Irrigated Potato Rotation Research in Manitoba

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Background

Increasing demand for potatoes from Manitoba, mostly from the expanding french fry processing industry, has increased the need for acreages suitable for irrigated potato production. That need can be met by bringing additional land into potato production, and by increasing the frequency of potatoes in rotation with other crops on existing potato land.

The first option is limited by the suitability of soils, the high cost of irrigation equipment, and the availability of water for irrigation. However, increasing the frequency of potatoes in rotation with other crops raises important concerns about soil sustainability, buildup of pests (diseases, insects, weeds), and potential contamination of surface and groundwater by fertilizer and pesticides.

Objective

To determine the effect of crop rotation and rotation length on potato yield and quality, disease incidence, weed ecology, and soil chemical, physical and biological properties.

Implementation

Consultation with producers and industry gave rise to the following potato rotations, ranging in duration from two to four years, and including a combination of oilseed, cereal and legume crops:

potato - canola
potato - wheat
potato - canola - wheat
potato - oat - wheat
potato - wheat - canola - wheat
potato - canola (underseeded to alfalfa) - alfalfa - alfalfa

Each phase of each rotation is included each year of the study for a total of 18 treatments per replicate. In 1997, a 4 ha area was selected on a Wellwood silt loam at the Manitoba Crop Diversification Centre in Carberry, MB and plots arranged in a RCBD.

**Progress**

Uniformity Study (1997)

Barley was established across the entire plot area in 1997. Yield, soil properties (e.g. soil texture, pH, EC, nutrient concentration), and weed populations were measured in each plot to characterize the site.

These data revealed variable soil nitrate-N contents across the site (Fig. 1); therefore, replicates were re-configured prior to establishment of the rotation treatments in order to avoid areas of high nitrate-N in the northeasterly corner of the site, and to account for variable nitrate levels within the site (Fig. 2)

Crop Rotation Study (1998 to present)

This study is ongoing. To date, crop rotation treatments have been in place for two years; rotation treatments were initiated in 1998, and continued in 1999. Each year, plant growth (plant density, biomass and crop yield), weed density, disease levels, and soil chemical, physical and biological properties are monitored.

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Figure 1. Soil nitrate-N content (kg N ha⁻¹ to 60 cm) within the experimental site in 1997.

Figure 2. Configuration of Potato Rotation Study in 1999.