A recipe for weed-free fields

Researcher looks at herbicide cocktail to weed-out resistance

Ridding farmers of troublesome herbicide-resistant weeds — some of which have acquired resistance to more than one herbicide group — may require a new herbicide cocktail, says Prof. François Tardif, Department of Plant Agriculture. Using basic statistics and common sense, he's cooking up a recipe to combat these "superweeds".

"Farmers have traditionally relied on crop rotation and conventional tillage to decrease potentially resistant weed populations," he says. "But with the introduction of environmentally friendly no-till systems, farmers can no longer count on plowing to kill weeds."

Specifically, Tardif is working on mixtures based on three herbicides with different modes of action leaving an extremely slim chance that any weed would survive. He's working with a recipe containing one-third of each recommended dose — ensuring the crop doesn't suffer chemical burns, while keeping the costs of herbicide treatment economical for farmers.

Plant scientist François Tardif is working on a herbicide cocktail to kill resistant weeds while leaving crops unaffected.

The complicating factor, he says, is finding three complementary herbicides that protect crops while controlling the same weed species.

"The perfect herbicide cocktail," says Tardif, "may comprise products developed by different companies — which will require agreement among manufacturers."

He also notes that federal regulatory bodies must study the environmental and human health and safety aspects of herbicide mixing before any of this research hits farmers' fields.

Seeding technique boosts wheat yields

Wheat researchers are pushing the climate envelope to its very edge. Profs. Duane Falk and Bill Deen, Department of Plant Agriculture, are investigating a technique called frost seeding, where seeds are planted into partly frozen ground — rather than waiting for it to thaw — to give them a head start on the growing season.

"Ultra-early seeding is what frost seeding is all about," says Falk. "We're extending the front end of the growing season to increase yield."

Normally, cereal growers plant winter wheat in the fall, or spring wheat in late April, or May. But there are concerns about both approaches — winter wheat can be risky because sub-zero temperatures are hard on the crop. And spring wheat isn't always an appealing option either: yields are up to 40 per cent lower than winter wheat, because germination and maturity take so much longer. Ground thawing and predictably wet fields in the spring are unable to support heavy farm equipment, delaying planting.

Frost seeding could be a happy medium. Using this technique, producers plant seeds in March or early April before thawing. By June, plant leaves are larger and more plentiful, so the plants can capitalize on the sunlight of looming summer days.

Falk and Deen hope frost seeding can produce yields 10- to 15 per cent higher than normal spring wheat — and help producers earn an extra $25 (CDN) per acre.

There's one caveat, though. Soil conditions must be just right for frost seeding to work — neither too warm and soft, nor too cold and hard.

Falk and Deen are now looking at frost seeding of barley and oats, as well, and different soils (sand, loam and clay). Their initial findings show that the technique works best for wheat and has benefits in almost any soil type. They also noted improved competitiveness against weeds.

Falk and Deen collaborated with Peter Johnson of the Ontario Ministry of Agriculture and Food. This research is sponsored by the Ontario Wheat Producers' Marketing Board.

Guelph's diverse research approach meet

Leave small pigs with birth sow… and give them extra attention

Low birth-weight piglets (those under 1 kilogram) end up having low weaning weights too, and do poorly post-weaning. That's why many producers "cross-foster," grouping similar-sized pigs into a common litter. But in a new study, Prof. Cate Dewey of the Department of Population Medicine found that small pigs in litters with various-sized pigs grew as well as those in litters with only small pigs. However, her results also showed that low birth-weight pigs receiving maximum care — three sow feedings per day, sleeping mats, electrolyte supplements and processing equipment cleaning — had significantly increased weight gain and double the survival rate.

Province sets acceptable levels for feedlot snow

Winter-applying feedlot snow — the mixture of snow, bedding and manure from beef feedlots — to crop land now has clear guidelines under the province's Nutrient Management Act (NMA), as a result of research by beef cattle nutritionist Christoph Wand. Under the new regulations, feedlot snow must contain no more than 16 per cent dry matter and must be applied on a relatively flat field. Otherwise, the feedlot snow will be considered manure, which means producers must store it until application conditions permit.

A pasture menu tailored for beef cattle

When it comes to orchardgrass, grazing beef cattle appear to prefer shorter, lower-yielding varieties, says Prof. Ann Clark of the Department of Plant Agriculture. In tests with four nutritionally similar varieties at three nitrogen fertilizer levels, cattle showed a subtle but clear preference for AC Splendor as compared to the Kay, Okay, or Jay. While this partiality didn't vary with nitrogen levels, the scientists believe taste, smell or leaf texture could play a role. They suggest varieties such as AC Splendor be incorporated into pastures to encourage intake and weight gain in growing animals.

The great nutrient escape

Manure applied on fields can allow nitrogen, phosphorus and bacteria — such as harmful *E. coli* — to enter the groundwater. To reduce these losses, Prof. John Lauzon of the Department of Land Resource Science is taking a new look at how rainwater carries nutrients through soil, in hopes of determining the best manure application methods. By regularly collecting and measuring groundwater and surface water, he'll be able to compare spring manure application — believed to result in fewer nutrient losses — to variations in fall application, with and without tillage, over the next year. Lauzon says understanding the various nutrient transport methods through soil will help develop management strategies to reduce nutrient losses.

Sowing the seeds for better hemp

Versatile hemp oil, which contains high essential fatty acid (EFA) levels, has been used in disparate products such as moisturizers, cosmetics and nutraceuticals. And with recent studies showing increased dietary EFA intake promotes cardiovascular health, hemp oil is poised to grab a large share of the functional foods market, with its growing number of health-conscious consumers. That's where Peter Dragla of Ridgetown College comes in: he's selectively breeding hemp plants that will produce larger seeds — many twice the size

ts the needs of producers and consumers

Left: Piglets under a heat lamp.
Above: Working amid a hemp research plot.
Top right: Beef cattle in a winter feedlot.
Lower right: A dairy freestall in Eastern Ontario.

of previous cultivars — that contain more oil to meet growing demand. Dragla has been selecting and breeding hemp plants to meet industry needs since 1998, producing varieties with lower tetrahydrocannabinol (THC) levels, and cold tolerance for Canada's short growing season.

Electronic "nose" sniffs out hog farm odours

Sniffing out the exact causes of offensive farm odours is a tough assignment for even the most discerning noses. For example, hog manure can consist of more than 200 chemical compounds, whose concentrations vary depending on factors such as management practices and environmental conditions. Now U of G Profs. Simon Yang, School of Engineering and Roger Hacker, Department of Animal and Poultry Science are teaming up to develop a robotic "nose" — consisting of chemical gas sensors controlled by computer software — that can quickly and economically determine the odour intensity (the perceived strength of an odour above its detection threshold) of hog farm smells, based on concentrations of key compounds responsible for the odours. This electronic nose will help producers identify the sources of odour, say the scientists, which is the first step towards reducing these smells.

Health and hormones may be linked in birds

Hormones and bird health could be more closely related than poultry producers realize, says University of Guelph animal scientist Gregoy Bédécarrats, and that could change the face of bird breeding. Traditional breeding strategies focus on higher egg production — which tends to select against prolactin, the hormone that stops egg-laying. But the scientist believes prolactin in poultry may increase the production of lymphocytes, the white blood cells that produce disease-fighting antibodies and attack invading cells, boosting the bird's immune system. If prolactin is shown to strengthen animal health, that could shift poultry breeders towards new breeding programs that include prolactin, because healthier birds could save producers more money than prolonged egg-laying periods.

The cost of a helping robotic hand

Researcher finds high-tech systems save some farmers time, money

Robotic hands could be a viable alternative to human hands for dairy producers wanting to save time milking. That's the word from a Kemptville College researcher, who has found robots save 2.26 minutes per cow per day and reduce farm labour costs.

Prof. Jim Fisher has been studying the economics behind parlour and robotic milking systems. Depending on the individual farm operation, he says, the time-saving milking robots could provide a financial benefit to some producers.

"Ultimately, producers want to save time milking and have a more flexible lifestyle," says Fisher. "Robots and parlours have advantages that need to be carefully weighed."

In his study, Fisher and his research group paired 22 robotic farms with similar parlour-based operations based on characteristics such as number of cows milking, manure system, feeding methods, housing set-up and geographic location. This comparison meant the major difference between paired farms was the milking system. The researchers milk- and water-tested each farm, observed typical labour activities, surveyed producers and calculated economic values of milking equipment costs and maintenance.

Milking robots save 2.26 minutes per cow per day, reducing farm labour costs.

They identified a 2.26-minute reduction in milking labour time per cow using robots. Along with factors such as number of cows milking, wage paid to labourers, robot and parlour purchase value, operational efficiency and service and repair costs, they used this time reduction to calculate the "lifestyle cost"— that is, the additional dollar amount a producer spends, or saves — of owning a robot compared to a parlour system.

The study showed the lifestyle cost for a single robot handling a 60-cow herd could range from $5,400 (where labour costs $7 per hour) to -$2,000 (where labour is $16 per hour). This means producers who pay higher wages could have a cost savings of up to $2,000 each year, and justify having a robot replacing a human milker — usually the farm owner — with a robot. That gives owners more time to spend with family and look after other herd management practices.

For multiple robot farms, however, the lifestyle cost was significantly higher, ranging from $27,000 to $12,000 for wage rates of $7 to $16 per hour, respectively. With these high lifestyle costs, Fisher says a producer could save more by installing a parlour and hiring the extra labour needed. In cases like this, he says, the real question becomes personal preference: one producer may feel the lifestyle cost for two robots is reasonable, while for another producer, it may be too high.

Kemptville College graduate student Angie Willoughby collaborated in collecting the on-farm data for this study.

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