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Influence of different organic manures and inorganic fertilizers on yield and yield traits of turnip (*Brassica rapa* L.) cv. purple top white globe

Gyanendra Singh, Vipin Masih Prasad, Vijay Bahadur, Nikhil Vikram Singh and Netra Pal Yadav

Abstract

The experiment was laid out in a Randomized Block Design (RBD) with 17 treatments along with combinations of organic manure and inorganic fertilizer including control and each treatment replicated thrice. The turnip (*Brassica rapa* L.) crop in Brassicaceae family with purple Top White Glove variety was grown with each comprising of treatment replicated thrice. Result revealed that the application of T₁₂ (50% NPK + 50% N through Poultry manure) influenced most of the characteristics significantly and recorded the highest values of Root length (14.66 cm, 15.42 cm, and 15.04 cm), Root diameter (11.68 cm, 12.67 cm, and 12.18 cm), Days to attaining good root size (45.16 days, 44.55 days and 44.86 days), Fresh weight of whole plant (518.58 g, 587.10 g and 552.84 g), Dry weight of root (28.97 g, 31.58 g and 30.28 g), Fresh weight of whole plant (773.38 g, 846.32 g and 809.85 g), Root yield (8.03 kg/plot, 8.59 kg/plot and 8.31 kg/plot), Root yield per hectare (35.69 t/ha, 38.18 t/ha and 36.94 t/ha) for the year 2018-19, 2019-20 and as pooled respectively.

Keywords: Inorganic fertilizers, FYM, vermicompost, poultry manure and yield

Introduction

Vegetables are nature's wonderful gift to humanity. Most of us enjoy veggies for their colour, flavour, and taste, but they also supply unique and essential nutrients to our bodies. Vegetables are an essential part of a well-balanced diet. They are high in vitamins, minerals, and antioxidants such as polyphenolic flavonoids, vitamin C, and anthocyanins. These substances not only protect the human body from oxidative stress caused by free radicals, but they also improve the body's immunity. Vegetables are also high in fibre, which aids digestion and slows the absorption of blood glucose. They are known to lessen the risk of cancer, control blood pressure, and protect the heart due to all of these properties.

The turnip (*Brassica rapa* L.) is a member of the cruciferae family. It is a winter crop as well as a popular root vegetable crop. It is botanically a plant, but it is grown as an annual root crop for both human and animal sustenance (Suma and Anita 2021) [18]. The young leaves, which are strong in vitamin C, iron, and vitamin A, are consumed as a green vegetable. Furthermore, turnip leaves and roots are high in roughages, vitamins, and minerals, which are essential for good health. Turnip bulb pulp includes 0.12% fat, 2.2% fibre, 7.84% carbs, 34mg calories, 1.10% protein, and no cholesterol per 100g (Susan, 2010) [16]. Forage turnip is a crop that provides a chance to bridge a gap in quality forage and availability during the month that is not optional for forage production.

Poultry manure provides sufficient macro and micro nutrients for horticulture crop development, productivity, and quality. Poultry manure has also gained prominence in crop production methods due to its nutritional value and ability to preserve soil physical and chemical qualities. If left exposed for 30 days, it will lose 50% of its nitrogen. When compared to other bulk organic manures, poultry manure includes more nitrogen and phosphorus. 1.5% N, 1.5% P₂O₅, and 1.8% K₂O are the typical nutritional contents (Yadav *et al.* 2019) [22].

Materials and Methods

An investigation entitled "Influence of different Organic Manures and Inorganic Fertilizers on Yield and yield traits of Turnip (*Brassica Rapa* L.) cv. Purple Top White Globe", was carried out during (2018-19 & 2019-20) at Horticulture Research Farm, Department of Horticulture, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj

(Allahabad), U.P., India-211007. The experiment was laid out in a Randomized Block Design (RBD) with 17 treatment along with combinations of organic manure and inorganic fertilizer including control and each treatment replicated thrice. The turnip (*Brassica rapa* L.) crop in Brassicaceae family with Purple Top White Globe variety was grown with each comprising of treatments replicated thrice. Source of variables were NPK, FYM, Vermicompost, Poultry Manure and Goat manure (at 25%, 50%, 75% and 100%) and combination of them with control treatment taken as seventeen treatments. To observe the effect of organic manure and inorganic fertilizer, vegetative growth parameters viz. Root length (cm), Root diameter (cm), Days to attaining good root size (days), Fresh weight of whole plant (g), Dry weight of root (g), Fresh weight of whole plant (g), Root yield (kg/plot) and Root yield per hectare (tn/ha), were studied in the investigation.

Results and Discussion

The results regarding yield of turnip were statistically analyzed and have been presented in Table: 1. A study of the table shows that the application of organic manures and inorganic fertilizers had significant effect on the Root length (cm), Root diameter (cm), Days to attaining good root size (days) and fresh weight of root /plant (g) of turnip in 1st year, 2nd year and when pooled. Revealed that the significant maximum root length (cm) 14.66 cm, 15.42 cm and 15.04 cm for the year 2018-19, 2019-20 and as pooled data respectively, and closely followed by treatments T₁₃ (50% NPK + 50% N through Goat manure) 12.83 cm, 13.58 cm and 13.21 cm for the year 2018-19, 2019-20 and when pooled respectively, which were significantly at par with each other and were significantly superior over T₁ (control) 4.97 cm, 5.45 cm and 5.21 cm for the year 2018-19, 2019-20 and pooled data respectively. Similar results were also reported by Soheir *et al.* (2012) [17], Zakir *et al.* (2012) [23], Kumar *et al.* (2014), Verma *et al.* (2016) [20], Wahocho *et al.* (2016) [21]. Revealed that the significant maximum root diameter (cm) 11.68 cm, 12.67 cm and 12.18 cm for the year 2018-19, 2019-20 and as pooled data respectively, and closely followed by treatments T₁₃ (50% NPK + 50% N through Goat manure) 10.77 cm, 11.77 cm and 11.27 cm for the year 2018-19, 2019-20 and when pooled respectively, which were significantly at par with each other and were significantly superior over T₁ (control) 3.98 cm, 4.34 cm and 4.16 cm for the year 2018-19, 2019-20 and pooled data respectively. The results of the present investigation agreed with the finding of Wahocho *et al.* (2016) [21], Verma *et al.* (2016) [20], Kiran *et al.* (2017) [9], Ingole *et al.* (2018) [3]. Among the treatments applied, treatment T₁₂(50% NPK + 50% N through Poultry manure)recorded significantly maximum days to attaining good root size (days)45.16 days, 44.55 daysand 44.86 daysfor the year 2018-19, 2019-20 and as pooled data respectively, and closely followed by treatments T₁₃ (50% NPK + 50% N through Goat manure)46.72 days, 46.08 daysand 46.40 days for the year 2018-19, 2019-20 and when pooled respectively, which were significantly at par with each other and were significantly superior over T₁ (control) 61.25 days, 60.86 daysand 61.06 daysfor the year 2018-19, 2019-20 and pooled data respectively. For different characters, similar results were also observed by various researchers like Jagadeesh *et al.* (2018) [4], Kaluram *et al.* (2019) [11], Olorunmaiye (2019) [13]. Among the treatments applied, treatment T₁₂ (50% NPK +

50% N through Poultry manure)exhibited significantly maximum fresh weight of root /plant (g) 518.58 g, 587.10 g and 552.84 gfor the year 2018-19, 2019-20 and as pooled data respectively, and closely followed by treatments T₁₃ (50% NPK + 50% N through Goat manure)488.04 g, 497.37 g and 492.71 g for the year 2018-19, 2019-20 and when pooled respectively, which were significantly at par with each other and were significantly superior over T₁ (control) 195.43 g, 209.24 g and 202.34 gfor the year 2018-19, 2019-20 and pooled data respectively. Similar finding for the fresh weight of root per plant were reported by Pathak *et al.* (2017) [15], Ingole *et al.* (2018) [3], Afrin *et al.* (2019) [1].

The results regarding yield of turnip were statistically analyzed and have been presented in Table: 2. A study of the table shows that the application of organic manures and inorganic fertilizers had significant effect on the dry weight of root /plant (g), fresh weight of whole plant (g), root yield (kg/plot) and root yield (tn/ha) of turnip in 1st year, 2nd year and when pooled. Among the treatments applied, treatment T₁₂(50% NPK + 50% N through Poultry manure)exhibited significantly maximum dry weight of root /plant (g)28.97 g, 31.58 g and 30.28 gfor the year 2018-19, 2019-20 and as pooled data respectively, and closely followed by treatments T₁₃ (50% NPK + 50% N through Goat manure)26.06 g, 28.67 g and 27.37 g for the year 2018-19, 2019-20 and when pooled respectively, which were significantly at par with each other and were significantly superior over T₁ (control) 11.43 g, 12.37 g and 11.90 gfor the year 2018-19, 2019-20 and pooled data respectively. Similar findings for average dry weight of root per plant were reported by Vijayakumari *et al.* (2012) [19], Kiran *et al.* (2017) [9], Ingole *et al.* (2018) [3]. Among the treatments applied, treatment T₁₂(50% NPK + 50% N through Poultry manure) exhibited significantly maximum fresh weight of whole plant (g)773.38 g, 846.32 g and 809.85 gfor the year 2018-19, 2019-20 and as pooled data respectively, and closely followed by treatments T₁₃ (50% NPK + 50% N through Goat manure) 737.30 g, 745.37 g and 741.34 g for the year 2018-19, 2019-20 and when pooled respectively, which were significantly at par with each other and were significantly superior over T₁ (control) 359.59 g, 367.42 g and 363.51 g for the year 2018-19, 2019-20 and pooled data respectively. Similar finding for fresh weight of whole plant were also reported by Afrin *et al.* (2019) [1], Getaneh and Mezgebu (2019) [2], Kaluram *et al.* (2019) [11], Kiran *et al.* (2019) [10], Kushwah *et al.* (2019) [5]. Among the treatments applied, treatment T₁₂ (50% NPK + 50% N through Poultry manure) exhibited significantly maximum root yield (kg/plot) 8.03 kg, 8.59 kg and 8.31 kg for the year 2018-19, 2019-20 and as pooled data respectively, and closely followed by treatments T₁₃ (50% NPK + 50% N through Goat manure)7.80 kg, 8.13 kg and 7.97 kg for the year 2018-19, 2019-20 and when pooled respectively, which were significantly at par with each other and were significantly superior over T₁ (control) 2.64 kg, 3.16 kg and 2.90 kg for the year 2018-19, 2019-20 and pooled data respectively. Similar finding for root yield per plot were also reported by Zakir *et al.* (2012) [23], Kumar *et al.* (2013), Kiran *et al.* (2016) [8], Messele (2016) [12], Wahocho *et al.* (2016) [21], Kiran *et al.* (2017) [9]. Among the treatments applied, treatment T₁₂(50% NPK + 50% N through Poultry manure)exhibited significantly maximum root yield (tn/ha) 35.69 tn/ha, 38.18 tn/ha and 36.94 tn/hafor the year 2018-19, 2019-20 and as pooled data respectively, and closely followed by treatments T₁₃ (50%

NPK + 50% N through Goat manure) 34.17 tn/ha, 36.13 tn/ha and 35.15 tn/ha for the year 2018-19, 2019-20 and when pooled respectively, which were significantly at par with each other and were significantly superior over T₁ (control) 11.73 tn/ha, 13.04 tn/ha and 12.39 tn/ha for the year 2018-19, 2019-

20 and pooled data respectively. Similar results in root crops for root yield per hectare have been reported by Afrin *et al.* (2019) ^[1], Getaneh and Mezgebu (2019) ^[2], Kaluram *et al.* (2019) ^[11], Kiran *et al.* (2019) ^[10], Pandey *et al.* (2020) ^[14].

Table 1: Influence of different organic manures and inorganic fertilizers on yield and yield traits of turnip (*Brassica rapa* L.) cv purple top white globe

Treatment	Yield											
	Root length (cm)			Root diameter (cm)			Days to attaining good root size (days)			Fresh weight of root /plant (g)		
	2018-19	2019-20	Pooled	2018-19	2019-20	Pooled	2018-19	2019-20	Pooled	2018-19	2019-20	Pooled
T ₁	4.97	5.45	5.21	3.98	4.34	4.16	61.25	60.86	61.06	195.43	209.24	202.34
T ₂	6.4	6.98	6.69	4.74	5.62	5.18	59.12	59.3	59.21	221.51	230.46	225.99
T ₃	6.84	7.37	7.11	5.02	6.14	5.58	58.81	58.18	58.5	234.3	236.88	235.59
T ₄	7.74	8.32	8.03	5.96	7.04	6.5	57.64	56.33	56.99	263.79	269.06	266.43
T ₅	7.36	7.91	7.64	5.14	6.97	6.06	58.16	57	57.58	242.45	252.15	247.3
T ₆	8.96	9.59	9.28	7.97	9.14	8.56	53.04	52.52	52.78	318.28	322.58	320.43
T ₇	9.25	9.9	9.58	8.6	9.63	9.12	52.58	51.67	52.13	329.3	354.9	342.1
T ₈	10.72	11.45	11.09	9.47	10.73	10.1	50.96	49.88	50.42	383.03	403.65	393.34
T ₉	9.81	10.49	10.15	8.99	9.91	9.45	51.37	50.75	51.06	354.73	382.31	368.52
T ₁₀	11.04	11.8	11.42	9.84	10.9	10.37	49.7	49.24	49.47	414.11	439.29	426.7
T ₁₁	12.1	12.92	12.51	10.1	11.35	10.73	48.38	47.96	48.17	450.24	471.23	460.74
T ₁₂	14.66	15.42	15.04	11.68	12.67	12.18	45.16	44.55	44.86	518.58	587.1	552.84
T ₁₃	12.83	13.58	13.21	10.77	11.77	11.27	46.72	46.08	46.4	488.04	497.37	492.71
T ₁₄	7.39	7.97	7.68	6.07	7.1	6.59	57.2	55.54	56.37	270.78	274.85	272.82
T ₁₅	7.94	8.52	8.23	6.5	7.57	7.04	55.57	54.96	55.27	283.9	287.03	285.47
T ₁₆	8.83	9.45	9.14	7.38	8.48	7.93	53.88	53.17	53.53	314.53	314.62	314.58
T ₁₇	8.15	8.72	8.44	6.94	8.06	7.5	54.22	54.4	54.31	299.71	302.97	301.34
C.D. at 5%	0.42	0.45	0.44	0.35	0.4	0.38	2.41	2.38	2.39	2.45	2.12	1.92
SEd (±)	0.21	0.22	0.21	0.17	0.2	0.19	1.18	1.17	1.18	1.2	1.04	0.94
F-Test	S	S	S	S	S	S	S	S	S	S	S	S

Table 2: Influence of different organic manures and inorganic fertilizers on yield and yield traits of turnip (*Brassica rapa* L.) cv purple top white globe

Treatment	Yield											
	Dry weight of root /plant (g)			Fresh weight of whole plant (g)			Root yield (kg/plot)			Root Yield (t ha-1)		
	2018-19	2019-20	Pooled	2018-19	2019-20	Pooled	2018-19	2019-20	Pooled	2018-19	2019-20	Pooled
T ₁	11.43	12.37	11.9	359.59	367.42	363.51	2.64	3.16	2.9	11.73	13.04	12.39
T ₂	14.77	16.51	15.64	377.99	390.58	384.29	3.66	4	3.83	16.27	17.78	17.03
T ₃	15.81	17.29	16.55	401.98	407.89	404.94	3.89	4.21	4.05	17.29	18.71	18
T ₄	17.68	19.06	18.37	439.14	448.44	443.79	4.12	4.62	4.37	18.31	20.53	19.42
T ₅	16.49	18.92	17.71	415.54	427.22	421.38	4.01	4.45	4.23	17.82	19.78	18.8
T ₆	19.81	21.67	20.74	515.25	525.6	520.43	5.36	6.13	5.75	23.82	26.24	25.03
T ₇	20.51	22.13	21.32	536.47	566.4	551.44	5.93	6.56	6.25	26.36	29.16	27.76
T ₈	22.84	24.59	23.72	600.95	620.09	610.52	6.83	7.36	7.1	30.36	32.71	31.54
T ₉	21.71	23.16	22.44	566.31	595.93	581.12	6.48	6.97	6.73	28.8	30.98	29.89
T ₁₀	23.75	25.57	24.66	636.55	668.53	652.54	7.21	7.5	7.36	31.64	33.33	32.49
T ₁₁	24.26	26.12	25.19	695.13	717.88	706.51	7.49	7.94	7.72	32.3	35.29	33.8
T ₁₂	28.97	31.58	30.28	773.38	846.32	809.85	8.03	8.59	8.31	35.69	38.18	36.94
T ₁₃	26.06	28.67	27.37	737.3	745.37	741.34	7.8	8.13	7.97	34.17	36.13	35.15
T ₁₄	17.9	19.51	18.71	447.31	458.36	452.84	4.26	4.72	4.49	18.93	20.98	19.96
T ₁₅	18.71	20.09	19.4	465.37	472.09	468.73	4.46	4.94	4.7	19.82	21.96	20.89
T ₁₆	19.27	21.2	20.24	506.47	512.04	509.26	5.11	5.84	5.48	22.71	25.96	24.34
T ₁₇	18.95	20.39	19.67	485.59	491.63	488.61	4.9	5.43	5.17	21.78	23.13	22.46
C.D. at 5%	0.91	0.99	0.95	2.25	2.26	1.89	0.25	0.27	0.26	1.12	1.21	1.17
SEd (±)	0.45	0.49	0.47	1.1	1.11	0.93	0.12	0.13	0.13	0.55	0.6	0.57
F-Test	S	S	S	S	S	S	S	S	S	S	S	S

Conclusion

On the basis of present investigation in both successive year 2018-19 and 2019-20. It is concluded that the treatment T₁₂ (50% NPK + 50% N through Poultry manure) was found best in terms of yield and yield attributes of turnip. So application

of this organic manure and inorganic fertilizer combination can be recommended to growers after few more conjunctive trials.

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