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Effect of Cutting Management on Seed Yield and its Quality in Grasses

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ABSTRACT In *Chrysopogon fulvus, Setaria sphacelata, Panicum maximum* and *Penisetum pedicellatum* maximum seed yield was recorded from the crops cut at 30 cm height from the ground at vegetative stage. Whereas in *Cenchrus ciliaris* higher seed yield was recorded from the uncut crop during the second year of crop establishment. The seed yield and seed quality were affected to a great extent and cutting height of 15 cm induced vegetative growth. Cutting of crops at 30 cm height was beneficial for the production of additional biomass and maximization of synchronized harvested seeds yield. The quality of seeds as indicated by seed test weight and germination was also maintained even if the crop was cut at 30 cm plant height.

Key words: Seed yield, cutting treatments, seed test weight, seed germination

In grasses, 'seeds' are dispersal units comprising a pair of spikelets or a group of spikelets or florets with varying structure and form. In majority of cases 'seeds' are fluffy in appearance and chaffy in nature due to awns, hairs on the surface of the spikelets or stiff bristles around the base [1, 2]. The caryopsis is enclosed in the husk (glumes, lemmas and paleas). All the 'seeds' do not produce a caryopsis and a sizeable portion of the 'seed' remain empty due to poor seed setting in the spikelets. Well grown grass seed crops produces seeds over a long period. New inflorescences develop progressively and each may then flower over a period of several days or even weeks. The pattern is further complicated by the continual turnover of seeds that are shed progressively from the standing crop as they ripen. For economic and quality seed production of grasses, timely manipulation of seed production practices are needed for better synchronization of flowering and seed maturity. Imposing of cutting at early vegetative stage may improve synchrony, seed setting, seed filling and seed recovery with uniform maturity. *Cenchrus ciliaris, Panicum maximum, Chrysopogon fulvus, Penisetum pedicellatum, Setaria sphacelata* are the dominate range grasses grown widely in different ecological region due to their wide adaptability and biomass productivity. The seed demand of these crops is increasing day by day and therefore, this investigation was proposed to study the effect of cutting management on seed setting, quality of seeds and seed yield of these grasses.

MATERIALS AND METHODS

Experiment was conducted during 2001-2003 at the Central Research Farm of Indian Grassland and Fodder Research Institute, Jhansi, India (25° 7'N, 78° 35' E, 275 msl). The soil was neutral and medium textured and contained 0.045 per cent N and 9.0 kg/ha available P. *Cenchrus ciliaris, Chrysopogon fulvus, Penisetum pedicellatum* and *Panicum maximum* were established by transplanting the 45 days old seedlings in the third week of July, 2001, where as *Setaria sphacelata* was transplanted in the second week of August. The crops were maintained as per recommended agronomic package of practices, with the basal application of 60 kg N and 40 kg

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P_2O_5. The distance between the two crops species was maintained 3 meter and the plot size was 4 x 4 meter in randomized designed in three replications. In the first year no cutting treatment was imposed as this was the establishment year. During the second year regeneration in all the grass species was started in the first week of July just after monsoon rains. Cutting treatments were imposed in the second week of August. In the cut treatments the cutting heights were 15cm and 30cm above ground level. Nitrogen was applied in the form of urea (30 kg/ha) every year. The observations on plant height, tiller number, fertile tillers, spike length, seeds per head were recorded. Seeds were collected manually in three pickings after maturation and seed yield was recorded. The seed test weight was determined by weighing 1000 seeds. Germination was observed separately on 100 seeds of each treatment of each grass species in seed germinator at 25°C on top of paper after six month of storage of seeds at ambient conditions.

RESULTS AND DISCUSSION

The effect of different treatments on various growth parameters and on seed contributing characters is presented in Table 1. In general, plant height was reduced by cutting treatments in all the grass species except in *P. maximum*, in which the height was marginally more in the cutting treatment of 30cm height. The number of tillers/tussock were observed higher in uncut crops. The number of fertile tillers/ tussock was also significantly high in the uncut crop. The fertile tiller production, ear length, number of seeds/ear, seed weight/ear and seed yield were affected to a great extent in the treatment of cutting height of 15cm in all the grass species except in *P. maximum*, where these characters observed differently under different treatments. The major influence of cuttings of crop at vegetative stage has been observed on the seed setting as indicated by the numbers of seeds per head which were reduced. Similarly the seed weight/ head were also reduced by the cutting treatments as compared to the uncut crops. Research by Loch *et al.*, [3] on *Chloris gayana* cv. Callide showed that heavy defoliation at the outset restricts the crop throughout its development: inflorescence emergence is slower and takes place over a longer time and the final number of inflorescence is lower than from a lenient cleaning cut.

In all the grass species maximum seed yield was recorded from the crop cut at 30cm plant height except in *C. ciliaris* in which it was higher from the uncut crop. The seed quality in term of 1000 seed weight was also affected by the cutting treatments and minimum seed weight was recorded in the crops cut at 15cm height from the ground. On the basis of cutting treatments it is recorded that severe cutting of crops (15cm above the ground) at vegetative stage did not favor seed production in these grass species whereas, cuttings of crops at 30cm plant height maximized seed production by over the uncut crops.

It has also been observed that the seed germination was also affected significantly by cutting treatments of 15cm plant height because of production of low seed test weight (Fig. 1). In general maximum seed germination was observed in *Penisetum pedicellatum* followed by *Setaria sphacelata* and minimum in *P. maximum* and *C. ciliaris*.

Cuttings of crops at 30cm height have two advantages-one is that production of additional biomass and second is maximization of

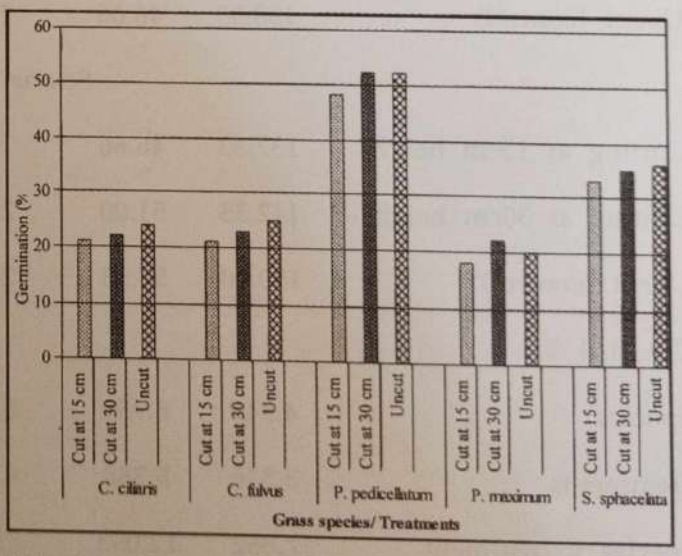

Fig. 1. Seed germination (%) of different grasses collected from cut and uncut crops

Table 1. Effect of cutting management on seed yield and seed yield contributing characters.

Treatments	Plant height (cm)	Tiller Nos./ tussocks	Fertile tillers/ tussocks	Ear length (cm)	Seeds/ ear head (nos.)	Seed/ ear head (wt)	1000 seed wt. (g)	Seed yield (kg/ha)
			Cenchrus cilliaris					
Cutting at 15cm height	116.66	39.66	18.66	11.00	175.00	0.339	1.746	82.33
Cutting at 30cm height	122.66	39.33	21.33	11.33	184.33	0.341	1.767	90.66
Uncut (control)	126.66	51.33	26.00	13.00	195.33	0.365	1.806	93.66
			Chrysopogon fulvus					
Cutting at 15cm height	187.66	70.66	38.00	11.63	215.00	0.504	1.97	100.66
Cutting at 30cm height	190.00	74.00	39.33	12.06	238.33	0.616	2.02	112.33
Uncut (control)	193.00	80.00	49.33	12.33	290.66	0.658	2.11	108.33
			Penisetum pedicellatum					
Cutting at 15cm height	140.00	122.33	122.33	11.66	410.00	0.400	0.83	177.66
Cutting at 30cm height	151.00	135.00	135.00	11.33	420.00	0.432	0.96	185.66
Uncut (control)	187.33	125.00	125.00	11.00	419.00	0.417	0.96	162.33
			Panicum maximum					
Cutting at 15cm height	141.00	40.00	16.00	27.33	347.66	0.237	0.691	121.33
Cutting at 30cm height	149.33	47.00	18.00	32.66	367.33	0.257	0.701	130.00
Uncut (control)	138.33	46.66	17.33	30.66	375.00	0.254	0.679	118.00
			Setaria sphacelata					
Cutting at 15cm height	137.33	46.66	19.33	21.00	551.66	0.450	0.816	89.00
Cutting at 30cm height	142.33	51.00	21.33	26.00	591.00	0.513	0.868	115.33
Uncut (control)	150.00	53.33	24.66	32.00	740.00	0.715	0.968	112.33
CD at 5 %								
Species	4.540	6.959	5.490	1.251	12.262	0.026	0.391	7.382
Treatments	3.516	5.388	4.252	0.969	9.499	0.020	0.030	5.718
Species x treatment	7.862	12.053	NS	2.167	21.240	0.046	0.068	12.785

synchronized harvested seeds yield. The quality of seeds as indicated by seed test weight and germination was also maintained even the crop cut at 30cm plant height in the early vegetative crop growth stage.

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