Original Research Article

EFFECT OF DIFFERENT ORGANIC AND INORGANIC FERTILIZERS ON GROWTH, YIELD AND QUALITY OF AMARANTHUS UNDER POLYHOUSE CONDITION (*Amaranthus cruentus*) cv.NSC 999IUS

ABSTRACT

The present investigation was carried out in the polyhouse of Horticultural Research Field ,Department of Horticulture, Naini Agriculture Institute, Sam Higginbottom University of Agricultural Technology and Sciences,Prayagraj during year 2021on Amaranthus .The experiment was carried out in a Randomized Block Design consisting of 12 treatments with three replications using farm yard manure, vermicompost, poultry manure and goat manure for organic fertilizers and NPK for inorganic fertilizers to find out the best treatment combination. The application of treatment T9[R.D.F50%+25%Poultry manure+25% Goat manure] was shown highest in terms growth attributes Plant height(37.02) ,Number of branches(29) ,plant spread(25.89), Root length(7.83), Yield per plant(151.27g) , Yield per plot(5.56kg) ,Yield per 200m^2(1112kg) and Anthocyanin content per100g (158.8mg). T□[R.D.F 50%+50%Poultry manure] has given best results in terms of leaf length(7.36) and ,Number of leaves (35.33). Therefore this treatment is best compared to other treatments and control.

Keywords: Amaranthus ,Farm yard manure ,Goat manure, Poultry manure ,Vermicompost.

1.INTRODUCTION

Leafy vegetables Play a vital role in crop rotation because of its short and large yield of edible matter per unit area .Amaranthus is one of the most important and popular one .Amaranthus is a cosmopolitan genus of annual or short lived perennial plants, cultivated as leaf vegetables pseudo cereals and ornamental plants. It is widely grown as a leafy vegetable in south east Asian countries especially Malaysia, Indonesia, southern china ,and the hot and humid regions of Africa. . It is often described as a poor man's leafy vegetable because of its low price and high nutritive value.The leaves and tender stems of Amaranth are rich in proteins minerals calcium vitaminA(carotene),Vitamin C,folic acid ,thiamine, niacin and riboflavin.Amaranthus had antinutrient factors like oxalates and nitrates. The oxalate results in kidney stones and nitrates form methaemoglobin in the blood. However normal consumptions do not have such problems.

Organic fertilizers release nutrients as they break down ,improving the soil and its ability to hold water and nutrients. Given time they make your soil and plants healthier and hardier. Organic

fertilizers carry little risk of a toxic overdose of chemicals ,but they require a breakdown of microorganisms to release nutrients limiting their seasonal effectiveness and potentially increasing the amount of time they take to feed your plants.

Inorganic fertilizers are fast releasing nutrients feeding your plant, show what you want and when you want. They are fully artificial and manufactured in exact doses. The use of inorganic fertilizer to sustain cropping was found to increase yield only for some few years but on long – term basic, it was not effective (**Ojeniyi 2009**).It often leads to decline in soil organic matter content, soil acidification and soil physical degradation ,leading to increase soil erosion . on the other hand ,inorganic fertilizers are beyond the reach of resource –poor farmers because of high cost and uncertain accessibility and organic inputs ,which often proposed as alternative to inorganic fertilizer composition and high labour requirement(**Remison *et al* 2020**).

It has long been known that plants containing colors are usually those that are of great benefit to human health.one suggestion for this is the inclusion of colored plants ,which contain compounds having a number of beneficial effects to human health, such types of compounds include the Anthocyanin **Getalado *et al*.(2019).**

This experiment is carried out to find suitable treatments of different organic and inorganic fertilizers on growth ,yield and Quality of Amaranthus.

2.MATERIALS AND METHODS

The experiment was carried out during 2021 July –September at the Experimental Research field , department of horticulture ,Sam Higginbottom University of Agriculture technology and sciences, Prayagraj (UP).The experiment was laid out in a randomized block design with three replications consisiting of 12 treatments having Organic and Inorganic fertilizers in varied combinations. The organic fertilizers used are Farm yard manure , Vermicompost, Poultry manure and Goat manure and inorganic fertilizers NPK of Recommended dose 75:25:25 kg ha^{-1} .Normal cultural and plant protection measures were followed during cultivation process. plants were randomly selected from each plot as a representative sample for recording data.Statistical. The observation were recorded for Plant height(cm) ,Leaf length(cm) ,Number of leaves ,Number of branches ,Plant spread(cm^2) ,Root length(cm),Herbage yield per plant (g) ,Herbage yield per plot(kg) , Herbage yield per 200m^2(kg), Anthocyanin content per 100g(mg).

3.RESULTS AND DISCUSSION

The present investigation concluded that treatment T_{12}(R.D.F 50% + 25 % Poultry manure + 25 % Goat manure) found the best results in terms of Growth parameters ,Yield parameters and Quality parameter and is highly recommended for farmers for profitable cultivation.

3.1Growth Parameters

The treatments significantly increased the growth of Amaranthus that gave a higher yield and improved its quality.The data were recorded in 15DAS and 30DAS.The treatment combination T_{12}(R.D.F 50% + 25 % Poultry manure + 25 % Goat manure) observed maximum in terms of Plant height(cm) (8.91,37.02) ,Number of branches(29.0,5.78) ,Plant spread(cm^2)(8.16,25.89) ,Root length(cm)(7.83).The application of Poultry manure and Goat manure along with NPK fertilizer increase the plant height significantly due to maintenance of soil fertility and plant nutrient supply at an optimum level. High nitrogen percentage in Poultry manure and Goat manure increases the protein production and thus result in an increase in plant height .These similar findings was given by **Hamma *et al*.(2019) and Oyedeji *et al*.(2014).**

The treatment combination T□ (R.D.F 50% + 50% Poultry manure) observed maximum in terms of Leaf length(cm)(2.86,7.36) and Number of leaves(6.67,35.33).More rapid growth of Amaranth was realized with use of organic and along with inorganic .this could be due to increased availability of soil nitrogen with application of inorganic fertilizer culminating into enhanced N uptake and hence faster growth. Release of nitrogen by manure however occurs slowly after mineralization .similar findings was recorded by **Bruce *et al*. (2008).** Organic manures help in maintaining soil fertility ,efficient use of nutrients and enhance water holding capacity of the soil. It was found that the treated treatments gave better plant height over the control.these similar findings was given by **Akinbile *et al*.(2016) .**

3.2 Yield parameters.

The Application of organic along with inorganic fertilizers significantly increased the yield characters of Amaranthus .The treatment combination T□□ (R.D.F 50% + 25 % Poultry manure + 25 % Goat manure) gave maximum Herbage yield per plant(g) (151.27), Herbage yield per plot (kg) (5.56), Total herbage yield per $200M^2$ (kg)(1112) .The control plot gave minimum values in terms of all paramerets.The application of organic and inorganic fertilizers together increased the vegetative growth of plant thus increased the yield .this could be due to the substantial growth rate obtained due to quick mineralization of organic component and slow release of inorganic constituents must have sustained the continuous better performance of Amaranthus than separate application. similar findings was given by **Akinbile *et al*.(2016).**

3.3 Quality parameters.

The treatment T_{12}(R.D.F 50% +25% Poultry manure + 25% Goat manure)(mg)(158.8) has the highest Anthocyanin as compared to other treatments and the lowest Anthocyanin content was recorded by control. Application of organic and inorganic fertilizers significantly influenced the Anthocyanin content .The leaves have higher Anthocyanin content than stem .Applying fertilizers with high nitrogen content is a promising way to improve Anthocyanin content in vegetative parts especially young leaves. Similar findings was given by **Patil *et al*.(2014)** in cotton.

Table 1.Effect of different Organic and Inorganic fertilizers on growth Attributes of Amaranthus 15 DAS (*Amaranthus cruentus*) cv.NSC 999 IUS.

Treatments	Treatment combinations	Plant height(cm)	Leaf length(cm)	Number of leaves	Number of branches	Plant spread(cm^2)
T_1	CONTROL	6.81	1.88	5.33	4.11	6.04
T_2	R.D.F (75:25:25)	7.44	2.33	5.89	4.89	6.11
T_3	R.D.F 25% + 75% FYM	8.91	2.44	6	4.89	8.16
T_4	R.D.F 25% + 75 % VERMICOMPOST	8.06	2.71	6.44	5.33	5.78
T_5	R.D.F 25% + 75% POULTRY MANURE	8.34	2.01	5.78	4.44	6.36
T_6	R.D.F 25% + 75% GOAT MANURE	7.78	2.42	5.56	4.22	7.07
T_7	R.D.F 50% + 50% FYM	7.07	2.51	5.89	4.89	7.03
T_8	R.D.F 50% + 50% VERMICOMPOST	7.5	2.67	6.22	4.85	5.81
T_9	R.D.F 50% + 50% POULTRY MANURE	7.54	2.86	6.67	4.44	6.18
T_{10}	R.D.F 50% + 50% GOAT MANURE	7.4	2.61	6.44	5.22	7.44
T_{11}	R.D.F 50% +25%FYM +25% VERMICOMPOST	8.87	2.62	6.22	5	7.92
T_{12}	R.D.F 50%+ 25%POULTRY MANURE+ 25%GOAT MANURE	9.1	2.56	6. 56	5.78	8.16

	F-TEST	S	S	S	S	S
	S.Ed(±)	**0.52**	**0.14**	**0.26**	**0.32**	**0.29**
	C.V	**11.55**	**9.92**	**7.43**	**11.36**	**7.28**
	CD	**1.54**	**0.41**	**0.77**	**0.93**	**0.84**

Table 2.Effect of different Organic and Inorganic fertilizers on growth Attributes of Amaranthus 30 DAS(*Amaranthus cruentus*) cv.NSC 999 IUS.

Treatments	Treatment combinations	Plant height(cm)	Leaf length(cm)	Number of leaves	Number of branches	Plant spread(cm^2)	Root length(cm)
T_1	CONTROL	27.43	4.72	18.22	17.67	8.53	4.17
T_2	R.D.F (75:25:25)	28.05	4.86	19.11	21.89	9.69	3.97
T_3	R.D.F 25% + 75% FYM	28.94	5.32	20.89	19.67	10.86	4.3
T_4	R.D.F 25% + 75 % VERMICOMPOST	30.82	6.34	22.56	25	14.61	5.07
T_5	R.D.F 25% + 75% POULTRY MANURE	30.62	6.62	25.33	23.11	19.67	4.07
T_6	R.D.F 25% + 75% GOAT MANURE	32.44	6.82	26.22	24.56	15.11	5.57
T_7	R.D.F 50% + 50% FYM	33.5	6.78	28.89	22.67	19.2	6.5
T_8	R.D.F 50% + 50% VERMICOMPOST	32.63	6.97	28.11	26.89	19.17	5.13
T_9	R.D.F 50% + 50% POULTRY MANURE	33.43	7.36	35.33	28.22	19.99	5.77
T_{10}	R.D.F 50% + 50% GOAT MANURE	34.43	7.12	31.67	29	19.34	6.2
T_{11}	R.D.F 50% +25%FYM +25% VERMICOMPOST	36.21	6.98	27.11	26.78	18.41	6.33
T_{12}	R.D.F 50%+ 25%POULTRY MANURE+ 25%GOAT MANURE	37.02	7.16	30.89	29	25.89	7.83

	F-TEST	**S**	**S**	**S**	**S**	**S**	**S**
	S.Ed(±)	**0.73**	**0.38**	**0.98**	**2.35**	**2.49**	**0.4**
	C.V	**3.94**	**10.33**	**6.45**	**16.61**	**25.81**	**12.74**
	CD	**2.14**	**1.12**	**2.86**	**6.90**	**7.30**	**1.17**

Table 3.Effect of different Organic and Inorganic fertilizers on yield and quality Attributes on Amaranthus (*Amaranthus cruentus*) cv.NSC 999 IUS.

Treatments	**Treatment combinations**	**Herbage yield per plant(g)**	**Herbage yield per plot(kg)**	**Herbage yield per 200m^2 (kg)**	**Anthocyanin content per 100g(mg)**
T_1	CONTROL	57.93	1.90	380.66	74.03
T_2	R.D.F (75:25:25)	66.50	2.30	461.33	80.21
T_3	R.D.F 25% + 75% FYM	63.67	3.07	614.66	77.54
T_4	R.D.F 25% + 75 % VERMICOMPOST	74.63	5.03	1006	84.50
T_5	R.D.F 25% + 75% POULTRY MANURE	87.00	5.22	1045.33	90.43
T_6	R.D.F 25% + 75% GOAT MANURE	91.90	3.12	624.66	92.08
T_7	R.D.F 50% + 50% FYM	93.33	3	600	93.71
T_8	R.D.F 50% + 50% VERMICOMPOST	103.33	3.59	718.66	98.71
T_9	R.D.F 50% + 50% POULTRY MANURE	96.97	3.81	762.66	103.73
T_{10}	R.D.F 50% + 50% GOAT MANURE	124.13	3.67	735.33	116.10
T_{11}	R.D.F 50% +25%FYM +25% VERMICOMPOST	145.97	5.40	1081.33	131.1
T_{12}	R.D.F 50%+ 25%POULTRY MANURE+ 25%GOAT MANURE	151.27	5.56	1112	158.8
	F Test	**S**	**S**	**S**	**S**

	S.Ed(±)	**4.57**	**0.12**	**23.19**	**3.15**
	C.V	**8.21**	**3.73**	**3.73**	**3.85**
	C.D	**13.39**	**0.24**	**48.10**	**6.53**

4.CONCLUSION

From the present Investigation on Amaranthus under polyhouse conditions it is concluded that application organic fertilizers along with inorganic fertilizers improved the growth, yield and quality. The treatment T_{12} [R.D.F 50% + 25% Poultry manure + 25% Goat manure] has Given the best results in terms of Plant Height , Number of branches , Plant Spread , Root length, Yield per plant , Yield per plot ,Yield per 200m^2 and Anthocyanin content per 100g and the treatment T□ [R.D.F 50% + 50% Poultry manure] has given best results in terms of leaf Length and Number of Leaves.

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