Influence of different organic manures and inorganic fertilizers on vegetative growth of turnip (*Brassica rapa* L.) cv Purple Top White Globe.

ABSTRACT

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. In this study the results revealed that the application of T_{12}(50 % NPK + 50% N through Poultry manure) significantly influenced most of the characteristics and recorded the highest values of plant height (58.94cm, 59.85cm and 59.40cm), number of leaves per plant (19.24, 21.03 and 20.14), leaf length (52.80cm, 55.59cm and 54.20cm), leaf width (20.51cm, 22.16cm and 21.34cm), fresh weight of leaves (247.14, 250.84 and 248.99 g/plant) and dry weight of leaves (20.08, 22.01 and 21.05 g/plant) for the year 2018-19, 2019-20 and as pooled data respectively.

Key words:- Organic manure, inorganic fertilizers, vegetative growth, turnip.

INTRODUCTION

"Turnip [*Brassica rapa* L. em. Mentzg. subsp. *rapa* syn *B. compestris* L.spp. *rapifera* Sinsk, (AA, 2n=20)] is an annual or biennial plant that is cultivated worldwide as vegetable and fodder" **(Rakow, 2004; Hammer *et al.*, 2013). "**Turnip (*Brassica rapa* var. *rapifera*) is a vegetableof the cruciferous family. sometimes it is known as field mustard or turnip mustard, is a plant that is extensively grown as a leaf vegetable, root vegetable, and oilseed. Before utilising a plant medicinally, always seek the counsel of an expert. Cancer is treated using a decoction of the leaves or stems. When cooked with fat, the root is used to treat breast cancers. Skin cancer is claimed to be helped by a salve made from the flowers. Furthermore, turnip extract can help decrease uric acid and remove kidney stones. It improves visual acuity and is used to cure night blindness. It improves vision and is used to cure night blindness. Turnip syrup improves memory" **(Khashayar, 2007). "**Allardice is a natural pesticide found in turnip root peelings. Turnip agriculture in India is largely limited to the northwestern states of Punjab, Haryana, Rajasthan, and Western Uttar Pradesh as an early winter season crop. Green Top, Purple Top, and 'Kenshin-Kaba' are all essential turnip cultivars for fodder production". **(Yadav and colleagues, 2021).**

"It is grown on 2500 acres in India, with an annual yield of 50,000 tonnes. The organics are the indigenous source of nutrients which can help in increasing production and productivity along with improvement in soil physical conditions. Use of such organic materials, which are being wasted in large amounts without proper use can help in reducing cost of cultivation, increasing productivity and improving soil as well as human and livestock health. Various organic manures so far recognized in this group are green manures, farm yard manure, vermicompost, poultry manure and goat manure etc. In India, all the organic manures together have a potential to supply approximately 33 million tonnes of N,P,K per year" **(Gaur *et al.*, 1990). "**Among organic manures, vermicompost is wieldy accepted by farmers and is produced due to the activity of earthworms. It is rich in all plant nutrients, beneficial microorganisms like N-fixers, biologically activemetabolites, particularly gibberellins, cytokinins, auxins and group B vitamins and several enzymes like lipase, cellulose, chitase, urease, dehydrogenase and nitrogenase" **(Bano *et al.*, 1987). "**The vermicompost can be applied alone or in combination with inorganic fertilizers to get better yield and quality of diverse crops. Organic farming is a method that integrates links between soil, plant, water, soil microflora and fauna. Organic farming seeks to create a healthy soil, aids in correct energy flows in the soil, crop, water, and environment, while the plant systems maintain the biological life cycle alive and aids in the maintenance of significant yield levels" **(Lampkin, 1990).** In recent years, the use of organic manures for increasing agricultural yield and sustaining soil fertility and productivity has gained popularity. Organic manure improves soil structure and water retention capacity **(Kale, 1991).**

MATERIALS AND METHODS

An investigation 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. T_1 - Control: RDF (100 Kg N, 80 Kg P_2O_5 and 50 K.g. K_2O /ha.), T_2- (100% N through FYM), T_3- (100% N through Vermicompost), T_4- (100% N through Poultry manure), T_5- (100 % N through Goat manure), T_6- (75 % NPK + 25% N through FYM), T_7- (75 % NPK + 25% N through Vermicompost), T_8- (75 % NPK + 25% N through Poultry manure), T_9- (75 % NPK + 25% N through Goat manure), T_{10}-

(50 % NPK + 50% N through FYM), T_{11}- (50 % NPK + 50% N through Vermicompost), T_{12}- (50 % NPK + 50% N through Poultry manure), T_{13}- (50 % NPK + 50% N through Goat manure),T_{14}- (25 % NPK + 75% N through FYM), T_{15}- (25 % NPK + 75% N through Vermicompost), T_{16}- (25 % NPK + 75% N through Poultry manure), T_{17}- (25 % NPK + 75% N through Goat manure). Source of variables were nitrogen, phosphorus, potash, farm yard manure, Vermicompost, Poultry Manure and Goat manure. the effect of organic manure and inorganic fertilizer, vegetative growth parameters viz. plant height (cm), number of leaves per plant, leaf length (cm), leaf width (cm), fresh weight of leaves (g plant^{-1}) and dry weight of leaves (g plant^{-1}) were studied in the investigation. The data collected on different parameters during the course of investigation were subjected to statistical analysis as per method of analysis of variance **(Panse and Sukhatme 1957).** The significance and non – significance of the treatment effect was judged with the help of F variance ratio test. Calculated F value was compared with the table value of F at 5 % level of significance. If calculated value exceeds the table value, the effect was considered to be significant. The significant differences between the means were tested critical differences at5% level of significance.

RESULTS AND DISCUSSION

The results regarding vegetative growth of turnip were statistically analyzed and are presented in table:1a. A study of the table shows that the application of organic manures and inorganic fertilizers had significant effect on the plant height (cm), number of leaves plant^{-1}, leaf length (cm) and leaf width (cm) of turnip in 1st year, 2nd year and when pooled.

Plant height (cm)

The result revealed that the significant maximum plant height 58.94cm, 59.85cm and 59.40cm for the year 2018-19, 2019-20 and when pooled respectively, was recorded with treatment T_{12}(50 % NPK + 50% N through Poultry manure) and followed by treatments T_{13} (50 % NPK + 50% N through Goat manure) 57.58cm, 58.20cm and 57.89cm at 55 days after sowing for the year 2018-19, 2019-20 and when pooled respectively, which were statisticaly at par with each other and were significantly superior over T_1 (control) 35.86cm, 37.14cm and 36.50cm at 55 DAS for the year 2018-19, 2019-20 and pooled data respectively. The results of the present investigation agreed with the finding of reported similarly that application of 10 to 15 t/ha of poultry manure

resulted in increased height of amaranthus plants. **(kumar *et al.*2014), (Mbatha *et al.*2014), (Verma *et.al.*2016)** and **(Okokoh and Bisong 2011).** The increased growth parameters attributed to beneficial effect of poultry manure has been reported by **(Uddain *et al.*2010)** and **(Subedi *et al*. 2018)** in radish, **(Sylvester *et al.*2015)** in carrot and **(Jagadeesh *et al.*2018)** in beetroot.

Number of leaves per plant-

The result revealed that the significant maximum number of leaves per plant 19.24, 21.03 and 20.14 for the year 2018-19, 2019-20 and when pooled respectively, was recorded with treatment T_{12}(50 % NPK + 50% N through Poultry manure) and followed by treatments T_{13} (50 % NPK + 50% N through Goat manure) 18.68, 20.25 and 19.47 at 55 DAS for the year 2018-19, 2019-20 and when pooled respectively, which were statisticaly at par with each other and were significantly superior over T_1 (control) 10.83, 11.13 and 10.98 at 55 DAS for the year 2018-19, 2019-20 and pooled data respectively. These results agree with the findings. who was found significant increase in number of leaves of radish with the sole application of NPK. The results of the present investigation agreed with the finding of **(Soheir *et al.*2012), (Vijaya kumar *et al.* 2012), (Aisha *et al.*2014), (Kumar *et al.*2014). "**The increased growth parameters attributed to beneficial effect of poultry manure has been reported" by **(Uddain *et al.* 2010) and (Subedi *et al.* 2018) in** radish**, (Sylvester *et al.* 2015)** in carrot and **(Jagadeesh *et al.* 2018)** in beetroot.

Leaf length (cm)

Among the treatments applied, treatment T_{12}(50 % NPK + 50% N through Poultry manure)recorded significantly maximum leaf length (cm) 52.80cm, 55.59cm and 54.20cm for the year 2018-19, 2019-20 and as pooled data respectively, and closely followed by treatments T_{13} (50 % NPK + 50% N through Goat manure) 51.15cm, 53.91cm and 52.53cm for the year 2018-19, 2019-20 and when pooled respectively, which were statisticaly at par with each other and were significantly superior over T_1 (control) 28.43cm, 31.15cm and 29.79cm for the year 2018-19, 2019-20 and pooled data respectively. These results coincide with the previous findings of who found "maximum leaf length in radish when NPK was used, as the plants received more readily available applied nutrients, which might had increased the vegetative growth and leaf length in radish". **(Islam *et al.*2011)**. Similar results were also reported by stating an increase in

cabbage leaf length, when inorganic fertilizers were used. Similar finding for the leaf length per plant were reported by **(Mbatha *et al.* 2014), (Zeid *et al.* 2015), (Kiran *et al.* 2016), (Wahocho *et al.* 2016)** and **(Zhou-Dongmei 2005)** reported that the effect of application of poultry manures on growth of radish (*Raphanus sativus* L.) and pakchoi (*Brassica chinensis* L.). The increased growth parameters attributed to beneficial effect of poultry manure has been reported by **(Uddain *et al.* 2010)** and **(Subedi *et al.* 2018)** in radish, **(Sylvester *et al.* 2015)** in carrot and **(Jagadeesh *et al.* 2018)** in beetroot.

Leaf width (cm)

Among the treatments applied, treatment T_{12}(50 % NPK + 50% N through Poultry manure) exhibited significantly maximum leaf width (cm) 20.51cm, 22.16cm and 21.34cm for the year 2018-19, 2019-20 and as pooled data respectively, and closely followed by treatments T_{13} (50 % NPK + 50% N through Goat manure) 19.87cm, 21.54cm and 20.71cm for the year 2018-19, 2019-20 and when pooled respectively, which were statisticaly at par with each other and were significantly superior over T_1 (control) 8.81cm, 9.25cm and 9.03cm for the year 2018-19, 2019-20 and pooled data respectively. Similar finding for the leaf width were reported by **(Chitti *et al.* 2018), (Dhital *et al.* 2018), (Ingole *et al.* 2018) and (Zhou-Dongmei., 2005)** reported that the effect of application of poultry manures on growth of radish (*Raphanus sativus* L.) and pakchoi (*Brassica chinensis* L.). The increased growth parameters attributed to beneficial effect of poultry manure has been reported by **(Uddain *et al.* 2010) and (Subedi *et al.* 2018)** in radish, **(Sylvester *et al.* 2015)** in carrot and **(Jagadeesh *et al.* 2018)** in beetroot.

The results regarding vegetative growth of turnip were statistically analyzed and have been presented in table: 1b. A study of the table shows that the application of organic manures and inorganic fertilizers had significant effect on the fresh weight of leaves (g/plant) and dry weight of leaves (g/plant) of turnip in 1st year, 2nd year and when pooled.

Fresh weight of leaves (g/plant)

Among the treatments applied, treatment T_{12} (50 % NPK + 50% N through Poultry manure) exhibited significantly maximum fresh weight of leaves (g/plant) 247.14 g/plant, 250.84 g/plant and 248.99 g/plant for the year 2018-19, 2019-20 and as pooled data respectively, and closely followed by treatments T_{13} (50 % NPK + 50% N through Goat manure)241.97 g/plant, 243.62

g/plant and 242.80 g/plant for the year 2018-19, 2019-20 and when pooled respectively, which were statisticaly at par with each other and were significantly superior over T_1 (control) 146.61 g/plant, 149.54 g/plant and 148.08 g/plant for the year 2018-19, 2019-20 and pooled data respectively. The presence of adequate amount of NPK might be the major cause of enhancing the soil fertility level which promoted plant growth thus causing an increased leaf weight plant. The enhancements in growth parameters of radish were also reported by the application of NPK. similar finding for the fresh weight of leaves per plant were reported by **(Kumar *et al.* 2018), (Subedi *et al.* 2018), (Messele 2016)** and **(Zhou-Dongmei., 2005)** reported that the effect of application of poultry manures on growth of radish (*Raphanus sativus* L.) and pakchoi (*Brassica chinensis* L.). The increased growth parameters attributed to beneficial effect of poultry manure has been reported by **(Uddain *et al.* 2010) and (Subedi *et al.* 2018)** in radish, **(Sylvester *et al.* 2015)** in carrot and **(Jagadeesh *et al.* 2018)** in beetroot.

Dry weight of leaves (g/plant)

Among the treatments applied, treatment T_{12}(50 % NPK + 50% N through Poultry manure) exhibited significantly maximum dry weight of leaves (g/plant) 20.08 g/plant, 22.01 g/plant and 21.05 g/plant for the year 2018-19, 2019-20 and as pooled data respectively, and closely followed by treatments T_{13} (50 % NPK + 50% N through Goat manure)19.67 g/plant, 21.52 g/plant and 20.60g/plant for the year 2018-19, 2019-20 and when pooled respectively, which were statisticaly at par with each other and were significantly superior over T_1 (control) 8.87 g/plant, 9.55 g/plant and 9.21 g/plant for the year 2018-19, 2019-20 and pooled data respectively. The effectiveness of NPK was obvious due to greater nutrients content and their readily availability. Our results agree with the findings a significant increase in the weight of leaves plant with the application of manures and chemical fertilizers in radish. Similar results were observed by **(Vijayakumari *et al.* 2012), (Zakir *et al.* 2012), (Aisha *et al.* 2014) and (Zhou-Dongmei., 2005)** reported that the effect of application of poultry manures on growth of radish (*Raphanus sativus* L.) and pakchoi (*Brassica chinensis* L.). The increased growth parameters attributed to beneficial effect of poultry manure has been reported by **(Uddain *et al.* 2010)** and **(Subedi *et al.* 2018)** in radish, **(Sylvester *et al.* 2015)** in carrot and **(Jagadeesh *et al.* 2018)** in beetroot.

CONCLUSION

Based on the current study, in both year 2018-19 and 2019-20 fiscal years. The treatment T12 (50% NPK + 50% N through Poultry manure) was determined to be the most effective in terms of turnip vegetative development. Following a few more added experiments, producers can be advised to apply this organic manure and inorganic fertilizer mix.

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Table 1a. Influence of different organic manures and inorganic fertilizers on vegetative growth of turnip (*Brassica rapa* L.) cv Purple Top White Globe

Treatment	Vegetative growth											
	Plant height (cm)			Number of leaves plant^{-1}			Leaf length (cm)			Leaf width (cm)		
	2018-19	2019-20	Pooled	2018-19	2019-20	Pooled	2018-19	2019-20	Pooled	2018-19	2019-20	Pooled
T_1	35.86	37.14	36.50	10.83	11.13	10.98	28.43	31.15	29.79	8.81	9.25	9.03
T_2	41.99	42.28	42.14	12.94	13.26	13.10	34.21	38.85	36.53	11.47	13.00	12.24
T_3	43.05	44.34	43.70	13.57	14.14	13.86	36.26	40.47	38.37	12.64	14.23	13.44
T_4	46.56	47.90	47.23	14.19	15.21	14.70	39.11	42.84	40.98	14.32	15.20	14.76
T_5	44.92	45.22	45.07	13.96	14.67	14.32	38.79	41.28	40.04	13.74	15.10	14.42
T_6	51.80	53.08	52.44	15.86	17.44	16.65	44.32	47.56	45.94	16.69	17.84	17.27
T_7	52.72	54.12	53.42	16.20	18.15	17.18	45.68	49.90	47.79	17.26	18.81	18.04
T_8	53.96	55.04	54.50	17.16	18.89	18.03	47.90	51.5	49.70	18.34	19.50	18.92
T_9	53.21	54.69	53.95	16.51	18.37	17.44	46.81	50.67	48.74	17.59	19.22	18.41
T_{10}	55.43	56.02	55.73	17.71	19.33	18.52	48.57	52.72	50.65	19.17	19.94	19.56
T_{11}	56.81	57.39	57.10	18.10	19.69	18.90	49.95	53.13	51.54	19.48	21.12	20.30
T_{12}	58.94	59.85	59.40	19.24	21.03	20.14	52.80	55.59	54.20	20.51	22.16	21.34
T_{13}	57.58	58.20	57.89	18.68	20.25	19.47	51.15	53.91	52.53	19.87	21.54	20.71
T_{14}	47.16	48.03	47.60	14.42	15.58	15.00	39.67	43.17	41.42	14.78	15.87	15.33
T_{15}	48.00	50.29	49.15	14.68	16.05	15.37	40.84	44.63	42.74	15.29	16.75	16.02
T_{16}	50.62	52.79	51.71	15.36	17.03	16.20	43.41	46.96	45.19	16.27	17.64	16.96
T_{17}	49.76	51.64	50.70	14.96	16.47	15.72	41.64	45.57	43.61	15.70	17.13	16.42
C.D. at 5%	**2.25**	**2.30**	**2.27**	**0.70**	**0.76**	**0.73**	**1.94**	**2.10**	**2.02**	**0.73**	**0.79**	**0.76**
SEd (±)	**1.10**	**1.13**	**1.12**	**0.34**	**0.37**	**0.36**	**0.95**	**1.03**	**0.99**	**0.36**	**0.39**	**0.37**
F-Test	**S**	**S**	**S**	**S**	**S**	**S**	**S**	**S**	**S**	**S**	**S**	**S**

Table 1b. Influence of different organic manures and inorganic fertilizers on vegetative growth of turnip (*Brassica rapa* L.) cv Purple Top White Globe

Treatment	Vegetative growth					
	Fresh weight of leaves (g/plant)			Dry weight of leaves (g/plant)		
	2018-19	2019-20	Pooled	2018-19	2019-20	Pooled
T_1	146.61	149.54	148.08	8.87	9.55	9.21
T_2	152.74	156.25	154.50	11.56	12.33	11.95
T_3	163.70	166.97	165.34	12.24	13.30	12.77
T_4	171.01	174.94	172.98	13.70	15.08	14.39
T_5	168.98	170.84	169.91	12.92	14.17	13.55
T_6	191.87	197.81	194.84	16.68	17.81	17.25
T_7	201.86	205.89	203.88	17.12	18.04	17.58
T_8	211.97	210.29	211.13	18.51	19.62	19.07
T_9	205.97	207.73	206.85	17.84	18.59	18.22
T_{10}	216.14	222.62	219.38	18.94	19.96	19.45
T_{11}	238.01	239.55	238.78	19.26	20.73	20.00
T_{12}	247.14	250.84	248.99	20.08	22.01	21.05
T_{13}	241.97	243.62	242.80	19.67	21.52	20.60
T_{14}	172.10	178.98	175.54	13.86	15.41	14.64
T_{15}	176.86	180.39	178.63	14.67	16.15	15.41
T_{16}	186.93	192.35	189.64	16.34	17.74	17.04
T_{17}	181.08	183.79	182.44	15.38	16.93	16.16
C.D. at 5%	**3.52**	**2.41**	**2.56**	**0.72**	**0.77**	**0.75**
SEd (±)	**1.73**	**1.19**	**1.26**	**0.35**	**0.38**	**0.37**
F-Test	**S**	**S**	**S**	**S**	**S**	**S**