

INCREASING MYCORRHIZAL COLONIZATION WITH INNOCULANTS

Interim Research Report W2007-29

INTRODUCTION

Research in Manitoba and Saskatchewan indicates that phosphorus levels on organic farms are generally deficient to severely deficient, according to conventional soil tests. Phosphorus does not move readily in soils. Plants need to be able to grow to the phosphorus to take it up. One way plants can extend their reach into the soil, and search larger areas, is to partner with mycorrhizae. The use of mycorrhizal inoculants might make nutrients such as P more available from the soil or organic sources. The combined effects of such inoculants are unknown. The goal of this study was to determine if mycorrhizal inputs can increase mycorrhizal colonization of plants.

WHAT WAS DONE

Experimental plots were established on two organic farms near Brandon, Manitoba in 2004 and 2005, with the assistance of AAFC Brandon researchers. The experiment consisted of seven treatments replicated four times each in a completely randomized block design at each site. Each plot was 16 by 300 feet (5 X 91 m) during 2004 and 16 by 100 feet (5 X 30 m) in 2005.

The treatments tested were:

- Control (no amendment)
- Myke[®], a mycorrhizal inoculant
- Rock phosphate
- Myke[®] + rock phosphate
- JumpStart[®] (*Penicillium bilaiae*)
- JumpStart[®] + rock phosphate
- Myke[®], JumpStart[®] + rock phosphate

Soil preparation, seed inoculation and seeding were performed by the two organic farmers (Gerry Wilson and Tom Curtis) at each site. Seeding of flax (cv. Omega Gold) took place June 11th, 2004 at a rate of 50 lbs ac⁻¹ (56 kg ha⁻¹) and May 25th, 2005 at a rate of 45 lbs ac⁻¹ (50 kg

ha⁻¹). Seeding in 2004 was delayed by excessive moisture. Black rock phosphate from Idaho was applied at a rate of 100 lbs ac⁻¹ (112 kg ha⁻¹). Myke[®] Pro PS3, an arbuscular mycorrhizal fungal inoculant for field crops, was acquired from Premier Tech Biotechnologies (Rivière-du-Loup, QC) and it was applied at the rate recommended by the company. JumpStart[®] inoculant (*Penicillium bilaiae*) was provided by Philom Bios (Saskatoon, SK) and it was applied at the recommended rate of 80 g per 150 kg seed.

Flax above-ground biomass and roots were collected twice: once at six weeks after seeding and once at harvest. Root samples were washed and prepared for analysis of mycorrhizal colonization. Root colonization by mycorrhizal analysis was assessed on fixed slides with stained root fragments. Images were captured electronically and analyzed later using image analysis software. Above-ground biomass was weighed fresh and air-dried (60°C) for later nutrient analysis.



Dishes used to culture mycorrhizae from flax roots (B. Frick)

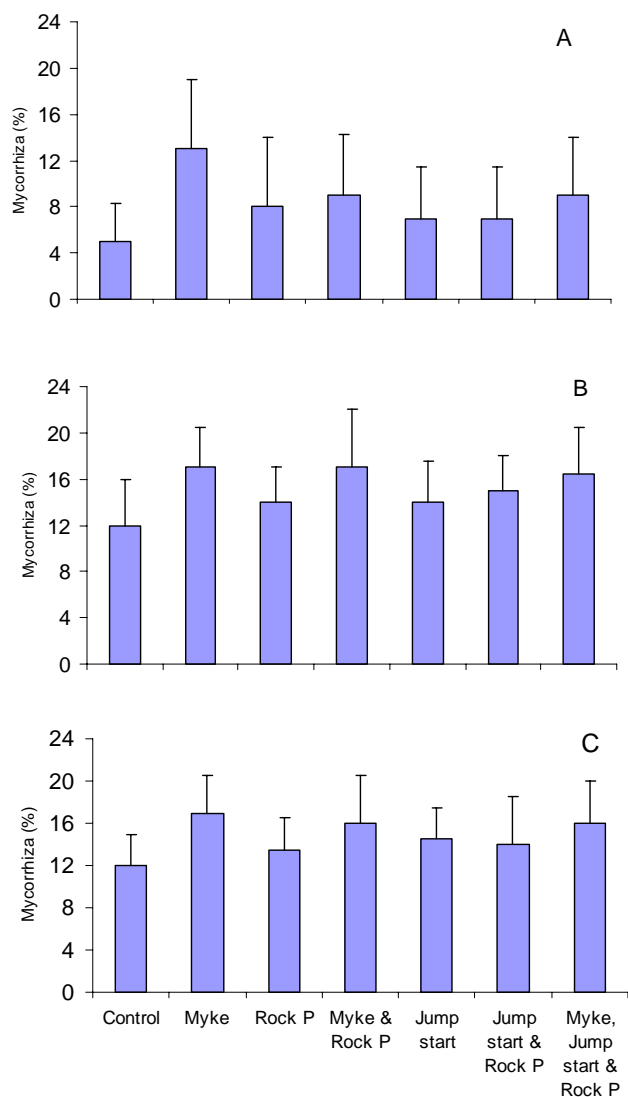


Figure 1. Mycorrhizal colonization (% , +SE) by arbuscular mycorrhizal fungi of flax roots six weeks after seeding at A) Site 1 in 2004, B) Site 1 in 2005, and C) Site 2 in 2005

CREDITS

Gerry Wilson and Tom Curtis (organic farmers, MB), Cindy Grant, Marcia Monreal and Josh Price (AAFC Brandon); Brenda Frick, Ralph Martin (OACC), John Hollinger (Manitoba Agriculture Food and Rural Initiatives) and Roxanne Beavers (OACC, ed.)

WHAT WE SAW

In 2004 at Site 1, mycorrhizal colonization of flax roots at six weeks after seeding was higher for the treatments inoculated with Myke[®], the mycorrhizal inoculant. Flax roots from the control treatment had the lowest mycorrhizal colonization (average 5%). The largest colonization percent was shown in roots when mycorrhizal inoculant was used. Colonization was intermediate when rock phosphate and/or Jumpstart[®] were used. Mycorrhizal colonization was larger in 2005 for all treatments. Average mycorrhizal colonization was 12% at Site 2. Agronomic data and plant nutrient content data remains to be analyzed.

THE BOTTOM LINE...

Preliminary results suggest that the colonization of flax roots by arbuscular mycorrhizal fungi may be positively affected by addition of a commercial mycorrhizal inoculant when compared with a non-inoculated control.

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