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Research Article

Effects of Different Sources of Organic Manures in Growth and Yield of radish (*Raphanus sativus* L.)

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Abstract

A field experiment was conducted in an Inceptisols with sandy loam soil of the research farm of Agriculture and Forestry University, Rampur, Chitwan, Nepal from October 2016 to January 2017 to evaluate the effects of different sources of organic manure in growth and yield of radish. The experiment was carried out in a Randomized Complete Block Design with six treatments (Poultry manure, goat manure, FYM, biogas byproduct, recommended dose of fertilizer and control) and was replicated four times. Pyuthane Red variety (released on 1994) of radish was used as a test crop. After analysis of primary nutrients of the organic manures, the amount was fixed on the basis of recommended nitrogen (100 kg N per hectare) as a reference value. The application of organic manures significantly increased the plant height, number of leaves, leaf breadth, root length, root diameter and biomass yield. The highest biomass yield (75.16 Mg/ha) and highest root yield (49.41 Mg/ha) was obtained from poultry manure application which was similar with recommended rate of fertilizer. The study suggested that application of poultry was found more beneficial and significantly improved growth and yield of radish.

Keywords*:* Organic manure; Radish; poultry manure; yield.

Introduction

Radish (*Raphanus sativus*L.) belongs to the family Brasicacceae is a popular root vegetable in both tropical and temperate regions of Nepal. Radish is grown for its young tender tuberous root which is consumed either cooked or raw. It is good source of vitamin-c and minerals like calcium, potassium and phosphorus. It has refreshing and diuretic properties. Being a short duration (70-80 days) and quick growing crop, the root growth should be rapid and uninterrupted. For good root development, it needs friable and light soil having good water holding capacity. Continuous use of chemical fertilizers causes the compaction and depletion of organic matter. Continuous synthesis and use of chemical fertilizers creates potential polluting effect in the environment and consumes a large amount of energy and money (Oad *et al*, 2004). As a recent trend very little work was carried out on organic farming of radish. Organic agriculture practices rely upon recycling of crop residues, animal manure, farm organic residues and wastes etc. (Choudhary *et al*., 2002; Stockdale *et al.*, 2001). Application of organic manure is a basic risk management strategy to counter depletion of organic matter in soil and

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improving physio-chemical properties of soil. There is growing interest in the use of organic manures due to depletion in the soil fertility and economic premiums for certified organic grains have been driving many transition decisions related to the organic farming (Delate & Camberdella, 2004). Recently emphasis has been given on organic vegetable production which minimizes cost of production, increases quality of product, and maintains fertility of soil.

Methodology

The field experiment was conducted at the horticulture farm of the Agriculture and Forestry University (AFU), Rampur, Chitwan, Nepal. The experiment was set in a randomized complete block design with six treatments (poultry manure, goat manure, FYM, biogas byproduct, recommended dose of fertilizers and control) and four replications. The area of each plot was 8 m^2 (4 m×2 m). As a test crop Pyuthane Rato variety of radish was planted in geometry 30cm x 20 cm. For control treatment, recommended dose of chemical fertilizer 100:60:40 kg NPK/ha was used. Where full dose of P and K and half dose of N were applied as basal dose and the remaining 1/2 N was applied at 35 DAS during intercultural operation. For other treatments, the required quantity of organic manures from various sources was incorporated into the soil 15 days prior to seed sowing.

Table 1: Nutrient status of various organic manures

Organic manures	pH	N (%)
Poultry manure(PM)	7.8	3.5
Goat manure(GM)	8	1.25
FYM	7.4	0.95
Biogas by-product(BGP)	7.2	0.70

Note: Nutrients content in the organic manure was calculated on dry weight basis.

The quantities of organic manures for the experiment were calculated on the basis of their respective nitrogen content (Table 1). The seven plants were tagged randomly with red thread leaving two rows in each side for data collection. Then bio-morphological characters of seven tagged plants were recorded at 20 DAS, 35 DAS, 50 DAS and at final harvest. The recorded observations were statistically analyzed using analysis of variance by Gen Stat.

Results and Discussion

The plant height, leaf number and leaf breadth of radish were significantly increased with the application of organic manures. The highest plant height, leaf number, leaf breadth and petiole length was obtained from the application of poultry manure. Poultry manure being the rich sources of micro and macronutrients, having low C: N ratio supplies nutrients continuously to the soil and plants**.** Sunassee (2001) reported that about 30% of nitrogen from poultry litter was in nitrate or ammonical form and thus was readily available to plant species. Also, Stephenson et al. (1990) and Oladotun (2002) reported that poultry manure contained macro and micro nutrients such as N, P,K, Ca, Mg, Cu, Bo and Fe.

Effect of different sources of organic manures on root length, root diameter of radish and yield is shown in Table 2.

The highest root diameter, root length and yield of radish obtained from poultry manure treatment could be due to the least value of C/N ratio of poultry manure also encouraged faster decomposition and quick release of nutrients for crop uptake and higher root yield parameters. This observation was supported by Ijoyah and Sophie (2009) who reported that the application of poultry manure increased cabbage yield. Costellanos and Pratt (1981) estimated that 60 per cent of the organic N in poultry manure was available. Due to its rapid mineralization, poultry manure was recognized as a valuable source of plant nutrients for crops. Espitiru *et al.* (1995) reported that the crop yield improvement due to addition of poultry manure was attributed to the presence of both readily available and slow release nitrogen. The increase in yield might not only due to nitrogen but also due to the presence of other nutrients. The application of RDF significantly increased the root diameter and radish yield than that of goat manure and biogas byproduct application and this could be due to the supply of readily available nutrients from the NPK fertilizer to the plant. This observation agreed with that of Makinde (2013) who reported that an increase in the readily available nitrate from the NPK fertilizer unlike the organic manure which must be mineralized before being utilized by crops.

Table 2: Effect of different sources of organic manures on plant height, leaf number and leaf breadth

	Plant height (cm)			Number of leaves				Leaf breath (cm)			
Treatment	20 DAS	35 DAS	50 DAS	20 DAS	35 DAS	50 DAS	65 DAS	20 DAS	35 DAS	50 DAS	65 DAS
PM	21.61^{a}	39.11^{a}	44^{a}	6.321^{b}	10.07^{a}	13.54^{a}	12.5^{a}	7.964^{a}	11.143^{a}	11.61^{a}	12.39^{a}
GM	17.46^{bc}	29.25^{bc}	34.3^{bc}	5.821^{b}	8.54^{b}	12^{b}	10.82^{ab}	6.393^{bc}	9.0^{b}	10.04^{ab}	10.18^{bc}
FYM	17.96^{bc}	29.36^{bc}	33.3^{bc}	5.107^{c}	8.39^{b}	10.43^{c}	10.93^{ab}	7.017^{ab}	9.357^{b}	9.86^{ab}	9.79^{c}
BGP	18.64^{b}	29.36^{bc}	34.3^{bc}	5.857^{b}	8.18^{bc}	10.54^{c}	10.57^{b}	6.714^{bc}	8.643^{b}	9.8^{ab}	10.18^{bc}
RDF	18.46^{b}	34.43^{ab}	40.5^{ab}	7^{a}	10^{a}	12.79^{ab}	12.07^{ab}	6.536^{bc}	10.821^{a}	11.79^{a}	11.79^{ab}
Control	15.79^{c}	25.50^{c}	30.1^{c}	4.714^{c}	7.25^{c}	9.89^{c}	8.89^{c}	5.857^{c}	8.643^{b}	9.32^{b}	9.21^{c}
Grand Mean	18.32	31.26	36.1	5.8	8.74	11.53	10.96	6.76	9.6	10.42	10.6
SEM ±	0.812	1.969	3.02	0.2191	0.331	0.439	0.52	0.314	0.483	0.729	0.535
LSD (0.05)	2.449	5.936	9.11	0.6604	0.997	1.324	1.606	0.947	1.456	2.196	1.613
C.V %	8.9	12	16	7.6	7.6	6.7	9.7	9.3	10.1	14	10.1

Means followed by the same letter (s) in a column are not significantly different at 5% level of significance as determined by DMRT

Table 3: Effect of different sources of organic manures on root length and root diameter of radish

Treatment	Root Length (cm)				Root diameter (mm)		
	20 DAS	35 DAS	50 DAS	65 DAS	35 DAS	50 DAS	65 DAS
PM	12.75^{a}	22.83^{a}	26.03^{a}	27.96^{a}	26.49^{a}	37.21^{a}	42.82^{a}
GM	10.62^{c}	18.25^{c}	22.70^{bc}	23.01^{b}	23.31^{ab}	31.42^{ab}	33.89^{b}
FYM	10.84^{bc}	18.42^{c}	20.75^{cd}	23.31^{b}	23.94^{ab}	33.83^{ab}	36^{ab}
BGP	10.98^{bc}	18.75^{bc}	21.46^{cd}	22.82^{b}	23.71^{ab}	31.83^{ab}	33.47^{ab}
RDF	11.97^{ab}	20.86^{ab}	24.37^{ab}	24.07^{b}	23.79^{ab}	33.42^{ab}	35.83^{ab}
Control	9.28^{d}	15.50^{d}	19.50^{d}	19.63^{c}	20.84^{b}	28.25^{b}	31.80^{b}
Grand Mean	11.07	19.1	22.47	23.47	23.6	32.66	35.63
SEM±	0.384	0.748	0.856	0.722	1.133	2.121	2.342
LSD (0.05)	1.156	2.253	2.579	2.176	3.415	6.394	7.059
C.V %	6.9	7.8	7.6	6.2	9.6	13	13.1

Means followed by the same letter (s) in a column are not significantly different at 5% level of significance as determined by DMRT

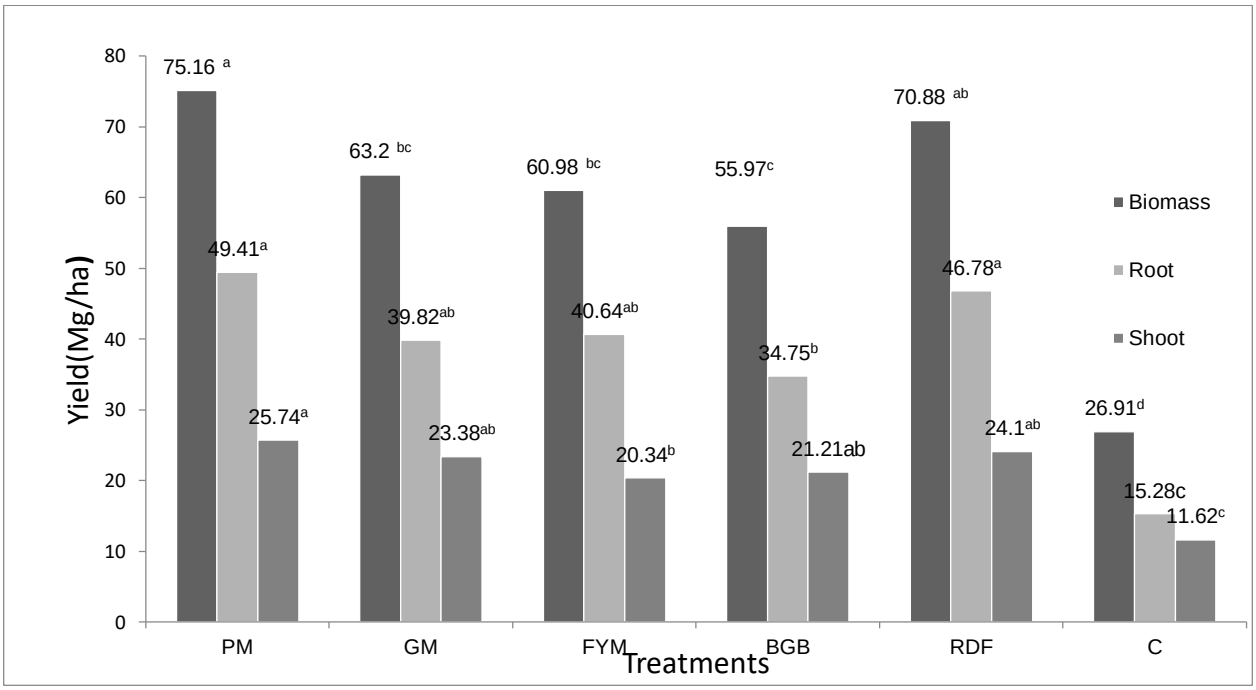

Fig. 1: Effects of organic manures on biomass root and shoot yields of radish.

Similarly, many researchers have found that addition of animal manure resulted in higher onion yield and nutrient uptake compared to NPK fertilizer. (Kumar et *al.*, 2001, Rumpel, 1998 and Sharma *et al.*, 2003). These results were also consistent with several researchers (El- Nemer et al 2005; Yasmeen et al 2009; Agele, 2001; Akani, 2005). Zakaria and Vimala (2002) also reported higher yields with chicken manure than with inorganic fertilizer for lettuce and tomatoes. Chicken manure is slightly basic with a pH 7.8 and higher organic matter and available plant nutrients contents relative to other organic materials.

Conclusion

The application of organic manures significantly increased the plant height, number of leaves, leaf breadth, root length, root diameter and biomass yield. It is concluded that application of poultry manure was found more beneficial source of organic manure and significantly improved growth parameters and yield of Pyuthane red variety of radish at grown under Rampur, Chitwan condition.

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