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Effect of introduction of *Setaria sphacelata* and cutting management on productivity of a natural grassland

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ABSTRACT

An experiment on the introduction of *Setaria sphacelata* (Schum.) Stapf & C.E. Hubb. ex Moss and cutting management was conducted in a natural grassland of Jorhat during 1995 and 1996 under rainfed condition. On an average of 2 years, an introduction of *Setaria sphacelata* cv. 'Kazungula' proved advantageous than the cv. 'Nandi' from production and quality point of view. Cutting management significantly influenced forage production and crude protein yield. Three cut management proved superior to 1 and 2 cuttings in respect of forage yield, quality and distribution point of view. The residual available N and P contents in soil decreased with the increase in number of cuttings.

Key words : Introduction, Cutting management, Productivity, Natural Grassland, *Setaria sphacelata*

Assam occupies natural grassland area of 0.187 million ha which is deteriorating due to the over-grazing, presence of the unproductive grass species and poor management practices. Grass species are in active growth only for 4–5 months during rainy (*kharif*) season in a year. Introduction of ecologically suitable grass species like *Setaria sphacelata* cvs. 'Kazungula' or 'Nandi' and proper cutting-management practice would be helpful in promoting the production, quality and distribution of the forage from a grassland. Farmers in general are reluctant to cutting-management practice, as a result, most of the grass species are over-matured and shed their leaves which deteriorates the quality of the hay. Since an information on the above aspects is almost lacking in this region, the present experiment was undertaken.

MATERIALS AND METHODS

An experiment was laid out in a Natural Grassland of Assam Agricultural University, Jorhat, during 1995 and 1996 under rainfed condition. The soil was sandy loam in texture, with pH 5.25, medium in organic carbon (0.67%) but low in available N (252.47 kg/ha), available P (7.85 kg/ha) and available K (89.60 kg/ha). The experiment comprising 3 treatments of introduction, viz. no introduction, 'Nandi'

and 'Kazungula' were assigned to main plots and 3 cutting managements, viz. 1 cutting (in September), 2 cuttings (in July and October) and 3 cuttings (in June, August and November) were kept in subplots of split-plot design with 4 replications. The introduction of 2 cultivars of *Setaria sphacelata* was done on 1 May 1995 in the existing grassland with the onset of monsoon. In the establishment year, 80, 40 and 20 kg N, P_2O_5 and K_2O/ha were applied. Nitrogen was applied through urea in split doses. Half the dose of 80 kg N/ha and full dose of 40 kg P_2O_5 and 20 kg K_2O/ha were applied at planting. Remaining nitrogen was top-dressed after each cutting as per cutting-management treatments. No phosphorus and potassium were applied in the second year, only nitrogen was applied @ 80 kg N/ha in the form of urea in split doses as given in the first year. Three rooted slips of *Setaria* were planted per hill at 8–10 cm deep holes at 50 cm × 40 cm spacing in the existing natural grass-cover which was already cleared before start of the experiment. The dominant grass species present in the experimental site were *Imperata cylindrica* L., *Saccharum spontaneum* L. and *Paspalum dilatatum* Poir. Legume component was practically absent.

RESULTS AND DISCUSSION

Introduction

Introduction of 2 *Setaria* cultivars, viz. 'Kazungula' and 'Nandi', in a natural grassland influenced green forage and dry-matter yields significantly (Table 1). Average data of 2 years showed that 'Kazungula' recorded 21.87 and 28.86% higher green forage and 19.19 and 27.54% higher dry-matter yield than 'Nandi' and no introduction respectively. The higher yielding ability of cv. 'Kazungula' may be ascribed to higher plant height, shoots/ tussock, per cent proportion and better

Table 1. Green-forage, dry-matter and crude-protein yields (q/ha) and net return as affected by introduction and cutting management (average data of 1995 and 1996)

Treatment	Green-forage yield (q/ha)	Dry-matter yield (q/ha)	Crude-protein yield (q/ha)	Net return (Rs/ha)
Introduction				
No introduction	222.54	77.95	3.23	4,909.24
'Nandi'	244.40	86.82	4.75	5,290.74
'Kazungula'	312.83	107.44	7.14	7,343.64
CD (P = 0.05)	20.23	11.37	0.21	
Cutting management				
1 cut	186.27	67.66	3.48	4,122.25
2 cuts	287.71	97.10	5.44	6,655.04
3 cuts	305.77	107.43	6.20	6,766.43
CD (P = 0.05)	21.67	7.32	0.36	

survival percentage (Table 2). The results confirm the findings of Jaswal (1986) and Sharma and Sood (1994). Crude protein yield was significantly higher in 'Kazungula' than that in 'Nandi' introduction. Variation of crude protein yield between the cultivars of *Setaria* was also reported by Dwivedi and Kanodia (1986). The net return was also higher in 'Kazungula' introduced plots. Introduction of grass in a natural grassland results in higher net return over no introduction (Singh and Shah, 1991; Gupta, 1995).

Cutting management

Cutting management had significant influence on forage production. The green-forage and dry-matter yields were significantly higher in 3-cut management than the other cutting-management treatments. However, the 2-cut management was statistically at par with 3-cut management for green-forage yield. On an average, the green-forage yield in 3-and 2-cut management was 39.08 and 35.26% higher than the 1-cut management. The corresponding increase in dry-matter yield in 3-cut management was 37.02 and 9.62% over 1- and 2-cut managements respectively. The higher forage-yielding ability in 3-as well as 2-cut frequencies over 1 cut may be ascribed to the fact that the cut grass generally followed by a lag period, during which the leaf and other tissues are accumulating to a point at which a more rapid growth can occur. These results are in agreement with the findings of Jatasra *et al.* (1980) and Sharma and Sood (1994).

The crude protein yield was also found to be significantly influenced by different cutting managements. Three-cut management resulted in significantly higher crude protein yield than 1- and 2-cut management treatments. The average crude protein yield increase in 3-cut was 43.73 and 12.30% over 1-and 2-cut managements respectively. Superiority of 3-and 2-cut managements over 1-cut was owing to higher crude protein content in herbage and higher dry-

Table 2. Plant height (cm), shoots/tussock, proportion (%), survival (%) of *Setaria* and residual soil-fertility status as affected by the introduction and cutting management

Treatment	Plant height (cm)	Shoots/ tussock	Proportion of *Setaria* (%)	Survival of *Setaria* (%)	Available nutrients (kg/ha)		
					N	P	K
Introduction							
No introduction					268.74	5.75	84.40
'Nandi'	91.7	8	14.19	82.4	266.14	5.68	84.37
'Kazungula'	97.8	14	22.83	92.1	264.12	5.64	84.31
CD (P = 0.05)					NS	NS	NS
Cutting management							
1 cut	107.9	11	18.72	85.9	269.35	5.84	84.41
2 cuts	90.6	12	18.41	88.2	265.96	5.65	84.35
3 cuts	85.8	12	18.91	87.7	263.62	5.58	84.31
CD (P = 0.05)					3.89	0.05	NS

matter production. Balasundaram *et al.* (1977) also obtained higher crude protein yield in the cutting interval which gave the highest dry-matter yield. The 3-cut management also recorded the highest net return than the other cutting managements. Similar findings were reported by Savalia *et al.* (1995).

The effect of different cutting managements on soil properties was significant for available N and available P only (Table 2). The available residual N and P status decreased gradually with the increase in number of cutting from 1 cut to 3-cut management. It may be due to the fact that 2- and 3-cut managements stimulate more number of shoots/tussock and more per cent proportion of *Setaria* and thus more biomass production which utilizes more soil N and P, resulting in decreases in residual available N and P compared to single-cut management.

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