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Effect of nitrogen levels and cutting management on green forage yield of fodder oat *(Avena sativa* L.)

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Abstract

The field experiment, conducted to evaluate the Effect of nitrogen levels and cutting management on growth, yield and quality of fodder oat *(Avena sativa* L.). A field experiment was conducted during *Rabi* season 2015-16 at Crop Research Centre (Chirauri) of Sardar Vallabhbhai Patel University of Agriculture and Technology, Meerut (U.P.) to evaluate the effect of nitrogen levels and cutting management on performance of fodder oat and chemical properties of soil. The area lie at a latitude of 29^o 40’ North and longitude of 77^o 42’ East with an elevation of 237 meters above mean sea level. The soil of the experimental field was well drained, sandy loam in texture and slightly alkaline in reaction. It was medium in available nitrogen and phosphorus but high in available potassium with an electrical conductivity (1:2, soil: water suspension) of 1.6 dS/m. The treatments comprised 5 nitrogen levels (0, 40, 80, 120 and 160 kg ha^{-1}) and 2 cutting management (single at 50% flowering and double at 60 DAS and 50% flowering), replicated 4 times in a factorial randomized block design. The data on growth, physiology, green forage yield and quality and its contributing traits were calculated on net plot area basis (16 m^2). The results indicated that green forage yield and dry forage yield of oat were significantly superior at 160 kg nitrogen ha^{-1}. Likewise, single cut resulted into higher values of above mentioned parameters than their respective counterparts like double cutting (60DAS and 50 % flowering).

Keywords: Oat, Fodder, Nitrogen and cutting

Introduction

Livestock population is the largest in India comprising 182.50 million cattle, among these, 61.30 million buffaloes, 76.65 million goats, 41.30 million sheep, 10.0 million pigs and 3.04 million other animals. (Jat *et al*., 2014) [3]. India is having the largest livestock population, 15% of the world’s livestock population (Neelar, 2011) [6]. Livestock contributing 7% to national GDP and source of employment and ultimate livelihood for 70% population in rural areas. Deficiency in feed and fodder has been identified as one of the major components in achieving the desired level of livestock production. At present, the country faces a net deficit of 63% green fodder, 24% dry crop residues and 64% feeds (Kumar *et al.,* 2012). The productivity of our livestock often remains low due to inadequate and nutritionally unbalanced supply of feed and fodder. Half of the total losses in livestock productivity are attributed to the inadequacy in supply of feed and fodder.

Oat (*Avena sativa* L.) is the important cereal (*Gramineae*) and forage crop, grown during *rabi* season and is next to berseem in nutritive value. It is also rich in energy, protein, vitamin B, phosphorous and iron (Tiwana *et al*., 2008) [8]. It is cultivated in an area of 1021 million ha with an annual production of 233 million tons in the world (Anonymous, 2009) [1]. The total area covered under oat cultivation in India is about 1.0 million ha with 350-500 q ha^{-1} green fodder productivity (IGFRI, 2011) [2].

There are several factors, which affect the productivity and quality of forage oat. Nitrogen is a one of the major component to influence the forage growth, yield and quality. Nitrogen play the vital role in the growth of fodder through the impact on cell elongation, cell division and inter-nodal expansion, it also play a major role in early establishment of the crop. Nitrogen is useful for the improvement of the leaf area by synthesis of enzymes and chlorophyll and also improves the leaf weight. Nitrogen improves the fodder yield through enhancement of growth parameters like plant height, number of tillers, leaf area index, number of leaves, leaf: stem ratio and dry matter accumulation. It is an essential part of protein and is a constituent of physiologically important compounds like nucleotides, vitamins, enzymes and hormones that promotes growth and development in crop plants (Kumar *et al*., 2001) [4] and also improve the meristematic activity, it is useful for absorbing of nutrients from the soil efficiently and enhance the protein content of the crop through improvement in synthesis of carbohydrates.

Forage oat especially multi-cut oat cultivars are heavy feeder of nutrients and remove large amount of nutrients from the soil. Nitrogen availability to the plant directly influence the forage yield, it is the reason to provide the nitrogen with the split applications.

Cutting management is the one of the important factor to influence the fodder crop growth, yield and quality. In general cutting management may fallowed in fodder crops for higher yields. Cutting exhibits the effect on nutrient and natural resource utilization by the crop. As compared to single cut multi cut crops absorb more nutrients, which directly influence the nitrogen content, protein content and other quality parameters of the crop.

Materials and Methods

The field experiment was conducted at Crop Research Centre of Sardar Vallabhbhai Patel University of Agriculture and Technology, Meerut (U.P.) during *rabi* season 2015-16. The climate of this region is sub-tropical and semi-arid and climate characterized with summers and extremely cold winters. Ten treatment combinations comprising of five levels of nitrogen viz., 0 kg ha-1 N(N0), 40 kg ha-1 N (N1), 80 kg ha-1 N (N2) , 120 kg ha-1 N (N3) and 160 kg ha-1 and two cuttings, single cut at 50% flowering stage and first cut at 60 DAS and second cut at 50% flowering. Oat seed were drilled by adopting a spacing of 25 cm. Kent cultivar was used in the study. Crop was harvested for green forage yield by cutting close to the ground with sickle from the net plot area (4 m x 3 m). The harvested green forage was weighed plot wise using hanging scale balance of 50 kg capacity. Thereafter, it was converted into q ha^{-1} from kilogram per plot.

Results and Discussion

Green forage yield (q ha^{-1})

Green forage yield was affected significantly by nitrogen levels and cutting management. Total green forage yield increase significantly with successive increment in nitrogen levels. Green forage yield increased by 14% due to the application of 40 kg N ha^{-1} over control. While, with the further increment in nitrogen increases in forage green yield was almost 8.0%. The green forage yield increased linearly with the application of nitrogen upto 160 kg ha^{-1}. Green forage yield was highly correlated with nitrogen levels upto 160 kg ha^{-1} and regression coefficient was 0.997. Cutting management also exhibited a significant effect on green forage yield. Single cut (662.9) gave the 25% more green forage yield than double cut (550.4) at 115 DAS.

The interaction effect between nitrogen levels and cutting management on green forage yield was significant. The interaction effect of nitrogen levels and cutting management exhibited the significant effect on total green forage yield. Single cut at every nitrogen level resulted significantly more green forage yield than double cut system.

Table 1: Effect of nitrogen levels and cutting management on green forage yield (q ha^{-1})

Green forage yield (q ha^{-1})			
Treatment	**1st cut**	**2nd cut**	**Total**
Nitrogen levels (kg ha^{-1})			
N - 0	39.8	453.1	492.9
N - 40	62.5	500.0	562.5
N -80	67.1	540.5	607.6
N -120	78.1	579.0	657.1
N - 160	89.0	625.0	714.0
S.Em (±)	1.07	6.38	4.4
CD at 5%	3.10	18.54	13.2
Cutting management			
50% flowering	_	662.9	662.9
At 60 DAS and 50% flowering	134.3	416.1	550.4
S.Em (±)	_	4.02	2.88
CD at 5%	_	11.72	8.36

Table 2: Interaction effect of nitrogen levels and cutting management on total green forage yield (q ha^{-1})

Cutting management	Nitrogen levels (kg ha^{-1})				
	N0	N40	N80	N120	N160
At 50% flowering	593.7	625.0	656.0	690.0	750.0
At 60 DAS and 50% flowering	390.0	500.0	559.3	624.0	678.1
S.Em (±)	3.22				
CD at 5 %	9.34				

Conclusion

Single cut given significantly high green forage and dry matter yield than double cut. The green forage and dry matter yield at both the cuts and in total, increased significantly with increase in nitrogen level upto 160 kg N ha^{-1}.

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