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

An experiment entitled "**Effect of different organic and inorganic fertilizers on growth, yield and quality of Amaranthus under Poly house condition(*Amaranthus cruentus*) cv. NSC 999 IUS**"was conducted 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 Urea ,SSP,MOP 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 ,Organic fertilizers ,Inorganic fertilizers ,Growth, Quality ,Yield

1.INTRODUCTION

Leafy vegetables plays 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 leafy vegetable in south east Asian countries especially Malaysia, Indonesia, southern china ,and 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 have antinutrient factors like oxalates and nitrates. The oxalate results in kidney stones and nitrates form methaemoglobin in the blood. However normal consumptions does 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 has not be effective (**Ojeniyi 2000**).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 material consist of variety of Amaranthus NSC 999 IUS released by National seed corporation.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 FYM,Vermicompost,Poultry manure and Goat manure and inorganic fertilizers N:P:K of Recommended dose 75:25:25 kg ha^{-1} .Statistical analysis of variance was performed on data collected throughout the experiment.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).The significance of the treatments was determined using the ‘F’ test at a level of significance of 5 %.

3.RESULTS AND DISCUSSION

3.1Growth Parameters

The data on growth parameters in different treatment combinations was recorded(Table 1).

The Maximum plant height [8.91 and 37.02] at 15 days after sowing and 30 days after sowing was recorded on soil Application for treatment T_{12} (R.D.F 50% + 25 % Poultry manure + 25 % Goat manure)while minimum was recorded for T_1(Control) [6.81 and 27.43] 15 ad 30 Days after sowing.The Maximum Number of branches [29.00 and 5.78] at 15 and 30 days after sowing was recorded on soil application for treatment T_{12} (R.D.F 50% + 25 % Poultry manure + 25 % Goat manure) while minimum for T_1 (Control) [4.22 and 17.67] at 15 and 30 days after sowing .The Maximum Plant spread [8.16 and 25.89] at 15 and 30 days after sowing was recorded on soil application for treatment T_{12} (R.D.F 50% + 25 % Poultry manure + 25 % Goat manure) while minimum for T_1 (Control) [6.04 and 8.53] at 15 and 30 days after sowing .The Maximum Root length [7.83cm] was recorded on soil application for treatment T_{12} (R.D.F 50% + 25 % Poultry manure + 25 % Goat manure) and Minimum [3.97cm] was recorded for T_1 (R.D.F (75:25:25).

The 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 recorded by **Hamma *et al*.(2019) and Oyedeji *et al*.(2014).**

The Maximum leaf length [2.86 and 7.36] at 15 days and 30 days after sowing was recorded on soil application for treatment T^1 (R.D.F 50% + 50% Poultry manure) while minimum was recorded for T_1 (Control) [1.88 and 4.72] at 15 and 30 days after sowing. The Maximum number of leaves [6.67 and 35.33] at 15 and 30 days after sowing was recorded on soil application for treatment T_9[R.D.F 50% + 50% Poultry manure] while minimum for T_1(Control) [5.56 and 18.22] at 15 and 30 days after sowing

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 recorded by **Akinbile *et al*.(2016) .**

3.2YIELD PARAMETERS

The Application of organic along with inorganic fertilizers significantly increased thr yield characters of Amaranthus as shown in Table 2.The Maximum Herbage yield per plant [151.27g] was recorded on soil application for treatment T_{12} (R.D.F 50% + 25 % Poultry

manure + 25 % Goat manure) and Minimum [57.93g] was recorded for T^1 (Control). The Maximum herbage yield per plot [5.56kg] was recorded on soil application for treatment combination T_{12} (R.D.F 50% + 25 % Poultry manure + 25 % Goat manure) and Minimum [1.90kg] was recorded for T_1 (Control) . The Maximum total herbage yield per $200M^2$ [1112kg] was recorded on soil application for treatment T_{12} (R.D.F 50% + 25 % Poultry manure + 25 % Goat manure) and Minimum [380.66kg] was recorded for T_1(Control).

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 recorded by **Akinbile *et al*.(2016).**

3.3QUALITY PARAMETERS

The treatment T_{12}(R.D.F 50% +25% Poultry manure + 25% Goat manure)(158.8mg) has the highest Anthocyanin content followed by treatment T_{11}(R.D.F 50%+25% FYM +25% Vermicompost)(131.1mg)as compared to other treatments and the lowest Anthocyanin content was recorded by treatment T_1(control)(74.03mg).

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 recorded by **Patil *et al*.(2014)** in cotton.

Table 1.Effect of different Organic and Inorganic fertilizers on growth parameters 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 @5%	**1.54**	**0.41**	**0.77**	**0.93**	**0.84**

Table 2.Effect of different Organic and Inorganic fertilizers on growth parameters 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 @5%	**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 parameters 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 @5%	**13.39**	**0.24**	**48.10**	**6.53**

4.CONCLUSION

From the present Investigation on Amaranthus under polyhouse conditions it is concluded that among the 12 treatments the Basal application of 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 . 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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