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SHORT COMMUNICATIONS

FORAGE PRODUCTION OF SELECTED PALATABLE GRASSES IN BUNDELKHAND REGION (U. P.)

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SUMMARY

Inspite of as soil binders and aid in soil conservation, the grasses assume prime importance as livestock feed. In their principal role, the tropical grasses stand as the highest potential yielder of starch and proteins equivalent to any other crop plants and further being the dominant component of tropical pastures, as the cheapest sources of animal feed (Rajora, 2002). The grass and grazing are important constituents of fodder resources in India. Out of the total land area of 3.2 million sq. km of this country, about one-third falls under arid and semi-arid zone (Vora and Bhatnagar, 2003). Perennial grass species like *Dichanthium annulatum, Iseilema laxum, Sehima nervosum* and *Panicum antidotale* are grouped as "High Perennial" species as they give high forage yield under natural rainfed conditions.

Key words : Palatable grasses, *Dichanthium, Iseilema, Sehima, Panicum*

Marvel grass (*D. annulatum*) is a palatable nutritious and warm season grass naturally occurring in dry sub-humid parts of the world. It has been widely introduced in other countries rangelands for its value as productive grazing. *D. annulatum* a perennial pasture grass species has a wider adaptability in varied edaphic habitats all over the country. It is a valuable tufted perennial grass in semi-arid and dry sub-humid area. It is an excellent grazing perennial suited to pasture and rangelands. Its high soil binding capacity is due to its clustered root system in the upper 8-10 cm layer of soil. It survives extreme and prolonged drought but grows vigorously when favourable conditions are set in. It is one of prominent species of *Dichanthium-Cenchrus-Lasiurus* grass cover type of tropical India (Dabadghao and Das, 1960).

I. laxum and *D. annulatum* are major components of *Sehima-Dichanthium* grass cover of India (Dabadghao and Shankarnarayan, 1973). *D. annulatum* and *I. laxum* when grown alone or in combination show significant variation in forage production. *D. annulatum* gives high forage.

The experiment was carried out at Bohadpura Sheep Farm, Orai located 25^0 59' N lat. and 79^0 37' E long. above msl 141.6 m in the western part of Uttar Pradesh, India. The study was conducted during the months of July, 2009 to June, 2010. The meteorological data, namely, average maximum temperature, minimum temperature, humidity, photoperiod and rainfall were recorded during the field experiment.

The average minimum and maximum temperature recorded during the field experiments was 18.37^0 and 34.11^0C, respectively. Peak minimum and maximum temperatures were $6.6\ ^0$C in December and 45.2^0C in May. Average relative humidity was 52.66 per cent and mean photoperiod of 13.10 h was observed. The average annual rainfall was 1069.6 mm.

The soil was sandy loam and slightly alkaline (pH 7.5) with 0.37 per cent organic carbon, electrical conductivity 0.15 mmhos, available nitrogen 288 kg/ha, available phosphorus 26 kg/ha and available potash 355 kg/ha.

The palatable fodder grasses selected for the experiment were *D. annulatum* and *I. laxum*. Tussocks of *D. annulatum* and *I. laxum* were collected from IGFRI, Jhansi. The material was sown in the experimental plots laid down at Bohadpura Sheep Farm, Orai (U. P.), India in randomized block design in five

replications. The plot size was 3 x 3 m and distance between the adjacent plots was 0.6 m. One hundred tussocks were planted in each plot according to row method, where row to row spacing was 30 cm and plant to plant spacing was 25 cm. Both grasses were sown individually and in combination of all two together in separate plots. Routine agronomic practices of fertilizer and irrigation were followed. Urea, superphosphate and muriate of potash were used for N, P and K sources, respectively. N and P were applied at top dressing, whereas K was applied in 2.5 to 5 cm wide bands on each side of the row at a depth of 10 cm. The application of fertilizers was followed by irrigation. The treatment was repeated after one month.

Ten plants were randomly selected and growth parameters such as number of leaves per plant, height of shoot, aboveground fresh weight and dry weight and belowground fresh weight and dry weight per plant were recorded at monthly interval from all sets. Three cuts of grasses were taken. The maximum roots generally occur in upper 30 cm depth of soil. Therefore, from the base of each plant, 20 cm radius was formed and each plant was excavated upto 30 cm depth with ball of earth with a shovel. The individual plants were kept in polythene bags and labelled. Belowground biomass was assessed after washing the excavated roots with a fine jet of water to remove the soil particles. The shoot portion was clipped upto ground level and weight was recorded in grams. This was recorded as fresh aboveground biomass and fresh belowground biomass. All the aboveground and belowground samples so collected were dried in oven at 80^0C till constant weight. The oven-dried weight of shoot and roots was recorded in grams by using electronic balance. This was recorded as aboveground dry biomass and belowground dry biomass, respectively.

It was recorded that *D. annulatum* grew well in a pure stand as well as in a mixed stand. The growth data (Tables 1 and 2) showed gradual increase in height, number of leaves, fresh and dry weight in all samples. The average height of *D. annulatum* at the end of 90 days was 73.8 cm, whereas in mixed stand it was 53.1 cm. The average number of leaves/plant was 14.4 and 11.4 in pure and mixed stand, respectively. Mean fresh weight of shoot/plant in pure and mixed stand was 112.62 and 97.00 g, respectively, after 90 days of sowing. The data showed equally good growth of *D. annulatum* in

TABLE 1
Growth parameters of *D. annulatum* in pure and mixed stand

Name	Days	Height (cm)	No. of leaves/plant	Fresh weight (g/plant)		Dry weight (g/plant)	
				Shoot	Root	Shoot	Root
D. annulatum	30	13.9	6.3	18.52	6.61	6.53	4.16
(pure stand)	60	54.1	11.2	85.42	22.41	22.35	8.41
	90	73.8	14.4	112.62	26.21	32.42	10.31
D. annulatum	30	9.3	5.3	8.87	7.73	4.42	4.44
(mixed stand)	60	33.8	9.8	63.73	17.47	19.36	7.69
	90	53.1	11.4	97.00	23.51	25.82	9.31

TABLE 2
Growth parameters of *I. laxum* in pure and mixed stand

Name	Days	Height (cm)	No. of leaves/plant	Fresh weight (g/plant)		Dry weight (g/plant)	
				Shoot	Root	Shoot	Root
I. laxum	30	10.9	3.1	15.10	5.40	3.11	2.01
(pure stand)	60	51.1	8.0	82.00	19.20	18.93	5.20
	90	70.8	11.2	109.20	23.00	29.00	7.10
I. laxum	30	6.3	3.1	5.45	4.52	2.10	2.11
(mixed stand)	60	30.8	6.6	60.31	14.26	16.04	5.48
	90	50.1	8.2	93.60	20.30	22.40	7.10

a mixed stand. Forage production of *D. annulatum* was not affected when grown with *I. laxum.* Average height of *I. laxum* after 90 days was 70.8 cm, whereas in mixed stand it was 50.1 cm (Table 2). Average number of leaves per plant also decreased in mixed stand. Fresh weight of shoot/plant was 109.20 and 93.60 g in pure and mixed stand, respectively. It was recorded that *D. annulatum* dominated over *I. laxum*.

Dabadghao and Shankarnarayan (1973) have described five types of grass covers. Forage yield of *Cenchrus-Dichanthium-Lasiurus* grass cover has been estimated as 3.3 t/ha (Kumar, 2002). Estimated air dried forage production on protected 'very poor', 'poor', 'fair', 'good' and 'excellent' grassland was 200, 500, 750, 1000 and 1500 kg/ha during normal years of rainfall (Bhimaya and Ahuja, 1969). In the present study, aboveground forage production of *D. annulatum* as a pure stand was found to be 2.4 t/ha, while as a mixed stand with *I. laxum* it was 2.3 t/ha.

Forage yield is affected by various biotic and abiotic factors (Kumar, 2002). Under irrigation and optimum fertilization conditions, a close relationship exists between temperature and dry matter production. The rate of leaf appearance in stems of graminaceous plants increases with high temperatures. Crop growth in *D. annulatum* (Marvel grass) peaked at the time of both high temperature and important precipitation events or sufficient soil moisture coexisted. *D. annulatum* (Marvel grass) grows at a slower rate during cooler climate than many other tropical grasses (Humpherys, 1967). Cool weather exerts a negative impact on growth in *D. annulatum* and also will enter a dormancy stage (little or no growth) under low soil humidity/no rainfall conditions. The soil dries off quickly hence stressing the plant. The yield was reduced by 25 per cent when water stress was excluded during vegetative growth, whereas yield was reduced by 59 per cent when water was imposed at flowering stage (Thomas *et al*., 2004). *D. annulatum* has been considered as a mild drought resistant grass species. It is adapted to a wide range of soil and climatic conditions. *I. laxum* grows well in pure stand but in combination with *D. annulatum*, its growth is affected due to profusely growing of *D. annulatum*. *D. annulatum* is an aggressive grass, by virtue of its extensive root system competing with associated species for water and nutrients.

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