INFLUENCE OF MATURITY ON CHEMICAL COMPOSITION OF SOME RANGE GRASSES

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Abstract

The objective of this study was to determine influence of maturity on chemical composition of Buffel grass (*Cenchrus ciliaris* Linn.), Bluepanic (*Panicum antidotale*), *Pennisetum orientale* and *Setaria sphacelata*. The experiment was laid at Punjab Forestry Research Institute, Faisalabad on sandy loam soil. The experimental design was completely randomized with four replications. Grasses were established by planting tuft splits in 1x3 m plots at 0.3x0.3 m spacing. No fertilizer was applied and frequent irrigation was done to ensure adequate soil moisture. Four clipping stages i.e. CS1, CS2, CS3 and CS4 (clipped after 1, 2, 3 and 4 months, respectively) were studied. Response variables were dry matter (DM), organic matter (OM), crude protein (CP), Neutral detergent fiber (NDF), acid detergent fiber (ADF) and acid detergent lignin (ADL).With increasing clipping stage, concentration of DM, OM, NDF, ADF and ADL increased in all plant parts whereas CP contents declined with increasing clipping stage. One month clipping stage these grasses got optimum nutritional value and sustained grass vigor.

Introduction

Efficient defoliation programmes for range grasses can help shrink the gap between supply and demand of nutrients for our ruminant animals. Generally, clipping at optimum intervals had been shown to increase the herbage yields of some species, (Drawe *et al*., 1972; Eck *et al*., 1975; Svejcar and Rittenhouse, 1982) and of rough fescue (McLean and Wikeem, 1985) resulted in low yields and reduced plant survival. This necessitates the determination of an appropriate clipping regimen of range grasses. There is little information available on the chemical composition of Buffel grass (*Cenchrus ciliaris* Linn.) Bluepanic (*Panicum antidotale)*, *Pennisetum orientale* and *Setaria sphacelata* grasses per se. thus, the present study was planned with the objective to characterize the chemical composition of these grasses as related to maturity.

Materials and Methods

The experiment was laid out in a completely Randomized Design with four replications at Punjab Forestry Research Institute, Faisalabad. Nursery of these grasses was raised through planting tuft splits in 1x3 meter plot say 0.3x biomass was manually clipped with sickle at 5 cm stubble height. The grass samples were chopped in a locally manufactured chopper and then were ground through a Wiley mill (2mm screen) and preserved in plastic bags for chemical analysis. These samples were analyzed for DM, CP and total ash by using AOAC (1990) method, NDF, ADF and ADL by method of van Soest *et al*. (1991). The data collected for different parameters were statistically analyzed

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using analysis of variance technique and comparison of means was done by Duncan' s Multiple Range Test (Steel and Torrie, 1981).

Results and Discussion

Daily minimum and maximum mean temperature and mean daily precipitation from day of planting to final harvest are shows that mean daily minimum temperature ranged from 15 to 31°C while corresponding maximum temperature was 32 to 42°C while corresponding maximum temperature was 32 to 42°C. Soil was sandy loam to loam.

Chemical Composition

Whole plant OM increased ($P<0.05$) with advancing plant age in all grasses under study except *Pennisetum orientale* which showed a non-significant increase (Table-1). The increased OM was due to decreased total significant increase (Table-1). The increased OM was due to decreased total ash contents of these grasses with advancing plant age. These result were consistent with those of Hamid (1972) defoliated Buffel grass at various maturity stages and reported that the total OM contents were low at early stages and increased significantly during the later growth stages. The results of present study are, however, different from those of Stefanon *et al*. (1996) who harvested brome grass at five different stages of maturity and reported that total OM remained almost constant throughout the experimental period. This may be due to species variation.

Crude Protein

The results revealed that as the plants got matured, CP contents declined and these were the lowest at CS4 clipping stage (Table 1). At CS1 clipping stage, CP concentrations were the maximum, decreased significantly with advancing maturity. The reduction in CP concentration with advancing maturity in this study can be attributed too reduction in leaf to stem ratio. These results were consistent with the previous findings (Sarwar and Nisa, 1999, Kalmbacher, 1983: Gupta and Sagar, 1987: Griffin and Jung, 1983, El-Shatnavi and Al-Qurran, 2003 and Sleugh *et al*., 2001). Sarwar and Nisa (1999) defoliated Mott grass at 40 and 60 days after cultivation and found that early cut grass had higher CP contents than the late cut grass. Kalmbacher (1987) who studied the effect of clipping stage on chemical composition of legume and non-legume forages. They reported that with the advancement of maturity, the concentration of CP and total cell contents decreased. Cattle require 8 to 9% CP for maintenance and reproduction (NAS-NRC, 1968). These grasses maintained this optimum CP concentration for the CS1 clipping stage only. This suggested that these grasses should be defoliated after one month interval in order to meet the maintenance and reproduction requirements of CP of cattle.

Neutral Detergent Fiber

The NDF contents increased ($P<0.05$) in whole plant with advancing plant maturity of all the four grasses (Table 1).

Table 1. Effect of clipping stages on chemical composition of range grasses

Parameters	Clipping Stage				
	CS1	CS2	CS3	CS4	S.E.
Buffel Grass					
OM	90.72	91.58	91.75	92.71 [a]	0.67
CP	8.79 [a]	6.83	5.76	4.52	0.33
NDF	73.68	75.00	78.35	80.00 [a]	0.46
ADF	38.14	42.71	47.42	49.47 [a]	0.53
ADL	4.12	5.15	6.32	7.29 [a]	0.14
Ash	9.28 [a]	8.42	8.25	7.29	0.21
Cellulose	35.42	38.14	41.24	43.16 [a]	0.63
Bluepanic Grass					
OM	91.67	92.63	93.88 [a]	92.78	0.77
CP	9.11 [a]	5.76	5.58	4.52	0.37
NDF	76.29	77.89	80.61	82.29 [a]	0.69
ADF	44.33	45.26	53.61	54.64	0.69
ADL	3.09	5.21	5.26	8.16 [a]	0.10
Ash	8.33 [a]	7.37	6.12	75.22	0.16
Cellulose	34.02	37.76	37.50	41.05 [a]	0.55
Pennisetum orientale					
OM	89.8	90.32	90.43	90.82	0.45
CP	9.15 [a]	7.05	5.82	4.47	0.18
NDF	66.67	72.45	72.73	76.53 [a]	0.67
ADF	31.63	37.63	41.84	42.42 [a]	0.74
ADL	2.15	3.06	6.38	9.18 [a]	0.14
Ash	10.2 [a]	9.6	9.50	9.10	0.15
Cellulose	30.61	33.67	34.41	35.71 [a]	0.92
Setaria sphacelata					
OM	90.11	90.91	93.75 [a]	93.62 [a]	.99
CP	10.81 [a]	4.42	3.49	3.42	0.23
NDF	70.71	72.53	7.00	76.77 [a]	0.66
ADF	31.87	38.38	45.74 [a]	45.83 [a]	0.53
ADL	3.30	5.05	7.45 [a]	7.29 [a]	0.17
Ash	9.89 [a]	9.09	6.25	6.38	0.18
Cellulose	29.67	34.34	37.23 [a]	37.5 [a]	0.58

Means within a row bearing different superscripts differ significantly ($P<0.05$).

CS1, CS2 and CS4 stand for clipping stages harvested at 1, 2, 3 and 4 months, respectively. S.E is the standard error. OM, CP, NDF, and ADL stand for organic matter, crude protein, neutral detergent fiber, acid detergent fibre and detergent lignin respectively. Increase in NDF concentration with advancing maturity may be attributed too decreased leaf to stem ratio. The findings of this study were consistent with those of Borreani *et al*. (2003) Dabo *et al*. (1988), Mero and Uden (1998). Borreani *et al*. (2003) studied the nutritive value of Sulla (*Hedysarum coronarium* L.) at vegetative and seed set morphological stages and reported that NDF contents increased from 20 to 61.6% with

advancing maturity. Gupta and Sagar (1987) reported increased concentrations of NDF with advancing growth to decreased leaf to stem ratio.

Acid Detergent Fiber

Concentration of ADF was also affected by maturation in all grasses under study. Change occurring in ADF because of maturation was best described by quadratic equation. Higher ADF concentration at CS3 and CS4 clipping stages (Table 1) may be due to reduction in leaf to stem ratio. The results of the present study were consistent with those of Kramberger and Klemen (2003), Madakadze *et al*. (1999) and Dabo *et al*. (1988). Kramberger and Klemen (2003) reported that with advancing maturity in *Cerastium holosteoides* grass there was a significant increase in ADF concentrations. Similar results were reported by Dong *et al*. (2003) who studied that in cultivated perennial grasses, ADF concentrations increased ($P<0.05$) with advancing maturity.

Acid Detergent Lignin

These results revealed that concentration of ADL was affected by plant maturation. The ADL concentrations increased through the experimental period. Changes occurring in ADL due to maturation were best described by quadratic equation. This might be due to more deposition of lignin in stems for the support of long parts of advanced growth. These results were similar to those of Kramberger and Klemen (2003), Gupta and Sagar (1987) Kilcher and Troelsen (1973) and Sankhyan *et al*. (1999).

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