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Initial performance of Barbados gooseberry plants grown on different soil covers

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Barbados gooseberry is an unconventional food plant with great protein production potential for human consumption. A field experiment was conducted with four types of soil covers and six replications to optimize the cultivation of this plant. Treatments were composed of four soil covers, forage peanut, straw from sun hemp and millet, white plastic cover, and a treatment without soil cover and with hoeing. After transplanting, the initial growth of seedlings was analyzed through weekly monitoring of plant height, stem diameter, and the number of leaves. After two months, the first cut was performed, and fresh biomass was quantified. Straw and white plastic cover presented improved plant height and leaf number compared to other treatments, resulting in a higher yield of Barbados gooseberry.

Key words: *Pereskia aculeata* Mill., vegetable protein, unconventional food plant.

INTRODUCTION

Barbados gooseberry (*Pereskia aculeata* Miller) is an unconventional food plant found throughout Brazil, rich in protein and antioxidant compounds. This plant is a cactus that, in addition to the true leaves used for human consumption, also produces honey flowers and edible fruits, considered important for feeding birds and frugivorous mammals. Barbados gooseberry is traditionally used as a medicinal plant in some regions of Brazil, and scientific research has increasingly attested to the therapeutic potential of the leaves (de Carvalho et al., 2019).

Due to its adaptability to different climates, Barbados gooseberry is a suitable option for cultivation; it is easy to propagate, has fast growth with a low incidence of pests and diseases, and adaptability to different types of soil and climate (Tofanelli and Resende, 2011). The production of Barbados gooseberry can be maximized since the responses of plants to factors that influence its growth and development are known. Currently, scientific studies on its cultivation are still scarce due to insufficient information about adequate soil conditions.

Therefore, crop production techniques that maximize yield and rationalize the use of natural resources are increasingly being adopted (Almeida et al., 2015). In this sense, the use of different soil covers can make the environment favorable for plant development. Several types of coverings are used in agriculture; they can be organic or inorganic, including plastic covering used in other crops such as vegetables already presents great benefits for the development, growth, and production of

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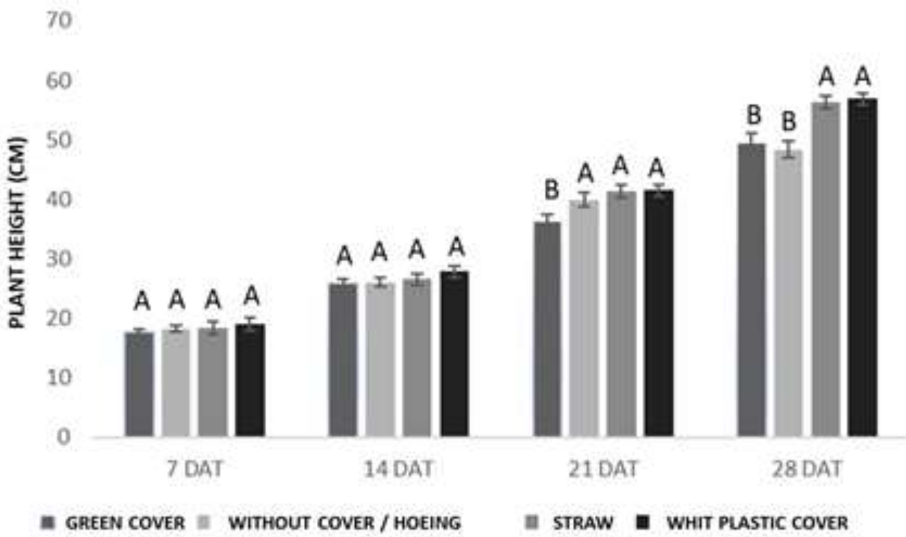

Figure 1. Plant height (cm) of Barbados gooseberry plants at 7, 14, 21, and 28 days after transplanting (DAT) grown on different soil covers: green cover, without cover/hoeing, straw, and white plastic cover. Means followed by the same letter within each interval (DAT) do not differ by the Tukey test at 5% probability.

vegetables (Mendonça et al., 2021). Cover crops have been vastly used in the no-tillage system in large crops such as soybeans and corn (Vieira et al., 2020).

The implementation of leguminous cover crops can present the advantages of obtaining nitrogen from the atmosphere and inhibit the emergence of invasive plants that can be very harmful in the early stages of crop development. They compete directly for water, light, and nutrients (Resende et al., 2020). This study aimed to evaluate the agronomic development of Barbados gooseberry plants on different soil covers

MATERIALS AND METHODS

The experiment was conducted under field conditions in the Horticulture Sector of the School of Agronomy of the Federal University of Goiás (latitude 16°35'12" S, longitude 49°21'14" W and 730 m of altitude). According to the Koppen climatological classification, the region's climate is Aw-type, tropical savannah with a potential water deficit between June and August and global solar irradiance significantly increasing between September and October (Santana, 2015).

Soil analysis was carried out in the 0-20 cm soil layer, whose physicochemical characteristics were $pH_{(CaCl2)}$: 6.0, $P_{(Mehlich)}$: 85.0 mg dm^{-3}, K: 60.0 mg dm^{-3}, Ca: 3.9 cmol dm^{-3}, Mg: 1.2 cmol dm^{-3}, Al: 0.0 cmol dm^{-3}, H+Al: 2.2 cmol dm^{-3}, organic matter: 18.0 g dm^{-3}. Also, the soil had 46% of clay, 44% of sand, and 10% of silt. Soil preparation was carried out in a conventional tillage system, with two operations with a plow, followed by the distribution of dolomitic limestone (ECCE: 100%) with a subsequent operation with a disc harrow.

The fertilization recommendations were carried out according to the requirements of the Barbados gooseberry crop (Madeira et al., 2016). The fertilization in the transplanting was carried out with an NPK formulation. The fertilizer 04-30-10 (NPK) and granular potassium chloride were used. The topdressing fertilization was carried out via fertigation.

The experimental design was randomized blocks with four treatments and six replications. The treatments consisted of different soil covers, including green cover (forage peanut), straw (sun hemp and millet straw), white plastic cover, and no cover with hoeing. The Barbados gooseberry seedlings were grown in a greenhouse. Cuttings (10 cm) were collected and remained in a substrate for 60 days, being transplanted after an acclimatization period. For the formation of soil over, the species *Pennisetum americanum* L. (millet) and *Crotalaria juncea* (sun hemp) were used, both being manually mowed fifteen days before transplanting the Barbados gooseberry seedlings.

Forage peanut was used as the green cover treatment. It was sown 60 days before transplanting the Barbados gooseberry seedlings. In the treatment without cover, the removal of weeds was carried out weekly through hoeing. White-colored mulching was used in the treatment with plastic covering, installed 60 days before transplanting the seedlings. During the crop development cycle, there was no need to apply pesticides. The growth analyses were performed weekly after transplanting the seedlings for four consecutive weeks. Plant height (PH) was evaluated with a graduated ruler. The number of leaves (NL) was assessed by counting. Stem diameter (ST) was evaluated with a caliper. The production of green mass (GM) was assessed on the first cut, which occurred 60 days after transplanting.

RESULTS AND DISCUSSION

Four evaluations of plant height, number of leaves, and stem diameter were taken after transplanting, at 7, 14, 21, and 28 days after transplanting (DAT). As shown in Figures 1 and 2, it was observed that the different soil covers influenced the plant height and number of leaves only at 21 and 28 DAT. At 21 DAT, plants of Barbados gooseberry on the green cover had lower plant height

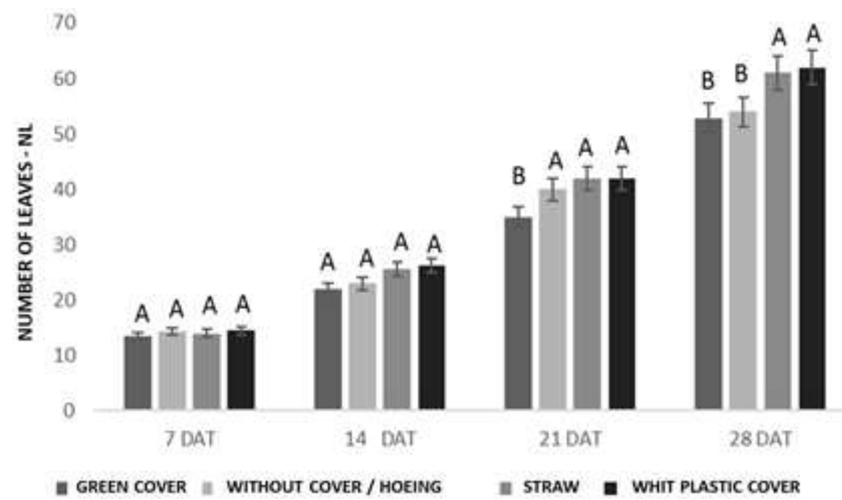

Figure 2. Number of leaves of Barbados gooseberry plants at 7, 14, 21, and 28 days after transplanting (DAT) grown on different soil covers: green cover, without cover/hoeing, straw, and white plastic cover. Means followed by the same letter within each interval (DAT) do not differ by the Tukey test at 5% probability.

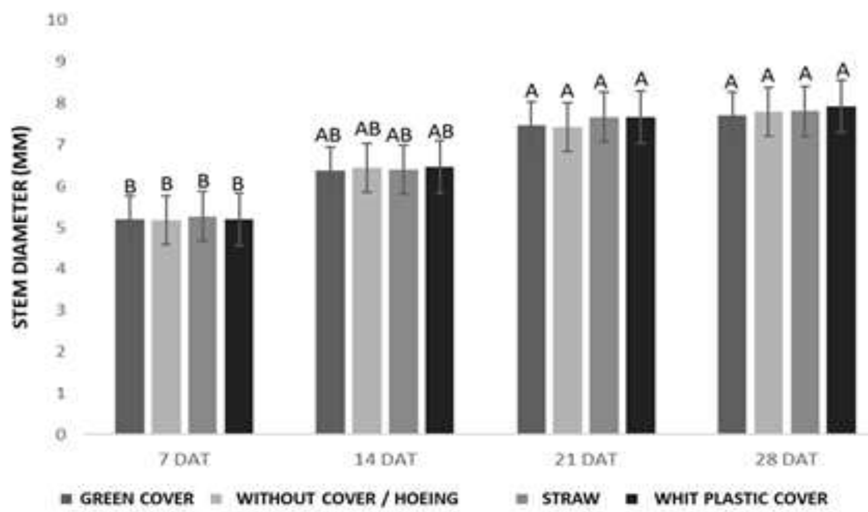

Figure 3. Stem diameter (mm) of Barbados gooseberry plants at 7, 14, 21, and 28 DAT (days after transplanting) grown on different soil covers: green cover, without cover/hoeing, straw, and white plastic cover. Means followed by the same letter within each interval (DAT) do not differ by the Tukey test at 5% probability.

and a smaller number of leaves than the other treatments. This result may have happened due to nutrient competition (Borges, 2016) between the green cover (forage peanut) and Barbados gooseberry plants. At 28 days after transplanting, it was observed that the straw and white plastic covering treatments provided the highest plant height and number of leaves. In contrast, no cover and green cover have the lowest plant height and number of leaves. This may have been due to the direct incidence of sunlight on the soil, raising temperatures (Gastl et al., 2021), and providing greater water evaporation from the soil, unlike other covers where temperatures were observed that temperatures did not rise during the hottest times of the day. Regarding the green cover treatment, it is believed that the competition for nutrients in this initial phase was responsible for the lower plant heights since the soil temperature was similar to the other treatments. Regarding stem diameter, no difference was observed among the treatments (green cover, without cover/hoeing, straw, and plastic cover) as shown in Figure 3, with of the plants.

In the end, at 60 days after transplanting, the first cut was performed, all leaves were collected, and the green mass per plant was evaluated. It was observed that the

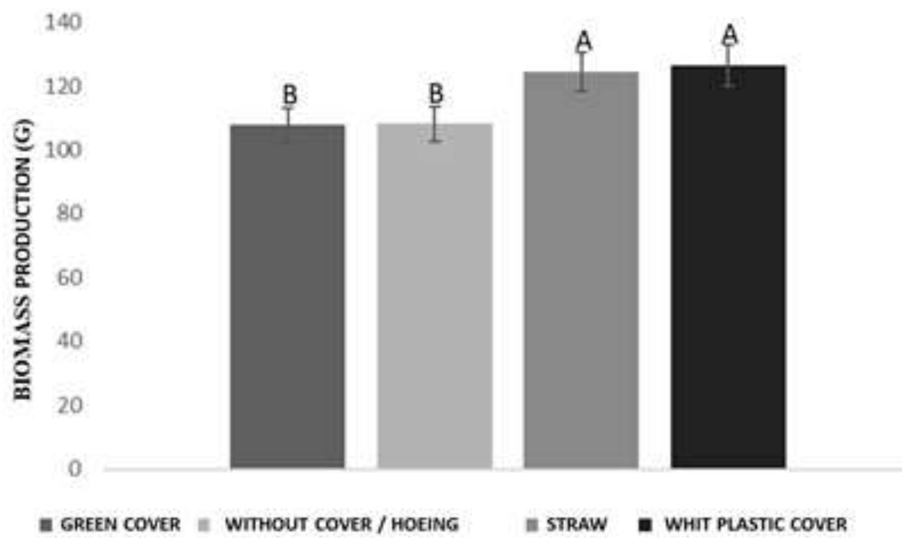

Figure 4. Biomass production (g) of Barbados gooseberry plants grown on different soil covers: green cover, without cover/hoeing, straw, and white plastic cover. Means followed by the same uppercase letter do not differ by the Tukey test at 5% probability.

treatments with white plastic cover and straw allowed greater production of green mass followed by no cover and green cover (Figure 4). With fewer leaves and lower plant height, the production of photo assimilates ends up being restricted, which directly reflects on yield.

Conclusion

Treatments with white plastic covering and straw (straw from sun hemp and millet) provided better results than the other treatments, allowing greater agronomic performance, evidenced by greater plant height, the number of leaves, and consequently higher plant biomass yield.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

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