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Pastures and forage

Carbon and nitrogen stocks in cactus pear crops at different planting densities

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The cactus pear has demonstrated widespread distribution in ruminant production systems in Arid and Semi-Arid regions. Besides being considered an essential forage for ruminants, it's important to evaluate soil conditions under the cultivation of this cactus. Thus, understanding soil carbon and nitrogen stocks is essential to assess the sustainability of forage cactus production in Semi-Arid environments. In this context, the objective was to evaluate soil carbon and nitrogen stocks under forage cactus cultivation at different planting densities. The experiment was conducted at the Caatinga Experimental Field, owned by EMBRAPA Semi-Arid, in Petrolina-PE. The region has a hot Semi-Arid climate (BShw'), and the soil is classified as Argissol with medium texture on flat terrain. The experimental period lasted thirty months, with twelve months for crop establishment and eighteen months for data collection (Oct. 2021 to Apr. 2023). The forage cactus clone used was IPA-200016/Mexican Elephant Ear (*Opuntia stricta* Haw.). The plot consisted of four planting densities (30,000; 45,000; 60,000; and 75,000 plants ha⁻¹). Carbon (C) quantification was done using the potassium dichromate oxidation method (K₂Cr₂O₇) 0.4 mol L⁻¹. Soil nitrogen content was determined using the Kjeldahl method. Soil density was evaluated using a volumetric ring with a volume of 48.86 cm³. Carbon and nitrogen stocks were calculated according to the equation: Stock (Mg ha⁻¹) = element content C or N (%) * depth (cm) * density (g cm⁻³). The results were analyzed using PROC REG in the Statistical Analysis System University (SAS 2015) software and subjected to analysis of variance and regression at $\alpha = 0.05$. Planting densities quadratically altered ($P < 0.001$) nitrogen stock, showing a maximum point of 11.14 Mg of N ha⁻¹ for a population density of 77,226 plants ha⁻¹. There was a quadratic effect of planting densities on soil C stock, demonstrating a maximum stock point of 344.07 Mg of C ha⁻¹ for a plant population of 70,455 ha⁻¹. In this perspective, soils capable of storing more C and N ensure cultivation sustainability and extended productivity. Consequently, increasing forage cactus planting density appears as a viable strategy to favor greater nitrogen and carbon stocks, recommending the establishment of plantations with densities of 75,000 plants ha⁻¹.

Palavras-chave: Cactácea, semiárido, manejo, *Opuntia stricta* Haw.

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