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Effects of ground cover from branches of arboreal species on weed growth and maize
yield

Effects of ground cover from branches of arboreal species on weed growth and maize yield[1]

Efeitos da cobertura do solo com ramos de espécies arbóreas no crescimento das plantas daninhas e rendimento do milho

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ABSTRACT - Cultivating maize under systems of alley cropping results in improvements to the soil, a reduction in weeds and an increase in yield. Studies using ground cover from tree shoots produce similar results. The aim of this study was to evaluate the effects on weed growth and maize yield of ground cover made up of 30 t ha-1 (fresh matter) of branches from the tree species: neem (*Azadirachta indica* A. Juss), gliricidia [*Gliricidia sepium* (Jacq.) Kunth ex Walp.], leucaena [*Leucaena leucocephala* (Lam.) de Wit.] and sabiá (*Mimosa caesalpiniifolia* Benth.). Two treatment groups (cultivars and weed control) were evaluated. The cultivars AG 1041 and AL Bandeirantes were subjected to the following treatments: no hoeing, double hoeing, and ground a cover of branches of the above species when sowing the maize. A randomised block design was used with split lots (cultivars in the lots) and ten replications. The cultivars did not differ for green ear or grain yield. Double hoeing was more effective than ground cover at reducing the growth of weeds. However, both weeding and ground cover resulted in similar yields for green ears and grain, which were greater than those obtained with the unweeded maize.

Key words: *Zea mays. Azadirachta indica. Gliricidia sepium. Leucaena leucocephala. Mimosa caesalpiniifolia.* Hoeing. Green corn.

RESUMO - O cultivo do milho em sistema de aléias resulta em melhoria do solo, redução das plantas daninhas e aumento do rendimento. Os trabalhos com a cobertura do solo com a parte aérea de árvores produz resultados semelhantes. O objetivo deste trabalho foi avaliar os efeitos da cobertura do solo com 30 t ha^{-1} (matéria fresca) de ramos das espécies arbóreas nim (*Azadirachta indica* A. Juss), gliricídia [*Gliricidia sepium* (Jacq.) Kunth ex Walp.], leucena [*Leucaena leucocephala* (Lam.) de Wit.] e sabiá (*Mimosa caesalpiniifolia* Benth.) sobre o crescimento das plantas daninhas e sobre o rendimento do milho. Dois grupos de tratamentos (cultivares e controle de plantas daninhas) foram avaliados. As cultivares AG 1041 e AL Bandeirantes foram submetidas aos seguintes tratamentos: sem capinas, duas capinas e cobertura do solo, por ocasião da semeadura do milho, com ramos das espécies referidas. Utilizou-se o delineamento de blocos casualizados com parcelas subdivididas (cultivares nas parcelas) e dez repetições. As cultivares não diferiram quantos aos rendimentos de espigas verdes e de grãos. A realização de duas capinas foi mais eficiente na redução do crescimento das plantas daninhas do que a cobertura do solo. Entretanto, as capinas e a cobertura do solo propiciaram rendimentos semelhantes de espigas verdes e de grãos, que foram superiores aos obtidos no milho não capinado.

Palavras-chave: *Zea mays. Azadirachta indica. Gliricidia sepium. Leucaena leucocephala. Mimosa caesalpiniifolia.* Capina. Milho verde.

INTRODUCTION

The soils of the Brazilian semi-arid region are generally not very fertile. In this region, as in other regions of Brazil and the world, so-called itinerant farming is common (LOJKA *et al.*, 2011; MAMEDE; ARAÚJO, 2008). This type of farming involves cutting and burning the Caatinga vegetation with crop cycles of from three to five years. Little fertilizer is used because limited resources and low rainfall restrict any potential return on investment in fertilizer (TIESSEN; SALCEDO; SAMPAIO, 1992). Crop yield decreases after the first year under cultivation when the fertilizing effect from the ashes and from the decomposition of organic material decreases. Crop cycles are followed by a cycle of ten years or more of lying fallow, during which fertility is restored and the native vegetation is partially re-established (TIESSEN; SALCEDO; SAMPAIO, 1992). Because of these and other problems with conventional agriculture (monocrops, for example), some researchers have recommended sustainable farming practices (SCHROTH; RUF, 2014).

Sustainable farming aims to maintain crop yields, reduce production costs and preserve the environment (CARVALHO, 2006). Among suggested sustainable farming practices, agroforestry systems have received great attention, including in the northeast of Brazil (DRUMOND; MORGADO, 2004). Agroforestry consists of systems and technologies in which perennial plant species are used in the same area with agricultural crops and/or animals in some form of spatial arrangement or temporal sequence. Agroforestry systems provide greater sustainability and have more economic advantages than itinerant agriculture (RAHMAN *et al.*, 2007). There are several types of agroforestry systems in the world, but one of the most common is alley cropping.

In alley cropping, trees or shrubs, usually leguminous, are grown in rows interspersed with rows of agricultural crops (BERTALOT *et al.*, 2010). Such systems are managed by pruning the shoots of the trees at the start of the growing season of the main crop, with the product of this pruning then being applied to the soil where it decomposes and provides nutrients to the plants (PEREZ-MARIN; MENEZES; SALCEDO, 2007). Studies of alley cropping with maize have shown that improvements to the soil, a reduction in weeds and an increase in yield take place (BERTALOT *et al.*, 2010; QUEIROZ *et al.*, 2007). Based on these results, several studies have been conducted using the shoots of arboreal species as ground cover in a type of simulation of alley cropping. Some of these studies have demonstrated, similarly to the alley cropping studies, that ground cover using tree shoots improves the properties of the soil, controls weeds and increases maize and other crops yield (MASHINGAIDZE *et al.*, 2012; MULVANEY; OMOVBUDE; UDENSI, 2012; PRICE; WOOD, 2011; ; RAJASHEKARAPPA; BASAVARAJAPPA; PUTTAIAH, 2013).

Controlling weeds with ground cover may be of great interest to many regions of the world where weeds are controlled by hoeing. Hoeing is laborious, expensive and time-consuming and is therefore often not carried out in time before the weeds cause damage to the crop.

The aim of this study was to evaluate the effects of soil cover using branches of the tree species (*Azadirachta indica*, *Gliricidia sepium*, *Leucaena leucocephala*, *Gliricidia sepium* and *Mimosa caesalpiniifolia*) on weed growth and maize yield. All these species are well adapted to the Brazilian semi arid region.

MATERIAL AND METHODS

The study was carried out on the Rafael Fernandes Experimental Farm of the Federal Rural University of the Semi-Arid (UFERSA) from August to September 2009. This farm is located in the district of Alagoinha, 20 km from the town of Mossoró (5° 11' S, 37° 20' W, at an elevation of 18 m) in the state of Rio Grande do Norte, Brazil. Under the Gaussen bioclimatic system, the climate in the region of Mossoró is classified as type 4ath, distinctly xerothermic (i.e., tropical hot), with a pronounced dry season lasting from seven to eight months, and a xerothermic index of between 150 and 200. The region has a maximum average air temperature of between 32.1 and 34.5 °C and an average minimum of between 21.3 and 23.7 °C, with June and July being the coldest months. The average annual rainfall is approximately 825 mm. Sunlight increases from March to October, with an average of 241.7 h; the maximum relative humidity reaches 78% in April with a minimum of 60% in September (CARMO FILHO; OLIVEIRA, 1989).

Under the Brazilian System of Soil Classification (Embrapa, 2006), the soil in the experimental area is classified as a Red-Yellow Argisol. Analysis of a soil sample collected at a depth of 0-20 cm gave the following result: pH (H_2O) = 6.1, organic matter = 21 g dm^{-3}, P (Mehlic-1) = 15 mg dm^{-3}, K^+ = 2.7 $mmol_c$ dm^{-3}, Ca^{2+} = 20 $mmol_c$ dm^{-3}, Mg^{2+} = 7 $mmol_c$ dm^{-3} and $H^+ + Al^3 + = $ 12 $mmol_c$ dm^{-3}.

The soil was prepared by tractor, harrowed twice, and received as sowing fertilizer 1/3 of the total N applied (120 kg ha^{-1}), 60 kg P_2O_5 and 40 kg K_2O per ha. The remaining N was applied in equal parts after each hoeing. Ammonium sulfate, single superphosphate and potassium chloride were used as sources of N, P_2O_5 and K_2O, respectively. The spacing between rows was 1.0 m, with the holes in any one row spaced 0.40 m apart. Sowing

was performed manually with four seeds per hole. At 20 days after sowing, the plants were thinned, leaving the two largest plants in each hole and giving the experiment a planned seeding density of 50 thousand plants ha^{-1}.

Control of the fall armyworm (*Spodoptera frugiperda* Smith), the main pest affecting the crop in this region, was carried out by spraying with 0.0-diethyl 0-(3,5,6-trichloro-2-pyridyl) thiophosphate (0.4 L ha^{-1}) using a backpack sprayer.

The experiment was conducted under sprinkler irrigation. The depth of water needed by the maize (5.3 mm) was calculated taking the effective depth of the root system to be 0.40 m. When to irrigate was based on the water retained in the soil at a pressure of 0.40 MPa. Irrigation began after sowing was carried out three times a week and was suspended five days before the mature ears were harvested.

A randomized complete-block experimental design was used with ten replications and split plots. Each lot consisted of four rows 6.0 m in length. The useful area was considered as being the area occupied by the two central rows, with the plants from one hole at each end being disregarded. The cultivars AG 1041 and AL Bandeirantes (plots) were subjected to the following treatments (subplots): no hoeing, two hoeings (at 20 and 40 days after sowing the maize), and ground cover of 30 t ha^{-1} (fresh weight) of the shoots (leaves and branches having a diameter of approximately 1.0 cm) of neem, gliricidia, leucaena and sabiá). The proportion of dry matter (as a percentage) from the branches of each of these species, based on the average of three samples and determined at the time the treatment was applied, was 33.1, 27.8, 32.3 and 44.5, respectively. The first three species are exotic but well-adapted to the Brazilian semi-arid region (KIILL; MENEZES, 2005), whereas sabiá is native to the semi-arid region (MAIA, 2004). Weeding was carried out with a hoe, always assigning the same employee to do the work in each block.

One of the two rows from the useful area of each lot was used randomly to evaluate the yield of green corn and the other to assess the yield of mature corn (dry). Green corn yield was assessed from the total number and weight of the ears and from the number and weight of marketable, unhusked and husked ears. The green ears were harvested when the grains exhibited a water content of between 70% and 80%, at 70-75 days after sowing. Marketable unhusked ears were considered to be those having a suitable appearance for marketing and a length of not less than 22 cm. Marketable husked ears were considered to be those with health and gradation suitable for marketing and a length of not less than 17 cm. These criteria were adopted based on the ears that are marketed

in the region where the study was carried out. The mature ears, harvested when the grains had a water content of approximately 20%, were left to dry and then threshed by hand.

After harvesting the ripe corn at 100 days after sowing, plant height and ear insertion in the maize were evaluated, as were the characteristics of the weeds. Plant height and ear insertion were measured in all of the plants from the same row used to evaluate grain yield. The height of the maize plants was considered to be the distance from ground level to insertion of the highest leaf blade; the height of ear insertion was measured from ground level to the base of the highest ear (first ear in the case of prolific plants). An area of 1.0 m x 1.0 m was set out in the center of the space between the two central rows of the lot. Weeds present in each of these areas were cut close to the ground, weighed and identified. A 200 g sample of these plants was placed into a forced air circulation oven set to a controlled temperature of 70 °C until reaching constant weight to assess weed growth.

Data from the maize and weeds were submitted to a test for homogeneity of variance prior to variance analysis. The means were compared at 5% probability by Tukey test.

RESULTS AND DISCUSSION

The species of weeds that occurred most frequently in the experiment (in percentages of the total number of experimental units) were: *Alternanthera tenella* Colla (70), *Cucumis anguria* L. (63), *Commelina benghalensis* L. (58), *Blainvillea acmella* (L.) Philipson (27), *Digitaria sanguinalis* Scop. (15), *Cenchrus equinatus* L. (13) and *Phyllanthus amarus* Schumach. & Thonn. (12). Other species occurred at frequencies of less than 8%.

There was an effect from cultivar (C) on the fresh and dry weed matter, but not from the method of weed control (M) or the interaction of C x M (Table 1). The effects from the method of weed control were different for the fresh and dry weed matter (Table 2). This may happen because the distribution of weeds in fields is not uniform (CARDINA; JOHNSON; SPARROW, 1997), with weed samples collected from different lots consequently differing in water content. For both characteristics, either hoeing or ground cover resulted in lower averages than in the unweeded maize, except for the leucaena branch treatment in the case of fresh biomass. Hoeing twice was more efficient than ground cover at reducing weed growth, almost certainly due to this method, which eliminated a greater proportion of weeds than the ground cover. There were differences among the ground covers in their effect

Table 1 - Summary of the variance analysis for weed biomass and maize cultivar characteristics in response to the methods of weed control (MWC)

Source of variation	Degrees of freedom	Weed biomass (g m^{-2})		Corn height (cm)	
		Fresh	Dry	Plant	Ear
		--------------------------Mean squares[1]--------------------------			
Blocks	9	1,485,606.1	26,834.0	225.3	150.2
Cultivars	1	366,528.5[ns]	76.8[ns]	3,774.4*	5.6[ns]
Error 1	9	104,760.0	9,554.0	141.4	100.8
MWC	5	13,280,354.2**	473,015.9**	4,274.4**	2,651.1**
C x MWC	5	415,466.4[ns]	11,621.3[ns]	100.9[ns]	77.8[ns]
Error 2	90	331,659.5	150,36.8	242.8	158.1

[1] ns, *, ** Corresponding to a non-significant or significant effect at 5% or at 1% probability, respectively, by F-test

Table 2 - Mean fresh and dry mass of weed shoots in a maize crop and plant height and ear height in maize cultivars as a response to methods of weed control[1]

Method of weed control[2]	Mass of weed shoots (g m^{-2})		Corn height (cm)	
	Fresh	Dry	Plant	Ear
No hoeing	2,719 a	529 a	163 c	81 c
Two hoeings	432 c	73 d	181 b	94 b
Ground cover of gliricidia branches	1,333 b	220 b	203 a	113 a
Ground cover of leucaena branches	2,324 a	338 c	197 a	108 a
Ground cover of Neem branches	1,310 b	210 b	193 ab	102 ab
Ground cover of sabiá branches	1,443 b	231 bc	195 ab	107 a
Cultivar				
AG 1051	1,538 A	268 A	183 B	101 A
AL Bandeirantes	1,649 A	266 A	194 A	101 A
CV$_{plots}$ (%)	20.3	36.6	6.3	10.0
CV$_{sublots}$ (%)	36.1	46.0	8.3	12.5

[1]Means followed by the same letter do not differ significantly at 5% probability by Tukey's test; [2]Ground cover consisted of 30 t ha^{-1} (fresh weight) of *Gliricidia sepium*, *Leucaena leucocephala*, *Azadirachta indica* or *Mimosa caesalpiniifolia*

on weed growth, with leucaena being the least efficient. Of the four species studied, leucaena has the smallest leaflets, and this may be associated with its reduced efficiency as ground cover, both physically and due to decomposing more rapidly (PANDEY; SHARMA; BARGALI, 2006).

Ground cover can affect weed emergence through physical, biological and/or chemical processes, with possible interactions between them. Physical effects are important for photoblastic positive seeds and for those that need a great range in daily temperature variation to start the germination process (PITELLI; DURIGAN, 2001). Furthermore, ground cover reduces the chances of survival of seedlings with limited reserves in their seeds.

Some biological actions can benefit from the presence of ground cover, as this creates conditions for the installation of a dense and diverse micro-biocenosis. Microorganisms may cause deterioration and loss of viability in the various types of propagules and seedlings in the soil. Additionally, straw forms a shelter for animals that feed on seeds and weed shoots (PITELLI; DURIGAN, 2001). Chemical effects are related to allelopathic phenomena, changes in the carbon to nitrogen ratio (C/N), and the immobilization and recycling of nutrients (QUEIROZ *et al.*, 2010). Allelopathic effects have been seen in the species studied in this work, i.e., in gliricidia (RAMAMOORTHY; PALIWAL, 1993), leucaena (CHOU; KUO, 1986), neem (SILVA *et al.*, 2007) and sabiá (FERREIRA *et al.*, 2010).

There was an effect of the cultivar (C) and the method of weed control (M) on plant height, but not from the interaction of C x M (Table 1). The cultivar AL Bandeirantes exhibited taller plants than did the cultivar AG 1041 (Table 2). Height in the maize plant is considered the most predictive feature of suppressive ability and tolerance to weeds in maize, although other characteristics, such as foliage and the leaf angle are also relevant. (ZYSTRO; LEON; TRACY, 2012). The height of ear insertion was affected by the method of weed control (Table 1). Interestingly, maize from the lots with ground cover exhibited greater plant height and ear insertion than either the hoed or unweeded maize (Table 2). It is possible that in addition to weed control, soil cover improves the physical, chemical and biological properties of the soil, favoring greater maize growth in terms of plant height and ear insertion.

There was an effect from the method of weed control on total and marketable unhusked and husked green ears (Table 3). There was no difference between carrying out two hoeings and using ground cover from tree branches, these being superior to unweeded maize for these characteristics (Table 4).

There was also an effect from the method of weed control on the total weight and marketable weight of unhusked and husked green ears (Table 5). There was

Table 3 - Summary of the variance analysis for characteristics of maize cultivars as a response to the methods of weed control (MWC)

Source of variation	Degrees of freedom	Number of ears per ha		
		Total	Marketable unhusked	Marketable husked
		--------------------------Mean squares[1]--------------------------		
Blocks	9	33,468,647.4	72,784,700.8	133,878,658.7
Cultivars	1	10,691,673.0^{ns}	25,920,037.0^{ns}	20,291,075.2^{ns}
Error 1	9	10,782,819.5	57,793,432.8	70,763,262.0
MWC	5	50,966,784.5*	1,083,260,530.0*	1,189,037,050.0*
C x MWC	5	27,691,714.2^{ns}	71,315,896.1^{ns}	60,045,349.5^{ns}
Error 2	90	14,181,409.2	48,431,881.7	52,081,472.3

[1]ns, *Corresponding to a non-significant or significant effect at 1% probability, respectively, by F-test

Table 4 - Mean values for green-ear yield in corn cultivars as a response to methods of weed control[1]

Method of weed control[2]	Number of ears per ha		
	Total	Marketable unhusked	Marketable husked
No hoeings	47,635 b	25,915 b	18,832 b
Two hoeings	51,603 a	43,884 a	35,670 a
Ground cover of gliricidia branches	50,293 ab	43,662 a	38,956 a
Ground cover of leucaena branches	50,361 ab	43,846 a	38,411 a
Ground cover of Neem branches	52,256 a	45,000 a	37,978 a
Ground cover of sabiá branches	49,947 ab	42,956 a	36,307 a
Cultivar			
AG 1051	50,648 A	41,342 A	34,770 A
Al Bandeirantes	50,051 A	40,412 A	33,948 A
CV$_{plots}$ (%)	6.5	18.6	24.5
CV$_{sublots}$ (%)	7.5	17.0	21.0

[1]Means followed by the same letter do not differ significantly at 5% probability by Tukey's test; [2]Ground cover consisted of 30 t ha^{-1} (fresh weight) of *Gliricidia sepium, Leucaena leucocephala, Azadirachta indica* or *Mimosa caesalpiniifolia*

Table 5 - Summary of the variance analysis for the characteristics of maize cultivars as a response to the methods of weed control (MWC)

Source of variation	Degrees of freedom	Weight of ears (kg ha^{-1})		
		Total	Marketable unhusked	Marketable husked
		---------------------------Mean squares[1]---------------------------		
Blocks	9	9,553,079.2	9,038,113.6	4,193,623.5
Cultivars	1	1,894,550.7[ns]	1,236,473.0[ns]	3,579,380.2[ns]
Error 1	9	6,714,083.1	6,200,830.3	4,365,788.5
MWC	5	168,877,916.8*	245,601,940.3*	99,542,828.5*
C x MWC	5	5,563,690.9[ns]	7,720,803.0[ns]	4,301,614.4[ns]
Error 2	90	5,410,565.9	6,537,228.1	2,970,437.8

[1]ns, * Corresponding to a non-significant or significant effect at 1% probability, respectively, by F-test

Table 6 - Mean values for green-ear yield in corn cultivars as a response to the methods of weed control[1]

Method of weed control[2]	Weight of ears (kg ha^{-1})		
	Total	Marketable unhusked	Marketable husked
No hoeing	7,205 b	5,008 b	2,288 b
Two hoeings	13,343 a	12,774 a	6,810 a
Ground cover of gliricidia branches	14,697 a	14,096 a	8,169 a
Ground cover of leucaena branches	14,550 a	13,808 a	8,094 a
Ground cover of neem branches	14,488 a	13,656 a	7,496 a
Ground cover of sabiá branches	14,017 a	13,252 a	7,523 a
Cultivar			
AG 1051	12,924 A	11,997 A	6,903 A
Al Bandeirantes	13,175 A	12,200 A	6,557 A
CV_{plots} (%)	19.9	20.6	31.0
$CV_{sublots}$ (%)	17.8	21.1	25.6

[1]Means followed by the same letter do not differ significantly at 5% probability by Tukey's test; [2]Ground cover consisted of 30 t ha^{-1} (fresh weight) of *Gliricidia sepium, Leucaena leucocephala, Azadirachta indica* or *Mimosa caesalpiniifolia*

no difference between carrying out two hoeings and the use of ground cover from tree branches, these being superior to unweeded maize for these characteristics (Table 6).

Of the three components of grain yield, there was only a difference between cultivars for the number of grains per ear (Table 7), provided that the cultivars did not differ in the number of ears ha^{-1} (estimated from the total number of green ears, shown in Table 2). There was also no difference between cultivars for grain yield (Table 7). There was no difference between carrying out two hoeings and using ground cover from tree branches, these being superior to unweeded maize for grain yield and its components (Table 8).

If average yields for the unweeded lots are set equal to 100%, the average yields of the hoed lots (or of those with ground cover), in numbers of total green ears, marketable unhusked green ears and marketable husked green ears are (as percentages) equal to 107, 169 and 199, respectively (Table 4). In terms of weight, the respective yields will be 197, 270 and 333 (Table 6). For grain yield, the value is 241% (Table 8). Therefore, by eliminating weeds through physical, chemical and biological processes, ground cover promoted relatively small increases in the total number of green ears compared to unweeded maize. However, increases in other characteristics used to evaluate green-ear and grain yields resulted in almost double or more than double the yields obtained without weed control.

Table 7 - Summary of the variance analysis for the characteristics of maize cultivars as a response to the methods of weed control (MWC)

Source of variation	Degrees of freedom	Kernels (No ear^{-1})	100-kernel weight (g)	Grain yield (kg ha^{-1})
		------------------------------Mean squares^1-----------------------------		
Blocks	9	3,975.4	13.6	1,692,049.5
Cultivars	1	38,449.2*	46.1^{ns}	4,110,700.8^{ns}
Error 1	9	4,003.9	27.4	2,924,141.9
MWC	5	92,773.8*	146.0*	50,363,068.0**
C x MWC	5	1,255.5^{ns}	6.3^{ns}	728,070.1^{ns}
Error 2	90	1,895.6	7.0	1,415,771.1

^{1}ns, *, ** Corresponding to a non-significant or significant effect at 5% or at 1% probability, respectively, by F-test

Table 8 - Mean values for the number of kernels per ear, 100-kernel weight and grain yield of maize cultivars as a response to the methods of weed control[1]

Method of weed control[2]	Kernels (No ear^{-1})	100-kernel weight (g)	Grain yield (kg ha^{-1})
No hoeing	285 b	25.4 b	2,731 b
Two hoeings	428 a	30.6 a	6,351 a
Ground cover of gliricidia branches	468 a	31.8 a	6,534 a
Ground cover of leucaena branches	455 a	32.7 a	6,692 a
Ground cover of neem branches	451 a	31.8 a	6,956 a
Ground cover of sabiá branches	443 a	32.1 a	6,352 a
Cultivar			
AG 1051	440 A	30.1 A	6,264 A
Al Bandeirantes	404 B	31.4 A	5,826 A
CV$_{plots}$ (%)	15.0	17.0	28.8
CV$_{sublots}$ (%)	10.0	8.6	20.0

[1]Means followed by the same letter do not differ significantly at 5% probability by Tukey's test; [2]Ground cover consisted of 30 t ha^{-1} (fresh weight) of *Gliricidia sepium*, *Leucaena leucocephala* or *Azadirachta indica*

Positive effects of ground cover from neem, gliricidia and leucaena in reducing the growth of weeds and increasing crop yields have been seen by other authors (AHAIWE; NWAIGBO; ANO, 2010; IBE; ALAMU; OLANIYI, 2012). Prates, Pires and Pereira Filho (2003) found a reduction in the growth of weeds with ground cover from leucaena branches. Apparently, the first account of ground cover from sabiá branches reducing the growth of weeds and increasing maize yield appears in the present article. Sabiá is a species that is native to the Caatinga and is at risk of extinction due to the extraction of its timber, which is greatly appreciated in the backlands of the Northeast (MAIA, 2004).

CONCLUSIONS

1. Carrying out two hoeings was more effective at reducing weed growth than ground cover consisting of 30 t ha^{-1} of branches of the neem, gliricidia, leucaena and sabiá;

2. Hoeing and ground cover gave similar yields of green ears and grain, which were higher than those seen in unweeded maize;

3. The cultivars did not differ as to green ear or grain yield.

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