

Soil microbial biomass in burned area cultivated with corn

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Abstract

The carbon of microbial biomass is a good indicator to soil changes. This work had the objective of evaluating the effect of organic residue burning on soil microbial biomass carbon content (C-bio) in area cultivated with corn. The evaluations were conducted 90 and 130 days after the emergency (dae). For 90 dae, the burning of residues increased the C-bio, while in the evaluation of 130 dae the burning of residues had no effect. Among the evaluations made to the 90 and 130 dae, the burning of residues reduced the C-bio.

Introduction

The microbial biomass carbon content indicates the potential of carbon reserve in the soil that participates in the humification process (Gama-Rodrigues et al., 1997). The estimate of C-bio supplies useful information on the changes in its biological properties due to diverse agricultural practices. According to Roscoe et al. (2006), besides being an important variable in the understanding of soil organic matter dynamics, the C-bio is also easy to be measured and it has been used as an indicator of soil quality. This work was carried out with the objective of evaluating the effects of doses and the burning of organic residues on C-bio content in area cultivated with corn.

Materials and methods

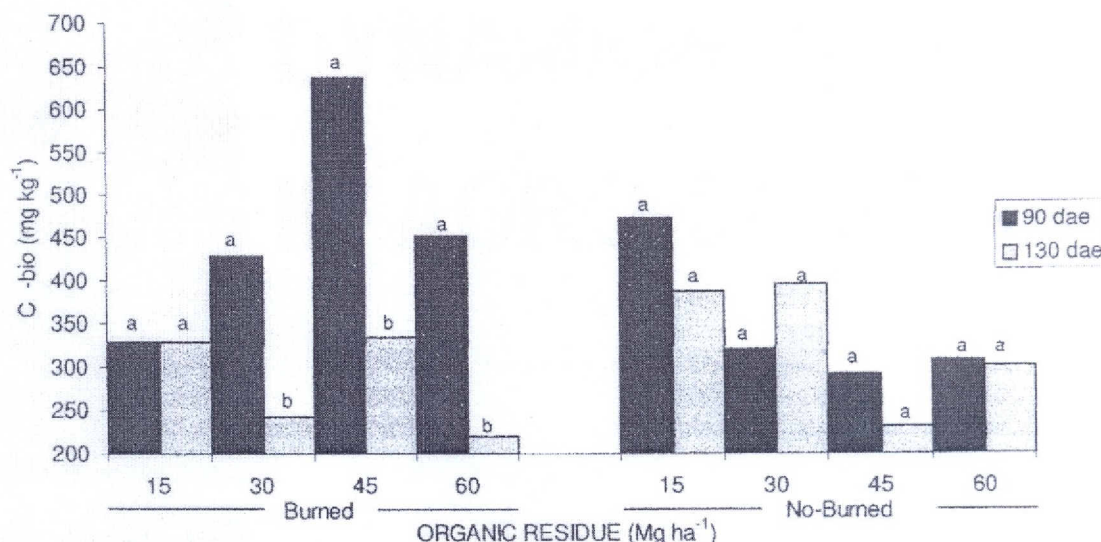
The experiment was carried out at State University of Londrina school farm- (Londrina/PR - Brazil - 23° 19' S; 51°11' W) in oxisol area, cultivated with corn without chemical fertilization. The experimental design was completely randomized in blocks and the treatments were distributed in a 4x2x2 factorial arrangement, where the factors were 4 doses of organic residues (15, 30, 45 and 60 Mg ha⁻¹), two use forms (with and without burn) and two sampling times (90 and 130 dae). The organic residue was obtained from the grinding of tree branches from Londrina city, that presented carbon/nitrogen relationship (C/N) = 52/1. In the determined sampling times, the soil samples were collected (0-10 cm) for C-bio determination using the fumigation-extraction methodology proposed by Vance et al., (1987). The obtained data were submitted to the variance analyses, adjusted to regression equations or compared by Tukey test (p>0,05).

Results and discussion

In the treatments with burns for the evaluation made only to the 90 dae, a significant effect of residue doses was observed. In this case, the C-bio increased and adjusted significantly to the quadratic model $y = -36,862 + 27,481x - 0,3151x^2$; $r^2 = 0,74$, with maximum in 43,60 Mg ha⁻¹. The observed increase probably occurred due to the high nutrients availability that resulted from residue burn.

In treatments without the burning of residue, there was significant effect in the two sampling times. In evaluation made to the 90 dae, the C-bio decreased with the increase of residue doses ($y = 691,73 - 17,711x + 0,1897x^2$; $r^2 = 0,98$), with defined minimum for the residue dose of 46,70 Mg ha⁻¹. To the 130 dae, the C-bio increased in the lowest doses (15 and 30 Mg ha⁻¹) and decreased in the highest doses (45 and 60 Mg ha⁻¹), being adjusted to a cubic function ($y = -196,7 + 67,07x - 2,1782x^2 + 0,02x^3$; $r^2 = 0,99$). This behavior can be attributed to slower decomposition of the organic residues due to the restrictions to oxidative biological process, because of less oxygen diffusion and poor concentration of nitrogen in the residue (high C/N). If we take the time sampling effect separately in consideration, it was verified that there were reductions in C-bio contents among the appraised times, except for the dose of 15 Mg ha⁻¹ (Figure 1), in treatments with the burning of residue. There was no significant effect in treatments without the burning of residue. The highest

and fastest nutrients liberation in treatments with the burning of residue only favored the increase of C-bio in the evaluation made to the 90 dae. This result indicates only an immediate advantage of the burns, once this effect had already disappeared in the evaluation of 130 dae. The pluviometric precipitation occurred between



the first and the second evaluation (259 mm) must have promoted the washing and leaching of the liberated nutrients, contributing to fast reduction of the initial benefits of residue burn.

Figure 1. Medium values for soil biomass carbon content (C-bio) in function of doses and sampling times in area cultivated with corn. For each dose, the averages followed by the same letter, do not differ to each other (Tukey test, $p > 0.05$).

These results are in agreement with Nardoto et al. (2003) that worked in savannah burned area and observed that the C-bio reached the maximum value (850 mg kg^{-1}) one month after the burning of residue and presented the same value of non burned area (350 mg kg^{-1}) three months after the burning. Luizão et al. (1999) verified that the C-bio was lower in area recently burned (829 mg kg^{-1}) than in two year-old pasture (1290 mg kg^{-1}) or in primary forest (1287 mg kg^{-1}).

Conclusions

In the evaluation made to the 90 dae, the burning of residues increased the C-bio, however, in treatments without residue burning there was reduction of C-bio; In the evaluation of 130 dae, the effect of residue burning was not observed, however, in treatments without residue burning, the highest values of C-bio were obtained in the lowest doses; Among the evaluations made to the 90 and 130 dae, the burning of residues reduced the C-bio.

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ORGANIC MATTER DYNAMICS IN AGRO-ECOSYSTEMS

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