Allelopathy of *Panicum maximum* Jacq. Cultivars on Tree and Shrub Forage Legumes: Greenhouse Estimate

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ALLELOPATHY OF *Panicum maximum* Jacq. CULTIVARS ON TREE AND SHRUB FORAGE LEGUMES: Greenhouse Estimate

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Abstract

The available information about allelopathic effects of the genus *Panicum* on tropical forage legumes is scarce and inconclusive. Based on this fact this research was carried out, under greenhouse conditions to evaluate potential allelopathic effects of aqueous extracts (0,10 and 20%) of three cultivars of *Panicum maximum* Jacq. cv. Mombaça, cv. Aruana and cv. Tanzânia-1 on three forage legumes, *Leucaena leucocephala* (Lam.) de Wit. (leucaena), *Cajanus cajan* (L.) Millsp. cv. Kaki (pigeon pea) and *Sesbania sesban* (L.) Merr. (sesbania) seeking for mixed grasses and legumes pastures. The following characteristics were evaluated: emergence porcentage, speed of germination index, root density, dry mass of roots, nodules, leaves and stems and leaf/stem ratio. At weekly intervals the height and leaf number of the plants were evaluated, totalising six evaluations. The results indicated that: a) the *P. maximum* cultivars presented allelopathic potential, that varied depending on the species of forage legume evaluated; b) the cv.Mombaça was more allelopathic to the legumes.

Keywords: allelopathic effects, leucaena, pigeon pea, sesbania

Introduction

Some plants can exercise a chemical inhibition or an estimulating effect over germination and development of other species, known as allelopathy or allelopathic effect (Rice, 1984). Several forage grasses have allelopathic effect over other plants (Almeida, 1993; Rodrigues et al., 1993; Chung and Miller, 1995; Fagioli et al., 1997; Almeida, 1999), which complicates the establisment of grasses together with legumes in pastures. There are few information about *Panicum* allelopathy, thus this work was carried out, to study the possible allelopathic effects of aqueous extracts of three *P.maximum* cultivars (mombaça, aruana e tanzânia), over three tree and shrub legumes (leucaena, pigeon pea and sesbania), in three concentrations (0, 10 and 20%).

Material and Methods

The *P.maximum* cultivars were sown under field conditions in November, 1997 and after 80 days of vegetative growth, the plants were harvested (shoot and root), washed and pressed under hydraulic pressure of 4.5 metric tons**.** After scarification and inoculation of the seeds, the legumes were sown in pots, in greenhouse. The soil used to fill the pots was analysed, corrected (base saturation of 70%) and fertilized according to the soil department of the University. Then, 50 ml of each *Panicum* extract or water was added to the pots, according to the sorted treatment. Fifty day after sowing, root and shoot were cut down close to the soil. Roots were separated from the soil and weighed and from total fresh mass, 1.0 gram was taken to estimate its density by "Intersection method" described by Bohm (1979), roots and shoot were dried at 65°C temperature, in forced air circulation oven until obtaining constant mass. The experimental design adopted was randomized blocks, with factorial scheme 3 x 3 x 3 (3 legumes; 3 *Panicum* cultivars and 3 extract concentrations), repeating 4 times, totalising

108 pots. Results were submited to analysis of variance processed with "ESTAT" software, determining the least significant difference by the Tukey test with 5% probability level.

Results and Discussion

Table 1 shows that grass aqueous extracts ($P < 0.05$) reduced at a higher extension sesbania and pigeon pea root densities. Almeida (1999), also had this reduction in laboratory, through scanning electron-microscopy from ealier roots of the same studied legumes. When legumes moistened with aqueous extracts from each *Panicum* cultivar were evaluated, it was found that sesbania showed lower root density when submited to the extracts of mombaça and aruana cultivars (Table 1). Dry mass of leucaena and pigeon pea roots did not show significant differences ($P > 0.05$) when moistened with different aqueous extracts of the grasses. However, dry mass of sesbania roots was lower ($P < 0.05$) when treated with aqueous extracts of mombaça and aruana cultivars (Table 1). Almeida et al. (1997) also found out that aqueous extracts of *Brachiaria brizantha* cv. Marandu decreased the dry mass production of the forage legumes , that varied according to the evaluated plant. Total dry mass production (shoot and root) of the sesbania had greater decrease ($P < 0.05$) when it was submited to aqueous extracts of mombaça cultivar (Table 1). According to Chou (1989), the *Panicum repens, Brachiaria mutica, Digitaria decumbens* and *Imperata cylindrica* var. *major* lixiviates, showed variable inhibition on intra and interespecific growth. *D. decumbens* lixiviates affected drastically its own growth and delayed the growth of *B. mutica* and *P. repens.* The *B. mutica* production was inhibited by its lixiviate, but *I. cylindrica* wasn't by lixiviates from different grasses. In this work, under greenhouse conditions, it could be observed that the aqueous extracts of grasses injured the early development and growth of the legumes. It was often clear an atrophy and drying up of the leaves as well as some plants showing low growth rate. Some of them presented normal growing, but another kept much

smaller than expected until the end of the experimental period. On some plants, the effect of aqueous extracts was so drastic that they could not survive. It was not observed death on legumes in pots where the plants were treated only with water. The conclusion is that *P. maximum* cultivars studied showed allelopathic effect, that varied depending of the legume evaluated and *P. maximum* cv. Mombaça showed to be the most allelopathic among studied legumes.

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Table 1 - Root density, dry mass of roots and total dry mass (shoot + root) of three forage legumes under aqueous extracts effects from three *Panicum maximum* cultivars.

Legumes	Concentration		
	Patern (0%)	10%	20%
	..... Root Density (cm root/cm^3 soil)		
Leucaena	1,33 Ac	0,76 Ab	0,90 Ac
Pigeon pea	8,85 Aa	5,54 Ba	4,87 Ba
Sesbania	6,18 Ab	4,75 Ba	3,36 Cb
	Cultivars		
	Mombaça	Aruana	Tanzânia-1
	..... Root Density (cm root/cm^3 soil)		
Leucaena	1,04 Ac	1,03 Ac	0,92 Ab
Pigeon pea	6,43 Aa	6,15 Aa	6,68 Aa
Sesbania	3,80 Bb	4,25 Bb	6,24 Aa
	..... Root Dry Mass (g)		
Leucaena	0,83 Ac	0,92 Ac	0,87 Ab
Pigeon pea	2,89 Aa	3,14 Aa	2,90 Aa
Sesbania	2,33 Bb	2,55 Bb	3,08 Aa
	..... Total Dry Mass (g)		
Leucaena	3,39 Ab	3,81 Ab	3,46 Ac
Pigeon pea	15,73 Aa	16,61 Aa	15,41 Ab
Sesbania	14,41 Ba	16,01 Aba	17,85 Aa

Means followed by same letters, capital letters in lines and lower case letters in columns, are not significantly different by the Tukey test ($P > 0,05$)