Using Mulches to Reduce Tillage in Organic Grain Production in Western Canada.

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Background:
In recent years, efforts have been invested in developing ways to reduce tillage on organic grain farms while maintaining good weed control (Vaisman et al. 2011). There has been a growing interest in trying to adapt the mulch production systems developed in the late 1980s by Brazilian no-till farmers (Bolliger et al. 2006) to Western Canadian organic grain production conditions. The objectives of the project were to determine the ability of different plant species to produce mulch and to measure the rate of decomposition of these various mulches. The ability for weed control of the mulches was also assessed, as well as the agronomic performances of the subsequent crop (spring wheat).

Project Overview:
A 2-year field study was conducted twice at the Carman Research Station in Carman, MB. In year 1 (Y1), the green manures (GM) were seeded in the spring and rolled in mid-summer, at the flowering stage. The GM species tested included barley, hairy vetch, pea, oilseed radish, and sunflower, in pure stand or in mixture. These rolled mulches were then left on the soil surface over the fall and the winter. In year 2, wheat was seeded directly into these mulches (no-till).

Hairy vetch established slowly in the spring (< 4 t ha^{-1} of aboveground biomass in mid-July Y1) compared to other GM species. However, hairy vetch was the only species that was not killed by the crimping action of the roller-crimper, and it kept growing until the end of October. Moreover, GM treatments with hairy vetch had the highest mulch biomass in September Y1 (9-11 t ha^{-1}), and in the spring Y2 (~7 t ha^{-1}).

The effect of GM treatments on weed biomass in the wheat crop in June Y2 was only marginally significant (P = 0.08). Wheat aboveground biomass at harvest was significantly higher in pure hairy vetch and in barley and hairy vetch mixture than in other treatments, in site A in 2011. Weed aboveground biomass at harvest was the lowest in pure hairy vetch and barley and hairy vetch treatments, in site A in 2011. Wheat will be seeded in site B in 2012.

Conclusions:
Continuous no-till in organic farming in Western Canada is definitely a challenge in terms of control of weeds and crop yield, although preliminary results from field experiments in 2010 and 2011 suggest that thick mulches (especially those including hairy vetch) have the ability to suppress weeds in mulch production system in Western Canada, thereby reducing the need for tillage. Concurrent research is monitoring decomposition of various mulches in litterbags for a period of 250 days. Other work considers the long-term agronomic performance of organic mulch production systems (no-till) compared to those of organic tilled systems.

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