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Performance of *Pereskia aculeata* Mill. on colored shading meshes

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ABSTRACT

With the Industrial Revolution, it became necessary to produce quality food, as well as the creation of new technologies for food production, mainly shading levels, with the use of colored shading meshes that contribute to productivity. The objective was to evaluate the performance of Ora-pro-nóbis - *Pereskia aculeata Miller* under shade screens with colored meshes. The work was developed at the LABPANC Unit of the Universidade Federal do Acre. The experimental design employed was the Completely Randomized, using mini-cuttings of 7.5 mm and 10 cm in height, with treatments: Full sun, Blue, Black, Red and Aluminet, with 50% colored meshes, with 5 repetitions, totaling 25 units experimental. Analyzes of height, number of leaves, number of branches and leaf area were performed. The data were submitted to analysis of variance and tukey test at 5%. In general, Pereskia aculeata presents similar results in all treatments. The black and red conditions provided the highest average height, being similar for leaf numbers, branch numbers were significant only in full sun, and leaf area showed similar results between treatments. It was concluded that the use of colored nets had a positive influence on the morphological performance of ora-pro-nobis.

Keywords: Unconventional food plant. Luminosity. Plant production.

Desempenho de ora-pro-nóbis (*Pereskia aculeata miller*) em função de telas coloridas

RESUMO

Com a Revolução industrial, tornou-se necessário a produção de alimentos com qualidade, assim também a criação de novas tecnologias para a produção de alimentos, principalmente níveis de sombreamento, podendo ser usadas as malhas de sombreamento coloridas que contribuem na produtividade. Objetivou-se avaliar o desempenho de (Ora-pro-nóbis) - *Pereskia aculeata* Miller sob telas de sombreamento de malhas coloridas. O trabalho foi desenvolvido na Unidade LABPANC da Universidade Federal do Acre. O delineamento experimental empregado foi o Inteiramente Casualizado, usando miniestacas de 7,5 mm e 10 cm de altura, com tratamentos: Pleno sol, Azul, Preto, Vermelho e Aluminet, com malhas de 50% coloridas, com 5 repetições, totalizando 25 unidades experimentais. Foi realizado análises de altura, número de folhas, número de ramos e área foliar. Os dados foram submetidos a análise de variância e teste tukey a 5%. De forma geral, *Pereskia aculeata* apresenta resultados similares em todos os tratamentos. As condições de preto e vermelho proporcionaram as maiores médias de altura, sendo similar para os números de folhas, números de ramos foi significativo somente a pleno sol, e área foliar apresentou resultados semelhantes entre os tratamentos. Conclui-se que o uso de malhas coloridas influência de forma positiva no desempenho morfológico de ora-pro-nóbis.

Palavras-chave: *Pereskia aculeata*. Luminosidade. Pancs.

INTRODUCTION

With the Industrial Revolution and the increase in population, sustainable development became even more important, with the goal of meeting the high food demand and technological development, which contributes to socioeconomic growth (COSTA, 2010). The interest that society has in relation to quality of life is well-known, especially when it comes to food, in the search for healthier and higher-quality foods, particularly those with health benefits. As a result, Unconventional food plants become a resource for daily consumption of vitamins and minerals needed to human development and food sovereignty (LIBERATO et al., 2019).

The unconventional food plants are a group of plants that are not exploited commercially or on a large scale, are not of interest to large producers, and can be found in environments with limited access, such as vacant lots and rarely visited forests. One of the main characteristics of this group of plants is that they can be used in part or all of the plant in food, which can be native or exotic, spontaneous or cultivated (KELEN et al., 2015).

According to Abras and Cato (2018), this group of plants has great socioeconomic development potential, with high gastronomic potential throughout the national and international territory, contributing to the interest in encouraging family farming through the cultivation and commercialization of the plants that are part of it. Those who feed on this group are typically traditional populations who are already familiar with the various species that can be used in human food, making it an important feature in the construction of traditional and cultural knowledge (BRASIL, 2010).

As an example, consider the (Ora-pro-nóbis) - *Pereskia aculeata*, a species of the Cactaceae family that is used in food, medicine, and ornamentation. It is known as "poor man's meat" due to its high protein content, which according to some studies can reach 25%, as well as calcium, iron, lysine, magnesium, and phosphorus (SILVA JNIOR et al., 2010). Its leaves are fleshy, commonly used fresh in salads and stews (ALMEIDA et al., 2012; KINUPP; LORENZI, 2014). Its leaves exhibit antioxidant capacity (SOUZA et al., 2014), and when added to meals, they lower triglyceride contents in rats (SOUZA et al., 2015).

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calcium, iron, lysine, magnesium, and phosphorus (SILVA JNIOR et al., 2010). Its fleshy leaves are typically eaten fresh in salads and stews (ALMEIDA et al., 2012; KINUPP; LORENZI, 2014). Its leaves exhibit antioxidant capacity (SOUZA et al., 2014), and when added to meals, they lower triglyceride contents in rats (SOUZA et al., 2015).

Light is one of the elements that influence the fundamental metabolic processes of the species, that is, physiological activities such as photosynthesis, respiration, and, as a result, the accumulation of photoassimilates. As a result, research into suitable levels of brightness is required when it comes to the development of plants in the seedling phase (HARA et al., 2020).

Shade screens, primarily coloured meshes, are one of the techniques used in plant production. The technology used in the work manipulates the light that reaches the leaves of the plants, providing benefits for productivity in terms of protected cultivation, as well as generating agronomic, performance, physiological, and morphological data that will support future research.

Shading levels trigger benefits in the development of the species in general, depending on the species, and this is related to the nitrogen content of the leaf, photosynthetic pigments, production and partitioning of photoassimilates in the calvin-benson cycle between the different organs in formation (COSTA et al., 2018).

Therefore, the goal of this study was to assess the performance of Pereskia aculeata miller in a protected environment of coloured shading meshes.

MATERIAL AND METHODS

The experiment was carried out at the LABPANC Unit of the Universidade Federal do Acre (UFAC), in the municipality of Rio Branco, Acre (9º58'29" S, 67º48'36"W, 164 m altitude), during the months of September to October de 2022. According to the Köppen classification, the local climate is Am-type, with annual rainfall ranging from 1.900 to 2.200 mm and average temperatures of 24 and 26 ºC (ALVARES et al., 2013).

The experimental design used was in Completely Randomized where the treatments consisted of four colored screens and the control treatment (T1 - Full sun (control); T2 - 50% Blue; T3 - 50% Red; T4 - 50% Black; T5 -50% Aluminet) with 5 repetitions, for standardization of the mini-cuttings 7.5 mm in diameter and 10 cm in height were adopted, totaling 25 experimental units. The minicuttings were placed in

180ml cups, using Plantmax® commercial substrate and irrigated every day during the experiment with the aid of a manual watering can.

The chemical properties of the commercial substrate given in the installation of the experiment were: pH = 4.2; EC = 3.0 dS. m; N = 72 mg. L-1; P = 11.0 mg; Cl = 100.0 mg. L-1; S = 560.0 mg. L-1; K = 156 mg. L-1; Na = 32.0 mg. L-1; Ca = 234.0 mg. L-1; Mg = 193 mg. L-1.

At 35 days after the seedlings had already formed, the biometric variables were evaluated: Leaf area (cm2), total number of shoots per cuttings, total number of leaves (un) and height (cm). All plants were examined and removed from disposable cups with substrate adhering to their roots to avoid root system injury. After separating the root system from the aerial portion, the roots were gently cleaned until the adhering soil was removed.

The leaf area was determined using a graduated ruler by measuring the length and width of two leaves from each unit and averaging the results. The total number of leaves and shoots was counted, and plant height was measured from the shoot to the apex.

The acquired data were subjected to the Grubbs test (1969), the Shapiro-Wilk test (1965), and the Bartlett test (1937) for verification of discrepant data (outliers). Following that, an analysis of variance was performed using the F test, and if statistical significance was discovered, mean comparisons were performed using the Tukey test with a 5% probability. Statistical analyses were carried out using the free and open-source software R.

RESULTS AND DISCUSSION

In general, all treatments showed similar responses, in terms of height there was a difference in the Aluminet colored mesh, number of leaves showed similar results, number of branches resulted significantly only in full sun, and leaf area showed similar results, this is due to the decrease of luminosity in the environment causing the etiolation of many species (Table 1).

Hirata et al., (2017) discovered that plants cultivated beneath shading screens grew taller than plants grown in direct sun. Lone et al., (2009) observed lower plant height when grown in full sun, a behaviour due to excess luminosity, above the capacity that each plant species has for its development, resulting in stress known as photoinhibition of

photosynthesis, and thus decreasing plant biomass production capacity (BARBE; ANDERSON, 1992).

The plants exhibited similar behaviour in the red and black environments; when the plants are exposed to low irradiance conditions, metabolites are changed, assigning more carbon to the stem, and therefore increased growth; this behaviour can be regarded as a survival strategy (SOUZA et al., 2018).

Table 1 Plant height (H), number of leaves (NL), number of branches (NB), Leaf A ea (LA) of (Ora-pro-nobis – *Pereskia aculeata*) seedlings produced in colored shading meshes. Rio Branco, AC, 2022.

Colored shading messhes 50%	H	NL	NB	LA
Red	9a	12a	2b	14a
Black	9a	11a	2b	14a
Blue	7ab	10a	2b	13a
Full sun	7ab	11a	3a	16a
Aluminet	6b	9a	2b	13a

Means followed by the same lowercase letter in the column do not differ ($p>0.05$) according to Tukey's test.

Quaresma et al., (2021) conducted an experiment with (Mentha x vilosa Huds) seedlings under shade levels and discovered that when the seedlings have an abnormal growth in height, which was attained at the 70% level, and when there is no increase in the stem, the plant is considered etiolated. The thermoreflective screens performed worse than the other meshes, with statistically significant differences ($p<0.05$). This mesh stores the heat it absorbs within, limiting the emission of thermal waves.

By obstructing airflow, a shade screen helps to maintain the relative humidity of the environment (OLIVEIRA et al., 2012). De Jesus et al. (2020), working with Ora-pro-nobis, discovered increased height in the red mesh, which was confirmed in our study.

There was no statistical difference for the variable number of leaves (NL), which is associated to genetic characteristics and fluctuates according to growth, cultivar, photoperiod, and temperature (OLIVEIRA, 2004). Leite et al., (2022) observed different outcomes in this investigation. Working with rocket for a varying number of leaves, we found that coloured meshes produced better results than full sun; a quantitative reduction was detected in this study on the Aluminet screen, but not statistically.

The variable is significant as an evaluation parameter since it typically displays the results of how the plant adapts to the environment in which it is placed. When plants are

exposed to high temperatures, their vegetative phase lengthens, resulting in early feathering and a reduction in the number of leaves (SEDIYAMA et al., 2009). Lima et al., (2021) discovered a variation in shading levels for the varied number of leaves in treatments of 50% and 75% of shading when dealing with Begonia (*Begonia cucullata* Willd.).

There was a difference (p0.05) in the number of branches (NR), Lima et al., (2021) observed that in full sun the variable presented lower results, and at 50% and 75% higher levels, however, according to the data presented in this work, when cultivated in full sun, the results are superior when compared to the use of other meshes. The red mesh has technology capable of changing the light that plants receive in their settings, such as a greenhouse, promoting growth and phytonutrient accumulation, and therefore adding to production and quality in regulated situations (DOU et al., 2017).

In general, the use of coloured meshes contributes to appropriate plant development conditions, as high temperatures and luminosity are detrimental to plant development and metabolism, whereas shading and coloured screens promote uniform distribution of radiation by diffusing it equally.

CONCLUSION

Coloured meshes are a viable choice for the production of ora-pro-nobis seedlings. These are healthy and ready for cultivation.

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