International Journal of Chemical Studies

P-ISSN: 2349–8528
E-ISSN: 2321–4902
www.chemijournal.com
IJCS 2020; 8(4): 1115-1116

Received: 06-05-2020
Accepted: 10-06-2020

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Nutrient management through organic source in grain ameranthus (*Amaranthus hypochondriacus* L.) under middle Gujarat condition

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DOI: https://doi.org/10.22271/chemi.2020.v8.i4i.9752

Abstract
The field experiment experiment was conducted at Agricultural Research Station for Irrigated crops, Anand Agricultural University, Thasra, Dist.: Kheda, Gujarat to study Nutrient management through organic source in grain ameranthus (*Amaranthus hypochondriacus* L.) under middle Gujarat condition. The field trial was laid out in Random Block Design with ten treatments *viz*., RDF (25-12.5-0 NPK kg/ha) (T_1), FYM 4.0 t/ ha (T_2), Vermicompost 1.0 t /ha (T_3), Castor cake 0.5 t/ha (T_4), Bio NP (Azatobactor & PSB Combiproduct 1 L/ha) (T_5), FYM 2.0 t/ ha + Bio NP (Azatobactor & PSB Combiproduct 1 L/ha) (T_6), Vermicompost @ 0.5 t /ha + Bio NP (Azatobactor & PSB Combiproduct 1 L/ha) (T_7), Castor cake 0.25 t/ha + Bio NP (Azatobactor & PSB Combiproduct 1 L/ha) (T_8), FYM @ 2.0 t/ ha + Vermicompost 0.5 t /ha (T_9) and FYM 2.0 t/ ha + Castor cake 0.25 t/ha (T_{10}). Treatment T_2 (FYM 4.0 t/ha) recorded significantly higher grain yield (1890 kg/ha) but was at par with treatment T_3 (Vermicompost 1.0 t /ha) than rest of the treatments. The economics of various treatments showed that treatment T_2 (FYM 4.0 t/ha) gave the highest net return of Rs 47701 per hectare with CBR 2.71.

Keywords: Nitrogen management, amaranthus

Introduction
Amaranth is quick growing, bushy plant with thick stalk grown with less risk. Being a C_4 plant, it was more efficiency of nitrogen utilization and photosynthesis along with yield potential of more than 50q/ha. Amaranth (*Amaranthus hypochondriacus* L.) constitutes an important part of the diet in several parts of India. It supplies a substantial portion of the protein, minerals and vitamins in the diet. The grain proteins usual because its amino acid complement is very similar to optimum balance required in the human diet. Its grain has relatively high value of protein, fat, carbohydrates and mineral content as compared to other cereal crops. Therefore, the nutritional qualities of amaranth fulfil the balance diet of low income people. Its grains also contain about 16% crude protein with high content of lysine (Joseph, 1979) [1]. In present day of cultivation, increasing the use of inorganic fertilizer increased the nutrient imbalance in soil, wich affected the nutritional value of crop. The use of organic fertilizer is known to provide the micronutrient and other important elements, which are essential for plant growth development and to increase the nutritional value of crop. In line of this matter, the experiment" Nutrient management through organic source in grain ameranthus (*Amaranthus hypochondriacus* L.) under middle Gujarat condition" was carried out.

Materials and Methods
The field experiment was conducted at the at Agricultural Research Station for Irrigated crops, Anand Agricultural University, Thasra, Dist.: Kheda, Gujarat during three consecutive *Rabi* seasons of the year 2016-17,2017-18 and 2018-19. The experiment was laid out in a randomized block design with four replications. The soil of the experimental field was sandy clay loam in texture having good drainage capacity. It was low organic carbon and nitrogen, medium available phosphorus and high available potassium. The experiment consisted of ten treatments *viz.* RDF(25-12.5-0 NPK kg/ha) (T_1), FYM 4.0 t/ ha (T_2), Vermicompost 1.0 t /ha (T_3), Castor cake 0.5 t/ha (T_4), Bio NP (Azatobactor & PSB Combiproduct 1 L/ha) (T_5), FYM 2.0 t/ ha + Bio NP (Azatobactor & PSB Combiproduct 1 L/ha) (T_6), Vermicompost 0.5 t /ha + Bio NP (Azatobactor & PSB Combiproduct 1 L/ha) (T_7), Castor cake 0.25 t/ha + Bio

NP (Azatobactor & PSB Combiproduct 1 L/ha) (T_8), FYM 2.0 t/ ha + Vermicompost 0.5 t /ha (T_9) and FYM 2.0 t/ ha + Castor cake 0.25 t/ha (T_{10}). Organic source of nitrogen was applied 7 days before sowing as per treatment. The seeds of amaranthus G.A.2 were utilized for sowing. Five plants were randomly selected for difference observations.

Results and Discussion

Significantly increase in yield attributes *viz*., length of spike, no. of spikelet's/spike, test weight (Table 1) was recorded with the application of FYM 4 t ha^{-1} over rest of the treatments. 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 nutrient in soil (Singh, 1981) [3]. Addition of FYM in soil having medium status of nutrient might have increased availability of macro and micro nutrients by improving root rhizsophere which ultimately enhanced removal of N, P and K as well as crop yield. Similar results were also reported by Prajapati *et al*., (1997) [2] in pearlmillet. Application of FYM 4 t ha^{-1} produced significantly higher grain and stover yield wich might be due to higher value of growth and yield attributes. This ultimately resulted in increase in grain and stover yield. The increase in grain and stover yield with the application of FYM might be due to adequate quantities and balanced proportion of plant nutrients supplied to crop during crop growth and development period reported by Thenmozhi and Paulraj (2010) [4]. The economics of various treatments (Table 2) showed that treatment T_2 (FYM 4.0 t/ha) gave the highest net return of Rs 47701 per hectare with CBR 2.71.

Table 1: Effect of nutrient management through organic source on yield and yield attributes

Sr. No.	Treatments	length of spike(cm)	No. of spikelet's /spike	Test weight (g)	Grain yield (kg/ha)	Stover yield (kg/ha)
T_1	RDF (25-12.5-0 NPK kg/ha)	66.48	63.64	0.620	1484	3340
T_2	FYM 4.0 t/ ha	76.59	74.62	0.725	1890	4438
T_3	Vermicompost 1.0 t /ha	73.08	70.88	0.701	1814	4328
T_4	Castor cake 0.5 t/ha	72.73	64.05	0.695	1766	4218
T_5	Bio NP (Azatobactor & PSB Combiproduct 1 L/ha)	68.70	65.06	0.586	1492	3903
T_6	FYM 2.0 t/ ha + Bio NP (Azatobactor & PSB Combiproduct 1 L/ha)	71.52	65.57	0.689	1635	3889
T_7	Vermicompost 0.5 t /ha + Bio NP (Azatobactor & PSB Combiproduct 1 L/ha)	70.24	65.00	0.650	1589	3621
T_8	Castor cake 0.25 t/ha + Bio NP (Azatobactor & PSB Combiproduct 1 L/ha)	71.09	65.40	0.621	1560	3779
T_9	FYM 2.0 t/ ha + Vermicompost 0.5 t /ha	70.34	66.48	0.641	1674	3951
T_{10}	FYM 2.0 t/ ha + Castor cake 0.25 t/ha	72.23	65.93	0.699	1733	3999
	S.Em±	1.18	1.31	0.006	40	107
	CD at 5%	3.30	3.66	0.02	112	301
	CV %	5.77	7.02	3.29	8.62	8.93
	Interaction YxT	NS	NS	NS	NS	NS

Table 2: Economics

Treatments	Yield (kg/ha)	Gross return (Rs/ha)	Cost of cultivation (Rs/ ha)	Net return (Rs/ ha)	BCR
T_1	1484	59360	22948	36412	2.58
T_2	1890	75600	27899	**47701**	**2.71**
T_3	1814	72560	27899	47661	2.60
T_4	1766	70640	27699	42941	2.55
T_5	1492	59680	22099	37581	2.70
T_6	1635	65400	25099	40301	2.61
T_7	1589	63560	25099	38461	2.53
T_8	1560	62400	24999	37401	2.50
T_9	1674	66960	27899	39061	2.40
T_{10}	1733	69320	27799	41521	2.49

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