# DEFOLIATION FREQUENCY AND INTENSITY OF ARRHENATHERUM ELATIUS

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## ABSTRACT

This experiment was conducted with the aim of studying whether the frequency and intensity of defoliation of the temperate grass fromental (*Arrhenatherum elatius* (L.) Presl.) affected its total dry matter (DM)/ha yield as well as the seasonal distribution of forage. Plots were seeded in 1988 and data collected from 1989 to 1991. Two frequencies and two intensities of defoliation were combined in a two factor randomized complete block design with six replications. Treatment plots were cut each year from early autumn to late spring. ANVA, Tukey and Dunnett tests were applied to find out differences between treatments and between treatments and control. Statistical significance was assumed at $p<0.05$. For the environmental conditions of this experiment cutting intervals were consistently responsible for differences in total DM yield: BI and BII were superior. The more productive treatment (BI) differed from those of better forage seasonal distribution (AI and AII).

## KEYWORDS

*Arrhenatherum elatius* (L.) Presl., fromental, defoliation, frequency, intensity, forage yield, seasonal distribution

## INTRODUCTION

Perennial Oat, Fromental (*Arrhenatherum elatius* (L.) Presl) is a perennial, bunchgrass temperate grass, with broad and tender leaves, native to Eurasia. (Correa, 1978). In the Humid Pampa Region (Buenos Aires province, Argentina) it grows from early autumn to early summer. Its vegetative traits made us consider it as a potential oat substitute in winter quality grass pastures, having the advantages of perennial over annual grasses. As there is a lack of information about fromental for our region, this trial was planned to study the effects of frequency and intensity of defoliation on yield and seasonal distribution of forage.

## MATERIALS AND METHODS

The experiment was seeded in 1988 autumn on a Typic Argiudol soil at Santa Catalina (Buenos Aires, Argentina, Lat. 34°45/48' S, Long. 58 29/24' W) and the data were collected from 1989 to 1991. Treatments combined two frequencies of defoliation (A: each time modal height of plants reached 20 cm; B: each time modal height of plants reached 40 cm) with two cutting heights (I: 5cm; II: 10 cm). Therefore sampling intervals were not fixed days. Plots of 24 $m^2$ sown with 200 viable seeds/$m^2$ were arranged in a two factor completely randomized block with 6 replications. A control plot/block only received a matching cut each year at the beginning of the growing period; treatment plots were cut from early autumn to early summer the three years studied. Dry matter yield (DM kg/ha) was recorded from 1$m^2$ each cutting date. ANVA was performed for annual and total DM kg/ha; Tukey and Dunnett tests were applied to find out differences between treatments and treatments-control. Statistical significance was assumed at $p<0.05$.

## RESULTS AND DISCUSSION

Figure 1 shows annual and total yield (DM kg/ha) for the treatments and control during 1989-1991. Defoliation frequencies significantly influenced dry matter yield.

Higher yields were obtained with severe and not frequent defoliations (BI); only total DM yield of this treatment did not differ from control total DM yield (Dunnett, $P<0.05$).

Table 1 shows the seasonal distribution of DM production. First year was uniform; differences were more evident at second and third year. Consistent differences among treatments within seasons were produced mainly by defoliation frequencies. Although the difference between A and B was significant, it was not as great in autumn as it was in winter and spring. Frequent defoliations (A) provided most forage in winter, sharing the remainder proportionally between autumn and spring. Frequencies B showed their higher production in spring.

Spring cutting intervals were reduced even though the growth rate of reproductive tillers surpassed that of vegetative tillers (Gillet, 1987) so that the reproductive tillers reached cutting height earlier. This allowed more than one cut/month even with infrequent treatments (B). The lower frequency of B in relation to A enabled these treatments to take greater advantage of the faster growth rate of reproductive tillers. However, although spring growth was faster, all treatments showed decreased productivity after plants suffered blunt. This was evident when treatments yield was comparied with control yield. Gillet (1987) among others, had stated that greater annual DM yield are obtained if the first defoliation is made at flowering stage.

During the study period, vegetative tillers maintained their apex below 2 cm from soil surface until the change to reproductive stage. Decapitation of reproductive apex began at early October (Maddaloni *et al*., 1992b). As treatments A were defoliated in winter and blunted one month earlier than B, reproductive tillers were replaced by vegetative or respiked ones, all with a slower growth rate. According to Gillet (1987) as tillering crisis is more attenuated after a blunt, the growth of living vegetative tillers compensates for the shoots' lower growth, and the plants' weight is restored at a quasi normal rate. Frequencies of defoliation could affect this compensatory growth because productivity after cuttings was restored more rapidly in those treatments with higher defoliation intervals (B). These treatments were not cut during winter when growth rate is lower and probably more energetically expensive for plants. As they were not defoliated, they had a more vigorous spring growth.

In A treatments, flowering was almost not allowed. But, treatments B flowered despite the they also suffered blunt and decapitation. Vegetative growth continued before plants flowered.

Although there were no clear differences during the first year, frequent and severe defoliations (AI) led to plant depletion, which reduced their diameter and number of tillers/$m^2$ at the end of second year (Maddaloni *et al*., 1992a). Defoliations less intense but frequent (AII) were placed in an intermediate situation. They offered forage during winter, but plants were not so vigorous as those of B at the end of the second year (Maddaloni *et al*., 1992a).

For the environmental conditions of this experiment cutting intervals were consistently responsible for differences in total DM yield: BI and BII were superior. The more productive treatment (BI) differed from those of better forage seasonal distribution (AI and AII).

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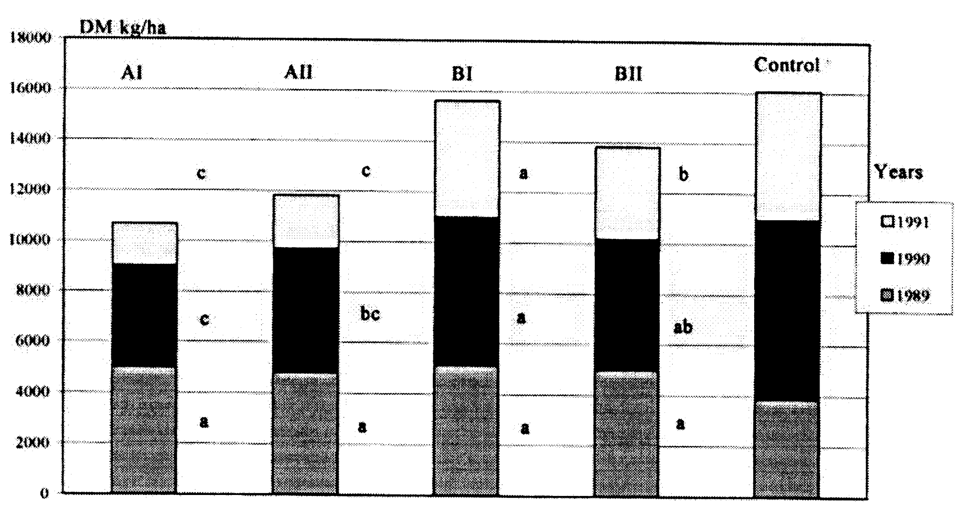
**Table 1**
Seasonal distribution of forage production (DM kg/ha and % over annual yield) of Arrhenatherum elatius during 1989-1991 period.

| Treat. | Year | AUTUMN | | | WINTER | | | SPRING | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | No. of cuts | DM Kg/ha | % /total | No. of cuts | DM Kg/ha | % /total | No. of cuts | DM Kg/ha | % /total |
| | 1989 | 1 | 2080.0 | | 2 | 964.0 | | 4 | 1935.5 | |
| AI | 1990 | 3 | 2137.0 | | 2 | 749.0 | | 6 | 1180.1 | |
| | 1991 | 1 | 82.8 | | 1 | 341.8 | | 3 | 1202.8 | |
| | Total | | 4299.8 | 40.3 a | | 2054.8 | 19.3 a | | 4316.3 | 40.4 b |
| | 1989 | 1 | 1975.3 | | 2 | 671.3 | | 4 | 2150.2 | |
| AII | 1990 | 4 | 2410.0 | | 4 | 898.0 | | 8 | 1619.2 | |
| | 1991 | 1 | 287.2 | | 1 | 305.2 | | 5 | 1503.5 | |
| | Total | | 4672.5 | 39.5 a | | 1874.5 | 15.9 b | | 5272.9 | 44.6 b |
| | 1989 | 1 | 2379.5 | | 0 | 0 | | 5 | 2760.8 | |
| BI | 1990 | 2 | 1499.0 | | 0 | 0 | | 3 | 4384.5 | |
| | 1991 | 1 | 1277.2 | | 0 | 0 | | 2 | 3308.2 | |
| | Total | | 5155.7 | 33.0 b | | 0 | 0.0 c | | 10453.5 | 67.0 a |
| | 1989 | 1 | 2201.8 | | 0 | 0 | | 5 | 2776.2 | |
| BII | 1990 | 2 | 1521.1 | | 0 | 0 | | 4 | 3688.8 | |
| | 1991 | 1 | 801.5 | | 0 | 0 | | 3 | 2847.8 | |
| | Total | | 4524.4 | 32.7 b | | 0 | 0.0 c | | 9312.8 | 67.3 a |

Values on the same column with different letters are different (Tukey, P<0.05)

**Figure 1**
Annual and total DM (kg/ha) yield of Arrhenatherum elatius in 1989-1991 period.




Values on the same line with different letters are different (P<0.05)
AI = frequency: modal height 20 cm; intensity: 5 cm.
AII = frequency: modal height 40 cm; intensity: 10 cm.
BI = frequency: modal height 20 cm; intensity: 5 cm.
BII = frequency: modal height 40cm; intensity: 10cm.