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**EFFECT OF SOWING TIME ON PHYTOMASS PRODUCTION  
DURING EARLY GROWTH OF TWO VARIETIES OF**

*Stylosanthes guianensis* (Aubl.) Sw.

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**Abstract**

The objective of this research was to determine the effect of two sowing times on phytomass production of two varieties of *Stylosanthes guianensis* (var. *pauciflora* and var. *vulgaris*). Two experimental periods were studied (1: January - May/1998 and 2: November/1998 - March/1999) using a completely randomized factorial design 2 x 2 x 14 (two periods, two varieties and fourteen ages of evaluation), with four replications. The results showed a difference between the periods concerning the growth and development of *Stylosanthes*, and that period 2 was the most favourable to this forage plant. There was, also, different adaptability between the two varieties concerning the sowing times. The var. *pauciflora* was more adapted in period 1, and the var. *vulgaris*, in period 2. The data showed the possibility of selecting *Stylosanthes* cultivars adapted to different seasonal conditions.

**Keywords:** stylo, dry mass, forage physiology.

## Introduction

The genus *Stylosanthes* has been known as a source of forage plants adapted to tropical grasslands. Among all known species, *Stylosanthes guianensis* has been one of the most used in South America, Asia and Africa (Milles and Grof, 1997). Several cultivars have been developed in Brazil, such as Bandeirante (*S. guianensis* var. *pauciflora*) and Mineirão (*S. guianensis* var. *vulgaris*).

Morphological and physiological characteristics that enhance production, quality and persistence of plants in the pasture must be used in the selection of forage plants (Clements et al., 1970; Ferreira et al., 1999). Thus, early growth, plant height and phytomass production are some important characteristics which are used in these evaluations (Edye, 1997). Besides the above characteristics, it is also desirable, to select plants with adaptability to a wide range of seasonal and edaphic conditions (Edye et al., 1998).

This research was conducted to evaluate physiological characteristics of two varieties of *Stylosanthes guianensis* ( var. *pauciflora* and var. *vulgaris*) concerning the phytomass production during early growth in two sowing times.

## Material and Methods

Two experimental periods (1: January - May/1998 and 2: November/1998-March/1999) were studied at FCAV/UNESP in Jaboticabal, Brazil, using a completely randomized factorial design 2 x 2 x 14 (two periods, two varieties and fourteen ages of evaluation), with four replications. The following varieties were evaluated: *S. guianensis* var. *pauciflora* (BRA 003671) and *S. guianensis* var. *vulgaris* (BRA 037991). Seeds were obtained from the Germplasm Bank of the Centro de Pesquisa Agropecuária dos Cerrados (CPAC- EMBRAPA/Brazil).

The seeds were hand scarified and sown in plastic pots containing a 3:1 mixture of soil and sand, respectively. The first evaluation was carried out on the 27<sup>th</sup> day after seedling emergence and the others, every seven days, up to a total of fourteen evaluations (total of 92 days, from the 1<sup>st</sup> to the 14<sup>th</sup> evaluation). At each evaluation, four plants of each variety of *S. guianensis* were collected. The shoot and the root of each plant were separated and the following characteristics were recorded: plant height, number of branches and leaves, and root fresh mass. Subsequently stems, leaves, and petiole were separated from each shoot. Afterwards, they were placed in paper bags separately and dried in the oven at 70°C for 48 hours to determine the dry mass of each part. The data were analysed according to SAS (1995), using GLM procedure.

### **Results and Discussion**

Table 1 shows the statistical p- values of seven characteristics analysed (plant height, number of branches and leaves, stems, leaves and petiole dry mass, and root fresh mass) of *S. guianensis* var. *pauciflora* and var. *vulgaris*, in the two sowing times. The period x variety interaction was significant ( $P < 0.01$ ) for plant height, stems, leaves, and petiole dry mass; and for number of branches and root fresh mass ( $P < 0.05$ ). These results show that the varieties were different concerning the growth characteristics and phytomass production, in the different sowing times. In one experiment carried out in field conditions, Paterniani et al. (1999) observed difference ( $P < 0.05$ ) in the production of leaf dry mass of the var. *pauciflora* and var. *vulgaris*.

Table 2 shows the average values and the results of the Tukey's test of the seven characteristics analysed for *S. guianensis* var. *pauciflora* and var. *vulgaris* in the two sowing times. The Tukey's test revealed that there was difference ( $P < 0.05$ ) between the two sowing times for all characteristics of both varieties, except for number of leaves in the var.

*pauciflora*. Both varieties showed higher average of plant height and of phytomass production (stems, leaves, and petiole dry mass and root fresh mass) during period 2 (November/1998- March/1999). These results showed that period 2 was the most favourable to the growth and development of *Stylosanthes*.

There were differences ( $P < 0.05$ ) in the characteristics of the two varieties in the same period of evaluation, except for dry mass of leaves and petiole in period 1 and root fresh mass in period 2.

In period 1, var. *pauciflora* showed higher average values of growth characteristics (plant height, branch number) and of phytomass production (stem dry mass, root fresh mass). As for var. *vulgaris*, it showed higher average values for plant height; stems, leaves, and petiole dry mass in period 2. According to Martins and Vello (1983) it is possible to increase the production of dry mass of *Stylosanthes guianensis* through the indirect selection of characteristics such as plant height and production of fresh mass.

The number of leaves was not affected ( $P > 0.05$ ) by the interaction period x variety (Table 1). Therefore, the two varieties were similar towards this characteristic, in the two growing seasons.

The results of this research leads to the following conclusions: The growth and development of the two varieties of *Stylosanthes* showed a seasonal pattern, being period 2 (November/1998 - March/1999), the most favourable to this forage plant; There is a different adaptability between the two varieties concerning the sowing times. Variety *pauciflora* was better adapted to period 1 (January- May/1998), and variety *vulgaris* was better adapted to period 2 (November/1998 - March/1999).

These results are important to breeding programmes since they show the possibility of selecting *Stylosanthes* cultivars adapted to different seasonal conditions.

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**Table 1** - Statistical p-values, determination coefficient ( $R^2$ ) and variation coefficient (C.V.%) for the characteristics: plant height (PHT, cm) number of branches (NB) and leaves (NL), stem dry mass (SDM,g), leaf dry mass (LDM,g), petiole dry mass (PDM,g) and root fresh mass (RFM, g).

Source of Variation	PHT	NB <sup>(1)</sup>	NL <sup>(1)</sup>	SDM <sup>(2)</sup>	LDM <sup>(2)</sup>	PDM <sup>(2)</sup>	RFM <sup>(2)</sup>
	----- p – values -----						
Period	0.0001	0.0006	0.0001	0.0001	0.0001	0.0001	0.0001
Variety	0.1615	0.0001	0.0007	0.9012	0.0164	0.0274	0.6470
Period x Variety	0.0001	0.0487	0.8299	0.0031	0.0009	0.0003	0.0320
Age	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Age x Period	0.0001	0.8302	0.0001	0.0001	0.0001	0.0001	0.0001
Age x Variety	0.0667	0.2861	0.0171	0.0504	0.0619	0.0124	0.1188
Age x Variety x Period	0.0415	0.8051	0.2836	0.4776	0.0631	0.0003	0.3109
$R^2$	0.9439	0.9162	0.9400	0.9626	0.9496	0.9222	0.9588
C.V. (%)	17.4075	10.9443	17.5446	21.3555	21.4571	36.6089	15.4196

(1) Original data converted to  $\sqrt{x+1}$

(2) Original data converted to  $\log(x+1)$

**TABLE 2** - Mean values<sup>(1)</sup> of the characteristics plant height (PHT,cm), number of branches (NB) and leaves (NL), stem dry mass (SDM,g), leaf dry mass (LDM,g) petiole dry mass (PDM,g), and root fresh mass (RFM,g), of two varieties of *Stylosanthes* in two growing periods (P1 : January – May/1998; P2 : November/1998 – March/1999).

Variety	PHT		NB <sup>(2)</sup>		NL <sup>(2)</sup>		SDM <sup>(3)</sup>		LDM <sup>(3)</sup>		PDM <sup>(3)</sup>		RFM <sup>(3)</sup>	
	P1	P2	P1	P2	P1	P2	P1	P2	P1	P2	P1	P2	P1	P2
<i>S. guianensis</i> var. pauciflora	30.05bA	39.56aB	3.2632aA	3.3714aA	9.4454	11.8494	0.8726bA	1.3128aB	0.8276bA	1.1032aB	0.1198bA	0.1820aB	2.0833bA	2.5802aA
<i>S. guianensis</i> var. vulgaris	25.88bB	46.89aA	2.8636bB	3.1681aB	8.4005	10.6973	0.7409bB	1.4357aA	0.7790bA	1.3242aA	0.0989bA	0.2456aA	1.9103bB	2.6971aA

(1) Means followed by the same lower case letters in the lines and the same upper case letters in the columns, to each characteristic, are not significantly different ( $P > 0.05$ ), by the Tukey Test.

(2) Original data converted to  $\sqrt{x + 1}$

(3) Original data converted to  $\log(x+1)$ .