

Integrated nutrient management in forage oat (*Avena sativa*)

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ABSTRACT

An experiment was conducted to study the effect of organic and inorganic fertilizers on the productivity and economics of forage oat (*Avena sativa* L.) during 1997–2000. Treatments consisted of FYM or vermicompost at 10 or 5 tonnes/ha, 100 or 50% recommended NPK and the combination of 50% NPK with 5 tonnes of either FYM or vermicompost and both. Application of 50% recommended NPK level of 40 : 20 : 0 kg/ha fertilizer + vermicompost + FYM each at 5 tonnes/ha, recorded higher green fodder yield of 40.5 tonnes/ha and the crude protein yield of 1.63 tonnes/ha which were comparable with that of 100% recommended NPK fertilizer to fodder oat. In addition, application of 50% recommended NPK fertilizer of 40 : 20 : 0 kg NPK/ha gave the highest net return of Rs 4,296/ha with a benefit of Rs 1.72 for every rupee invested on cost of cultivation.

Key words : Forage oat, Integrated nutrient, Vermicompost, Productivity, Net return

Oat is particularly important, as it furnishes a highly sustaining fodder during the winter months, when fodder supply is both scarce and costly. This comes up well in temperate regions and cool subtropical places. Coimbatore being nearer to temperate or cool subtropical, oat was tried here for the past several years and proved to be quite suitable during winter season. Oat fodder is not popular due to lack of adequate information on its appropriate varieties, doses of fertilizers and management practices. Application of heavy doses of inorganic fertilizers is a not a sound management practice, because of high cost

of fertilizers, nitrate toxicity due to high nitrogen fertilizer application and soil and water pollution in the long run. Hence the field experiment was conducted to study the herbage production potential of oat under different combination of organic and inorganic nutrient sources.

MATERIALS AND METHODS

A field experiment was conducted at the Forage farm of Department of Forage Crops, Tamil Nadu Agricultural University, Coimbatore, from November to February 1997–98, 1998–99 and 1999–2000. The soil of the experimental field was clay loam

with low nitrogen and phosphorus and high potassium contents. Treatments consisted of vermicompost and FYM @ 10 tonnes or 5 tonnes/ha, 100% or 50% recommended NPK, 50% recommended NPK + vermicompost or FYM at 5 tonnes/ha and 50% recommended fertilizer + FYM and vermicompost each at 5 tonnes. The experiment was laid out in randomized block design, replicated thrice. The recommended dose of fertilizer for fodder oat is 80, 40 and 0 kg NPK/ha. Forage oat was harvested at 50% flowering stage, which coincides with 60–65 days after sowing. The data on plant on plant height, number of tillers, green and dry fodder yields and crude protein yields were recorded at the time of harvest. Protein yield was calculated as per the procedure suggested by Piper (1996). Net return and benefit : cost ratio were worked out based on cost of cultivation and returns from the oat forage production.

RESULTS AND DISCUSSION

Growth attributes

Application of 100% recommended N : P : K fertilizer (80:40:0 kg/ha) recorded taller plants of 87.2 cm, which was on par with 50 % recommended NPK fertilizer + FYM and vermicompost each at 5 tonnes/ha or 50% recommended NPK fertilizer + vermicompost at 5 tonnes/ha

More number of tillers were recorded with 100% recommended NPK fertilizer. The tiller production was comparable with the application of 50% NPK fertilizer + FYM and vermicompost each at 5 tonnes/ha or application of vermicompost alone 10 tonnes/ha (Table 1). Growth of cereal crops like oat in terms of plant height and

tiller production are mainly decided by the availability of N nutrient at optimum level, which was met out with the application of either 100% recommended NPK or 50% in combination of organic sources like FYM or vermicompost. Influence of inorganic N nutrient on the growth of oat was reported by Bhat *et al.* (2000) with increased N application.

Green and dry fodder yields

Application of 50% recommended NP fertilizer (40 kg N + 20 kg P) with FYM and vermicompost each at 5 tonnes/ha gave higher green fodder yield of 40.5 tonnes/ha. The green fodder yield was comparable with that of 100% recommended NPK fertilizer or 50% recommended fertilizer with either FYM or vermicompost 5 tonnes/ha (Table 1). This indicated that the application of inorganic fertilizer nutrients in combination with organic manures is better than the application of FYM or vermicompost or inorganic N and P fertilizers alone. The higher green fodder yield recorded with application of organic and inorganic nutrient together could be attributed to enhanced availability and gradual release of N and P nutrients through organic sources. The yield advantage of applying inorganic nutrients with organic sources was also reported by Singh (1995) in forage cereals.

Higher dry fodder yield (9.4 tonnes/ha) was recorded with 50% recommended NPK fertilizer + FYM and vermicompost each at 5 tonnes/ha was on par with that of 100% NPK fertilizer application. Similar significant increase in dry-matter yield of greengram was observed with vermicom-

Table 1. Effect of vermicompost and inorganic fertilizer on forage oat (pooled data of 3 years)

Treatment	Plant height (cm)	Number of tillers	Green-fodder yield (tonnes/ha)	Dry fodder yield (tonnes/ha)	Crude protein (%)	Crude protein yield (tonnes/ha)	Net return (Rs/ha)	Benefit : cost ratio
Control	71.9	6.5	24.9	4.5	11.5	0.51	2,073	1.40
Vermicompost 10 tonnes/ha	80.9	7.9	34.1	6.8	15.6	1.07	1,997	1.24
FYM 10 tonnes/ha	79.2	7.3	33.8	6.6	14.3	0.93	1,702	1.21
100 % NPK	87.2	8.2	37.5	8.5	16.5	1.41	4,215	1.62
50% NPK	77.6	7.3	35.1	7.5	15.0	1.13	4,296	1.72
Vermicompost 5 tonnes/ha	77.7	6.9	34.5	6.3	14.8	0.89	2,843	1.43
FYM 5 tonnes/ha	77.8	6.9	31.9	6.0	13.4	0.81	3,645	1.39
50% NPK + vermicompost 5 tonnes/ha	81.6	7.6	36.5	7.8	15.6	1.21	3,213	1.43
50% NPK + FYM 5 tonnes/ha	79.8	7.4	36.4	7.6	15.2	1.17	3,180	1.43
50% NPK + vermicompost 5 tonnes/ha + FYM 5 tonnes/ha	85.9	8.1	40.5	9.4	17.2	1.63	2,925	1.32
CD (P=0.05)	9.83	1.04	5.00	1.32		0.80		

post and FYM by Srinivas Reddy and Uma Mahesh (1997). Rawat *et al.* (1998) reported maximum increase in straw yield with 40 kg N/ha in grain oat. Better growth characters like plant height and tiller production and higher forage yield of oat with combined application of inorganic N and P fertilizer and organic manure might be due to the improvement in soil health and built up of soil fertility.

Crude protein content and yield

Application of 50% recommended NPK fertilizer with FYM and vermicompost each at 5 tonnes/ha gave higher crude protein content (17.2%) and yield (1.63 tonnes/ha) and was on par with that of 100% NPK fertilizer application. Chattopadhyaya *et al.* (1997), Baral *et al.* (1997) and Kubra Bana (1997) reported that use of vermicompost would be beneficial in maintaining higher fertility status, reducing the need for application of inorganic nutrients and increasing the quality of fodder

Economic returns

Maximum net returns and benefit: cost ratio were obtained with the application of 50% recommended NPK fertilizer. Application of organic manures together with 50% NP fertilizer gave a net return of Rs 2,925/ha. This may be due to high cost involved in vermicompost.

To sustain the soil health, productivity and for getting quality fodder, application of 50% of the recommended N : P : K (40 : 20 : 0 kg/ha) fertilizer with vermicompost and FYM each at 5 tonnes/ha can be adopted for single cut oat under irrigated condition.

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