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CARBON AND NITROGEN STOCKS AND FORMS OF N IN A RED DYSTHROPHIC ARGISOL GROWN OR NOT WITH PEANUT FORAGE

ESTOQUE DE CARBONO E DE NITROGÊNIO E FORMAS DE N EM UM ARGISSOLO VERMELHO DISTROFICO CULTIVADO OU NÃO COM AMENDOIM-FORRAGEIRO

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The low availability of nitrogen (N) is considered one of the most limiting factors for the productivity of pastures, often responsible for their degradation. Overall, due to the high cost of nitrogen fertilizers, it is not applied in sufficient quantities. In this context, the cultivation of legumes is an option for adding nitrogen in the soil and simultaneously is into high-protein food. Forage legume may reduce the emission of greenhouse gases, changing nutrient cycling (C and N) and can improve productivity and sustainability of agricultural systems. Most of the N in the soil is in the organic form compounds, that is converted into inorganic fraction, the predominant mineral forms of nitrogen (NH_4^+ and NO_3^-), available to plants by mineralization process. The C:N ratios from soil and plant residues affect the decomposition rate and the balance between N mineralization and N immobilization by microbes. The aim of this study was to evaluate the improvements in soil quality by comparing the forage legume *Arachis pintoi* cv. Belmonte, cultivated for eight years and a bare soil - an adjacent area (AA) in a soil Ultissol (Red Dysthrophic argisol). We evaluated the levels and stocks of C, total N and C:N, NH_4^+ and NO_3^- in soil from a depth of 0-20 cm. The experimental design was a randomized complete block with ten replications. Variance analysis (ANOVA) was used to detect significant differences between the study areas, averages were compared using test for multiple comparisons Student Newman-Keuls - SNK test ($p < 0.05$). Analyses were performed using SAS (2010). The availability of mineral N in uncultivated area was low, with mean values below 10 mg kg^{-1} for both nitrate and ammonium, possibly due to the low organic matter content (17.8 g kg^{-1}). However, under the cultivation of the peanut forage there were increases ($p < 0.05$) of the contents and stocks of C and N, and the levels of ammonium and nitrate. Increases in total N and inorganic N forms are the result of the mineralization and decomposition of high quality litter (22.1% crude protein) from peanut forage, resulting from biological N fixation. This forage legume improved soil quality and play a major role in reducing greenhouse gas emissions.

Key words: *Arachis pintoi*, ammonium, nitrate, forage legume, sustainable pasture.

Table 1. Soil carbon and nitrogen contents and stock, NH_4^+ and NO_3^- under different land use – *Arachis pintoi* cultivation or bare soil. Nova Odessa (Sao Paulo state, Brazil)

Treatments	Carbon	Nitrogen	C: N	Stock C	Stock N	NH_4^+	NO_3^-
	g kg^{-1}			Mg ha^{-1}		mg kg^{-1}	
Arachis pintoi	18.7 a	1.30 a	14.4 a	21.9 a	3.27 a	37.0 a	60.5 a
Bare soil	10.3 b	0.88 b	10.0 b	14.9 b	2.39 b	9.2 b	9.6 b

Means with different letters in column differ significantly on SNK test ($p < 0.05$).