Leaf Appearance Rate in *Brachiaria decumbens* Grown in Nitrogen and Potassium Rates

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LEAF APPEARANCE RATE IN *Brachiaria decumbens* GROWN IN NITROGEN AND POTASSIUM RATES

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Abstract

A greenhouse experiment was carried out with *Brachiaria decumbens* Stapf. cv. Basilisk grown in nutrient solution. Five nitrogen rates (42; 140; 238; 336 and 434 mg/L) and three potassium rates (78; 234 and 390 mg/L) were studied in a factorial experiment, in a randomized complete block design, with four replications. Green leaf number was evaluated in six times in the first period of growth (27, 30, 33, 36, 39 and 42 days after transplanting) and nine times in the second period (45, 48, 51, 54, 57, 60, 63, 66 and 69 days after transplanting). Data was registered in three plants per pot. The average green leaf number per tiller changed significantly ($P<0.01$) with nitrogen rates in the two growth periods. Leaf appearance rate was higher at nitrogen rates of 336 or 434 mg/L.

Keywords: leaf appearance , phyllochrone, signal grass

Introduction

Forage growth and productivity depend on both enviromental factors (such as water, temperature, light, nutrients and so on) and genetic characteristics of the plant. Herbage accumulation is a dynamic process envolving leaf tissue turnover in grass swards (Bircham and Hodgson, 1983).

Leaf elongation, appearance and lifespan are morphogenetic characteristics of a pasture species (Chapman and Lemaire, 1993). The time period between the initiation of the primordium of two succesive leaves is called plastochrone (Skinner and Nelson, 1995; Wilhelm and McMaster, 1995). On the other hand phyllochrone is defined as the period between the apperance of two successive leaves (Wilhelm and McMaster, 1995) and such period is affected by enviromental factors. By using the inverse of the phyllochrone the leaf appearance rate (LAR) is obtained and shows the number of leaves per tiller.day (Zarrough et al.,1984; Skinner and Nelson, 1992; Van Loo, 1992; Pinto et al., 1994; Gomide et al., 1997).

Nutrient availability (particularly N, P, K and Mg) directly influence leaf elongation and can be used in plant metabolism from that supplied through the soil solution (via xylem) or through the remobilization from older leaves (Dale, 1992). Besides their own contribution, N and K supplies should be balanced in order to result in better forage growth (Robinson, 1985). The objective of this experiment was to determine the individual effects of N and K, as well as their interaction, on leaf appearance rate in *Brachiaria decumbens* Stapf. cv. Basilisk.

Material and Methods

An experiment was carried out in a greenhouse located at Piracicaba, SP, Brazil during the spring and summer seasons. Seeds of the grass were germinated in washed sand and 15 seedlings were tranfered to plastic pots (3.6 L each) filled with ground quartz. Five plants were

kept in each pot. Five nitrogen rates (42; 140; 238; 336 and 434 mg/L) were combined to three potassium rates (78; 234 and 390 mg/L). The nutrient solution was prepared as described by Sarruge (1975), with due cations modified to fit in the nitrogen and potassium rates. One liter of nutrient solution was applied to each pot. In the first week of the nutrient solution supply, solutions were diluted to one third of the total concentration. Each solution was circulated through the substrate three times a day and the one liter volume was reestablished everyday by adding deionized water. The experiment was a complete 5x3 factorial in a complete randomized block design with four replications. Notes on leaf appearance was taken from three plants per pot in six dates (27; 30; 33; 36; 39 and 42 days after the day of seedlings transplanting to the pots, and nine dates (45; 48; 51; 54; 57; 60; 63; 66 and 69 days after seedlings transplanting to the pots), during the first and second growth periods, respectively. Leaf appearance rate was calculated from the original data according to Pinto et al.(1994). Statistical analysis followed GLM procedures, with the REAPEATED MEASURES options from the SAS-System for Windows release 6.12 (Sas Institute, 1988).

Results and Discussion

Nitrogen rates significantly ($P<0.01$) affected the leaf appearance rate (LAR) in the two growth periods of signal grass. On the other hand, no effect was observed for potassium rates as well as for the nitrogen x potassium interaction ($P>0.05$).

LAR was 0.443 leaves/tiller.day at the lowest nitrogen supply (42 mg/L) and 0.510 leaves/tiller.day for the highest nitrogen rate (434 mg/L). As a consequence, phyllochrone was 2.26 days/leaf and 1.96 days/leaf for nitrogen rates of 42 and 434 mg/L, respectively, during the first growth period (Table 1).

During the second growth period LAR ranged from 0.189 to 0.212 leaves/tiller.day for nitrogen supply of 42 and 434 mg/L, respectively. Phyllocrone varied from 5.29 days/leaf (N=42 mg/L) to 4.72 days/leaf (N=434 mg/L) (Table 2).

Phyllocrone values were higher in the second than in the first growth period. Probably this was due to the plant establishment from the seedlings in the first period, whereas plants were well established (including vigorous root system) for the second growth period.

In both growth periods LAR for the highest nitrogen rates (336 and 434 mg/L) was significantly different from that found at 42 mg/L. For other grasses, LAR had higher values at abundant nitrogen supply than at non-sufficient nitrogen supply for the signal grass.

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Table 1 - Phyllocrone and leaf appearance rate in the first growth period of signalgrass, as related to nitrogen rates in the nutrient solution.

N rates	Leaf appearance	
(mg/L)	Phyllocrone (days/leaf)	LAR (leaves/tiller.day)
42	2.26b	0.433b
140	2.04a	0.490a
238	2.00a	0.500a
336	1.96a	0.510a
434	1.96a	0.510a

Means followed by the same letter are not significantly different (Tukey, 0.05)

Table 2 - Phyllocrone and leaf appearance rate in the second growth period of signalgrass as related to nitrogen rates in the nutrient solution.

N rates	Leaf appearance	
(mg/L)	Phyllocrone(days/leaf)	LAR (leaves/tiller.day)
42	5.29b	0.189b
140	4.95ab	0.202ab
238	4.81ab	0.208ab
336	4.74a	0.211a
434	4.72a	0.212a

Means followed by the same letter are not significantly different (Tukey, 0.05).