

Original Research Article

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Effect of Different Organic Manure and Inorganic Fertilizers on Soil Characteristics and Growth Attributes and Yield of Bottle Gourd [*Lagenaria siceraria* (Mol.) Standl.] under Indo-Gangatic Belt

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ABSTRACT

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A field experiment was conducted at Agricultural Research Farm, Baba Raghav Das Post Graduate College, Deoria affiliated to Deen Dayal Upadhyay Gorakhpur University, Gorakhpur (U.P.) during kharif season 2017-2018 to study the response of organic manures and inorganic fertilizers on soil characteristics and growth attributes and yield of bottle gourd on sandy loam soil. City solid waste (7.5 t ha⁻¹), Poultry Manures (7.5 t ha⁻¹), Farm Yard Manures (7.5 t ha⁻¹) and vermicompost (7.5 t ha⁻¹) were applied during preparation of field. The maximum growth attributes and yield of bottle gourd observed in vermicompost treated plots followed by poultry manures, farm yard manures and city solid waste as well as higher growth attributes and bottle gourd were recorded in 100 Kg N ha⁻¹ followed by 75, 50 and 25 Kg ha⁻¹, respectively. The soil pH slightly decrease while Bulk Density, Electrical Conductivity and Organic Carbon is increased due to organic manures added. The mineralization of organic matter to build up available inorganic N, P, K nutrients to available NPK in soil.

Introduction

Bottle gourd [*Lagenaria siceraria* (Mol.) Standl.] is one of the most important cucurbitaceous vegetable crops grown throughout the tropical and subtropical region of the country. Bottle gourd is rich nutritional contains protein, fat, carbohydrates, minerals and vitamin. It has become popular due to antioxidant, antidiabetic and antiobese proportion (Chadha, 2019). Its seed kernels contain 45% oil and 35% protein. Hard shells

of mature fruits are used as water jugs, domestic instruments and made musical instruments. It is highly digestible and cooling effect on human being.

The higher yield and maximum returns to vegetable crops of Indian farmers. Integrated plant nutrients management is one of the current methods of supplying nutrients to the plants through organic as well as inorganic fertilizers means together to fulfil the nutrient requirements. The main aim of integrated

plant nutrient management is to minimize the use of chemical fertilizers. Compost, vermicompost, poultry manure, farm yard manure are bulky organic manures although supply slow and balance of all essential plant nutrients for several year. Balance dose of NPK to plant give maximum production due to sufficient amount of nutrient absorb by plants (Satish Singh Baghel, 2017). The continuous use of inorganic fertilizers and unbalance to adverse effect on soil physical, chemical and biological properties. Considerable attention in the recent past with hope to meeting the farmer's economic need as well as maintaining favourable ecological condition on long basis.

Organic material may be boon to the poor and marginal farmers.

They cannot afford to use fertilizers in the requirement quantities. The organic manures have narrow C: N ratio and it mineralised rapidly after incorporation into the soil resulting release of nutrient for the use of growing crops (Bhandari *et al.*, 1992).

Materials and Methods

Field experiment was conducted at Agricultural Research Farm, Baba Raghav Das Post Graduate College, Deoria affiliated to Deen Dayal Upadhyay Gorakhpur University, Gorakhpur (U.P.) during kharif season 2017-18. The soil was sandy loam, pH 7.8, electrical conductivity (EC) 0.24dSm⁻¹, low organic carbon (0.36%) and available NP and K in experimental soil were 190.2, 14.6 and 186.3 Kgha⁻¹, respectively.

Twenty five treatment combination consisting four organic manures viz. city solid waste (7.5 t ha⁻¹), poultry manures (7.5 t ha⁻¹), farm yard manures (7.5 t ha⁻¹), vermicompost (7.5 t ha⁻¹) and with levels of N (0, 25, 50, 75 and 100 Kg ha⁻¹ having three replication in split plot

design. City solid waste collected from Deoria City it is 70% degradable material, poultry manure collected from 5 KM distance from Agricultural Research Farm, farm yard manures taken from near dairy farm and vermicompost prepared back side of Agricultural Chemistry department, raw material used as 20 days old cow dung. Making vermibed size 10×3×2 feet with the help of bricks, cement and sand under iron shed all side was open. Earthworm species i.e. *Eisenia foetida* was inoculated 1 Kg for 50 Kg dung to 50-55 days vermicompost prepared. Bottle gourd seed were sown in the field at a spacing of 2×1 m in plot size 4×3 m. Five plant were selected at random each plot of each treatment as representative sample for recording the data. Applied various organic manures in the experimental plot at field preparation.

Soil sample were taken before addition of organic manures and after harvest of bottle gourd. The basal application of 60 Kg P₂O₅ and 60 Kg K₂O through single super phosphate and potassium chloride was done further the bottle gourd received N doses as per treatments through urea at the rate of 1/3rd before sowing as basal remaining 2/3rd of N applied in 2 split doses. First split doses to be applied 25-30 days after sowing and second one at flowering stage.

Standard method and procedures were followed for analysis of soil such as pH and EC in 1:2.5 soil and distilled water suspension with the help of pH and EC meter method (Jackson, 1973), bulk density (BD) by core cutter method (Jackson, 1973), organic carbon in soil sample by chromic acid digestion method (Walkeley and Black, 1934) available NPK in soil by alkaline permanganate method (Subbiah and Asija, 1956), (Olsen *et al.*, 1954) and neutral normal ammonium acetate extract method (Jackson, 1973), respectively.

Results and Discussion

Effect of organic manures and levels of nitrogen on growth attributes of bottle gourd

The data pertaining to bottle gourd (Table 1) reveals that maximum growth attributes and yield were days taken to appearance of first female flower (58), length of main vine (4.73 m), no. of primary branches per vine (12.28), percent fruit set (58.76), no. of fruit per vine (11.93), weight of fruit (1080 g), total yield per vine (11.16) and yield (265.39 qha⁻¹) in vermicompost treated plots followed by poultry manures, farm yard manures and city solid waste, respectively (Chaudhary *et al.*, 2019). The plot receiving organic manures along with recommended dose of fertilizers recorded higher growth attributes and in 100 KgNha⁻¹ followed by 75, 50, 25 and 00 Kg ha⁻¹ during both the year of bottle gourd. Similar finding have also been reported by (Neaz *et al.*, 2017). The incorporation of organic manures in the plot leading to fast mineralization might have released nutrient at faster rate resulting into higher growth attributes and yield of bottle gourd. The significant improvement in soil NH₄-N oxidised to NO₃-N at different growth stage of bottle gourd. These observations are also in agreement with finding of (Goswami *et al.*, 1988).

Physico-chemical properties of soil

Bulk density is most properly to be affected by levels of organic matter in soil because added material has lower density than soil matrix, therefore, the relationship improved aggregate condition and a reduction in bulk density. Data given in Table-2 reveals that bulk density of soil got decrease significantly in vermicompost incorporated plots followed by poultry manure, farm yard manure and city solid waste after harvest of bottle gourd. The

applied organic manures and inorganic fertilizers gave lower bulk density in 100 Kg N ha⁻¹ followed by 75, 50, 25 Kg ha⁻¹.

During decomposition of applied organic manures several polysaccharides and humus are produced which may be responsible for binding the soil particles resulting is more stable aggregate and causing reduction in bulk density. The reduction of Bulk Density also occurrence to relatively higher organic matter content in soil which would have improved porosity of such soil. Dehanns (1977) had reported that green manures added to sandy soil decrease bulk density.

After harvest bottle gourd addition of organic manures combines with fertilizers slightly reduced soil pH and increased EC of soil as compared to control plots. Reduced the pH was treatment received vermicompost followed by FYM, poultry manure and city solid waste, respectively. Organic manures affect soil pH due to produced organic acid and CO₂ during decomposition, which can furnish proton to soil inducing a decreased in soil pH. Generally showed that slightly change EC appeared by applied organic manures and combined fertilizers which increased EC due to soluble salt. The EC data showed that EC of the soil was significantly higher in organic manures combined with fertilizers field. The similar result was reported by Dekamedhi and Datta (1995). Bellakki and Badanur (1997) have also reported that organic carbon of surface and subsurface soil increased significantly with organic manures along with recommended dose of fertilizer application. The increased the higher organic matter in vermicompost plot followed by farm yard manure, poultry manure, city solid waste and fallow. The maximum organic carbon in organic manure treated plot along with recommended dose of 100 Kg N ha⁻¹ followed by 75, 50 and 25 Kg ha⁻¹.

Table.1 Effect of organic manure manures and levels of N on growth attributes of bottle gourd (Pooled data two year)

Treatments	Days taken to appearance of first female flower	Length of main vine(M)	No. of primary branches per vine	Percentage fruit set	No. fruit per vine	Weight of fruit	Total yield per vine	Yield Q ha ⁻¹
Fallow	63	4.11	11.88	48.62	9.65	820	7.04	210.60
City Solid Waste	60	4.26	11.90	54.10	11.02	976	10.11	242.16
Poultry Manure	59	4.38	12.09	55.41	11.71	991	10.21	250.43
Farm Yard Manure	60	4.58	11.96	55.21	11.56	982	10.41	245.76
Vermicompost	58	4.73	12.28	58.76	11.93	1020	11.16	265.34
SE±	0.24	0.23	0.16	0.29	0.62	16.34	0.17	2.61
CD (O= 0.05)	0.62	0.56	0.38	0.72	1.52	40.06	0.42	6.68
Nitrogen Levels								
N ₀	62	3.83	11.32	49.24	9.32	801	7.81	198.80
N ₁	60	4.16	11.91	51.43	10.10	902	9.10	220.11
N ₂	58	4.33	12.24	52.86	10.53	930	9.82	235.02
N ₃	58	4.62	12.68	54.70	12.36	1020	10.73	265.94
N ₄	56	4.76	13.02	56.28	12.93	1036	11.42	277.43
SEm±	0.20	0.24	0.17	0.31	0.60	15.64	0.15	2.70
CD(P=0.05)	0.42	0.51	0.68	0.66	1.22	32.13	0.34	5.52

Table.2 Effect of organic manures and levels of N on physico-chemical properties of after harvest of bottle gourd (Pooled data two year)

Treatments	BD	pH	EC dSm ⁻¹	Organic Carbon g Kg ⁻¹	Available Nutrient Kg ha ⁻¹		
					N	P	K
Fallow	1.48	7.7	0.24	3.8	190.25	14.90	190.63
City Solid Waste	1.45	7.6	0.25	4.0	203.11	15.16	209.82
Poultry Manure	1.43	7.6	0.28	4.3	206.31	16.81	216.81
Farm Yard Manure	1.42	7.5	0.27	4.4	204.50	15.50	212.30
Vermicompost	1.39	7.4	0.28	4.6	210.32	18.50	220.40
SEm±	0.01	0.09	0.01	0.11	1.56	0.73	1.53
CD(P=0.05)	0.03	NS	0.03	0.30	4.12	1.93	3.47
Nitrogen Levels							
N ₀	1.46	7.6	0.24	3.6	185.40	14.40	180.20
N ₁	1.43	7.6	0.25	3.9	190.60	15.82	196.60
N ₂	1.42	7.5	0.26	4.0	200.68	16.42	210.50
N ₃	1.39	7.5	0.28	4.3	207.00	17.06	221.58
N ₄	1.37	7.4	0.30	4.5	215.17	19.93	228.53
SEm±	0.01	0.07	0.01	0.12	1.42	0.58	1.47
CD(P=0.05)	0.02	NS	0.02	0.26	2.86	1.18	2.78

The data pertaining to available NPK status of soil after harvest of bottle gourd in given Table-2. Data reveals that available N of surface soil increased significantly with addition of vermicompost combined with inorganic fertilizers followed by poultry manures, farm yard manures and city solid waste. The addition of organic manures treated plot multiplication of microbial population which conversion of organically bounded N to NO_3 inorganic form. The organic manures C:N ratio less than 20:1 favour the mineralization process of soil N leading to build up of higher available N. Similar findings also have been recorded by Bhandari *et al.*, (1992). Talanur and Badanur (2003) have also confirm that available P in soil increased due to addition of organic manures application alone and contribution with NPK fertilizers. Data pertaining to available status revealed that organic manures with inorganic fertilizers treated plot recorded maximum amount of available K in soil. The increase K may be due to direct addition of K to surface soil. The result of study reveals that available NPK build up were higher in treatment receiving in vermicompost inoculated plot followed by poultry manures, FYM city solid waste. The higher NPK were recorded in organic manures along with 100 Kg N ha^{-1} followed by 75, 50 and 25 Kg ha^{-1} . These findings get a support from that of Prasad *et al.*, 2015.

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