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Research Article

EFFECT OF ORGANIC MANURE ON YIELD ATTRIBUTES, NUTRIENT CONTENT AND UPTAKE OF GRAIN AMARANTHUS (*Amaranthus paniculatus* L.)

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Abstract- A field experiment was conducted during winter season of 2011-2012 at Instructional farm, Department of Agronomy, Junagadh Agricultural University, Junagadh to evaluate the effect of organic manure on yield attributes, nutrient content and uptake of grain Amaranthus (*Amaranthus Paniculatus* L.). The Result revealed that Application of Farm yard manure (FYM) @ 6t ha^{-1} was found efficient to achieve significant increase grain yield (1701 kg ha^{-1}) and stover yield (3303 kg ha^{-1}). Further increase nitrogen, phosphorus and potassium status in grain and stover and uptake by grain amaranthus over the control.

Keywords- Vermicompost, Farm yard manure, Crop yield, Fertility, Macro mineral

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Introduction

Amaranthus is an important vegetable in human diet as a source of nutrients such as vitamin, minerals, sugar, water, protein and fiber needed for healthy body growth and sustenance [1]. Amaranthus grain contains 6 to 10 % oil, which is found mostly within the germ [2-4]. It is predominantly an unsaturated oil (76%) and is high linoleic acid, which is necessary for human nutrition. In India, *A. paniculatus* L. is known as "rajgeera" (the king's grain) and is often popped to be used in confection called "laddoos" which are very similar to Mexican "alegria" In Nepal, amaranth seed are eaten as a gruel called "sattoo" or milled into a flour to make chappatis [5]. Grain amaranth is one of the few economic plants of great food value bestowed by nature with multiple uses. Crop yield is governed by several environmental factors as well as cultural practices. Among the various agronomic practices, judicious uses of nutrient management play an important role in increasing the yield of amaranthus. Proper nutrient management includes chemical fertilizer along with organic manures which supply major and micronutrients. Which also improves the growth, yield and quality of amaranthus as well as soil physical, biological and chemical properties. Among the several organic sources, farm yard manure and vermicompost play crucial role for yield and quality improvements as well as sustain the soil fertility status. Farm yard manure (FYM) is the principle source of organic matter in our country which has been used since antiquity of man. The organic carbon in the organic matter act as a source of energy for soil microorganisms and upon mineralization release essential elements during crop growth. In addition to supply of available plant nutrients directly [6], the use of FYM also mobiles the unavailable nutrients present in the soil.

Vermicompost as organic fertilizer helps to improve the quality and quantity of yield as it contains nitrogen, phosphorus, potassium, organic carbon, sulphur, hormones, vitamins, enzymes and antibiotics. It is observed that due to continuous misuse of chemical fertilizers, soil losses its fertility and gets salty day by day. To overcome such problems, vermicompost application is the best solution. Precise information regarding appropriate organic manures requirements for grain amaranthus crop is very limited. Keeping in view the above considerations, comprehensive research programme was planned to study the judicious use of optimum organic manures requirement for grain amaranthus.

Material and Methods

The experiment was carried out during *rabi* season of the year 2011-12inInstructional Farm, Department of Agronomy, College of Agriculture, Junagadh Agricultural University, Junagadh. The soil was clayey in texture, plentiful in organic carbon, available nitrogen was low, high phosphorus and medium in potassium. soil having pH of 7.9. 12 treatment combinations comprised of four levels of irrigation *viz.* 0.4,0.6,0.8,1.0 IW/CPE ratios and three levels of organic manures *viz.,* no manure, FYM @ 6 t ha^{-1}and Vermicompost @ 0.5 t ha^{-1}were laid out in split plot design with four replications. Gap filling and thinning operations were carried out 15 days after sowing to facilitate optimum plant population by maintaining intra row fertilized with 60-40-00 kg N, P,K ha^{-1} in form of DAP and urea commonly to all the plots and farm yard manure and vermicompost as per treatments. Besides above crop was grown with recommended evaluated in terms of N, P and K concentration and their uptake as well as yield.

Result and Discussion

Effect of organic manures on yield attributes

Significantly increased in yield attributes *viz.,* length of spike, length of spikelets and number of spikelets per spike, grain and stover yields per plant, test weight [Table-1] were recorded with the application of FYM @ 6t ha^{-1} over control. The beneficial effect of organic manures on yield attributes could be due to the fact that after proper decomposition and mineralization, the manure supplied available nutrients directly to the plant and also had solubilising effect on fixed forms of nutrients in soil having medium status of nutrient might have increased availability of macro and micro nutrients by improving root rhizophere which ultimately

enhance removal of N, P and k as well as crop yield. Similar results were also reported by Prajapati *et al.* [7] in pearlmillet. Application of FYM @ 6 t ha^{-1} produced significantly higher grain and stover yields [Table-1] might be due to higher values of growth and yield attributes which ultimately resulted in increases in grain and stover yields. The increase in grain and stover yields with the application of FYM might due to adequate quantities and balanced proportion of plant nutrients supplies to crop during the crop growth and development period. More or less similar results were also reported by Thenmozhi and Paulraj[8].

Table-1 *Effect of Organic Manures on growth parameter, yield Attributes and test weight.*

Treatments	Length of spike (cm)	Length of spikelet (cm)	Number of spikelets per spike	Grain yield per plant (g)	Stover yield per plant (g)	Grain yield (kgha^{-1})	Stover yield (kgha^{-1})	Test weight (g)
Organic Manures								
M_0: No manure	36.2	18.3	46.9	8.4	16.5	1506	2775	0.50
M_1: FYM @ 6t ha^{-1}	39.3	19.0	51.4	9.3	18.1	1701	3303	0.53
M_2:Vermicompost @ 0.5t ha^{-1}	38.1	18.7	50.8	9.3	17.9	1664	3252	0.52
S.Em.±	0.80	0.40	0.45	0.07	0.17	9.67	51.97	0.004
C.D. at 5%	2.40	NS	1.33	0.22	0.49	28.43	151.69	0.01
C.V.%	8.70	8.70	3.69	3.39	3.91	7.80	7.23	3.38

Effect of organic manures on nutrient content and uptake

Application of FYM @ 6 t ha^{-1} significantly increased the nitrogen, phosphorus and potassium content and uptake [Table-2] by the crop. Maximum N,P and K content in grain and stover of 2.64, 1.32 and 1.11.,and 1.00,0.31 and 0.32, respectively were observed with the application of FYM @ 6 t ha^{-1}. Corresponding values of N,P and K uptake by grain and stover with the application of FYM @ 6 t ha^{-1} were 44.00, 22.16,18.00., and 34.92,10.18, 10.05 kg ha^{-1} accordingly. The increase in nutrient content and uptake with the application of FYM @ 6 t ha^{-1} might due to increased availability of nutrient to the plants. It was also improved the soil environment, which encouraged proliferous root-system, resulting in better absorption of moisture and nutrient and thus resulting in higher biomass production [9].The increase in nutrient uptake may be due to increase in available N, P and K content in the soil Structure for higher uptake of nutrient similar results were also observed by Davari *et al.*[10].

Table-2 *N,P and K content and Uptake by grain and Stover as influence byorganic manures*

Treatments	Nutrient Content						Nutrient Uptake					
	N		P		K		N		P		K	
Organic Manures	Grain	Stover	Grain	Stover	Grain	Stover	Grain	Stover	Grain	Stover	Grain	Stover
M_0: No manure	2.53	0.90	1.31	0.30	1.00	0.27	38.56	25.34	19.89	8.66	15.93	8.26
M_1: FYM @ 6t ha^{-1}	2.64	1.00	1.32	0.31	1.11	0.32	44.00	34.92	22.16	10.18	18.00	10.05
M_2:Vermicompost @ 0.5t ha^{-1}	2.63	0.97	1.31	0.30	1.07	0.30	43.03	31.86	21.80	9.87	17.47	9.74
S.Em.±	0.01	0.01	0.004	0.002	0.01	0.006	0.68	1.05	0.42	0.21	0.19	0.21
C.D. at 5%	0.05	0.04	0.01	0.008	0.04	0.02	2.00	3.06	1.24	0.62	0.57	0.62
C.V.%	2.88	6.01	1.43	3.54	5.27	9.70	5.31	13.69	5.31	9.01	4.30	9.20

Conclusion

It was concluded that application of FYM @ 6 t ha^{-1} significantly increase yield attributes and nutrient uptake and content.

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Ethical approval: This article does not contain any studies with human participants or animals performed by any of the authors.

Conflict of Interest: None declared

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