



Yellow mustard growing at Canada-Manitoba Crop Diversification Centre (CMCDC) just prior to plow-down as a green manure.

PHOTO COURTESY: OSCAR MOLINA, UNIVERSITY OF MANITOBA.

The compost treatment also received another application in 2008, prior to seeding potatoes.

The green manure crops were seeded in late spring or early summer, and then plowed down later in the year. Mustard crops are allowed to grow to their peak flowering stage, and then either chopped, flailed or rolled before being plowed under. Soil moisture should also be adequate; otherwise the green manure will not work as well. The discing operation is important for incorporating the green manure to a depth of five to 10 centimetres (two to four inches), and providing a second extra chopping of the plant material.

The perennial crops can be harvested and then plowed down in late September. "The Canada milkvetch should be treated the same way," says Tenuta. "Canada milkvetch is very experimental and something unique to the University of Manitoba. We did find it more difficult to get established, and the slow establishment meant more potential weed problems, but by the end of July it was doing well." The researchers are also experimenting with other potential uses of Canada milkvetch, such as an extract that may provide an alternative to seed treatment.

Preliminary results show promise

The potato crop was harvested in late September 2008, but the final grades and yield information are not available to date. "Our preliminary results indicate

we are definitely getting responses from some of the treatments, although they are varied," explains Tenuta. "In some cases, verticillium wilt pathogens are being killed directly, in others the pathogen levels are lowered, but this doesn't necessarily relate to an increase in yield or quality."

The question remains whether or not the overall yield is impacted by the various treatments. "We will be analyzing the results during the fall and winter, as well as continuing the lab work to refine our experiments and to determine what is happening in the field," explains Tenuta. "Some of the treatments that seem to be the most interesting are the mustard green manure and seed meal treatments that definitely knock down the verticillium wilt populations in the soil. The mustards don't eradicate verticillium wilt, but they lower the populations."

Mustard meal also lowers the verticillium wilt populations and more effectively than the mustard green manure treatments. Some of the other green manure treatments, such as alfalfa and Canada milkvetch, did not lower the verticillium wilt pathogen, but the plants were healthier and yields were higher. The compost treatment also showed similar results, with preliminary examination indicating the greatest increase in yield. "Once we have completed our analysis, we expect to have better answers for growers," says Tenuta. "We believe there is the potential for the use of green manures and soil organic amendments in any crop rotation. With higher value crops, there is potentially more leeway to cover added labour or other costs by using green manures and soil organic amendments."

The key for growers before deciding to use green manures or soil organic amendments is to know the diseases and soil conditions to carefully identify what the problem is. "Likely the disease and soil conditions will design the objectives of a green manure or organic amendment application and help determine which of the various approaches and different mechanisms will work the best for that situation." ■

Hit yield potential of irrigated crops

by Helen McMenamin

It also takes high, well-managed inputs, crop management skills and attention to detail.

Hitting the full yield potential of irrigated crops means getting a lot of things right.

Ross McKenzie, research agronomist with Alberta Agriculture, along with soil and water scientist, Shelley Woods, have been running a major research project on 11 crops at four sites in Alberta for the last three years. He will collect more data in 2009, the final year of the study. He is looking at seeding dates and rates, nitrogen use efficiency and crop water use efficiency.

Once the project is complete, McKenzie will have a huge amount of data even though not all crops or comparisons are grown at every site. When analyzed, he will have much more confidence in cropping recommendations than is possible at present. "We're developing nitrogen response curves that will allow us to update our recommendations from research done in the 1980s," he says. "Those response curves are outdated, for soft wheat, for example, top yields then were 110 bushels. Now we get 160 bushels, sometimes 200."

Fundamentals always apply

Already, McKenzie has come to some strong conclusions. Variety selection, he says, is the first and most important decision of the cropping year. He advises choosing the variety with a very high yield potential, but making sure it has good disease resistance and lodging resistance. "In the high-moisture environment of an irrigated crop, good

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disease resistance is essential," he says. "And, you want good standability."

Having chosen a variety, use good quality certified or close to certified seed with a seed treatment. "You need high germination, high vigour seeds to achieve the high plant populations you need," says McKenzie. "It must be plump, which generally means higher vigour, and it must be relatively free of weeds."

McKenzie advises seeding early at a relatively high rate. That allows a grower to take advantage of the optimal moisture conditions created under irrigation. Most crops should be in by May 1 if possible. Corn and beans are the exceptions, as they need warm soil and are more susceptible to frost injury. "Variety, early seeding and a high seeding rate are all critical," he says.

Nutrient management, particularly of N and P, is also important. McKenzie advises soil testing every field every year and taking soil cores down to 24 inches, preferably in zero to six, six to 12, and 12 to 24 inch increments. Except for pulses, McKenzie advises applying fertilizer to bring soil plus fertilizer N to at least 180 pounds for most cereal and oilseed crops. This is only a general rule: he says

using nitrogen fertilizer response curves along with N fertilizer price and crop value is the best approach. If the value of the crop justifies it, 200 pounds of N may be better.

Apply fertilizer either just before seeding the crop, or band in late fall. Fall banding is often the best as it allows earlier seeding in the spring into the better moisture conditions of undisturbed soil.

McKenzie recommends applying fertilizer P with the seed if soil test P levels are below 50 lbs per acre. If soil test P is greater than 60 or 70 pounds, a grower can cut back or eliminate P fertilizer, depending on its cost.

Sandy soils may need potash, but most loam or clay soils have adequate K. Sulphur is almost never required on irrigated soils because irrigation water that comes from mountain sources contains sulphate-S. As a rule of thumb, McKenzie says, 12 inches of irrigation water contains about 30 pounds of sulphate-S, which is more than sufficient for high-yielding irrigated crops including canola.

Weed control must be excellent if the crop is to reach its yield potential. Early

removal of weeds is critical. "The longer you leave weeds, the greater the yield reduction," says McKenzie.

In-season scouting key, as well

Once the crop is growing, growers should scout diligently. They need to walk through all their crops every week. Watch for signs of insects and diseases specific to each crop, and be ready to treat for any problem as soon as the disease or insect population reaches the threshold level. Most diseases thrive in the dense plant populations and high-moisture environment of productive irrigated crops. Fungicide may be needed to keep disease in check.

Water management is another big issue for irrigated crops particularly as energy costs have risen so much, says McKenzie. Pivots are a great advantage, allowing relatively light frequent water applications that enhance yields.

As a general rule, maintaining soil moisture in the top 50 centimetres (20 inches) of soil at 60 to 90 percent of field capacity all through the growing season gives the best yields. Allowing the soil moisture to be depleted below 50 percent of field capacity, even for a few days, can reduce yields. To maintain soil moisture at adequate levels means monitoring to at least the two-foot depth once or twice a week through the growing season.

Water management and several diseases can interact, particularly at flowering. For example, fusarium invades at flowering under even brief high-moisture conditions. Manage irrigation to avoid applying water during flowering for affected crops.

Some water management schedules are being developed to save water and reduce pumping costs, but they have to be developed for the specific crop. For example, Alan Efetha, Alberta Agriculture irrigation specialist, has found beans thrive on frequent light irrigation to keep the top 30 centimetres (12 inches) moist until flowering, followed by heavier, less frequent water applications to keep the top 60 centimetres (24 inches) moist from flowering on. That allows maximum vegetative growth, but reduces disease incidence after flowering. ■



Research is renewing old irrigated fertility recommendations.

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