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Pastures and Forage

Soil carbon, nitrogen and phosphorus stoichiometry under *Opuntia stricta* Haw cultivation at different planting densities

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Soil is considered the foundation of agricultural production. Therefore, knowing the dynamics between nitrogen, carbon and phosphorus will guide soil biogeochemical changes and microbial activity. However, the stoichiometric ratios of the soil under cactus cultivation in semi-arid regions are still scarce. Therefore, the objective was to evaluate the stoichiometry of carbon, nitrogen and phosphorus in soil under cactus pear cultivation at different cultivation densities. The experiment was conducted at the Caatinga Experimental Field, belonging to Embrapa Semiárido, in Petrolina, Pernambuco. The soil in the experimental area is classified as Argisol with flat relief. The area was planted with cactus pear Orelha de Elefante Mexicana clone IPA-200016. The treatments consisted of four crop densities (30,000, 45,000, 60,000 and 75,000 plants ha⁻¹) distributed in a randomized block design with four replications. The experimental period comprised thirty months, with twelve months dedicated to establishing the culture and eighteen months for data collection. From the carbon (C), nitrogen (N) and phosphorus (P) data, the stoichiometric ratios between C and N (C:N), C and P (C:P) were calculated, and the stoichiometric ratio between the C, N and P (C:N:P). The results obtained were analyzed using PROC REG from the Statistical Analysis System (SAS University) and subjected to the mean test at 5% probability. There was an effect of crop densities ($P < 0.05$) on the C:N ratio in the soil profile of 0-0.10 and 0.10-0.20 m, demonstrating a quadratic behavior with maximum points of 35.69 g.kg⁻¹ for a population of 42,601 plants ha⁻¹ for the 0-0.10 m profile while the 0.10-0.20 m profile demonstrated a maximum point of 57.29 g.kg⁻¹ for a population of 48,033 plants ha⁻¹. However, the C:N ratio demonstrated a linearly decreasing effect on the 0.30-0.40 m profile. The C:P ratio showed a quadratic effect ($P = 0.037$) in the 0-0.10 m profile with a maximum point of 123.57 g.kg⁻¹ in the C:P ratio for a population of 60,783 plants ha⁻¹ and an increase ($P < 0.001$) of 4.77 g.kg⁻¹ for every thousand additional plants in the area in the 0.10-0.20m profile. There was an increasing linear effect of planting density ($P = 0.004$) on the C:N:P ratio in the soil profile of 0.10-0.20 m. There was no effect of crop densities on C:N:P stoichiometry in the 0-0.10 m profiles; 0.20-0.30 and 0.30-0.40 m. Planting density changes the stoichiometry between nitrogen, carbon and phosphorus, requiring monitoring of soil fertility and adjustment of the organic matter used to improve the efficiency of mineral use.

Keywords: Cactacea, forage, semiarid, nutrients, Soil

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