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Impact of Clipping treatments on the biomass of *Cenchrus ciliaris. L*

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Abstract:

Buffel grass (Cenchrus ciliaris.L) is a warm season grass naturally occurring in drier parts of the world. A study was conducted to evaluate impact of clipping treatments on biomass production of Cenchrus ciliaris. The experimental site was GEER Foundation, Gandhinagar, Gujarat, India (latitude 23° 13'00" and longitude 78°42'00") .Gandhinagar, the 'Greenest Capital City' of Asia, has an average elevation of 81 meters(265 feet). The city is located on the banks of the river Sabarmati, in north-central-east Gujarat. The experiment was conducted in three replicates. The density and spacing of plants were kept uniform and the clipping heights were (Base, 5 cm, 10 cm, 15cm) and the clipping interval was 15 days, 30 days and 45 days. Regular irrigation practice was followed. Herbage production for each treatment was calculated after 90 days. For each treatment shoot length, number of tillers, Above Ground Biomass and the Below Ground Biomass were assessed at the end of the experiment. Statistical analysis of the data was done to evaluate the significance of the clipping treatments. Greater herbage was produced when the plants were clipped at a height of 15 cm and at an interval of 45 days, as compared to the other clipping treatments and frequent clipping apparently renders little time for herbage replacement, hence food manufacture and downward translocation was limited which caused the retardation in belowground biomass and closer clipping eventually reduces the herbage yield and this in turn the biomass.

Key words: Buffel grass, *Cenchrus ciliaris* , Clipping, Above Ground Biomass(AGB), Below Ground Biomass (BGB).

Introduction

Grasslands, including sown pasture and rangeland, are among the largest ecosystems in the world and contribute to the livelihoods of more than 800 million people. They are a source of goods and services such as food and forage, energy and wildlife habitat and prevent soil erosion. Buffel grass (*Cenchrus ciliaris* Linn.), a perennial pasture grass species, has wider adaptability in varied edaphic habitat. Perennial grasses are major components of tropical pastures, provide bulk of herbage to animals. Knowledge and appreciation of the morphology and growth habits of the species used and their responses to defoliation is very helpful in maintaining the desired proportion of grass and legumes in forage stand. In an actively growing plant, all of the energy captured from sunlight is not utilized in the production of new plant tissue, but part of it is used in respiration and part of it is stored mainly in basal portions of the plant so that new leaves can be produced after defoliation. Thus, knowledge of the effect of defoliation at different stages of growth and at different frequency is essential in foreseeing the possible effect of grazing or cutting practices (Singh and Mall, 1976). Clipping is desirable for increasing herbage yield as observed by Dabadghao and Das, 1963. Therefore, the present study was undertaken with a view to evaluate morphological characteristics and growth of *Cenchrus ciliaris* generally cultivated in an arid ecosystem in India.

Material and Method

The experimental site was located at the Botanical Garden of GEER Foundation, Gandhinagar,Gujarat. India. (latitude 23˚ 13'00" and longitude 78˚42'00"). Gandhinagar has a monsoon

climate with three main seasons: summer, monsoon and winter. Other than during monsoon the climate is generally dry and hot. The soil of the experimental site was sandy loam and slightly alkaline (pH 7.5) with 0.36% organic carbon, Electrical conductivity- 0.16mmho, Available Nitrogen – 285 kg/ha, Available Phosphorus- 24 kg/ha , Available Potash – 356 kg/ha. The water was suitable for irrigation as its electroconductivity is 0.98, pH is 7.8 and Ca+Mg is 5.57 M.e/L. *Cenchrus ciliaris* was sown in the experimental plots in randomized block design in five replications. The Plots size was 3m×3m and distance between the adjacent plots was 2 m and hundred tussocks were planted in each plot according to the row method, where row-to-row spacing was 30 cm and plant to plant spacing was 25 cm. Clipping treatments were conducted and one sub plot was left unclipped and the other four were clipped. The clipping heights were (Base, 5 cm, 10 cm, 15 cm). Clipping interval was 15 days, 30 days and 45 days. Frequency of clipping was 15 days (6 times), 30 days (3 times) and 45 days (2 times).The meteorological data namely average maximum temperature, minimum temperature, humidity, photoperiod and rainfall were noted during the field experiment (Fig.1). Growth data of the individual C*enchrus ciliaris* plant was calculated. Data on height of plant, number of tillers, fresh weight of shoot and fresh weight of roots on individual *Cenchrus ciliaris* plant was calculated. The maximum roots generally occur in upper 30cm, depth of soil. Therefore, from the base of each plant 20cm, radius was formed and each plant was excavated up to 30cm, depth with ball of earth with a shawal. The individual plants were kept in polythene bags and labeled. Belowground biomass was assessed after washing thereby the excavated roots with a fine jet of water to remove the soil particles. The shoot portion was clipped up to ground level and green weight was recorded in grams. All the above ground and below ground samples so collected were recorded in grams by using electronic balance.

Statistical analysis of the data was done to evaluate the significance of the treatments.

Results and Discussion

It was revealed that greater herbage was produced when the plants were clipped at the height of 15 cm and at an interval of 45 days, as compared to 10 cm, 5 cm, base heights, and 15-day and 30-day interval of clipping. Yield is supposed to be reflection of the clipping height.The basal meristems are likely to be injured in close clipping or grazing. Thus15 cm seems to be an optimium height for increased herbage production in *Cenchrus ciliaris.* Frequency of herbage removal had pronounced effect upon production of forage. Increasing the length of clipping interval resulted in significant increase in Yield Average production decreased with increased number of clipping. Clipping at 15- and 30-day intervals produced less herbage than clipping at 45-day interval. It may be concluded that biweekly and monthly clipping of the herbage reduced the amount of food materials available for translocation to the roots, so that the capacity to produce new tillers was reduced in *C.ciliaris.* Data on quantity of belowground production under different treatments is depicted in table 4. It reveals significant differences with respect to clipping height and interval. Unclipped plants and those clipped fewer times (30 and 45 days) produced the high yield. Height of clipping had a significant effect upon root growth. The average yields for the base and 5 cm heights were lower than grass clipped at 10 cm and 15cm. For belowground production frequent clipping (15 days interval) apparently renders little time for herbage replacement, hence food manufacture and downward translocation was limited which caused the retardation in root growth. It is observed that increased frequency of clipping grasses significantly reduces the root yield. In general treatments that produced the greatest herbage production

likewise produced the greatest root yield. Plants in high vigour displayed a well-developed root system. It appears that any herbage removal reduces total root production. Clipping height also had a significant effect upon root growth. The closer clipping reduces the herbage yield and this in turn the belowground production.

The height of the plant was thus substantially reduced to clippingand number of tillers were reduced during frequent clipping intervals 15 and 30days. It may be argued that biweekly and monthly clipping of the herbage reduces the amount of food materials available for translocation to the roots which in turn lowers the capacity of *Cenchrus ciliaris* grass to produce new tillers.

Cutting forage plants at a stage of maturity or harvest interval range provide adequate food reserves and/or basal or auxiliary tillers or buds for regrowth and reproduction to occur without loss of plant vigor. Cutting forage plants at certain heights promotes the vigor and health. Cutting heights provides adequate residual leaf area, adequate numbers of terminal, basal or auxiliary tillers or buds, insulation from extreme heat or cold, and or unsevered stem bases that store food reserves needed for full, vigorous recovery.

TABLE 1 Height (cm/plant) under various clipping treatments for *Cenchrus ciliaris*

Clipping Heights	Clipping Interval		
	15 days	30 days	45 days
	frequency (6 times)	frequency (3 times)	frequency (2 times)
Unclipped (after 90 days)	125		
Base	64	82	110
5 cm	69	92	120
10 cm	88	115	132

TABLE 2 Number of Tillers/plant under various clipping treatments for *Cenchrus ciliaris*

Clipping Heights	Clipping Interval		
	15 days	30 days	45 days
	frequency (6 times)	frequency (3 times)	frequency (2 times)
Unclipped (after 90 days)	31		
Base	14	21	30
5 cm	21	29	38
10 cm	24	32	42
15 cm	28	34	48

TABLE 3 Above ground herbage production (gm/plant) under various clipping treatments for *Cenchrus ciliaris*

Clipping Heights	Clipping Interval		
	15 days	30 days	45 days
	frequency (6 times)	frequency (3 times)	frequency (2 times)
Unclipped (after 90 days)	272		
Base	81	146	192
5 cm	88	158	196
10 cm	182	214	273
15 cm	291	328	343

TABLE 4 Below ground herbage production(gm/plant) under various clipping treatments for *Cenchrus ciliaris*

Clipping Heights	Clipping Interval		
	15 days	30 days	45 days
	frequency (6 times)	frequency (3 times)	frequency (2 times)
Unclipped (after 90 days)	235		
Base	64	82	142

5 cm	69	92	156
10 cm	88	115	223
15 cm	94	124	251

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