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INFLUÊNCIA DO RESÍDUO DE LEGUMINOSAS ARBÓREAS NA FITOMASSA DO SORGO

MARCO ANTÔNIO ROSA DE CARVALHO[1], LILIAN CRISTINA CASTRO DE CARVALHO[2], REGINALDO ROSSI LOPES DE MARIA[3], SARAH ARAÚJO TEIXEIRA[4], INGRID SOLEDADE JERONIMO DE ARAÚJO[5]

[1]Eixo de Recursos Naturais, Instituto Federal de Educação, Ciência e Tecnologia do Ceará (IFCE), Campus Sobral, Av. Dr. Guarany, 317, Bairro Derby Clube, CEP 62.042-030, Sobral, Ceará, Brasil, E-mail: marcorosa@ifce.edu.br
[2]Eixo de Recursos Naturais, Instituto Federal de Educação, Ciência e Tecnologia do Ceará (IFCE), Campus Sobral, Av. Dr. Guarany, 317, Bairro Derby Clube, CEP 62.042-030, Sobral, Ceará, Brasil, E-mail: liliancarv@ifce.edu.br
[3]Eixo de Recursos Naturais, Instituto Federal de Educação, Ciência e Tecnologia do Ceará (IFCE), Campus Sobral, Av. Dr. Guarany, 317, Bairro Derby Clube, CEP 62.042-030, Sobral, Ceará, Brasil, E-mail: reginaldorossi_93@hotmail.com
[4]Eixo de Recursos Naturais, Instituto Federal de Educação, Ciência e Tecnologia do Ceará (IFCE), Campus Sobral, Av. Dr. Guarany, 317, Bairro Derby Clube, CEP 62.042-030, Sobral, Ceará, Brasil, E-mail: sarah.araujo60@aluno.ifce.edu.br
[5]Eixo de Recursos Naturais, Instituto Federal de Educação, Ciência e Tecnologia do Ceará (IFCE), Campus Sobral, Av. Dr. Guarany, 317, Bairro Derby Clube, CEP 62.042-030, Sobral, Ceará, Brasil, E-mail: ingrid.soledade.jeronimo45@aluno.ifce.edu.br

RESUMO: Este estudo teve o objetivo de avaliar a interação entre leguminosas arbóreas e a cultura do sorgo cultivado em solo degradado no município de Sobral-CE. O experimento foi conduzido nas instalações de uma casa de vegetação localizada no Instituto Federal de Educação, Ciência e Tecnologia do Ceará – IFCE, Campus Sobral, região noroeste do estado. O delineamento experimental adotado foi o de blocos ao acaso, com dez tratamentos e quatro repetições, totalizando quarenta parcelas experimentais. Foram avaliados os seguintes tratamentos: 1) Folhas de *Leucaena Leucocephala*, 2) Galhos de *Leucaena Leucocephala*, 3) Folhas + galhos de *Leucaena Leucocephala*, 4) Folhas de *Mimosa hostilis*, 5) Galhos de *Mimosa hostilis*, 6) Folhas + galhos de *Mimosa hostilis*, 7) Folhas de *Mimosa caesalpiniifolia*, 8) Galhos de *Mimosa caesalpiniifolia*, 9) Folhas + galhos de *Mimosa caesalpiniifolia* e 10) Sem resíduo de leguminosas. Cada parcela experimental foi representada por um vaso plástico com capacidade de 10 dm^3 de substrato, contendo três plantas. Foram feitas as seguintes avaliações: matéria seca da parte aérea no primeiro corte e no segundo corte (rebrota). Os dados para cada variável estudada foram submetidos à análise de variância sendo as médias comparadas pelo teste de Tukey a 5%.

Palavras-chave: qualidade do solo; adubação verde; matéria orgânica.

INFLUENCE OF LEGUME TREE RESIDUAL IN PHYTOMASS OF SORGHUM

ABSTRACT: This study aimed to evaluate the interaction between leguminous trees and sorghum grown on degraded soil at Sobral-CE. The experiment was conducted on the premises of a greenhouse located at the Federal Institute of Education, Science and Technology of Ceará - IFCE Campus Sobral, Northwest Region in the state. The experimental design was a randomized block with ten treatments and four replications, totaling forty plots. We evaluated the following treatments: 1) Leaves of *Leucaena leucocephala*, 2) branches of *Leucaena leucocephala*, 3) leaves + branches of *Leucaena leucocephala*, 4) leaves of *Mimosa hostilis*, 5) branches of *Mimosa hostilis*, 6) leaves + branches of *Mimosa hostilis*, 7) leaves of *Mimosa caesalpiniifolia*, 8) branches of *Mimosa caesalpiniifolia*, 9) leaves + branches of *Mimosa caesalpiniifolia* and 10) no residue of leguminous plants. Each plot was represented by a plastic vase with a capacity of 10 dm^3 of substrate containing three plants. The participants were asked the following ratings: the aboveground part of the first cut and the second cut (regrowth). The data for each variable were subjected to analysis of variance, and the means were compared via Tukey's test at 5%.

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Keywords: soil quality, green manure, organic matter.

1 INTRODUCTION

Species of the legume family can add large amounts of organic matter and nitrogen (N) to the soil through litter in a relatively short time, favoring nutrient cycling and the rehabilitation process (Chaer *et al.*, 2011).

Knowledge of the interactions between legumes and annual crops is highly important for the management of agroforestry systems, since legumes establish symbiotic relationships with nitrogen-fixing bacteria and serve as mulch and green manure (Santos *et al*., 2010).

Among the desirable characteristics for selecting cover species, the production of phytomass and the capacity to accumulate N through biological fixation or absorption of nutrients in the soil stand out. These attributes, together with the C/N ratio of the straw, allow estimation of the potential of cover crops to increase the supply of N for subsequent crops (Oliveira; Carvalho; Moraes, 2002; Boer *et al*., 2007).

The thrush (*Mimosa caesalphiifolia* Benth.) is a woody species of the Caatinga in Northeast China and is well known for being a tree that is used for various purposes, such as wood, forage, stakes, and honey production. It is one of the most suitable species for use in agroforestry systems, as it has fast growth, good protein and energy value, high regrowth power and resistance to drought (Carvalho; Garcia; Araujo Filho, 2004).

Black jurema (*Mimosa hostilis)* Benth.), a legume found in almost the entire northeast region, has a high capacity for drought tolerance and good growth in shallow soils and is one of the pioneer species in degraded areas. This species has a shrubby appearance and a forked trunk, and after five years, it has reached an average height of 4.5 meters (Lima, 1996).

Leucaena (*Leucaena leucocephala*) has a wide geographic distribution and grows in regions with rainfall ranging from 600 mm to 1,700 mm per year. However, it can also be found in drier areas, with rainfall of approximately 250 mm. It can withstand periods of drought lasting more than eight months and an annual water deficit of up to 870 mm. It is restricted to the tropics and subtropics, with temperatures between 10 °C and 40 °C. It is a shrubby tree, with a height of up to 20 m and a diameter at breast height (DBH) of up to 30 cm (Drumond; Ribaski, 2010).

This study aimed to evaluate the interaction between the plant residue of leguminous trees and sorghum crops grown in degraded soil.

2 MATERIALS AND METHODS

The experiment was conducted in the facilities of an agricultural screen located at the Federal Institute of Education, Science and Technology of Ceará - IFCE/Sobral *Campus* in the municipality of Sobral - CE. The geographic coordinates of the region where the experiment was installed are 3° 41' South latitude, 40° 20' West longitude and an average altitude of 70 m.

The substrate used to fill the pots was degraded soil without any fertilization. The plant residue that constituted the treatments was collected directly from the plants in the vicinity of the experimental site.

Sorghum bicolor L. Moench) seeds were planted in trays on January 27, 2014, and the seedlings were subsequently transplanted into pots on February 10, 2014. The legume residue was applied as mulch; after drying in an oven and grinding in a knife mill, it was applied on March 20, 2014, with a standardized weight of 76 g for each pot. On June 10, 2014, the aerial part was harvested and placed in an oven immediately afterward to determine dry matter. On July 14, the aerial part of the regrowth was harvested and immediately taken to the oven to determine dry matter.

Irrigation management was based on daily readings from a Class A tank installed inside the screen, with the irrigation depth equal

to 100% of the evaporated depth. Seedling thinning was performed 10 days after emergence, and the three most vigorous plants were left in each pot.

The experimental design adopted was randomized blocks, with ten treatments and four repetitions, totaling forty experimental plots. The following treatments were evaluated: 1) Leaves of *Leucaena leucocephala, 2) Leucaena leucocephala* twigs, 3) *Leucaena leucocephala* leaves + twigs**, 4)** *Mimosa hostilis* leaves, 5) *Mimosa hostilis* twigs, 6) *Mimosa hostilis* leaves + twigs, 7) *Mimosa caesalpiniifolia* leaves, 8) Branches of *Mimosa caesalpiniifolia*, 9) Leaves + twigs of *Mimosa caesalpiniifolia* and 10) no legume residue. Each experimental plot was represented by a plastic pot with a substrate capacity of 10 dm3, which contained three plants.

To quantify the sorghum phytomass, the aerial part dry matter (MSP) and the regrowth dry matter (MSR) were determined. The plants (stems and leaves) were collected and fractionated with the aid of pruning shears, placed in previously identified paper bags, and then placed to dry in an air circulation and renewal oven at 65 °C until they reached a constant weight. Then, the aerial dry matter was determined on a precision digital scale (0.01 g).

Statistical analyses were performed according to the criteria established by experimental statistics (Ferreira, 2000). In these analyses, EXCEL spreadsheets were used in the analysis of variance; treatments were compared via the F test, considering a minimum significance level of 1% probability. Comparisons between means were performed via the Tukey test at the 5% probability level.

3 RESULTS AND DISCUSSION

The "no coverage" treatment presented the lowest MSP, and the best MSP performance was from the "Leucena leaves" treatment.

The results of the analysis of variance revealed that there was a significant difference at the 1% probability level between the treatments, and there was no significant difference at the 5% probability level for the blocks (Table 1).

Table 1. Analysis of variance of the effects of tree legume residues on the dry matter of the aerial parts of sorghum plants (in g).

Cause of variation	GL	SQ	QM	F
Treatments	9	63974.49	7108.27664	50.69 **
Blocks	3	44.39	14.79516	0.11 ^{ns}
Residue	27	3786.52	140.24152	
Total	39	67805.40		

^{ns}: Not significant at the 5% probability level.
**: Significant at the 1% probability level.

The coefficient of variation of the dry matter in the aerial part of the experiment was 21.31%. To compare the means of the treatments, the Tukey test was performed at the 5% probability level (Table 2).

Table 2. Comparison of the dry matter of the aerial parts of sorghum plants (in g) among the ten treatments.

Treatments	Treatment averages
No coverage	8.21 a
Branches of Thrush	11.83 a
Jurema branches	16.39 ab
Leucaena branches	31.53 ab
Jurema leaves and branches	41.81 b
Sabiá leaves and branches	44.09 b
Leucaena leaves and twigs	79.51c
Jurema Leaves	88.46c
Sabia Leaves	107.02 cd
Leucaena Leaves	127.00 d

Treatment means with the same letter do not differ from each other according to the Tukey test at the 5% probability level.

The "Jurema branches" treatment presented the lowest MSR, and the best MSR performance was from the "Leucena leaves" treatment.

The results of the analysis of variance revealed that there was a significant difference at the 1% probability level between the treatments, and there was no significant difference at the 5% probability level for the blocks (Table 3).

Table 3. Analysis of variance of the effect of tree legume residues on the dry matter of sorghum plant regrowth (in g).

Cause of variation	GL	SQ	QM	F
Treatments	9	90.46201	10.05133	8.78 **
Blocks	3	0.71282	0.23761	0.21 ^{ns}
Residue	27	30.89553	1,14428	
Total	39	122.07036		

^{ns}: Not significant at the 5% probability level.
**: Significant at the 1% probability level.

The coefficient of variation of the experiment in the analysis of the dry matter of the regrowth was 57.23%. To compare the means of the treatments, the Tukey test was performed at the 5% probability level (Table 4).

Table 4. Comparison of the dry matter of the regrowth of sorghum plants among the ten treatments.

Treatments	Treatment averages
Jurema branches	0.38 to
No coverage	0.42 to
Branches of Thrush	0.53 ab
Leucaena branches	0.73 ab
Jurema leaves and branches	1.29 abc
Sabia Leaves	1.58 abc
Sabiá leaves and branches	2.14 abc
Leucaena leaves and twigs	3.07 bcd
Jurema Leaves	3.37 cd
Leucaena Leaves	5.19 d

Treatment means with the same letter do not differ from each other according to the Tukey test at the 5% probability level.

4 CONCLUSIONS

The “no coverage” treatment presented the worst performance in relation to the development of sorghum, closely followed by the treatments with branches.

The treatments with Leucena residue provided the greatest gains in the sorghum crop, with an emphasis on the “Leucena leaves” treatment.

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