INTRODUCTION

Range and grasslands represent major ruminant production areas in the South Asian region (Sarwar et al., 2002; Sarwar et al., 2005). Proper management of range grasses can help shrink the increasing gap between supply and demand of nutrients for ruminants in the region. A common goal of pasture management is to maximize the yield of forage produced and harvested without inducing pasture deterioration and forage quality. Forage production is strongly affected by defoliation regimens (Warner and Sharrow, 1984). Therefore, knowledge of the effect of defoliation frequency on forage yield and its quality is crucial for successful pasture management and for sustainable animal agriculture.

The interval between harvests of grasses profoundly affects herbage production, nutritive value, re-growth potential, botanical composition and species survival (Crowder and Chheda, 1982; Nisa et al., 2005). The period of maximum forage production varied with different grass species (Haggar, 1970). Frequent defoliation reduced total forage yield and carbohydrate reserves and caused a decline in root development, favored weed invasion as well as adversely affected re-growth potential (Perez and Lucas, 1974). More nutritious herbage was obtained with reduced clipping intervals.

In grasses, digestibility depends mainly on the growth stage, growth cycle and the species (Van Soest, 1994; Sarwar et al., 2004). Digestibility of grasses and legumes generally decreased with advancing age, because of increased fiber concentration in plant tissues (Wilson et al., 1991; Khan et al., 2004), increased lignification (Morrison, 1980; Sarwar et al., 2003; Nisa et al., 2004) and reduced leaf to stem ratio (Hides et al., 1983).

Pennisetum orientale (PO) and Panicum antidotale (PA) are palatable deep-rooted perennial drought resistant grass species (Gohl, 1981). However, scientific evidence regarding their chemical composition, herbage yield, and nutritive value in buffaloes is limited. This study was, therefore, planned to determine the effects of clipping interval on chemical composition, biomass production, digestibility and digestion kinetics of PO and PA in ruminally cannulated Nili buffalo bulls.

MATERIALS AND METHODS

Establishment of grass plots

The experiment was laid out in a Randomized Complete Block Design with four replications at Punjab Forestry Research Institute, Faisalabad, Pakistan. Soil was sandy loam to loam. Nurseries of PO and PA grasses were raised separately through planting tuft splits in 1x3 m plots at 0.3x0.3 m spacing to maintain optimum plant density of 5 to 10 plants/m² (Butt and Ahmad, 1994). Two clipping
The data collected for different parameters of grasses were separately statistically analyzed using analysis of variance technique and comparison of means was done by Duncan’s multiple range test (Steel and Torrie, 1981). The SAS® (1996) was used for statistical analysis.

RESULTS

During experimental period mean daily minimum temperature ranged from 15 to 31°C while corresponding maximum temperature was 32 to 48°C.

Leaf to stem ratio of PO and PA grasses decreased (p<0.05) with increasing clipping interval (Tables 1 and 2). In both PO and PA higher leaf mass was observed with more frequent clipping interval (CI) than with grass clipped at every two month or at four month age.

Chemical composition and nutrient yields of PO and PA grasses however, OM contents of both grasses were not affected by clipping interval. The CP concentrations in PO and PA decreased (p<0.05) with increasing clipping interval (Tables 1 and 2). Significant differences in DM and NDF disappearance were observed (p<0.05) with increasing clipping interval (Tables 1 and 2).
Yields of DM and CP increased (p<0.05) with increasing clipping interval in both PO and PA. *Pennisetum orientale* harvested at bimonthly clipping interval yielded 2.0 times, while the control plots of this grass produced 4.4 times more herbage than that of monthly clipping interval. *Panicum antidotale* dry herbage yield indicated that CI 2 and the control yielded 1.4 and 4.1 times more herbage than that of CI1 clipping interval.

Ruminal DM and NDF digestibilities of PO (Table 3) and PA (Table 4) in buffalo bulls decreased (p<0.05) with increasing clipping interval. Ruminal rate of disappearance and extent of digestion of DM and NDF were decreased (p<0.05) in both PO and PA grasses in buffalo bulls with increasing clipping interval. However, the ruminal DM and NDF lag time increased (p<0.05) with increasing clipping interval in both grasses (Tables 3 and 4).

**DISCUSSION**

Decline in leaf to stem ratio of PO and PA with increasing clipping interval may be attributed to accumulation of more cell wall components in plant tissues as a result of stem development with advancing maturity. With increasing plant age, the leaf proportion of the old world bluestem grass was declined (Dabo et al., 1988).

Decreasing CP contents of both grasses with increasing clipping interval may be because of reduced leaf to stem ratio (Chaparro and Sollenberger, 1997) or by a dilution effect due to increased DM yield with less frequent grass clipping (Crowder and Chheda, 1982). The results of the present results were consistent with those of Mero and Uden (1998) and Fraser et al. (2001) who attributed decline in CP concentration to higher cell wall contents in more mature grasses. Crowder and Chheda (1982) reported that more frequent clipping stimulated plant development and sustained biological processes, thus there was a greater demand for N. They explained that as plants matured, these activities declined, resulting in low CP concentration in grass species.

Higher herbage yield in PO and PA grasses with longer clipping interval may be attributed to additional tillers and leaf formation (Cuomo et al., 1996), leaf elongation and stem development with increasing plant age (Crowder and Chheda, 1982). These findings were consistent with those of previous researchers (Pittman and Holt, 1983 and Mutz...
and Drawe, 1983). Low herbage yield at shorter clipping interval in both grasses may be attributed to their reduced photosynthetic area to the extent that photosynthate was not adequately available for re-growth after clipping.

Decreasing digestibility with increasing clipping interval of PO and PA may be due to accumulation of more indigestible fibre, increased lignification and reduced leaf to stem ratio with increasing grass maturity. Less frequently defoliated samples of these grasses might have provided more structural resistance to bacterial attachment from lignification (Sleugh et al., 2001), resulting in lower bacterial colonization and decreased digestibility (Sarwar et al., 2004). Terrill et al. (2003) also reported that in vitro DM digestibility of Pueraria lobata declined with increasing clipping interval. In the present study, higher DM and NDF digestibilities of both grasses at early clipping interval may be attributed to their shorter ruminal lag time and faster rate of disappearance (Tables 3 and 4) because of less lignification and high proportion of cell soluble material at early maturity.

CONCLUSIONS

In conclusion, the results from the study imply that two month clipping interval for both PO and PA grasses favored higher biomass yield with greater nutritional value for Nili buffaloes and sustained grass vigor compared with either of these grasses clipped at every month and/or at four month age.

REFERENCES


