Root systems in tropical pasture restoration treatments in Rondônia, Brazil

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Introduction Soil management can influence physical and chemical soil properties, with fundamental differences in root system development. Our objectives were to quantify carbon (C) and nitrogen (N) concentrations, dry mass and length of roots subjected to different restoration treatments of degraded pasture.

Materials and methods This research was conducted in an existing 63 ha pasture area established in 1983 in the process of degradation at Fazenda Nova Vida, in central Rondônia (10°30'S, 62°30'W), Brazil. The experiment consisted of four random blocks (replicates) of three pasture reformation treatments: (1) Control *Brachiaria brizantha* + weeds; (2) Conventional tillage followed by planting of forage grass and fertiliser (NPK + micronutrients) and (3) Herbicide (2.4 D) followed by fertiliser (NK + micronutrients). Root systems were evaluated using the profile wall method 5 months after the start of soil management (March, 2002). Soil was collected from four pits (100 x 50 x 30 cm) of each treatment, from 0-5, 5-10 and 10-20 cm depths. Root samples were separated by sieving into different diameter classes (very fine, fine and coarse roots). The roots of different diameters were analysed with "SIARCS" (Integrated system for root and soil vegetation covering evaluation) to determine root length and root dry mass per unit soil volume (Crestana *et al*., 1994). Root samples were oven-dried at 60°C and ground for analysis of total C and N in composite samples per diameter class and treatment. Contents of C and N were determined by dry combustion with a LECO CN-2000 Elemental Analyser.

Results Contents of C and N were higher in coarse roots for all treatments. The C: N ratios ranged from 33 to 50; 36 to 48 and 24 to 37, in control, ploughing and herbicide treatments, respectively. Root C concentrations were higher in 10-20 cm layer (Table 1). Root dry mass and length decreased with depth in the soil profile, and both were higher in herbicide treatment compared with control (Figure 1). Ploughing showed negative influenced to root mass and length (Figure 1).

Table 1 Root carbon and nitrogen contents under restoration pasture treatments in Rondônia, Brazil

Depth	Control			Plowing			Herbicide		
(cm)	VF	F	C	VF	F	C	VF	F	C
				Carbon (%)					
0-5	21	20	35	23	24	33	20	19	41
5-10	18	22	36	19	31	35	22	22	42
10-20	22	27	46	26	27	48	19	25	45
				Nitrogen (%)					
0-5	0.6	0.6	0.7	0.5	0.7	0.8	0.7	0.8	1.4
5-10	0.5	0.5	0.7	0.5	0.7	0.7	0.6	0.7	1.2
10-20	0.6	0.8	1.0	0.5	0.7	1.1	0.5	0.9	1.2
				C:N ratio					
0-5	33	34	47	43	37	41	29	24	30
5-10	34	41	50	36	45	48	36	30	34
10-20	37	36	44	52	37	44	36	27	37

VF = very fine roots (diameter< 0.3mm); F = fine roots (diam. = 0.3mm) and ; C = coarse roots (diam. = 0.5mm)

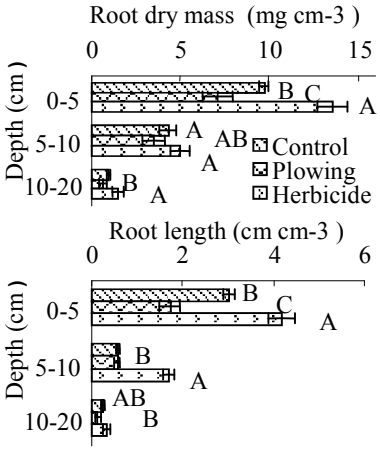

Figure 1 Roots dry mass and roots length. Mean values (n=4)± standard error. Tukey test ($p<0.05$)

Conclusions Herbicide treatment had advantages in root mass and length and roots C and N contents, 5 months after the soil restoration management. This treatment, did not have competition with weed plants on the root system development, and had an extra source of nutrients from the weed roots to forage grass roots.

References

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