

Full Length Research Paper

Water content and soil nutrient in consortium of native fruit trees with cover crops

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Received 9 July, 2016; Accepted 26 September, 2016

The use of cover crops in intercropping is an important strategy for soil management and conservation, the improvement of edaphic conditions, and the optimization of cultivation of intercropped plants of commercial interest. The goal of the present study was to evaluate the water content and soil nutrient as well as initial growth of some fruit trees native to the Cerrado, Brazil. That is, *Eugenia dysenterica* Mart. ex DC., *Dipteryx alata* Vogel and *Caryocar brasiliense* Camb., when intercropped with *Arachis pintoi* L., *Crotalaria spectabilis* Roth., *Dolichos lablab* L., and *Urochloa decumbens* Stapf., with nitrogen (81 kg N ha⁻¹) and *Urochloa decumbens* without nitrogen (*Urochloa decumbens* Stapf.) treatments. Fruit tree nutrient uptake, the biomass production of the cover crops, and the effects of the cover crops on soil moisture were evaluated. It was noted that *C. spectabilis* and *D. lablab* were less effective at maintaining soil moisture, but resulted in the highest nitrogen concentrations in *E. dysenterica* and *D. alata* leaves SO, these cover plants are recommended for these native species. The highest nitrogen concentrations in *C. brasiliense* were measured in response to N fertilizer. *A. pintoi* produced less biomass than the remaining cover crops tested, but resulted in the lowest soil moisture losses, justifying its use for soil moisture conservation.

Key words: Cerrado fruits, green fertilization, biomass, soil moisture, growth.

INTRODUCTION

The current situation in the Cerrado biome is of concern due to high deforestation rates and neglect of the soil grown and the addition of inputs to increase their fertility. Factors such as urban growth and agricultural exploitation, in 50 years have promoted the reduction of vegetation to less than half of the natural area. These human activities are responsible for several species

which enter the group of plants at risk of disappearing, endangering the biodiversity and the ecosystem, and contribute to environmental change.

The native cerrado plants among plant species are the most promising for reforestation and restoration of altered soils. The ability to develop lush roots that reach deeper than other species, and already are adapted to the

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natural conditions of the region. The extinction of several species indicates the need for changes in the use of natural resources (Scalon and Jeromine, 2013). The plants constituting the Cerrado's vegetation mosaic are medicinal resources and sources of food, wood, plant dyes, and ornamental plants.

There are over 50 species of fruit trees that are native to the Cerrado, of which many have agricultural potential (Ribeiro and Rodrigues, 2006). However, their cultivation, production and handling have scarcely been studied.

Species such as *E. dysenterica*, *D. alata*, and *C. brasiliense* yield high-quality fruits with high nutrient concentrations; these fruits may be consumed fresh or processed in different ways (Fernandes et al., 2010; Sousa et al., 2011). These plants have potential for honey and wood production and medicinal uses and may be used in orchards and reforestation (Martinotto et al., 2007). Therefore, these species should be studied.

During cultivation of large amounts of fertilizers and lime, as well as pesticides, contaminate soil and water are used. The traffic of machines in farming and animal trampling in the grasslands, causes compression, changing the soil structure (Martins et al., 2015). Low infiltration of rainfall, drought and soil hardens quickly, the water that flows over the surface transports fertilizers and pesticides, causing erosions. The strong relationship between soil and native vegetation is clear, and the need for changes in the forms of use of natural resources (Scalon and Jeromine, 2013; Schwenk et al., 2013), the integration of plants that provide benefits to the farming system and recover the altered soil properties.

Although they are adapted to the conditions in the Cerrado, plants native to this biome suffer as a result of edaphoclimatic conditions such as acid soil, low nutrient concentrations, irregular rainfall and high temperatures (Guecker et al., 2009). Another important factor is the rapid decomposition of plant residues deposited on the soil surface. Crop handling methods are therefore needed to protect the soil against direct exposure to factors that cause its degradation, such as rain, insolation and drought (Guareschi et al., 2012).

The use of cover crops is an important strategy for soil management and conservation and may improve soil conditions and thereby increase the growth of plants of commercial interest when used in intercropping. The decomposition of cover crops releases nutrients, organic acids, amino acids and phytohormones, which may be beneficial for intercropped plants (Buzinaro et al., 2009).

Nitrogen is an essential nutrient for plants, and its deficiency causes low plant metabolism and development. Cover crops from the family Fabaceae should be highlighted because they establish associations with microorganisms that can perform biological nitrogen fixation (BNF) in large quantities, with economical benefits to producers (Perin et al., 2007).

The use of cover crops may improve soil characteristics by decreasing erosion, increasing soil nitrogen through

BNF, improving nutrient cycling and moisture maintenance, decreasing the soil temperature range, and promoting the activity of beneficial microorganisms in the soil (Almeida et al., 2014, 2015). However, cover crops should be carefully selected. The growth time and habit of cover crops should be in agreement with fruit tree management, and other effects of coexistence should be considered to minimize competition (Perin et al., 2009).

The goal of the present study was to evaluate the water content and soil nutrient as well as initial growth of some fruit trees native to the Cerrado in an intercropped system with cover crops.

MATERIALS AND METHODS

Local

The experiment was performed between December 2013 and December 2014, at the Federal Institute of Goiás (Instituto Federal Goiano), Rio Verde Campus, located in the southwest state of Goiás, a region with Cerrado vegetation. The experimental area was located at 17° 48' 46" S and 50° 54' 02" W, at an altitude of 693 m, and consisted of *Urochloa decumbens* Stapf. pasture. The soil was classified as a dystrophic Red Latosol. The climate of this region is Aw according to the Köppen climate classification, that is, tropical, with rainfall concentrated in summer and a well-defined dry period in winter.

Experimental design

The experimental design was completely randomized, with a 3 x 5 factorial scheme (three native fruit trees, *E. dysenterica*, *D. alata* and *C. brasiliense*, and five cover crops, *A. pintoii*, *C. spectabilis*, *D. lablab*, *U. decumbens* + N and *Urochloa decumbens* without nitrogen), with four replicates. The *Urochloa decumbens* was a treatment with *U. decumbens* and no nitrogen as the cover crop.

Site preparation

The experiment began with the sowing of the cover crops in December 2013 (Figure 1b). The experimental area was prepared two months before the beginning of the experiment, with pasture desiccation (960 g kg⁻¹ glyphosate), and mechanized soil preparation, with subsoiling, harrowing and leveling (Figure 1a). Soil samples were collected from depths of 0-10, 10-20 and 20-40 cm and used for determination of soil chemical properties and particle size (Table 1).

The cover crops *A. pintoii*, *C. spectabilis* and *D. lablab* were sown manually in furrows spaced 50 cm apart. *U. decumbens* grew spontaneously because it was the previous pasture. Holes measuring 40x40x40 cm were dug between the planted rows; these holes were spaced 5x5 m apart (Figure 1c). Fertilizer was applied during the filling of the holes, that is, the equivalent of 27 kg ha⁻¹ P₂O₅, based on recommendations for soil in this region. The substrate was left to settle in the hole for thirty days, after which the native fruit tree seedlings were planted.

Biometric monitoring

Biometric monitoring of *E. dysenterica*, *D. alata* and *C. brasiliense* seedlings during cultivation was performed by measuring height



Figure 1. Intercropping of fruit trees native to the Cerrado with different cover crops. (A) Preparation of the experimental area, that is, harrowing. Scale bar = 1.5 m. (B) Sowing of *A. pinto*. Scale bar = 1 m. (C) Planting of fruit trees. Scale bar = 0.5 m. (D) Top-dressing fertilization. Scale bar = 0.3 m. (E) Measurements of height and stem diameter. Scale bar = 0.2 m. (F) Growth of cover crops at 150 DAS. Scale bar = 0.2 m. (G) Grubbing of cover crops. Bar = 1.5 m. (H) Collection of leaves for analysis of nutrient concentration. Scale bar = 0.3 m. (I) Collection of leaves for foliar analysis. Scale bar = 0.3 m.

Table 1. Chemical and physical properties of soil collected from different soil depths and analyzed for the cultivation of seedlings of fruit trees native to the Cerrado, grown in intercropping systems with cover crops.

Depth	pH CaCl ₂	P mg dm ⁻³	Ca	Mg	K	Al	H+Al	Clay	Silt	Sand
			cmol _c dm ⁻³							
00 - 10	5.3	4	0.32	0.15	0.41	0.00	0.19	270	170	560
10 - 20	5.3	2	0.33	0.14	0.31	0.00	0.20	310	220	470
20 - 40	5.3	2	0.34	0.14	0.29	0.00	0.18	370	230	400

(cm) and stem diameter (mm) at 0, 180 and 365 days after transplanting (DAT). The average height and stem diameter at 0 DAT were, respectively, 16.82 cm and 29.02 mm for *E. dysenterica*, 21.20 cm and 3.09 mm for *D. alata*, and 6.31 cm and 5.97 mm for *C. brasiliense* (Figure 1e). Four plants located in the center of each plot were identified and measured. Height was measured from the ground to the highest tip of the plant, using a measuring tape. Stem diameter was measured at a height of two cm above the ground, using a digital pachymeter.

Tree crowning to a 0.50 m radius and weed and ant *Urochloa decumbens* were performed in the experimental area as needed. Top-dressing fertilization was performed for treatment *U. decumbens* + mineral N, send 81 kg ha⁻¹ de urea. The equivalent of 36.45 kg N ha⁻¹ was applied to the crowns of the fruit trees in three stages, that is, February, April and November 2014 (Figure 1d). This amount of urea is an approximate average nitrogen fixation

capacity by cover crops and the influences that they suffer (Alcântara et al., 2000; Andrade Neto et al., 2010; PERIN et al., 2004).

Cover crop management was performed 150 days after sowing (Figure 1f), by cutting the plants at ground level (Figure 1g). Biomass production was measured using a 1-m² quadrat that was placed in the center of each plot, and all plant mass within the quadrat was collected. The samples were weighed fresh and placed in a convection oven at 65°C for a minimum of 72 h, and the dry weight was measured. Fully expanded leaves from the fruit trees were also collected (Figure 1h), washed with distilled water (Figure 1i), dried in an oven as described for the cover crops, ground using a Wiley mill (2-mm sieve), and analyzed according to Malavolta et al. (1997).

Following sampling, grubbing of the cover crops, except *A. pinto* due to its low height, was performed using a grubber. Part of the

Table 2. Nitrogen (N), phosphorus (P) and potassium (K) contents (g kg^{-1} dry matter) on Cerrado fruit trees at 180 days after transplanting (DAT) under different cover crops.

Plant roof	Fruit plants of the cerrado								
	<i>E. dysenterica</i>			<i>D. alata</i>			<i>C. brasiliense</i>		
	g kg^{-1}			g kg^{-1}			g kg^{-1}		
	N	P	K	N	P	K	N	P	K
<i>A. pintoi</i>	19.0	1.2	4.0	19.0	1.6	8.8	16.0	1.2	4.8
<i>C. spectabilis</i>	24.0	1.0	4.0	24.0	1.8	7.2	16.0	1.6	5.6
<i>D. lablab</i>	17.0	1.2	4.0	22.0	1.6	5.6	16.0	1.4	4.8
<i>U. decumbens+ N</i>	22.0	1.2	3.2	24.0	1.8	4.8	19.0	1.4	4.0
<i>U. decumbens</i>	17.0	1.6	4.8	19.00	1.8	10.4	16.0	1.4	5.6

straw was placed under the fruit trees to maintain moisture, *Urochloa decumbens* weeds, and enrich the soil with organic matter and nutrients resulting from its decomposition. Soil moisture measurements were conducted on soil samples collected at a depth of 0 to 10 cm, from all treatments except the *U. decumbens*, using a hoe according to Embrapa (2007).

For the nutrients contents on leaves of these plants, one individual was considered, since there was not enough plant material for this analysis. The growth characteristics of native fruit and fresh and dry mass of cover crops were also evaluated.

Analysis of variance was performed, followed by a Tukey test when needed, at a significance level of $p \leq 0.05$.

RESULTS AND DISCUSSION

With respect to nutrients contents, N content on *E. dysenterica* in different cover crops ranged from 17 to 24 g kg^{-1} . The P content ranged from 1.0 to 1.6 g kg^{-1} , while for K values were between 3.2 and 4.8 g kg^{-1} . The foliar N observed in *D. alata* plants ranged from 19.0 to 24.0 g kg^{-1} , while the P levels were 1.6 and 1.8 and K 4.8 to 10.4 g kg^{-1} . In *C. brasiliense* plants, N concentration ranged from 16.0 to 19.0 g kg^{-1} while the P levels ranged from 1.2 to 1.6 g kg^{-1} . For the K were observed levels of 4.0 to 5.6 g kg^{-1} . These are important data because of the scarce number of works in this area, and the fact of characterize macronutrient contents of native plants intercropped with different cover crops (Table 2).

E. dysenterica presented low nutrient requirements for its initial growth. This species is very well adapted to different soil environments, nutrient availabilities, moisture levels and low pH (Naves et al., 2002), and this hardiness results in slow and somewhat uneven growth. In addition, this species is characterized by a greater initial investment into root growth (Venturoli et al., 2013). This is in accordance with the average *E. dysenterica* heights observed in the present study, which ranged from 22.57 cm at 180 DAT to 30.71 cm at 365 DAT across all intercropping systems.

The low nutrient requirements of *E. dysenterica* indicate its potential use in degraded areas of the Cerrado (Oliveira et al., 2015). The few existing reports regarding fertilization indicate that native Cerrado species

are tolerant to low nutrient availabilities, and their low leaf nutrient concentrations reflect the low soil nutrient availability. In addition, *E. dysenterica* has been reported to be well adapted to low nutrient availability, high soil acidity and high aluminum in the soil (Naves et al., 2002), and to be resistant to drought).

Souza et al. (2013) studied the initial fruit production of cultivated *E. dysenterica* and observed that plant growth was slow and uneven. These authors suggested some strategies for the improvement of these factors, such as irrigation during drought periods and mulching. These characteristics of *E. dysenterica* have been attributed to its adaptation to environmental factors and to its high genetic variability (Aguilar et al., 2009).

D. alata usually exhibits greater growth than other Cerrado plant species, such as *E. dysenterica* and *Hancornia speciosa* Gomes. Studies on *D. alata* populations in natural and exploited environments show that although this species can become established in poor soils, it grows better with medium fertility levels (Ribeiro and Rodrigues, 2006), which is in agreement with the present results. Correa et al. (2008) studied the physical parameters of the fruits and seeds of Cerrado plant species and also assumed that *D. alata* prefers more fertile soils.

C. brasiliense has been observed to occur in different soil types, including those with low nutrient concentrations and different textures, ranging from sandy to clayey, and with the presence of gravel and boulders. However, this species has a high light demand, preferring areas with vegetation of small size and density (Santana and Naves, 2003). It was verified that the leaf contents corroborate Santana and Naves (2003), with a slight increase on this content, since this plants are located in different regions, climate, soil and genetics. Moreover, these results can be justified due to previous fertilizations carried out in the area of this study.

A. pintoi presented the lowest fresh ($p \leq 0.05$) and dry weights for the cover crops (Figure 2). This is because *A. pintoi* is a perennial plant that has a low height and presents slow initial growth compared with annual plants.

Cover crops have beneficial effects on soil

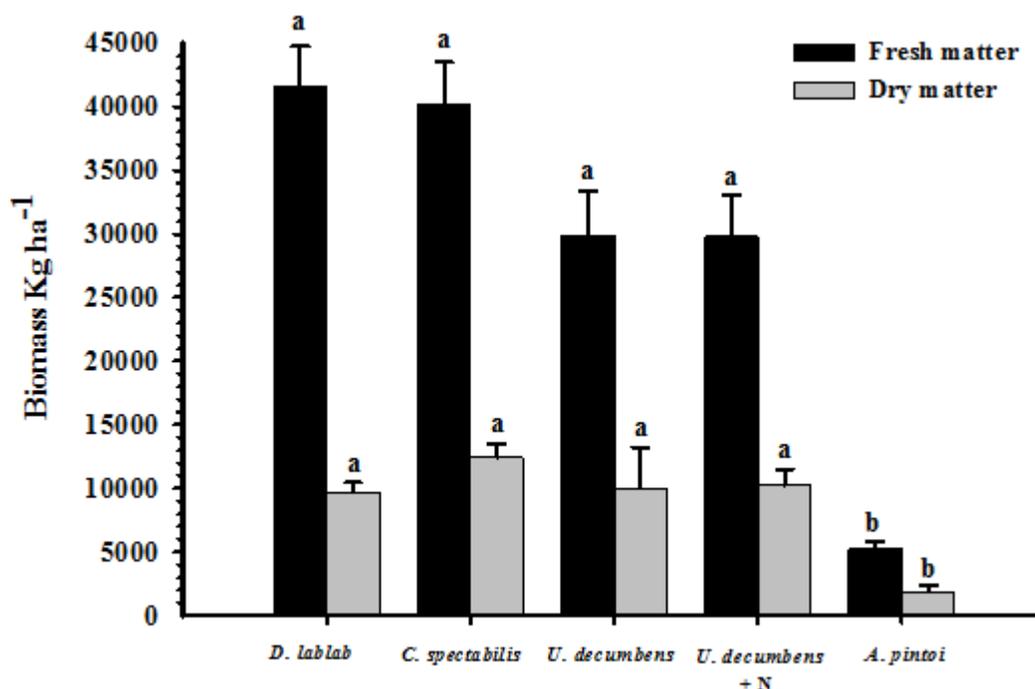


Figure 2. Fresh and dry weight of cover crops intercropped with fruit trees native to the Cerrado, 180 days following sowing.

characteristics and consequently on the plants of interest. These beneficial effects occur as a result of increased soil fertility through BNF and nutrient recovery from deeper soil layers and protection of the soil against erosion due to climate factors (Perin et al., 2009; Silva et al., 2008). Moreover, cover crops may improve the physical structure of the soil, increase soil organic matter concentrations, facilitate the maintenance of soil moisture levels and temperature, help to *U. decumbens* weeds, and decrease the load of agrochemicals in the soil. For these reasons, the use of cover crops is strategic in the cultivation of several crops of interest. This is in agreement with Vilela et al. (2011), who observed that deposition of plant mass close to *Coffea arabica* L. plants resulted in increased nutrient concentrations, plant growth, and soil pH.

Except for *A. pinto*, the tested cover crops exhibited rapid growth and a strong potential for soil cover. Consequently, thinning the area where the fruit tree crown was located was necessary during the vegetative cycle of the cover crops to prevent choking and lodging of the fruit trees. The rapid growth and performance of *D. lablab* and *C. spectabilis* were beneficial for fruit trees, especially in terms of biomass production. This is in accordance with Carneiro et al. (2008), who observed increases in microbial biomass carbon. Pereira et al. (2012) reported that *C. spectabilis* was the cover crop with the highest mass production, which is in agreement with the results from the present study. *A. pinto* had the lowest mass production among the cover crops tested.

Teodoro et al. (2011b) also observed slow initial growth of *A. pinto*, up to 90 days. However, this species provided efficient soil covers and weed inhibition following this period.

Regarding the effect of cover crops on soil moisture, *U. decumbens* and *D. lablab* resulted in better maintenance of soil moisture at the beginning of the experimental period, followed by *C. spectabilis* and *A. pinto* (Figure 3). This pattern may be related to the amount of plant biomass produced and the extent of the soil cover, which protects the soil from sun exposure and results in higher moisture retention. In comparison to the remaining cover crops tested, *D. lablab* exhibited senescence. This may have been important for its effects on *D. alata* growth because this resulted in the maintenance of soil moisture and constant nutrient recycling, as reported by Teodoro et al. (2011a).

Soil moisture is one of the most important factors that affect plant growth. Zhu et al. (2012), observed a positive correlation between soil moisture and photosynthesis in tomato plants. Photosynthesis was low in soil with 55% field capacity and increased with increasing soil moisture. Soil moisture was considered to have greater effects than fertilization on fruit production, plant biomass and the root/shoot ratio.

In the present study, the most pronounced decrease in soil moisture may be associated with the annual life cycle of *D. lablab* and *C. spectabilis*. *U. decumbens* and *A. pinto* are perennial plants with resprouting ability, and these species presented the greatest capacity for soil

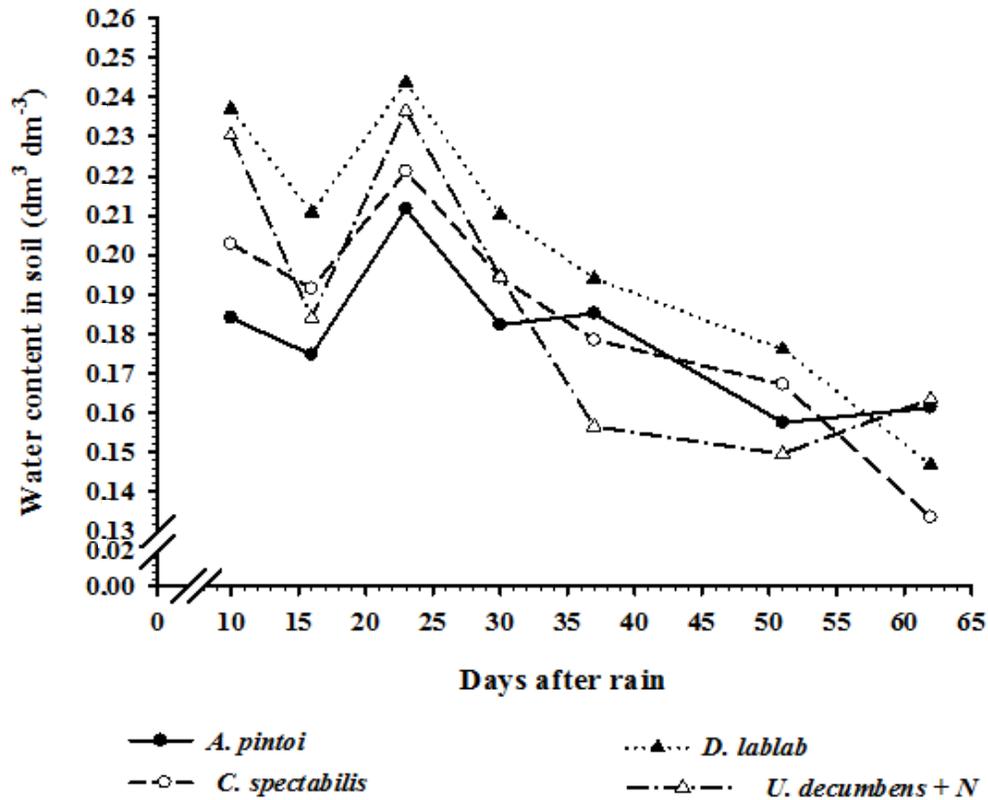


Figure 3. Variation in the soil water content of a dystrophic Red Latosol cultivated with different cover crops (evaluation period: 21/05/2014 to 22/07/14).

cover and soil moisture maintenance. The decrease in soil moisture may also be attributed to the low C/N ratio of *C. spectabilis* and *D. lablab*, which resulted in faster biomass decomposition. Intercropping of legumes with cruciferous plants and grasses has been observed to result in higher plant biomass and lower residue decomposition compared with monocropped legumes (Doneda et al., 2012).

The drought period following the cutting of cover crops resulted in decreased soil moisture throughout the experimental area. However, at the end of the experimental period, this decrease was more pronounced with *D. lablab* and *C. spectabilis* (38 and 34%, respectively) than with *A. pintoi* and *U. decumbens*, which presented similar soil moisture values (Figure 4).

For height and stem diameter, interaction was significant. Thus, no differences in plant height were observed for *E. dysenterica* intercropped with different cover crops ($p > 0.05$). *D. alata* plants were taller at 180 DAT when intercropped with *U. decumbens*+N and at 365 DAT when intercropped with *U. decumbens*+N and *D. lablab*. *C. brasiliense* height at 180 DAT was the lowest when intercropped with *C. spectabilis*, whereas *U. decumbens*+N and the *Urochloa decumbens* treatment yielded the greatest heights at 365 DAT (Table 2).

D. alata presented greater growth compared with the

remaining fruit trees up to 180 DAT, for all intercropping systems tested. *C. brasiliense* presented similar growth to *D. alata*, except when intercropped with *C. spectabilis* and at 365 DAT when intercropped with *C. spectabilis* and *D. lablab*. Within the *U. decumbens* treatment, no differences ($p > 0.05$) were observed in the growth of the fruit trees until 180 DAT. At 365 DAT, *C. brasiliense* was significantly taller than *E. dysenterica* (Table 3).

The higher growth observed for *D. alata* than for the remaining fruit tree species is in agreement with Vieira et al. (2006), who studied fruits native to the central-western region of Brazil and observed the occurrence of *D. alata* in soils with medium fertility.

The growth of *C. brasiliense* intercropped with the *U. decumbens* and the *U. decumbens*+N treatment indicated the ability of this species to adapt to different environments and nutrient concentrations. This may be explained by several factors, such as the adaptation of this species to the soil of the region, that is, with low fertility and moisture, the accumulation of nutrient reserves in the seeds, investment in root growth, and high genetic variability (Martins et al., 2015).

No stem diameter differences were observed when *E. dysenterica* was intercropped with various cover crops ($p > 0.05$), at both evaluation times (Table 4). *D. alata* had a lower stem diameter at 180 DAT when intercropped

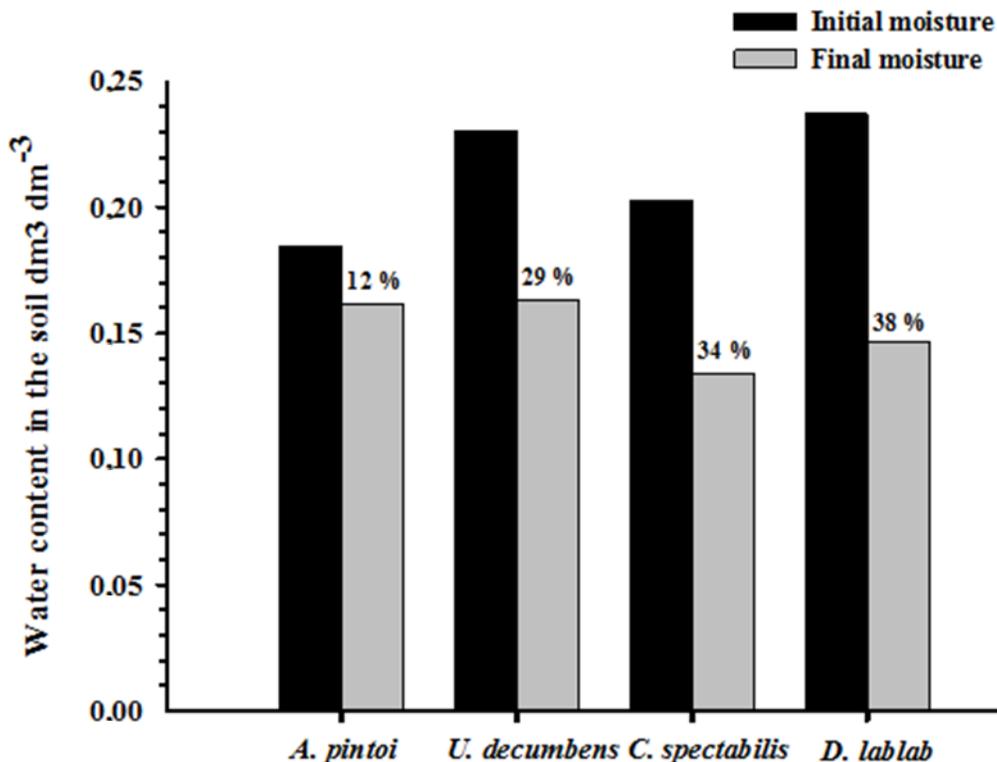


Figure 4. Water storage in a Latosol cultivated with different cover crops (evaluation period: 21/05/2014 to 22/07/14). *Values are the relative water loss during the evaluation period.

Table 3. Height (cm) of fruit trees native to the Cerrado grown in intercropping systems with different cover crops, 180 and 365 days after transplantation.

Fruit tree	Cover crops				
	<i>A. pintoi</i>	<i>C. spectabilis</i>	<i>D. lablab</i>	<i>U. decumbens+N</i>	<i>U. decumbens</i>
	180 DAT				
<i>E. dysenterica</i>	23.00 ^{Abz}	21.57 ^{Ab}	16.50 ^{Ab}	24.50 ^{Ac}	27.00 ^{Aa}
<i>D. alata</i>	29.12 ^{Bab}	38.12 ^{Ba}	39.25 ^{Ba}	56.87 ^{Aa}	36.37 ^{Ba}
<i>C. brasiliense</i>	29.62 ^{ABab}	23.00 ^{Bb}	33.75 ^{ABa}	44.87 ^{Aab}	41.25 ^{Aa}
	365 DAT				
<i>E. dysenterica</i>	29.00 ^{1Ab}	32.00 ^{Aab}	20.50 ^{Ab}	44.25 ^{Ab}	27.80 ^{Ab}
<i>D. alata</i>	58.50 ^{Bab}	60.00 ^{Ba}	66.00 ^{ABa}	95.00 ^{Aa}	46.00 ^{Bab}
<i>C. brasiliense</i>	67.50 ^{BCa}	26.00 ^{Db}	36.00 ^{CDb}	106.00 ^{Aa}	77.25 ^{ABa}

^zValues followed by the same upper case letter within a line, and lower case letter within a column are not significantly different at $p < 0.05$ according to the Tukey test.

with *C. spectabilis* and *D. lablab* and at 365 DAT when intercropped with the *U. decumbens*. The highest *C. brasiliense* stem diameter ($p \leq 0.05$) was measured in the *A. pintoi*, *U. decumbens+N* and *U. decumbens* intercropping systems at 180 DAT and in the *U. decumbens+N* and *Urochloa decumbens* intercropping systems at 365 DAT. *D. alata* and *C. brasiliense* had greater stem diameters than *E. dysenterica*, regardless of cover crop (Table 4).

D. alata and *C. brasiliense* had similar or higher initial stem diameters than *E. dysenterica* in all intercropping systems tested. *D. alata* and *C. brasiliense* presented faster growth than *E. dysenterica*.

The taller height and greater stem diameter of *D. alata* and *C. brasiliense* in all intercropping systems are in agreement with Oliveira et al. (2015), who observed similar responses for *D. alata* and *C. brasiliense* compared with *E. dysenterica* in monocropped systems.

Table 4. Stem diameter (mm) of fruit trees native to the Cerrado grown in intercropping systems with different cover crops, 180 and 365 days after transplantation.

Fruit tree	Cover crops				
	<i>A. pintoi</i>	<i>C. spectabilis</i>	<i>D. lablab</i>	<i>U. decumbens</i> + N	<i>U. decumbens</i>
180 DAT					
<i>E. dysenterica</i>	4.13 ^{Ac1}	4.23 ^{Ab}	3.00 ^{Ab}	4.06 ^{Ab}	3.60 ^{Ac}
<i>D. alata</i>	9.48 ^{ABab}	8.60 ^{Ba}	8.58 ^{Ba}	12.41 ^{Aa}	8.94 ^{ABab}
<i>C. brasiliense</i>	12.06 ^{Aa}	7.05 ^{Cab}	7.91 ^{BCa}	12.88 ^{Aa}	10.95 ^{ABa}
365 DAT					
<i>E. dysenterica</i>	5.53 ^{Ab1}	5.44 ^{Ab}	4.34 ^{Ab}	5.66 ^{Ab}	4.21 ^{Ac}
<i>D. alata</i>	14.21 ^{ABa}	15.05 ^{ABa}	14.84 ^{ABa}	19.35 ^{Aa}	12.85 ^{Bb}
<i>C. brasiliense</i>	17.01 ^{Ba}	8.04 ^{Cb}	9.80 ^{Ca}	24.85 ^{Aa}	23.91 ^{Aa}

¹Values followed by the same upper case letter within a row, and lower case letter within a column are not significantly different at $p < 0.05$ according to the Tukey test.

Conclusions

1. For the nutrient content, independently of the consortium used, high levels of nitrogen, phosphorus and potassium presented in the leaves of native plants, highlights the importance of consortium with cover crops, especially with perennials, *A. pintoi* and *U. decumbens* which promoted higher soil water storage.
2. For the water content was observed that the *Arachis pintoi* was the cover plant that produced the smallest amount of biomass, however provided the lowest soil moisture loss.
3. For the initial growth success of native plants (*E. dysenterica*, *C. brasiliense*, *D. alata*) was observed that the intercropping with cover crops (*D. lablab*, *A. pintoi*, *U. decumbens*, *C. spectabilis*) can be better than chemical fertilization.

Conflict of Interests

The authors have not declared any conflict of interests.

ACKNOWLEDGMENTS

The authors wish to thank the Federal Institute of Goiás (Instituto Federal Goiano), Rio Verde Campus, for permission to use the experimental area, agricultural machinery and machinery operators to perform the crop management actions.

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