

Soil Quality in Riparian Areas of the Cerrado Biome as Affected by Deforestation Followed by Citrus Cultivation

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A debate is occurring in Brazil on how deforestation for agricultural usage influences the quality of natural resources, including the soil. This debate has focused heavily on the Cerrado Biome that nowadays is strongly impacted by deforestation and agriculture. Deforestation can take place in highlands as well as lowlands associated with riparian areas, which usually are flooded during the rainy season. This study was aimed at determining changes in the quality of soils of riparian areas converted to citrus cultivars after deforestation. The research was conducted in a riparian area of the Cerrado Biome in which soils under riparian vegetation are bordered by soils under citrus cultivation (Figure 1). In this riparian area, the citrus has been cultivated for about 30 years.

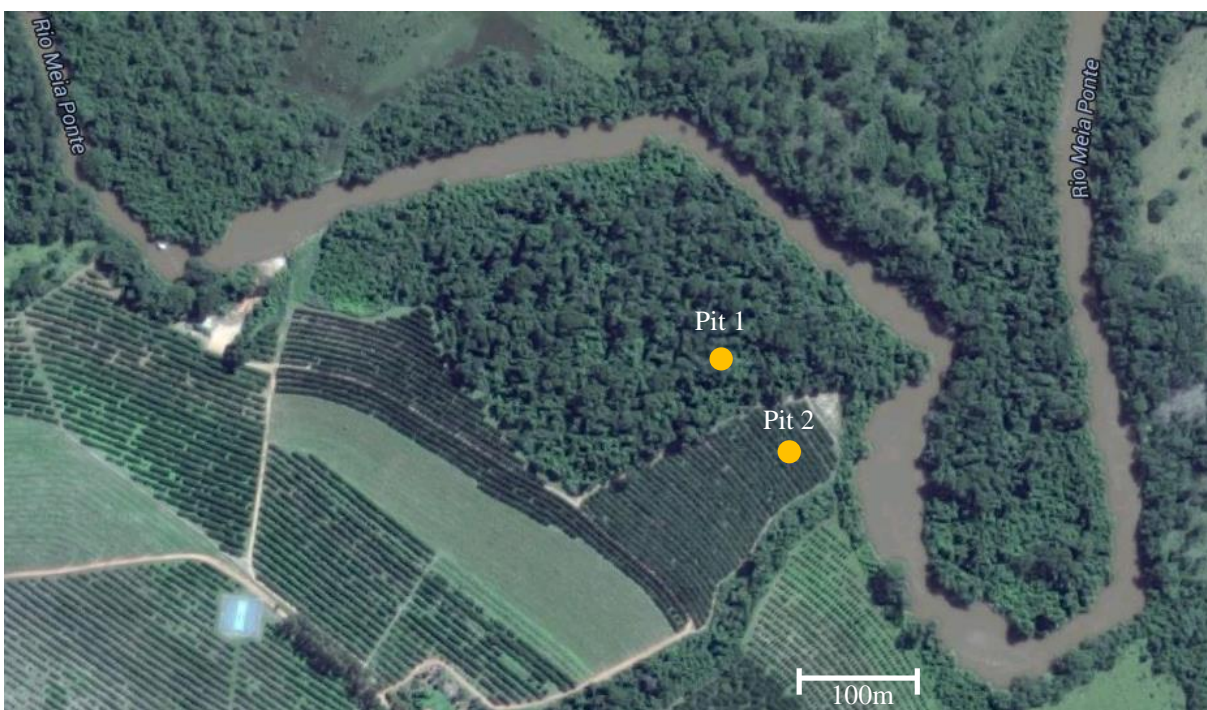


Figure 1. Study area (coordinates: -16.950009, -49.107766). Pit 1, preserved riparian vegetation area. Pit 2, deforested riparian vegetation area under citrus. Source: Google maps, accessed on 13/01/2016.

Soil profile pits were dug at both the preserved and disturbed riparian vegetation areas (Figure 1). After the profile description, samples were collected at soil horizons down to a 2 m depth, then analyzed for chemical soil quality parameters: plant available metals and nutrients (Ca, Mg, Al, K, P, S, Na, Zn, B, Cu, Fe, Mn), CEC, base saturation, organic carbon and pH

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(Table 1). The Soil Quality Index (SQI) was calculated based on the chemical parameters outcomes for the soil under citrus using the equation below, as proposed by Maia (2013).

$$SQI = \frac{\sum_{i=1}^n QI_i}{n}$$

SQI = Soil quality index;
QI_i = sum of quality index for each parameter;
n = number of parameters.

Table 1. Average measured soil chemical parameters for horizons A and B.

Land Use	Horizon	Ca	Mg	Al	K	P	S	Na	Zn	B	Cu	Fe	Mn	CEC	Base Sat.	C	pH
		cmolc dm ³					mg dm ³					cmolc dm ³	%	g dm ³			
Riparian	A	2.90	1.27	0.13	0.18	2.33	2.27	6.00	8.30	0.30	0.90	21.50	32.23	8.44	50.20	15.85	4.87
Vegetation	B	0.57	0.37	0.63	0.10	0.80	2.27	5.00	6.43	0.23	0.90	27.80	9.43	4.02	24.91	5.80	4.67
Citrus	A	3.45	0.55	0.20	0.70	39.70	32.40	8.00	3.75	0.43	2.00	23.85	26.55	8.39	56.25	7.25	4.80
	B	1.82	0.84	0.00	0.18	1.18	41.54	7.00	5.50	0.34	0.90	31.84	10.90	4.86	59.64	4.52	5.64

The results showed that the SQI of the riparian area under citrus cultivation decreased by 52% (SQI=0.48) in comparison with the riparian vegetation area when the SQI calculation was performed coupling the A and B horizons. Changes in organic carbon and nutrient concentrations (Ca, Mg, K, P, S, B, Fe) and pH values led to decreased SQI for the soil under citrus. These results are in agreement with those from Maia (2013), who also reported a decrease in soil quality for tropical soils cultivated with irrigated melon.

In conclusion, deforestation of riparian areas of the Cerrado Biome followed by cultivation of citrus strongly affects soil quality. The management of organic matter and nutrients in the riparian area under citrus cultivation appear to be the main issue needing to be addressed for improving soil quality.

References

Maia, C.E. 2013. Qualidade ambiental em solo com diferentes ciclos de cultivo do meloeiro irrigado. *Ciência Rural* 43(4): 603-609.