

Influence of Nitrogen and Water Management on Yield and Chemical Composition of Oat (*Avena sativa*, L.) Forage

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ABSTRACT

An experiment was conducted on sandy loam soil to study the yield and quality of oat (Kent variety) forage as influenced by nitrogen (0, 40, 80 and 120 kg N/ha) and soil moisture regime (irrigation at 25, 50 and 75 per cent available soil moisture). The yield of dry forage gradually increased from 79 to 99 q/ha with progressive increase in levels of nitrogen from 0 to 120 kg N/ha. The crude protein content increased with successive dose of nitrogen fertilization, while the trend was not consistent for phosphorus, calcium, ash, silica and acid detergent fibre content of oat forage. Frequent irrigation depressed the concentration of crude protein, phosphorus, calcium, ash, silica and acid detergent fibre in the forage.

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INTRODUCTION

The high yielding and cross-bred cows need regular supply of green and nutritious forage throughout the year to maintain their performance in milk production. Oat is grown in winter chiefly to provide green forage to livestock and it is an important forage crop, when there is an acute shortage of cereal green forage in winter.

Water and fertilizer are two important inputs in agricultural production. These two inputs being scant and costly, need to be efficiently used through proper management to get maximum production of good quality oat forage per unit area. Information on water and nitrogen requirement of oat for sandy loam soil of middle Gujarat is lacking. This consideration prompted to undertake the present investigation to find out the optimum dose of nitro-

gen and proper time of irrigation to get the maximum production of good quality oat forage in winter season.

MATERIALS AND METHODS

An experiment was conducted in sandy loam soil of Anand in rabi season on oat variety kent. There were twelve treatments consisting of four levels of nitrogen (0, 40, 80 and 120 kg/ha) and three levels of irrigation (irrigation at 25, 50 and 75 per cent available soil moisture level). The treatments were replicated three times. A dose consisting of 30 kg P_2O_5 as superphosphate + 25 kg K_2O as muriate of potash per hectare was ploughed into all the plots. Nitrogen was applied in the form of urea as per treatment to respective plots at the time of preparation of seed bed.

The initial fertility status of the experimental field was total nitrogen

607 kg/ha, available P_2O_5 -67 kg/ha and available K_2O -363 kg/ha. The field capacity and permanent wilting point of soil were 18.2 and 5.4 per cent respectively. The crop was harvested at about 50 per cent flowering stage. The green forage yield of each plot was recorded. From the moisture per cent of green forage, dry matter yield for each plot was computed. The replication-wise plant samples were analysed for

crude Protein, Phosphorus, Calcium, Ash, Silica and A.D.F. as per methods of A.O.A.C. (1970).

RESULTS AND DISCUSSION

Forage yield

The data on dry forage yield of oat as influenced by soil moisture regimes and nitrogen levels are presented in Table-1.

TABLE 1

Dry forage yield (q/ha) of oat as influenced by nitrogen and irrigation levels.

Nitrogen levels	Soil moisture regimes			
	I_{25}	I_{50}	I_{75}	Mean
N_0	77	79	82	79
N_{40}	83	87	90	87
N_{80}	97	101	93	97
N_{120}	102	103	92	99
Mean	90	92	89	90
	Nitrogen (N)		Soil moisture (I)	N×I
S.Em. $\pm$	1.29		0.89	2.21
C.D. 5%	3.77		N.S.	6.29

A perusal of the data revealed that the effects of nitrogen levels and $N \times I$ interaction on dry forage yield of oat were significant. The yield of dry forage gradually increased from 79 to 99 q/ha with progressive increase in levels of nitrogen from 0 to 120 kg N/ha. However, the yield obtained at higher two levels of nitrogen (80 and 120 kg/ha) were at par. Thus the optimum level of nitrogen was 80 kg/ha for higher production of oat forage. These results are in line with those reported by Patel *et al.* (1972) and Singh *et al.* (1973).

The dry forage yield varied between 89 q/ha under I_{75} and 92 q/ha under I_{50} treatments without significant difference. Therefore, an appli-

cation of 80 kg. N/ha and irrigation at 25 ASM would be advantageous for optimum forage production of oat.

Forage quality

The data on crude protein, phosphorus, calcium, ash, silica and acid detergent fibre contents of oat forage are presented in Table-2.

Crude protein content of oat forage significantly increased with successive dose of nitrogen fertilization. The increase in crude protein content over control was by 21, 29 and 54 per cent due to application of 40, 80 and 120 kg nitrogen per hectare respectively. The crude protein content was significantly higher under the treatment of soil

moisture regimes varied from 0.53 per cent under $N_0 I_{75}$ to 0.70 per cent under $N_{40} I_{25}$ treatments.

Significant effect on calcium content of oat forage was observed due to nitrogen and soil moisture regimes. Application of nitrogen at the rate of 80 and 120 kg/ha were at par and significantly superior over nitrogen levels N_{40} and N_0 . The effect of soil moisture regimes on calcium content of oat forage was significant. It was observed that the calcium content under either wet (I_{75}) or dry (I_{25}) regime of soil moisture was lower than medium regime (I_{50}).

The ash content of oat forage ranged from 9.32 to 9.55 per cent due to variation in nitrogen levels but the difference was not significant. The ash content was significantly lower (9.15 per cent) under dry soil moisture regime (I_{25}) than those under medium (I_{50}) and wet regimes (I_{75}). The interaction of soil moisture regime and nitrogen levels had significant effect on ash content of oat forage.

The silica content of oat forage was not significantly influenced either by nitrogen or irrigation levels.

The differences in A.D.F. content due to nitrogen levels and soil moisture regimes as well as their interaction were significant. However the variation in A.D.F. content of oat forage due to different treatments was narrow with an average value of 43.99 per cent.

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