weight with top (total weight), root weight without top (root weight only).

Significantly maximum marketable root yield of radish 43.318 t ha⁻¹ was recorded in T4 (Mustard Cake) and cost benefit ratio 1:2.85 followed by T7 (FYM + Poultry Manure + Mustard Cake) (36.973 t ha⁻¹, 1: 2.23 root yield and cost benefit ratio, respectively) While, minimum cost benefit ratio 1: 1.19 was obtained in the T3 (Poultry Manure) due to higher expenditure on the treatment which calculated root yield 20.698 t ha⁻¹ as compared to other treatments.

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