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RESEARCH ARTICLE

Effect of integrated nutrient and micronutrients treatment on plant growth parameters in oat cultivar (*Avena sativa* L.)

■ M.S. PUNEETH RAJ AND B.S. VYAKARANAHAL

SUMMARY

The field experiment was carried out at MARS, UAS, Dharwad, during *Rabi* season of 2012 to assess the effect of organics and micronutrients on plant growth, seed yield and quality of oat (*Avena sativa* L.). The experiment consisted of 12 treatment combinations of treatments includes fertilizer: F_1- 100:60:40 N, P_2O_5, K_2O per ha (RDF), F_2 100:60:40 N, P_2O_5, K_2O per ha+ FYM 10t/ha, F_3- 100:60:40 N, P_2O_5, K_2O per ha + vermicompost 5t/ha. Micronutrients includes M_1- RDF+ $MgSO_4$ @ 5 kg/ha, M_2- RDF + ferrous sulphate @ 5 kg/ha, M_3- RDF + copper sulphate @ 5 kg/ha, M_4- RDF +zinc sulphate @ 15 kg/ha. Results revealed that there was a significant difference for the application of 100:60:40 N, P_2O_5, K_2O per ha + vermicompost 5t/ha for plant height (cm) at 45 days after sowing (DAS), tiller number 30 DAS, number of leaf at 45 DAS. RDF + zinc sulphate @ 15 kg/ha plant height (cm) at 45 days showed significant difference.

Key Words : Organics, Micronutrients, Plant growth parameters, Oats

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Oat (*Avena sativa* L.) belongs to family Poaceae, it is presently grown in many parts of the world including India, USA, Canada and Europe etc. as spring-sown cultivar. In the tropical countries as a winter annual crop, It is the most important cereal fodder cum food crop grown in the winter season in the north western and central India and now extending to the eastern regions. It ranks around sixth in the world cereal area, production and productivity followed by wheat, maize, rice, barley and sorghum. It requires a long and cool season for its growth, therefore, it is successfully grown in the plains and hilly areas of the country. Livestock production is backbone of Indian Agriculture and source of employment in rural areas for centuries. This sector has been the primary source of energy provide for agricultural operation and major source of animal protein for the rural masses. Our whole system of rural economy has revolved around livestock production. India is house to 15 per cent world cattle population and 16 per cent of human population to be sustained and progressed on 2 per cent of total geographical area. Due to ever increasing population pressure of human, arable land is mainly used for food and cash crops, thus, there is little chance of having good quality arable land available for fodder and seed production.

These are generally considered “healthful”, or a health food, being used commercially as nutritious. The discovery of the healthy cholesterol-lowering properties has led to wider appreciation of oats as human food. They are rolled or crushed into oatmeal, or ground into fine oat flour. Oatmeal is chiefly eaten as porridge, but may also be used in a variety of baked goods, such as oatcakes, oatmeal cookies and oat bread. Oats are also an ingredient in many cold cereals. Oats may also be consumed raw.

MEMBERS OF THE RESEARCH FORUM

Author to be contacted :
M.S. PUNEETH RAJ, Department of Seed Science and Technology, University of Agricultural Sciences, DHARWAD (KARNATAKA) INDIA
Email: rajpuneeth@gmail.com

Address of the Co-authors:
B.S. VYAKARANAHAL, Department of Seed Science and Technology, University of Agricultural Sciences, DHARWAD (KARNATAKA) INDIA

These are suitable for human consumption as oat meal and rolled oats is one of the most common uses is as livestock feed. It has an important character to show a regrowth of good quality and quantity of fodder when it is cut at vegetative stage. Highly nutritive fodder to all categories of livestock make up a part of the daily diet of horses, about 20 per cent of daily intake or smaller and are regularly fed to cattle as well, used in some brands for chicken feed, commonly marketed as cat grass to cat enthusiasts, since cats readily harvest and eat tender young oat, wheat and some other grass sprouts.

These are also occasionally used in several different drinks. In Britain, they are used for brewing beer. Oatmeal stout is one variety brewed using a percentage of oats for the wort. The more rarely used oat malt is produced by the Thomas Fawcett and Sons maltings and was used in the Maclay Oat Malt Stout before Maclays Brewery ceased independent brewing operations. A cold, sweet drink made of ground oats and milk is popular refreshment throughout Latin America. Hence, to increase its productivity, yield of fodder both in terms of green forage and dry matter, is a function of number of tillers, plant height and foliage which are significantly influenced by nitrogen application (Vyas *et al*., 1988).

Information on the variety of oat with respect to organic application fertilization and micronutrients effects to improve seed quality parameters is meager in south Indian conditions to improve seed production. Hence, an attempt was made to evaluate promising varieties of oats varying treatments in south Indian condition and also to improve storability of oat seeds.

MATERIAL AND METHODS

The field experiment was carried out at Main Agricultural Research Station, UAS, Dharwad, during *Rabi* season of 2012 to assess the effect of organics and micronutrients treatments on plant growth of oat cultivar (*Avena sativa* L.).

Seeds were obtained from the main Agricultural Research Station (MARS), Mandya, V.C. Farm. The seeds were used to record the initial quality parameters. After recording the initial observations, treatments combination was made. Treatments: control: 100:60:40 N, P_2O_5, K_2O per ha, organic fertilizer: F_1: control, F_2: FYM 10t/ha, F_3: vermicompost 5t/ha, Micronutrients: cinc sulphate, copper sulphate, ferrous sulphate.

Fertilizer: F_1- 100:60:40 N, P_2O_5, K_2O per ha, F_2 - 100:60:40 N, P_2O_5, K_2O per ha+ FYM 10t/ha**,** F_3- 100:60:40 N, P_2O_5, K_2O Per ha + vermicompost 5t/ha. Micronutrients: M_1: $MgSO_4$ @ 5 kg/ha, M_2: ferrous sulphate @ 5 kg/ha, M_3: copper sulphate @ 5 kg/ha, M_4: zinc sulphate @ 15 kg/ha these are soil application treatment Combinations: 12, the experiment was laid out in Randomized Complete Block Design with three replication and 12 treatment combinations in Dharwad during *Rabi* Season sowing 2012.

Sowing was done with a spacing of 30 cm x 10 cm. Seed rate is 100 kg per hactare OS-6 variety. 25 tonnes/ha FYM at the time of sowing.

RESULTS AND DISCUSSION

Results revealed that significantly higher plant height at 45 DAS 34.73cm for 100:60:40 N, P_2O_5, K_2O Per ha + vermicompost 5t/ha followed by 32.82 cm 100:60:40 N, P_2O_5, K_2O Per ha+ FYM 10t/ha and 30.88cm control (100:60:40 N, P_2O_5, K_2O Per ha). Similarly there was significant difference for number of leaves at 45 DAS and

. . . . . $_2O_5$, K_2O Per ha + zinc sulphate @ 15 kg/ha followed by 32.69 cm 100:60:40 N, P_2O_5, K_2O per ha+ copper sulphate @ 5 kg/ha and 32.56 cm 100:60:40 N, P_2O_5, K_2O per ha+ ferrous sulphate @ 5 kg/ha, 32.10 cm 100:60:40 N, P_2O_5, K_2O per ha+ $MgSO_4$ @ 5 kg/ha).

The incorporated organic manures like FYM, VC under decomposition have released the soil native P and K which

Table 1: Effect of integrated nutrients and micronutrients management on plant growth of oat cultivar OS-6

Treatments	Plant height at (30 DAS)				Plant height at (45 DAS)			
Micronutrients (M)	Fertilizers (F)				Fertilizers (F)			
	F_1	F_2	F_3	Mean	F_1	F_2	F_3	Mean
M_1	9.33	10.78	11.17	10.43	30.33	31.97	34.00	32.10
M_2	9.37	10.81	12.28	10.82	30.67	32.67	34.33	32.56
M_3	10.33	11.00	12.33	11.22	30.72	32.71	34.63	32.69
M_4	10.67	11.08	12.67	11.47	31.80	33.93	35.97	33.90
Mean	9.93	10.92	12.11	10.99	30.88	32.82	34.73	32.81
For comparing the means of	S.E.±		C.D. at 5%		S.E.±		C.D. at 5%	
M	0.889		NS		0.439		1.288	
O	0.770		NS		0.380		1.116	
M x O*	1.539		NS		0.761		NS	

M - Micronutrients M x O – Interaction O– Organic fertilizers NS=Non-significant

Table 2: Effect of integrated nutrients and micronutrients management on plant growth of oat cultivar OS-6

Treatments	Number of leaf at (45DAS)				Number of tillers at (30DAS)			
	Fertilizers (F)				Fertilizers (F)			
Micronutrients (M)	F_1	F_2	F_3	Mean	F_1	F_2	F_3	Mean
M_1	21.00	22.33	23.40	22.24	2.33	2.90	3.37	2.87
M_2	21.37	22.71	23.71	22.60	2.39	3.11	3.39	2.96
M_3	21.67	22.73	23.77	22.72	2.57	3.27	3.40	3.08
M_4	21.83	23.00	24.67	23.17	2.72	3.33	3.57	3.21
Mean	21.47	22.69	23.89	22.68	2.50	3.15	3.43	3.03
For comparing the means of	S.E.±		C.D. at 5%		S.E.±		C.D. at 5%	
M	0.449		NS		0.19		NS	
O	0.389		1.140		0.17		0.48	
M x O*	0.778		NS		0.33		NS	
		C.V.				C.V.		
		5.937				18.89		

M - Micronutrients + RDF; M x O – Interaction; F– Organic fertilizer+ RDF
NS=Non-significant; DAS= Days after sowing; F_1 : 100:60:40 N, P_2O_5, K_2O Per ha
F_2 : RDF + FYM 10t/ha; F_3 : RDF + Vermicompost 5t/ha; M_1 : Magnesium sulphate @ 5 kg/ha
M_2 : Ferrous sulphate @ 5 kg/ha; M_3 : Copper sulphate @ 5 kg/ha; M_4 : Zinc sulphate @ 15 kg/ha

have led to more nutrient availability to produce significantly varied number of tillers per plant. These organic sources have served as base for native microflora to multiply at faster rate and growth and quick spread. These might have helped to release N and P along with micronutrients mobilization which significantly influenced the plant growth characters (plant height and productive tillers). These results are in accordance with the findings of Rajapriya (2005) and Balamurali (2006). Organic nutrition has increased the plant vigour with higher absorption of nutrients resulted in higher productive tillers production (Nagaraju and Krishnappa, 1995). Organics application registered higher dry matter production and increased photosynthetic rate (Singh *et al*., 1987), rapid mineralization of N from organic manure and absorption by rice crop (Balasubramaniyan, 2003; Rajapriya, 2005 and Shanmugam, 1997).

Plant height, Tillers number/plant 30 DAS and number of leaves at 45 DAS also plays a important role in increasing parameters due to increase in photosynthetic area. These results are in agreement with the findings of Singh *et al.* (1979), Uhliar (1979), Veera Raghavaiah *et al*. (1979), Singh *et al.* (1989), Han and Kim (1992), Jan and Jan (1994) and Kakol *et al.* (2000). Further there was estimation that the yield may increase mainly due to significantly higher performance of all the growth parameters *viz.*, plant height, number of tillers, Singh *et al*. (1989) opined that the beneficial effects of nitrogen on cell division and elongation, formation of nucleotides and co-enzymes resulted in increased meristematic activity and photosynthetic area and hence, more production and accumulation of photosynthates.

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