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RESEARCH ARTICLE

SUBSTRATES ALTERNATIVE ENABLE SEEDLINGS PRODUCTION IN IMPLANTATION OF *CYNODON* SPP. TIFTON 85

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ABSTRACT

Tifton 85 is a promising pasture propagated only by vegetative method, which requires technologies for production of seedlings and deployment of pastures. Thus, the aim of this study was to evaluate alternative substrates for the production of Tifton 85 seedlings. The experiment was conducted under completely randomized design with six treatments and four replications. The studied treatments were: fresh wood shavings, decomposed wood shavings, decomposed wood shavings+soil, carbonized rice husk, soil and commercial substrate. The cuttings were obtained from developed plants of Tifton 85 and deployed in pre-filled polyethylene trays of cells with substrates studied. In substrates measured the carbon (C), nitrogen (N) and the ratio carbon to nitrogen (C: N), as well as the survival percentages at 15; 30 and 45 days and plant height at 30 and 45 days after implantation. In transplanting, at 45 days evaluated the dry weight of shoot and root system and its relation. In the field the seedlings were evaluated the percentage of survival set after transplanting. The wood shavings treated by composting method stood out for use in the production of seedlings of Tifton 85, as it presented the best C: N ratio (18: 1) and high survival rates in seedling production.

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INTRODUCTION

The use of animals in experimental research is critical for advances in the medical field (Mizziara *et al*., 2012). However, to ensure animal welfare, among other aspects the tests shall ensure safety and comfort to the animals. This comfort can be obtained from the soft bed of use, with good absorbent capacity and free of contamination (Damy *et al*., 2010), such as wood shavings. Due to the aforementioned features, the wood shavings is also the main bed used in commercial broiler systems (Avila *et al*., 2008) and breeding of pigs on deep beddings (Hentz *et al*., 2008). However, despite this bed is completely biodegradable after use as bedding in animal facilities, it has the potential of environmental contamination due to the feces and urine of animals kept on it during experimental trials. Thus, studies that consider the correct treatment and disposal of these beds are relevant to the prevention of environmental contamination. Among the alternatives for the treatment of organic waste, there is composted, which aims to modify its chemical and physical characteristics (Gomes *et al*., 2014) and providing more appropriate conditions for the activity of micro-organisms and decomposition of organic matter (Orrico Jr. *et al*, 2009).This process enables the mineralization of nutrients present in organic waste and causing an organic compound which may be intended for various purposes, such as organic fertilizer of the soil, or used as a substrate for production of the vegetable seedlings, forestry or other like Tifton 85 grass which belongs to the *Cynodon.* Cultivars and hybrids of this genre have been highlighted by good productivity and the high nutritional value (Castagnara *et al*., 2012). However, this is a grass whose propagation is only possible by vegetative method, by producing and seedling establishment, which makes it expensive and costly to implement grazing areas. Seedlings of Tifton 85 is traditionally grown in large areas, which require in addition to an extended period of establishing an expensive work at the time of transplant these seedlings to areas of permanent pasture. Neres *et al*. (2012) used rooting cuttings in polypropylene trays to obtain Tifton 85 seedlings to the experimental area of deployment with sucess. Tadielo *et al.* (2014) also used polypropylene trays and different substrates to obtain Tifton 85 plants in protected cultivation and obtained a reduction in the time of production of seedlings and favorable rates of fixation of cuttings. However, there are still little information about alternative methods for obtaining Tifton 85 plants, as well as the possible use of alternatives

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substrates. In this sense, the present study aimed to evaluate the production of Tifton 85 plants in polypropylene trays using alternative substrates and their performance after transplanting to the field.

MATERIALS AND METHODS

Place and time

The trial was conducted in winter-spring 2015 in the Gaucho Pampa region, Brazil.

Design treatments

The experimental design was completely randomized with six treatments and four replications. The treatments consisted of fresh wood shavings bedding, wood shavings bed decomposed, wood shavings decomposed+soil, carbonized rice husk, soil and commercial substrate. Each repetition consisted of 18 cells in a polyethylene tray, and each cell was deployed a cutting Tifton 85.

Preparation of materials

In the obtaining of substrates, the shavings bed was decomposed for a period of 120 days on a concrete floor with tumbling of the material every 15 days and had in their composition 82% wood shavings and 28% stool kept rodent experimental vivarium. The carbonized rice husk was obtained in the horticultural sector, while fresh wood shavings bed was obtained in the vivarium trial University. The soil was collected in enviroment and the commercial substrate was obtained in the local market. To define the treatments, it adopted the beds of fresh wood shavings and decomposed as alternative substrates. Aiming a high contribution of nutrients in the substrate decomposed wood shavings, it was mixed with soil at a ratio of 1:1, yielding the substrate decomposed shavings bed+soil. In contrast to alternative substrates, we opted for the use of conventional substrates, for which adopted the carbonized rice husk, the commercial substrate and soil. The soil used in the test was classified as Haplic Plintossoil.

Mounting test

In the preparation of the trays, the cells were filled with the substrates and irrigated for further accommodation of cuttings. The cuttings were obtained from Tifton 85 plants deployed in conventional area and age of 180 days of development. To prepare the cuttings, the stolons were sectioned every eight centimeters, yielding a viable cuttings with yolk. In each cell of the trays was deployed a stake for all substrates. Irrigation of the trays was performed daily to ensure water availability.

Chemical analysis of the substrates

After defining and obtaining of substrates, they were sampled to determine the nitrogen (N) total carbon (C) and its C: N. N was determined by sulfuric acid digestion and distillation semi-micro system Kjeldal (Embrapa, 2009), while C was obtained from the determination of organic matter in muffle as described by Silva and Queiroz (2009). To estimate the concentration of C in the samples, the concentration of organic matter was divided by 1.72, as recommended by Peixoto *et al*. (2007) and described by Cestonaro *et al*. (2010).

Evaluations vegetative

The development period adopted to seedlings 15; 30 and 45 days, in which we evaluated the sett of the seedlings and the height thereof. The minimum interval of 15 days between the introduction and the first assessment was set from search results observed by Oliveira *et al*. (2000). In the evaluations determined the percentage of survival, accouting the stakes that issued tillers from their buds and plants originated in the total stakes implanted for each repetition. At the same time measured the height of seedlings of Tifton 85 generated from the stakes, taking the height of 10 plants in each repetition with subsequent arithmetic mean. In determining the dry matter production of shoot and root system, also at 45 days ten changes of each repetition were sampled separating the aerial part of the root system. After separation, the root system was washed with the aid of screens for the removal of all soil, and subsequently submitted to both parts of the plants to oven drying, separately, to determine the dry mass of the aerial part and system root seedlings.

Evaluations the field

After 45 days of development, in the evaluation of the percentage of survival, twenty seedlings for each repetition were transplanted to the field in soil previously prepared by plowing and disking. In transplanting, the soil was furrowed in intervals between rows of 0.40 m and 0.30 m between plants. At 15 days after transplanting it was carried out the evaluation of the percentage of fixation of seedlings, accounting for the total of live plants in the area in relation to the total planted seedlings.

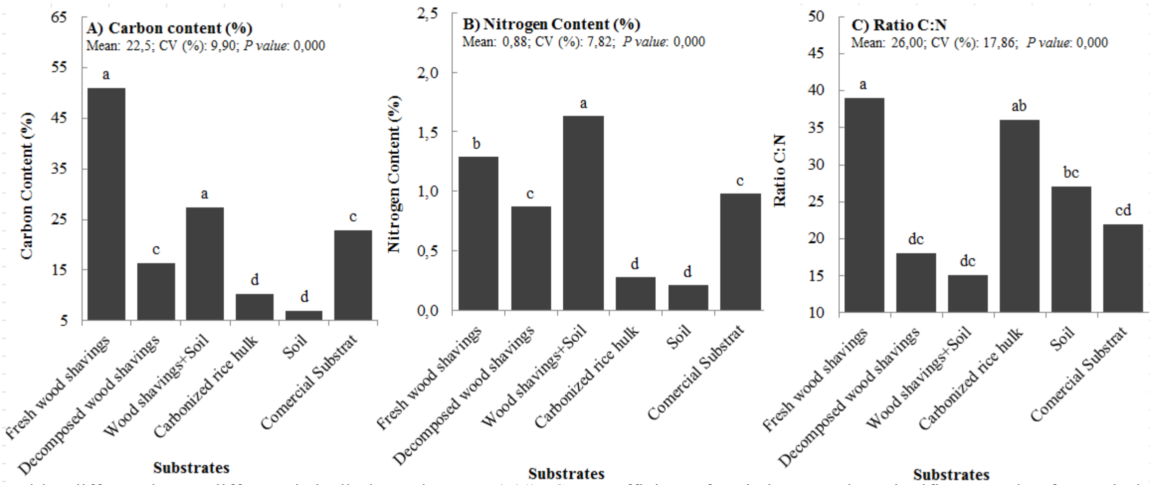
Statistical analysis

The data were submitted to analysis of variance and the hypotheses were tested by F Fischer test at 5% probability. When found significance means were compared by Tukey test at 5% probability.

RESULTS

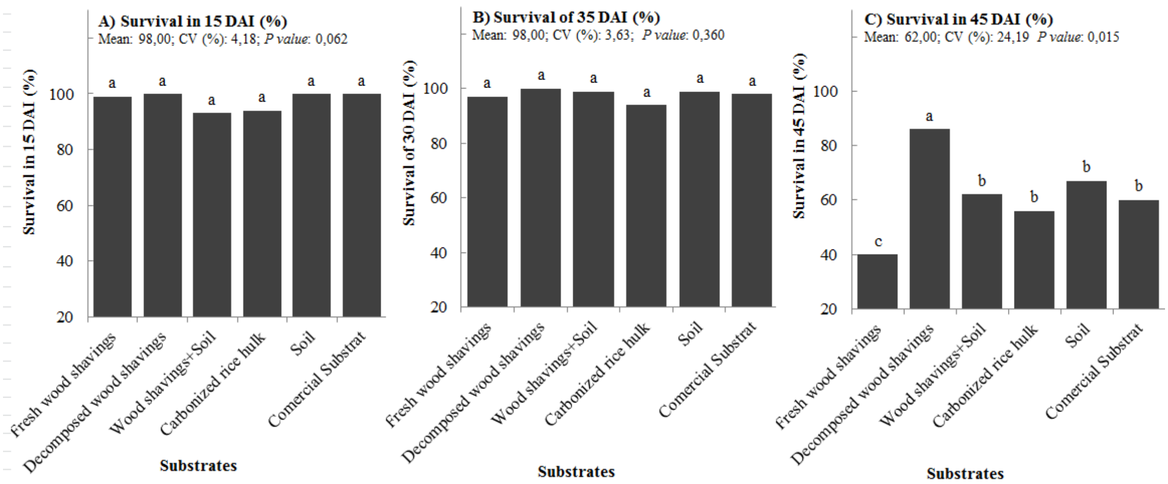
In the composition of the substrates was detected statistical significance for carbon (C), nitrogen (N) and the C:N ratio (Figure 1). Fresh wood shavings showed the highest content (C) carbon, while the lower carbon content was observed in the soil substrate. The lowest C:N ratio was observed in the substrate wood shavings bedding decomposed + soil (15:1) then decomposed wood shavings (18.1), while the higher C: N ratio was observed in fresh wood shavings bedding (39:1) (Figure 1). In the survival, at 15 and 30 significant differences between the studied substrates no were observed (Figure 2), however, at 45 days, wood shavings decomposed provided greater survival of rate of cuttings 45 days after its planting.

At 30 days after implantation, the stakes implanted in substrado with wood shavings bed decomposed + soil had the highest plant height, however, 45 days after implantation, the major development measured by height was observed in susbstrato with bed shavings decomposed (Figure 3). The dry weight of shoot and root system were not altered by susbstratos used and their relationship (Figure 4). In transplanting the field, there was no significant difference in survival of plants of different substrates, with 71% mean survival.



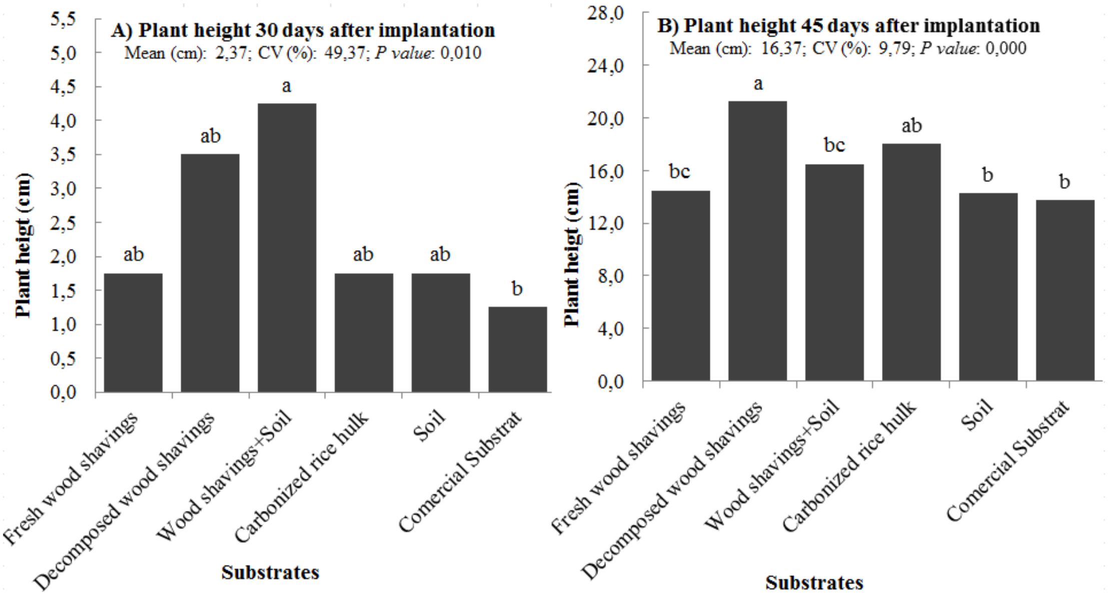
Means followed by different letters differ statistically by Tukey test (5%); CV: coefficient of variation; P value: significance value for F Fischer test (5%); C:N: carbon-nitrogen ratio.

Figure 1. Contents carbon-C(A), nitrogen-N (B) and C:N ratio (C) in alternative substrates for the production of seedlings of *Cynodon* spp. Tifton 85 in polypropylene trays



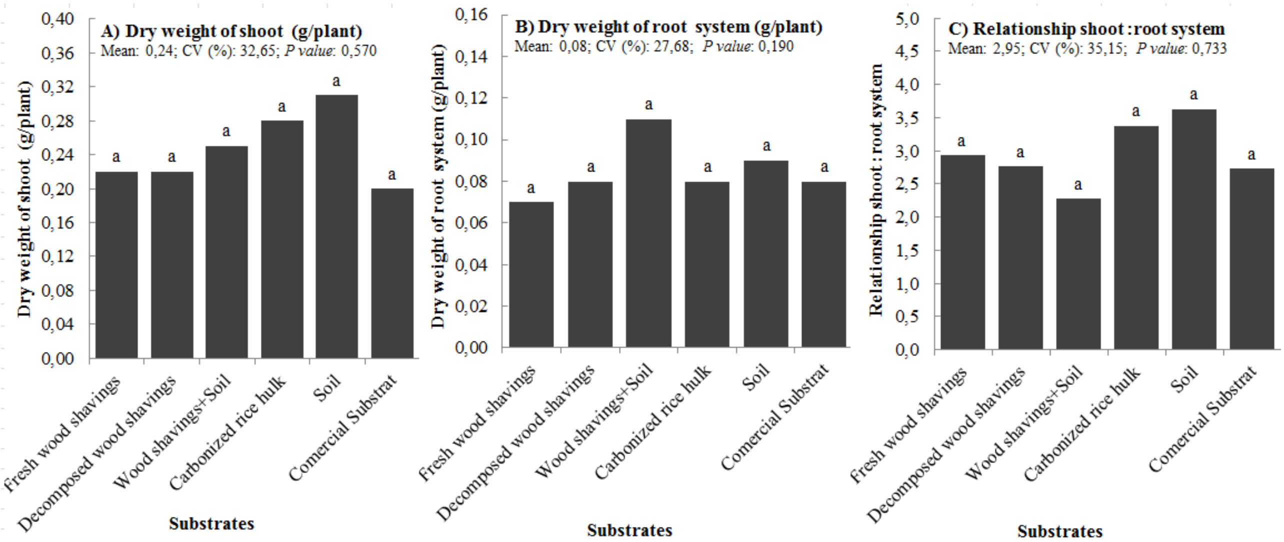
Means followed by different letters differ statistically by Tukey test (5%); CV: coefficient of variation; *P value*: significance value for F Fischer test (5%)

Figure 2. Percentages of survival of stakes planted in different substrates for the production of seedlings of *Cynodon* spp. Tifton 85 in polypropylene trays in 15 (A), 30 (B) and 45 (C) days after implantation (DAI)



Means followed by different letters differ statistically by Tukey test (5%); CV: coefficient of variation; P value: significance value for F Fischer test (5%);

Figure 3. Height of plants from cuttings of *Cynodon* spp. Tifton 85 deployed on different substrates for the production of seedlings in polypropylene trays in 30 (A) and 45 (B) days after implantation



Means followed by different letters differ statistically by Tukey test (5%); CV: coefficient of variation; P value: significance value for F Fischer test (5%)

Figure 4. Dry weight of shoot (A) and root system (B) and its relation (C) of *Cynodon* spp. Tifton 85 plants planted in different substrates for the production of seedlings in polypropylene trays

DISCUSSION

The higher carbon content observed in fresh shavings due to its composition, because it is obtained by trimming or scraping of the timber forming ferpas that after drying to reduce moisture contamination and is intended for use as bedding. Cestonaro *et al*. (2010) to study the decomposition of wood shavings used in composting broiler carcasses also found higher carbon content compared to other alternative substrates composted for 30 days. Regarding the low carbon content found in the soil used in the test is related to the organic matter content of the Rio Grande do Sul Pampa soils, Brazil, which are known to have low levels of organic matter (Carmona *et al*., 2009). Only the substrates obtained from the decomposition of wood shavings bedding, mixture with soil and commercial substrate showed relationship C:N below than recommended by Lopes *et al* (2009) for proper plant growth, which is 25:1. This variable is essential for proper plant growth, because substrates with C:N ratio greater than 25:1 limit the growth of plants due to nitrogen immobilization process (Amado *et al*., 2003). Hentz *et al*. (2008) studying the potential fertilizer on deep beddings of breeding of pigs and subjected to the composting process, observed values carbon 26.59% and C: N ratio of 33.23, below therefore of the potential at the shavings used as bedding for mice in animal facilities. Costa *et al*. (2007) emphasize the advantages of the commercial substrate for the growth of seedlings as best feature for water retaining and aeration. However, according to Freitas *et al*. (2013) these characteristics are canceled when using alternative substrates with the same potential of the added advantages of providing nutrients for high seedling development. The carbonized rice husk was reported by Saidelles *et al*. (2009) as an interesting alternative, however, to be used as a component in substrates used as substrates component allows for proper aeration of the roots within the tray cell by stimulating their development. When being observed carbon values C: N in fresh shavings and decomposed (Table 1), there is a significant reduction in both parameters analyzed. This reduction of the organic carbon and the C: N ratio after the composting must degradation of organic matter which occurs during the process (Maragno *et al*., 2007). The higher survival rate of seedlings at 45 days with wood shavings substrate decomposed due to the lower C: N ratio obtained on the substrate and also to their carbon content (Table 1). To survival of plants is essential to a good water retention in the soil to maintain the water availability for the stakes. Likewise, a ratio C:N suitable (less than 25:1) ensures the availability of nutrients for plant growth, including root growth that contributes to further exploration of the substrate volume and water available in the cell tray polypropylene.

The biggest development of the plants 45 days after planting in the substrate with wood shavings bed decomposed due to the composting process, which accelerates the decomposition of organic matter by providing more appropriate conditions for the activity of microorganisms (Orrico Jr. *et al*, 2009), allowing the mineralization of nutrients present in the organic waste. With increased availability of nutrients, there was major development. Oliveira *et al*. (2000) studied the tillering of Tifton 85 observed a minimum of 14 days to issue aerial tillers in plants already installed. In this test, only 30 days after planting it was possible to observe the development of aerial tillers originated from cuttings planted in trays, and 45 days the seedlings were in transplanting conditions. Even with this delay for issuing and development of air tillers there is a gain estimated at 80% of the time that would be demanded for the production of seedlings in conventional beds. The lack of significance to the dry weight of shoot and root system reveals that even the limitations imposed on the development of seedlings due to nutrient restrictions depending on the composition of the substrates were not significantly enough to limit the dry mass deposition both by air as the root system. However, when it comes to implementation of pastures as Tifton 85, where each node formed stolon will lead to a new clump will field, which will issue new stolons with their respective nodes and so on, the plants with less of us will have greater difficulty in providing quick ground cover and pasture establishment. The relationship between dry matter of the shoot and root system was close to recommended values as a reference to obtain seedlings of tree species, which should be 2:1 (Caldeira *et al*, 2012). This value is recommended to avoid excessive loss of water by the air through aerial part due exceeding the capacity of water absorption by the root system, compromising the chances of survival of plants after their transplanting. The mean fixation of 71% to substratesconfirms that tods provided the same adherence to the root system, which according to Steffen *et al*. (2010) is one of the factors that prevents dryness of the roots of seedlings and preserves its moisture, thus contributing to increased survival after transplanting. Freitas *et al*. (2013) when working with alternative substrates for production of lettuce seedlings pointed out that alternative substrates provided increased survival after transplanting.

Conclusion

The wood shavings treated by composting method stood out for use in the production of seedlings of Tifton 85, as it presented the best C: N ratio (18:1) and high survival rates stake in seedling production.

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