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Influence of the herbicide glyphosate on soil microbial biomass carbon as affected by the rate of application

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A laboratory study was conducted at the Faculty of Agriculture, University of Ruhuna in order to assess the effect of glyphosate on soil microbial biomass carbon. The experiment was set according to Completely Randomised Design (CRD) with four replicates. Soil belongs to Red Yellow Podzolic great soil group collected from Matara district was treated with glyphosate at the rate of 0.3546, 3.546 and 35.46 μg/g soil, corresponding to field rate (C1), 10 times (C2) and 100 times (C3) of the field rate. Untreated control (without glyphosate) was also included. Determination of soil microbial biomass carbon was carried out at 1, 3, 5, 7, 14, 21, 35 and 56 days after herbicide application.

No significant ($p \leq 0.05$) differences of soil microbial biomass carbon contents were found between the glyphosate treatment of 0.3546 μg/g soil (field rate) and the control throughout the incubation period. However, when the application rates were increased up to 3.546 μg/g soil (10 times) and 35.46 μg/g soil (100 times), soil microbial biomass carbon content were decreased significantly ($p \leq 0.05$), compared to that of the control, in particular during the first 10 days of incubation.

The highest reduction (43 %) of the soil microbial biomass carbon was observed at the application rate of 35.46 μg/g soil. But the maximum reductions were only 27 % and 7 % for the application rates of 3.546 μg/g soil and 0.3546 μg/g soil, respectively. Glyphosate is tightly adsorbed to the soil particles when it is applied to the soil and it gradually breaks down by microbes. Therefore, it inactivates in the soil solution. This might be the reason for no significance at lower level of glyphosate and not affecting 10 days after application even with higher dosages (100 times)

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