# Effects of Defoliation Frequency on Foraging Selective Behaviour in Pasture with Paspalum Dilatatum

G L. Acosta
*University of Buenos Aires*

A T. Ayala Torales
*University of Buenos Aires*

V A. Deregibus
*University of Buenos Aires*

# EFFECTS OF DEFOLIATION FREQUENCY ON FORAGING SELECTIVE BEHAVIOUR IN PASTURES WITH *PASPALUM DILATATUM*

G.L. Acosta, A.T. Ayala Torales and V.A. Deregibus
Agronomy School, University of Buenos Aires
Av. San Martín 4453, (1417) Buenos Aires, Argentina

## ABSTRACT

The objective was to assess defoliation effects exerted by sheep grazing on a pasture composed by falaris and dallisgrass, at two phenological stages during spring and summer. A sown pasture of *Phalaris aquatica* and *Paspalum dilatatum* were grazed at two phenological stages: stage I ($S_I$), with no more than 5% of reproductive tillers, and stage II ($S_{II}$), with at least 70% of reproductive tillers. Tillers of both grass species were marked with plastic colour rings along two transects in each plot. Phenological stage of tillers, and the number, age and length of each leaf per tiller were registered. Tiller defoliation rates (TDR), Leaf defoliation rates (LDR) of young and old leaves and Defoliated tiller percent (DTP) were estimated for both species. The results obtained demonstrated that selective forage behaviour of grazing sheep showed the existence of mechanisms towards maximum forage consumption.

## KEYWORDS

Defoliation, selectivity, sheep grazing, *Paspalum dilatatum*, *Phalaris aquatica*.

## INTRODUCTION

The inclusion of dallisgrass (*Paspalum dilatatum P.*), a $C_4$ species, in mesothermal pastures increases forage annual production, especially during summer (Acosta et al., 1994). Different phenology stages, consequence of distinct defoliation regimes, can modify quantitative and qualitative features of the pasture, and hence forage animal intake. Defoliation is the most evident mechanism of plant herbivore interaction (Mc Naughton, 1983), affecting both components and modifying processes related to production and seasonal forage distribution in the ecosystem (Dyer et al., 1982). Defoliation management requires knowledge about pastures special characteristics and foraging behaviour to predict different animal decisions at different temporal and spatial scales. The scarce knowledge about these relations restrict the possibilities to design efficient and sustainable animal production systems.

## METHODS

Experimental site was located in Agronomy School field in Buenos Aires location, in a sown pasture of phalaris (*Phalaris aquatica L.*) and dallisgrass (*Paspalum dilatatum P.*). The pasture was grazed by sheep, at two phenological stages: stage I ($S_I$), with no more than 5% of reproductive tillers, and stage II ($S_{II}$), with at least 70% of reproductive tillers. In both treatments sheep grazed the plots during two days. The number of animals per plot was fixed considering forage availability of at least 2.5 kg of dry matter per animal per day. Plot area was 40 $m^2$. Initial available aerial biomass was measured prior to grazing, cutting samples at soil level in each plot. Harvestable biomass was separated in forage components, and dried at 65°C up to constant weight. Fifty tillers of each grass species were marked with plastic colour rings along two transects in each plot. Phenological stages and the number, age and length of each leaf were registered. Dallisgrass was evaluated in spring and summer, and phalaris only in spring because of its summer latency.

Tiller defoliation rates (TDR) (Agnusdei and Mazzanti, 1995) were estimated in each species:

$TDR_i = DTN_i / MNT_i \times GP$
$DTN_i$ = number of defoliated tiller of species i
$MTN_i$ = number of marked tiller of species i
GP = grazing period (days)

Leaf defoliation rates (LDR) of each species were estimated for young (leaf 1 and 2) and old leaves (leaf 3 nd 4):

$LDR_i = DLN_i / MLN_i \times GP$
$DLN_i$ = number of defoliated leaves of species i
$MLN_i$ = number of marked leaves of species i
GP = grazing period (days)

Defoliated tiller proportion ($DTP_i$) of each species was estimated:

$DTP_i = (DTN_i$ / total number of defoliated tillers) x 100

Summer harvestable forage quality was estimated through acid detergent fiber (ADF) determinations according to Goering and Van Soest (1970).

A randomized experimental design was used, with two replicates. Analyses of variance and Tukey tests were used to determine statistical differences among mean values (P< 0.10).

## RESULTS AND DISCUSSION

**Tiller defoliation rates:** In spring, the tiller defoliation rates of both species (TDR) showed differences depending on the phenological stage of the pasture, being higher at earlier developmental stages ($S_I$) (Table 1). At $S_I$, the initial aerial available biomass was 46% lower than in $S_{II}$. These results coincide with those obtained in monofitic pastures (Hodgson, 1966), since consumption rates are highly correlated with forage availability. In summer, no differences in the TDR of dallisgrass were observed between pasture stages. This results may be associated to the proportion of dallisgrass which was 86 % of the initial aerial biomass availability at both pasture stages. Phalaris was not evaluated in this period because of its latency.

Pasture stages affected the TDR of both species. Phalaris was defoliated at higher rates than dallisgrass at $S_I$ stage, while at $S_{II}$ stage there were no differences between species. At $S_I$, a greater proportion of total defoliated tillers belonged to phalaris (phalaris: 58 %, dallisgrass: 42%), while in $S_{II}$ there were no differences in the proportion of defoliated tillers. These results may be related to a higher proportion of initial aerial biomass availability of phalaris at $S_I$ stage (phalaris: 44 %, dallisgrass: 12 %).

**Leaf defoliation rates:** In spring in both pasture stages ($S_I$ y $S_{II}$), the leaf defoliation rate (LDR) of dallisgrass was higher in young leaves, without differences due to leaf age in phalaris (Table 2). The lower accesibility of dallisgrass in spring due to its greater proportion of vegetative tillers (84 %) than phalaris (10 %), might enhance the selectivity of young leaves, located at the upper layer of the canopy. Meanwhile, in phalaris the greater proportion of reproductive tillers might cause similar accessibility of young and old leaves.

In summer there were no differences in the LDR of young and old leaves. Despite the higher proportion of reproductive tillers of $S_{II}$

stage ($S_I$: 30 %, $S_{II}$: 54 %), forage quality of the pasture, estimated through acid detergent fiber (ADF), was not different between pasture stages ($S_I$: 39.5 %, $S_{II}$: 40.9 %).

The results obtained demonstrated that selective forage behaviour of grazing sheep showed the existence of mechanisms towards maximum forage consumption.

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**Table 1**
Tiller defoliation rates (TDR) (tiller/day) of *Paspalum dilatatum* and *Phalaris aquatica* at 2 phenological stages during spring and summer.

| | SPRING | | | SUMMER | | |
|---|---|---|---|---|---|---|
| | **Stage I** | **Stage II** | **SEM$^z$** | **Stage I** | **Stage II** | **SEM$^z$** |
| *Paspalum dilatatum* | 0.3828$^{aA}$ | 0.1848$^{bA}$ | 0.1446 | 1.200$^a$ | 0.7500$^a$ | 1.0392 |
| *Phalaris aquatica* | 1.0788$^{aB}$ | 0.1320$^{bA}$ | 0.1446 | --- | --- | |
| Mean | 0.7308$^a$ | 0.1584$^b$ | | | | |
| **SEM$^z$** | | | 0.1457 | | | |

a,b Values on the same line with different superscripts are different, P<0.10
A,B Values on the same column with different superscripts are different, P<0.10
z Standard error of the mean