

Effect of Different Nitrogen Levels on Growth, Yield and Economics of Fodder Oat Varieties under Lateritic Soil of Konkan Region

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Abstract A field experiment was conducted during the *rabi* season of 2015-16 at the experimental field of Agronomy Department, College of Agriculture, Dr Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli to evaluate the effect of different nitrogen levels on performance and nutrient uptake of fodder oat varieties under lateritic soil of konkan region. Three fodder oat varieties viz. RO-19 (V_1), Kent (V_2) and OS-6 (V_3) with four nitrogen levels viz. 40 kg N ha⁻¹ (N_1), 60 kg N ha⁻¹ (N_2), 80 kg N ha⁻¹ (N_3) and 100 kg N ha⁻¹ (N_4) were used in split plot design. On the basis of results, the highest growth parameters, green and dry fodder yield and economics was associated with the application of 100 kg N ha⁻¹ in the variety RO-19.

Keywords Oat, Variety, Nitrogen, Yield, Growth Parameters.

Introduction

Fodder availability in Maharashtra is 13 kg per cattle and average milk productivity is 32 L per animal [1]. Total area under forage crops in Maharashtra is 8

Lakh ha and estimated green forage production is 32.4 MT. In konkan, it is negligible. Maharashtra has about 4.0 crore of livestock population which needs about 12 crore tons dry fodder. However, only 7 crore tons dry fodder is available from all resources. It means there is 45% deficit of green fodder in Maharashtra. Thus, there is a huge gap between demand and supply in the state. A vast varietal diversity of oat enables its cultivation over wide range which have high yield potential and grown for producing green fodder as well as seed. Being a fast growing and high yielding crop, oat requires a large quantity of fertilizer nitrogen for enhancing production as well as quality of herbage. Hence, substantial increase in yields of these varieties along with growth parameters can be achieved by providing balanced fertilizer. So, application of adequate dose of nitrogen and selection of well adapted variety to the agro-climatic conditions of Konkan will play an important role in increasing productivity, quality and nutrient uptake of the fodder. As there is no information on these aspects under agro-climatic conditions of Konkan, hence the present investigation was undertaken.

Materials and Methods

A field experiment was conducted during *rabi* season of 2015-16 at the Agronomy farm, College of Agriculture, Dr Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli, Dist Ratnagiri. The soil of the experimental plot was sandy clay loam in texture, slightly acidic in (pH 5.68) and medium in organic carbon content (0.97%). It was medium in available nitrogen (284.2 kg ha⁻¹) and potassium (264.22 kg⁻¹)

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Table 1. Growth parameters of oat as influenced by different levels of nitrogen and varieties at harvest.

Treatments	Plant height (cm)	Tillers (running meter ⁻¹)	Dry matter (g)
Varieties			
V ₁ : RO-19	92.69	99.56	118.43
V ₂ : Kent	89.98	97.02	116.62
V ₃ : OS-6	89.37	96.94	112.85
SEm ±	0.41	0.52	0.53
CD at 5%	1.63	2.04	2.10
Nitrogen levels			
N ₁ : 40 kg ha ⁻¹	87.53	95.48	112.71
N ₂ : 60 kg ha ⁻¹	89.34	96.55	114.68
N ₃ : 80 kg ha ⁻¹	92.09	98.88	116.94
N ₄ : 100 kg ha ⁻¹	93.74	100.44	119.53
SEm ±	0.60	0.69	0.48
CD at 5%	1.77	1.77	1.42
Interaction			
SEm ±	1.03	1.03	0.83
CD at 5%	3.07	NS	NS

and low in available phosphorus (10.80 kg ha⁻¹). The experiment was laid out in the Split Plot Design with three replications. The treatments consist of four levels of nitrogen (40, 60, 80 and 100 kg ha⁻¹) and three fodder oat varieties (RO-19, Kent and OS-6). The crop was sown on 6th November, 2015. The required quantity of nitrogen in the form of urea (46%) as per the treatments along with uniform dose of 40 kg ha⁻¹ phosphorus in the form of single super phosphate (16% P₂O₅) and 40 kg ha⁻¹ potash in the form of muriate in potash (60% K₂O) was applied one day before sowing of the crop along the open furrow spaced 30 cm apart at 4-5 cm depth which were mixed properly with the soil. At the time of sowing half dose of N with full dose of P₂O₅ and K₂O was applied as a basal dose. The remaining half dose of nitrogen was applied after one month of sowing. The crop was harvested at 50% flowering.

Results and Discussion

Growth parameters

Table 1 shows that the growth and development pa-

Table 2. Fodder yield of oat as influenced by levels of nitrogen and varieties.

Treatments	Leaf: stem ratio	Green forage yield (q ha ⁻¹)	Dry forage yield (q ha ⁻¹)	(kg day ⁻¹ ha ⁻¹)	(kg day ⁻¹ ha ⁻¹)
Varieties					
V ₁ : RO-19	0.85	290.60	279.42	91.11	77.21
V ₂ : Kent	0.82	253.43	261.27	83.18	74.94
V ₃ : OS-6	0.66	251.97	259.76	82.96	74.74
SEm ±	0.02	1.58	1.59	2.30	2.07
CD at 5%	0.06	6.21	6.26	NS	NS
Nitrogen levels					
N ₁ : 40 kg ha ⁻¹	0.67	234.98	236.12	72.20	63.67
N ₂ : 60 kg ha ⁻¹	0.75	250.05	251.34	77.83	68.64
N ₃ : 80 kg ha ⁻¹	0.81	272.21	273.97	88.70	78.33
N ₄ : 100 kg ha ⁻¹	0.87	304.08	305.83	104.28	91.89
SEm ±	0.01	3.45	3.47	2.00	1.77
CD at 5%	0.03	10.26	10.30	5.93	5.25
Interaction					
SEm ±	0.02	5.98	6.00	3.46	3.06
CD at 5%	NS	17.77	17.83	NS	NS

rameters of oat varieties viz. plant height, number of tillers running meter⁻¹ and dry matter accumulation running meter⁻¹ were significantly influenced by different varieties throughout the crop growth period.

The higher plant height was observed in variety RO-19 as compared to variety Kent and OS-6 while the differences between Kent and OS-6 were up to the mark and remained statistically identical with each other at all growth stages. This might be due to particular characteristics of varieties, which in turn promoted greater photosynthesis and ultimately resulted in increased vegetative growth. Pathan and Bhilare [2] observed that variety RO-19 recorded higher plant height than Kent and OS-6. Roshan et al. [3] also recorded that the variety OS-6 to be statistically identical with Kent in respect with height. In case of the number of tillers running meter⁻¹ increasing trend is noticed. Variety RO-19 recorded significantly higher number of tillers, where, Kent variety was found on same bar with variety OS-6 and OS-6 recorded minimum number of tillers at all the growth stages. These results are in conformation with the earlier findings [2—4].

The mean dry matter accumulation by crop was increased with the increases in the duration of crop and was highest at harvest. Increase in dry matter production per running meter is a first step towards maximum fodder yield. Dry matter production is an important pre-requisite for higher dry fodder yields as it signifies photosynthetic ability of the crop and also indicates other synthetic processes during developmental sequences. Variety RO-19 noted significantly higher dry matter accumulation and was at par with Kent and significantly superior over OS-6. The more number of leaves with better availability of sunshine and moisture has further synthesized more food material which is evident from the accumulation of more dry matter in the oat crop. These results confirm the earlier findings [2, 3].

It was observed from Table 1 that, the plant height gave significant responses to application of different nitrogen levels at all the growth stages of crop under study. It was found that, the plant height increased significantly with increase in the levels of nitrogen fertilization. Application of 100 kg N ha⁻¹ recorded maximum plant height followed by 80 kg N ha⁻¹ which was at par with each other and significantly superior over rest of the treatment. These findings are in close proximity with results reported earlier [2-5]. Nitrogen application produced higher number of tillers at all the growth stages. Application of 100 kg N ha⁻¹ recorded significantly higher number of tillers per meter row length at all the growth stages. Mean dry matter was significantly maximum at application of 100 kg N ha⁻¹ was found to be at par with 80 kg N ha⁻¹. This might be due to higher level of nitrogen application which helped in synthesizing more photosynthates resulting in higher dry matter accumulation. These results are in accordance with those reported earlier [2, 5, 6].

Yield

The green fodder and dry fodder yield were significantly affected by nitrogen application (Table 2). At harvest, the leaf : stem ratio was found to be higher in variety RO-19 followed by Kent which was statistically identical with each other, but significantly superior over variety OS-6. The significantly lowest leaf : stem ratio was recorded by variety OS-6 at the time

Table 3. Mean total cost, gross return, net return and B : C ratio (after harvest) of oat plant as influenced by different treatments.

Treatments	Total cost (Rs ha ⁻¹)	Gross return (Rs ha ⁻¹)	Net return (Rs ha ⁻¹)	B:C ratio (Rs ha ⁻¹)
Varieties				
V ₁ : RO-19	60135.51	116239.38	56103.86	1.93
V ₂ : Kent	57657.46	101371.08	43713.62	1.75
V ₃ : OS-6	57560.12	100787.04	43226.92	1.75
Nitrogen levels				
N ₁ : 40 kg N ha ⁻¹	55986.46	93993.35	38006.89	1.68
N ₂ : 60 kg N ha ⁻¹	57284.99	100018.99	42734.01	1.74
N ₃ : 80 kg N ha ⁻¹	59056.76	108884.14	49827.38	1.84
N ₄ : 100 kg N ha ⁻¹	61475.91	121633.51	60157.60	1.97
General mean	58451.03	106132.50	47681.47	1.81

of harvest. Application of 100 kg N ha⁻¹ recorded significantly higher leaf : stem ratio than of the treatments viz. 80, 60 and 40 kg N ha⁻¹ in that descending order of significance. However the lowest leaf : stem ratio was found with application of 40 kg N ha⁻¹ at harvest. These results are in a close vicinity to those reported earlier [2, 5, 7]. Green forage yield and dry forage yield (q ha⁻¹ and kg day⁻¹ ha⁻¹), was observed significantly higher under variety RO-19 followed by variety Kent and OS-6. However variety Kent was found to be at par with variety OS-6 in respect with green forage yield (q ha⁻¹). Application of 100 kg N ha⁻¹ recorded significantly higher green and dry forage yield in terms of kg ha⁻¹ and kg day⁻¹ ha⁻¹ followed by 80, 60 and 40 kg N ha⁻¹ in that descending order. These results are in confirmation with those obtained from [2, 8, 9].

Economics

Economics of the different oat varieties cultivation indicated that variety RO-19 gave the highest net returns of (RS 56103.86 ha⁻¹ followed by variety Kent (Rs 43713.62 ha⁻¹) and OS-6 (Rs 43226.92 ha⁻¹) respectively (Table 3). The highest B : C ratio was recorded by variety RO-19 was (1.93) followed by the varieties

Kent (1.75) and OS-6 (1.75). The increased net returns and benefit : cost ratio in a particular variety were mainly due to its highest green forage yield and dry fodder yield. These results confirmed the earlier findings [6, 7, 10]. Gross returns were found to be numerically higher with application of 100 kg N ha⁻¹ (Rs 121633.51 ha⁻¹) followed by application of 80 kg N ha⁻¹ (Rs 108884.14 ha⁻¹), 60 kg N ha⁻¹ (Rs 100018.99 ha⁻¹) and 40 kg N ha⁻¹ (Rs 93993.35 ha⁻¹). Similarly, net return were numerically maximum with the application of 100 kg N ha⁻¹ (Rs 60157.60 ha⁻¹) as compared to application of 80 kg N ha⁻¹ (Rs 49827.38 ha⁻¹), 60 kg N ha⁻¹ (Rs 42734.01 ha⁻¹) and 40 kg N ha⁻¹ (Rs 38006.89 ha⁻¹) respectively. The highest B : C ratio of 1.97 was recorded under 100 kg N ha⁻¹ while minimum B : C ratio 1.68 was observed in 40 kg N ha⁻¹. The above observations are in accordance with [4, 6, 7].

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