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Short-term residual effects of various amendments on organic C and N, and available nutrients in soil under organic crop production

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ABSTRACT

Two 3-year (2008-2010, wheat-pea-barley) field experiments were conducted on certified organic farms near Spalding (Dark Brown Chernozem-Typic Haploboroll) and Star City (Gray Luvisol-Typic Haplocryalf) in northeastern Sas-katchewan, Canada, to determine the residual effects of compost, alfalfa pellets, wood ash, rock phosphate, *Penicillium bilaiae*, gypsum and MykePro on organic C and N (total organic C [TOC], total organic N [TON], light fraction organic C [LFOC], light fraction organic N [LFON]) and mineralizable N (N_{min}) in the 0 - 15 cm soil layer, and ammonium-N, nitrate-N, extractable P, exchangeable K and sulphate-S in the 0 - 15, 15 - 30 and 30 - 60 cm soil layers in autumn 2010. Compared to the unamended control, mass of TOC, TON, LFOC and LFON increased with compost and alfalfa pellets in both soils. However, the increases were much more pronounced for LFOC (by 125% - 133%) or LFON (by 102% - 103%) than TOC (by 19% - 29%) or TON (by 25% - 40%). The N_{min} also increased in these two treatments compared to the control, but the increases were much smaller for compost than alfalfa pellets. In general, residual nitrate-N increased with increasing rate of compost and alfalfa pellets in the 0 - 15 and 15 - 30 cm layers in both soils. Extractable P increased with compost and exchangeable K with alfalfa pellets, but only in the 0 - 15 cm soil layer. Sulphate-S increased with compost, but mainly in the 30 - 60 cm soil layer. Soil pH usually increased with compost and more so with wood ash, but no effect of any amendment on ammonium-N. Overall, the quantity of organic C and N, and available nutrients in soil increased with compost and/or alfalfa pellets, but the magnitude varied with amendment and/or soil type. In conclusion, our findings suggest that soil quality and fertility can be improved with these organic amendments, suggesting sustainability of production from organic crops.

KEYWORDS

Amendments; Compost; Organic C and N; pH; Soil Fertility; Soil Quality

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