IMPACT OF LIQUID HOG MANURE AND INORGANIC PHOSPHORUS (P) FERTILIZER ADDITIONS ON SOIL TEST P AND P UPTAKE BY RYEGRASS

I.P. O'Halloran[1] and J. Lauzon[2]
[1]Ridgetown College, University of Guelph, Ridgetown, Onatrio
[2]Department of Land Resource Science, University of Guelph, Guelph

Abstract

Ontario recently introduced a phosphorus (P) index to assess the relative risk of surface water contamination resulting from P application to cropland, and to suggest possible management strategies and application restrictions to reduce this risk. The index incorporates various soil/site characteristics (soil test P level, erosion/runoff potential etc.) as well as management practices (rate and method of P application). Within the development of the P index, questions were raised regarding the relative availability, compared to commercial inorganic fertilizers, of P contained within animal manures and the resulting impact on soil test P levels. Currently, in Ontario, in the year of application manure P is considered only to be 40% as available to the crop as commercial fertilizers. The P index also assumes that the long term contribution of manure P to the soil test is only 80% of that associated with commercial fertilizers. A controlled environment study was conducted to assess the relative availability to Italian ryegrass of liquid hog manure (LHM) P and inorganic fertilizer P (monocalcium phosphate (MCP)) in 10 Ontario soils ranging in textures and soil test P levels. Treatments involved applying 0, 50, 100, 200 and 400 kg/ha of P as either LHM or MCP. Additional nutrient were applied to ensure that P was the only potentially limiting nutrient. Italian ryegrass was grown in a greenhouse and above ground biomass harvested three times during a 100 day study. Plant biomass and P content were determined for each sampling. After the final harvest, soils were analyzed for extractable soil test P (0.5 M sodium bicarbonate). As expected, plants grown on soils with lower soil test P levels gave greater biomass increases in response to P additions. Plant biomass was curvi-linearly related to the rate of P application to the soil. For the most part there were no significant differences due to the source of P, although in two soils the higher rates of LHM addition reduced plant growth. Plant P uptake was either linearly or curvi-linearly related to P application rate, again with no significant difference due to source of P. Soil test P levels tended to increase linearly with increasing P additions, again with no apparent effect of P source. Although textural differences were observed, the overall rate of P addition to bring about a unit change in soil test P very close to the value of 22 kg P ha^{-1} per 1ppm change in soil test P which has been found in other studies in Ontario. These results suggest that current assumptions regarding manure P availability and impact of soil test P levels should be revisited and that further research (with other manure sources and field studies) is warranted.

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519/271-9269

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