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YIELD AND QUALITY OF FODDER OAT (*Avena sativa* L.) AS INFLUENCED BY SOWING DATES, FERTILITY LEVELS AND CUTTING MANAGEMENT

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ABSTRACT

A field experiment was conducted during 2009-10 and 2010-11 at Research Farm, Division of Agronomy, SKUAST-K, Shalimar (J&K) to assess the influence of sowing dates, fertility levels and cutting management on yield and quality of forage oat. Early sowing gave higher green and dry fodder yields while high crude protein, low crude fibre and high ash contents were observed in oats sown on October 10. Green fodder and dry fodder yields and crude protein content increased with increase in fertility level up to 150 kg N + 70 kg P_2O_5 + 40 kg K_2Oha^{-1}. Double cut crop gave higher forage yield and better quality traits as compared to single cut crop.

Keywords: Cutting management, oats, quality, sowing dates, yield

INTRODUCTION

Inadequate supply of quality feed and fodder is the primary cause of lower productivity of milch animals in India (Patel *et al.,* 2011). Management practices to improve the quality and production of forage crops need to be standardized and adopted to meet the forage demand. Oats is an important fodder crop because of its excellent growth and wide adaptability as a fodder for milch animals. In Jammu and Kashmir fodder requirement is about 4.31 million tonnes against the availability of 3.26 million tonnes, there by having deficit of 1.05 million tonnes on dry matter basis (Anonymous, 2008). Kashmir valley experiences a long lean period of winter from December to early spring months, resulting in scarcity of green and quality fodder which results in drastic decrease in milk and meat production. Therefore, to meet the need of animal products and to maintain good health and potential of livestock in terms of draught, milk, meat and wool, there is a great importance of fodder cultivation with proper management practices to compensate the fodder scarcity during lean periods. Cutting management plays an important role in quality of oat (Bhilare and Joshi, 2007). Proper fertilization management in oats increases the herbage yield per unit time along with improvement in quality parameters to take care of two biological systems 'soil-plant' and 'plant-animals' (Suhrawardy and Kalita, 2001) .In view of the meager information available on these aspects the present work conducted to assess the effects of sowing dates, fertility levels and cutting management on fodder oats under temperate conditions of Kashmir.

MATERIALS AND METHODS

The field experiment was conducted at a single site for two consecutive years (2009-10 and 2010-11) at the Research Farm, Division of Agronomy, SKUAST, Kashmir, Shalimar situated between 34^o.05' N

latitude and 74°.89' E longitude at an altitude of 1587 masl. Soil texture was silty clay loam having pH 6.9, high organic carbon (0.89%), medium available nitrogen (261.48 kg ha^{-1}), medium phosphorus (20.83 kg ha^{-1}) and medium potassium (165 kg ha^{-1}) content. The precipitation was 383.70 and 428.10 mm during the cropping season of 2009-10 and 2010-11, respectively. The experiment was laid out in factorial randomized block design, having 18 treatment combinations each replicated three times. The treatments comprised of three sowing dates viz., 20September, 30 September and 10 October and three fertility levels viz., 150 kg N + 70 kg P_2O_5 + 40 kg K_2O ha^{-1}, 125 kg N + 60 kg P_2O_5 + 30 kg K_2O ha^{-1} and 100 kg N + 50 kg P_2O_5 + 20 kg K_2O ha^{-1} and two cutting management viz., single cut at 50% flowering and double cut (1st cut on December 15 and 2nd at 50 % flowering). The oat variety 'Sabzar' was used. Light pre-sowing irrigation was given during both the years of experimentation. Half dose of nitrogen and full dose of phosphorous and potassium was applied to each plot as per treatments in the form of urea, di-ammonium phosphate, and muriate of potash, respectively, as basal. Remaining nitrogen was applied in two equal splits i.e. 30 days after sowing (DAS) and first week of March, each after weeding. The fresh fodder yield from net plots, leaving border and penultimate rows, was recorded immediately after crop harvest, which was then sun-dried separately and weighed for dry fodder yield. Representative plant samples from 25 cm row length in penultimate row was oven-dried and then ground using 2 mm sieve to estimate crude protein, crude fibre and ash content. Nitrogen content was determined by the modified Kjeldahls method (Jackson, 1967) and crude protein calculated by multiplying it with a factor of 6.25. Crude fibre and ash contents were determined by standard method of AOAC (1995). The data obtained was statistically analyzed as per Cochran and Cox (1963).

RESULTS AND DISCUSSION

Sowing dates significantly influenced green and dry fodder yield (Table 1). The yield was higher in early sown dates viz., 20 September and 30 September, which were at par with each other. Sowing on 10 October resulted in green and dry fodder yield decline by 42.7 and 25.0% over 30 September sown crop, respectively. This could be attributed to less forage production in 1st cut owing to lower temperature at early growth stage in late sown crop as compared to early sown crop. These results are in conformity with Sood *et al.* (1992).

Table 1: Green and dry fodder yield of oats (q ha^{-1}) as influenced by sowing dates, fertility, levels and cutting management

Treatments	Green fodder yield			Dry fodder yield		
	2009-10	2010-11	Pooled	2009-10	2010-11	Pooled
Sowing dates						
September 20	379.47	359.40	370.76	104.79	97.39	100.59
September 30	382.85	364.50	372.82	105.00	99.04	102.27
October 10	269.63	253.90	261.24	83.99	79.25	81.76
SE(m)±	3.86	4.22	4.31	1.21	1.28	1.37
$CD_{0.05}$	11.45	12.18	12.43	3.51	3.72	3.96
Fertility levels (N:P_2O_5:K_2O kg ha^{-1})						
150 : 70 : 40	370.54	354.58	362.06	103.71	99.68	101.96
125 : 60 : 30	344.43	333.71	339.37	97.06	93.90	95.15
100 : 50 : 20	316.88	289.50	303.39	93.01	82.06	87.50
SE(m)±	3.86	4.22	4.31	1.21	1.28	1.37
$CD_{0.05}$	11.45	12.18	12.43	3.51	3.72	3.96
Cutting levels						
Single cut	320.32	301.44	310.68	95.40	89.27	92.51
Double cut	367.59	350.41	359.20	100.40	94.51	97.25
SE(m)±	3.24	3.45	3.52	0.99	1.05	3.24
$CD_{0.05}$	9.34	9.94	10.14	2.86	3.03	1.12

Higher crude protein and lower crude fibre and ash contents were observed in October 10 sown crop as compared to September 20 and September 30 sown crops (Table 2). This may be attributed to the higher nitrogen content at early stages. However, reverse trend was noticed in case of crude fibre and ash content, which may be attributed to the inverse relationship between protein and carbohydrates resulting in decreased crude fibre content. Lower dry matter content recorded with late sown crop might have resulted in lower ash content.

Table 2: Crude protein, crude fibre and ash contents in oats as influenced by sowing dates, fertility levels and cutting management (pooled over two years)

Treatments	Crude protein (%)		Crude fibre (%)		Ash (%)	
	1st cutting	2nd cutting	1st cutting	2nd cutting	1st cutting	2nd cutting
Sowing dates						
September 20	17.34	8.50	19.21	22.71	9.18	8.94
September 30	19.03	8.56	19.14	22.51	9.02	9.29
October 10	19.59	8.81	18.80	22.00	8.91	9.23
SE(m)±	-	0.06	-	0.17	-	0.06
$CD_{0.05}$	-	0.17	-	0.50	-	0.18
Fertility levels (N:P_2O_5:K_2O kg ha^{-1})						
150 : 70 : 40	19.50	8.90	19.00	22.31	9.17	9.58
125 : 60 : 30	19.09	8.59	19.55	22.40	9.01	9.31
100 : 50 : 20	17.43	8.37	19.15	22.55	8.94	9.06
SE(m)±	-	0.06	-	0.17	-	0.06
$CD_{0.05}$	-	0.17	-	ns	-	0.18
Cutting levels						
Single cut	-	8.46	-	23.02	-	9.61
Double cut	18.62	8.77	19.05	21.82	9.04	9.04
SE(m)±	-	0.05	-	0.14	-	0.05
$CD_{0.05}$	-	0.14	-	0.41	-	0.15

The increase in fertility level from 100 kg N + 50 kg P_2O_5 + 20 kg K_2O to 150 kg N + 70 kg P_2O_5 + 40 kg K_2O ha^{-1} depicted a consistent increase in green and dry fodder yields (Table 1). The enhancement in fodder yield might be due to the luxuriant and vigorous vegetative growth because of balanced supply of nutrients to the plant. These results are in agreement with Dubey *et al*. (1995) and Bali *et al*. (2003). The application of fertilizer @ 150 kg N + 70 kg P_2O_5 + 40 kg K_2O ha^{-1} significantly improved crude protein and ash content in plants. These results are in line with the findings of Bhilare and Joshi (2007).

Double cutting recorded significantly higher green and dry fodder yields as compared to the single cutting management. The increase may be attributed to the additional supply of fodder at 50% flowering stage. Earlier Singh and Dubey (2007) have also reported higher green and dry fodder yield in double cut. The magnitude of increase in green and dry fodder yield was 15.6 and 5% over single cut crop.

Double cut crop had significantly higher crude protein content than single cut crop. However, the crude fibre and ash content were significantly higher in single cut crop (Table 2). Higher crude protein in double cut crop may be due to more protein content at first cut and consequent loss of nitrogen by cutting might have forced the crop to absorb relatively more nitrogen at later stage. Earlier Bhilare and Joshi (2007) also reported similar findings. The higher lignin concentration in stem accounted for reduced digestibility with increased maturity in single cut crop, thereby making the crop more fibrous than double cut crop. Higher ash content in single cut crop could be attributed to lesser moisture content in crop compared to double cut.

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