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## Morphogenesis and Defoliation Frequency of Italian Ryegrass (*Lolium multiflorum*) and *Paspalum urvillei* in Lowland under Three Levels of P and K

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**MORPHOGENESIS AND DEFOLIATION FREQUENCY OF ITALIAN RYEGRASS  
(*Lolium multiflorum*) AND *Paspalum urvillei* IN LOWLAND UNDER THREE LEVELS  
OF P AND K**

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**Abstract**

This trial was conducted to evaluate growth dynamics and defoliation frequency of Italian ryegrass (*Lolium multiflorum*) and *Paspalum urvillei* in a lowland area under three levels of P and K. Using randomization tests we observed that, in a general way, fertilizer treatments were not the determinant factors of leaf appearance and elongation rates for both species. Only the leaf appearance rate of *Paspalum urvillei* at 100 % of recommendation level and the elongation rate for Italian ryegrass, in the same treatment, was different. Probably other factors, like drainage, are contributing to these results. I. ryegrass phyllochron ranged from 57.3 to 72.6 degree-days. *Paspalum urvillei* presented higher grazing frequency in almost all evaluated periods, revealing a high preference by the grazing animals.

**Keywords:** Growth dynamics; leaf appearance rate; leaf elongation rate; drainage; animal preference

## **Introduction**

The state of Rio Grande do Sul (RS) has about five millions of hectares (ha) of lowlands. One of the soil management practices for those areas is soil leveling which changes soil chemical properties (Vizzotto, 1999). Marchezan et al. (1998) showed that introducing cool season forage species can improve soil physical and chemical conditions and enhances the nutritional value of those native pastures.

Introduced and native species, which start undergoing a succession process after disturbance by leveling, drainage, trampling and grazing, are part of vegetation composition. Italian ryegrass (*Lolium multiflorum*) is a cool season grass that has been used in this environment and *Paspalum urvillei* is a natural grass of great abundance in this area. The effect of grazing over vegetation is as important as climate and soil. Herbivores are one of the determinant elements of vegetation structure, mainly in pasture areas (Sala, 1988). This trial had the goal of evaluate tillers growth dynamics and defoliation frequency upon these species under three of P and K levels.

## **Material and Methods**

The trial was carried in a lowland area of Agronomy Department of Universidade Federal de Santa Maria, RS, Brazil, an Albaqualf.

The experimental area has three ha and was divided in six paddocks. In early 1997, the lowland was leveled to a 0.06 % slope, with a maximum 0.3 m soil layer and superficial drains. After this procedure the treatments were imposed with 150 % (195 kg/ha of P<sub>2</sub>O<sub>5</sub> and 156 kg/ha of K<sub>2</sub>O); 100 % (130 kg/ha of P<sub>2</sub>O<sub>5</sub> and 104 kg/ha of K<sub>2</sub>O) and 50 % ( 65 kg/ha of P<sub>2</sub>O<sub>5</sub> and 52 kg/ha of K<sub>2</sub>O) of fertilizer recommendation by the Soil Fertility Commission of

RS (1994). In the following years the paddocks received 60, 40 and 20 kg/ha of P<sub>2</sub>O<sub>5</sub> and K<sub>2</sub>O, respectively, for each the treatments. All treatment received 112.5 kg/ha of N, in 1999.

The paddocks were continuously grazed by yearling steers of 220 kg of liveweight, with a mean stocking rate of 918 kg of liveweight /ha.

Three parallel transects with five quadrats of 0.25 m<sup>2</sup> were marked in each paddock. In the quadrats three tillers of each species were evaluated. The tillers were marked with color rings made of one mm telephone wires. Grazed leaves had their apices marked with a white watercolor pen. Morphogenetic evaluations on Italian ryegrass were made from 06/29 to 10/05 and for *Paspalum urvillei* from 10/19 to 11/09. Marked tillers were examined each week to register leaf elongation (cm of leaf blade/tiller), leaf appearance (number of leaves/day) and defoliation frequency (% of tillers grazed).

Randomization tests were used to compare the effects of treatments and differences between species, utilizing MULTIV software (Pillar, 1997).

## **Results and Discussion**

Leaf elongation rates of Italian ryegrass are significantly different for 150 % and 50 % treatments, only in the second period of evaluation. In other periods the elongation rates are similar and this was also observed for *Paspalum urvillei* (Table 1). This similarity in leaf elongation rates for both species can be ascribed to an equal amount of fertilizer N applied in all treatments as a maintenance fertilization. N availability is one of determinant factors in leaf elongation rate. No difference among treatments was detected for leaf appearance rates of Italian ryegrass in all periods. *Paspalum urvillei* had a higher rate for 100 % fertilizer recommendation. Both species showed similar leaf appearance rates, needing about ten to thirteen days for a leaf to appear. Higher rates was find in 100 % fertilizer recommendation treatment, for both Italian ryegrass and *Paspalum urvillei*, indicating that other factors,

independent from fertilizer treatments, had been relevant to the comprehension of the species growth dynamics. One of these factors could be the poor drainage of the area.

There was a difference between treatments 150 % and 50 % fertilizer recommendation for Italian ryegrass phyllochron (Table 1). Calculated values are lower than the ones usually cited in the literature about the species (Lattanzi et al., 1996), but this is probably due to the fact that evaluated tillers are under grazing and the maximum length of leaves was not achieved in that situation.

The defoliation frequency was similar between all the evaluated periods (Table 2), and with the exception the first period, *Paspalum urvillei* had the higher defoliation frequency. This is a surprising feature for a natural species, that has never been under a selection or breeding program, and is usually seen as an undesirable weed by farmers and some researchers. These data suggest a need for more research efforts in the evaluation of animal production in pastures that includes *Paspalum urvillei* as major component.

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**Table 1** – Leaf blade elongation and appearance rates of Italian ryegrass (*L. multiflorum*) and *Paspalum urvillei*, and phyllochron of Italian ryegrass, in a lowland area, under three fertilizer levels. (average data) Santa Maria – RS, 1999.

Fertilizer recommen- dation (%)	Elongation rates (cm of leaf blade/tiller/day)				Appearance rates (number of leaves/day)				Ryegrass average phyllochron (degree days)
	Italian ryegrass		<i>P. urvillei</i>		Italian ryegrass		<i>P. urvillei</i>		
	29/06 - 20/07	03/08 - 17/08	14/09 - 05/10	19/10 - 09/11	29/06 - 20/07	03/08 - 17/08	14/09 - 05/10	19/10 - 09/11	
150	0.15	0.46 a*	0.26	0.28	0.07	0.09	0.08	0.08 b**	57.57 a***
100	0.18	0.37 ab	0.21	0.24	0.08	0.11	0.08	0.10 a	69.16 ab
50	0.19	0.21 b	0.25	0.23	0.08	0.09	0.08	0.09 b	72.58 b

Values followed by different letters had significant difference at \* (P=0.06), \*\* (P<0.03) and \*\*\* (P=0.07).

**Table 2** - Defoliation frequency (% of grazed tillers/period) in Italian ryegrass (*L. multiflorum*) and *Paspalum urvillei* in four evaluation periods ,in a lowland area. Santa Maria – RS, 1999.

Species	Periods			
	29/06 - 20/07	03/08 - 17/08	14/09 - 05/10	19/10 - 09/11
Italian ryegrass	0.4944a	0.4461a	0.6222a	0.4741a
<i>P. urvillei</i>	0.4222b	0.5681b	0.7259b	0.8722b

Values followed by different letters had significant difference (P=0.0001).