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SOIL HEALTH IN ORGANIC POTATO SYSTEMS

Interim Research Report E2007-22

BACKGROUND

There has been a steady increase in consumer demand for organically produced potatoes (*Solanum tuberosum* L.) during the past decade because of health and environmental concerns. However, the intensive cultivation required for potato production and the little or no organic matter returned to the soil makes it difficult to avoid soil degradation. A component of organic farming is the use of extended rotations to minimize soil degradation. This allows biological indices to recover and the condition of the soil to return to a state of health prior to the inclusion of the potato crop. Research has suggested that if the frequency of the rotation is too short, biological indices of soil health fail to recover. The maintenance of soil health is therefore a central concept in sustainable agriculture, as it is the "capacity for a specific soil to function within natural or managed ecosystem boundaries, to sustain biological productivity, maintain environmental quality, and promote plant, animal and human health." (Pankhurst *et al.* 1997)

Maintenance of soil health is important in organic agriculture (K. Nelson)

Assessment of soil health is problematic as measurements relate to specific soil functions or management goals. A number of key parameters are assessed as indicators of the overall system function using a minimum data set of biological, physical, and chemical soil properties. Organic agriculture has particular interest in soil biological health as soil biota, are largely responsible for nutrient transformation and fundamental soil properties. This greater reliance on biological processes is used to compensate for reduced use of fertilizers and other inputs in comparison to conventional agriculture. The use of soil organisms as bioindicators or early warning indicators of changes in soil health throughout the potato rotation can be valuable for the farmer in determining more sustainable management methods.

OBJECTIVES

The aims of this on-farm study are to:

(i) Examine the length of time required for the soil to rebuild its health prior to the inclusion of the potato crop; and

(ii) Evaluate the use of the soil organism, *Folsomia candida,* as a potential standard indicator of soil health.

WHAT WAS DONE?

In July 2006, composite soil samples (n=4) were collected from quadrats (n=4) throughout the phases of 4-5 year forage/grain/potato rotations from four farm sites across Prince Edward Island and New Brunswick. Soil total and available carbon and nitrogen, microbial biomass, light fraction, and bulk density are to be determined on the soil collected. Earthworms were hand-sorted and collected from two 0.75 m^2 quadrants from the phases of the rotation to determine abundance and biomass.

NEXT STEPS

Trials will be set up in 2007 to assess the sensitivity of the soil organism, *Folsomia candida* to changes in key parameters used to determine soil health. Bioindicators are soil organisms that respond to changes in management practices and can be used as early warning indicators of detrimental or improved soil health.

Microcosms will be set up utilizing *Folsomia candida* and soil collected throughout the phases of the potato rotation to assess their survival, growth and reproduction. This will enable us to determine if this organism can act as a bioindicator for soil health, similar to the use of the minimum data set of soil properties.

THE BOTTOM LINE...

Organic agriculture has greater reliance on biological processes to compensate for reduced use of fertilizers and other inputs in comparison to conventional agriculture. Intensive rotations reduce soil biota resulting in decreased soil health.

This research will evaluate the state of soil biological health in Maritime potato fields, and determine if the soil organism *Folsomia candida* can be used as a bioindicator for soil health.

REFERENCE

Pankhurst, C. E., B. M. Doube, and V. V. S. R. Gupta. 1997. Biological indicators of soil quality. Wallingford, New York: CAB International. 421 p.

CREDITS

Karen Nelson (Graduate student, NSAC), Derek Lynch (NSAC), Gilles Boiteau (AAFC Fredericton) and Roxanne Beavers (OACC, ed.)

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Hand-sorting technique used for earthworm sampling (K. Nelson)

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OACC Technicians:
Chris Nelson
Andrea Munroe
Heather Purves

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For more information:
Visit oacc.info or contact us at
P.O. Box 550 Truro, NS B2N 5E3
Tel: (902) 893-7256
Fax: (902) 896-7095
Email: oacc@nsac.ca

Nova Scotia Agricultural College