CASE STUDIES

POTATOES

Growing potatoes in Ontario in the 1990s has been especially challenging, due to extreme pest pressure and a lack of new pesticides. Here's how the industry in Alliston has responded.

Potatoes are grown on sandy loam soil in three areas of the province – Essex-Kent, Alliston and Shelburne. In the Alliston area, roughly 6,000 hectares are grown mainly for the processing market. It is a concentrated area with minimal crop rotation and intensive pesticide use. Growers have invested heavily in specialized equipment and storage. Crop rotation is practised, but often the rotated fields are right beside non-rotated fields.

PEST COMPLEX

INSECTS	DISEASES	WEEDS
Colorado potato beetle	Late blight	Pigweed
Aphids	Early blight	Nutsedge
Leafhoppers	Verticillium wilt	Horsetail
Wireworms	Bacterial ring rot	Barnyard grass
Tarnished plant bug	Scab	
Flea beetles	Blackleg	
	Seed piece decay	
	Fusarium dry rot	
	PVYN	
	Rhizoctonia	

IPM PRACTICES

Monitoring

- ▸ 90 percent of hectares is scouted in the Shelburne and Alliston areas
- ▸ 1 scout can look at 200 hectares
- ▸ cost is about $5 per hectare

Sanitation – used to reduce disease incidence

- ▸ late blight: destruction of cull piles, roguing volunteer plants
- ▸ verticillium: burning of vines after top killing
- ▸ ring rot: disinfection of planters, cutters, graders and diggers

Crop rotation

- ▸ used by 85 percent of growers, but since most of area is in potatoes, there is significant pest pressure

CASE STUDIES

Resistance management
- ▸ Colorado potato beetle is the major potato production problem due to insecticide resistance
- ▸ regular scouting leads to well-timed insecticide applications that control small larvae
- ▸ dip tests done before insecticide treatments determine which insecticides are likely to be most effective
- ▸ rotate chemical families

Models
- ▸ Blytcast is used as a predictive model to help growers deal with all of the major potato diseases

Biotechnology
- ▸ potato plants with the transgenic gene for the B.t. toxin are being tested in Canada
- ▸ these plants will be resistant to Colorado potato beetle because they carry the insecticide gene and manufacture their own B.t., which is toxic to various stages of the pest

BARRIERS TO IPM

- ▸ limited potential for rotation because:
  - ▷ farms are highly specialized – most of entire region is potatoes
  - ▷ the crop is best adapted to a narrow range of soils
  - ▷ at least three kilometres are required for effective Colorado potato beetle control by rotation, but farms are fairly small
- ▸ few new pesticides
- ▸ few resistant cultivars

APPLES

Apples have an extensive pest complex, and are one of the first crops in Canada for which IPM programs were developed. Nova Scotia growers have been practising IPM since the 1950s; since the 1980s, all apple-growing areas in Canada have had IPM programs.

Ontario's orchards are concentrated in several regions close to the Great Lakes. Pest biology and threshold levels have been well-documented, and provincial coverage has been relatively easy, even with regional differences in the pest complex.

Nonetheless, the pest complex is constantly changing as the industry evolves to high-density systems with many new cultivars. In the 1970s, apple maggot, codling moth, plum curculio, mites and scab were the main pests and growers sprayed weekly. In the 1980s, orchards were monitored and sprayed only every three weeks for major pests.

Some of the pests live in the orchard; others come in from abandoned or wild trees.

CASE STUDIES

PEST COMPLEX

INSECTS	DISEASES	MITES
Apple maggot	Apple scab	Apple rust mite
Codling moth	Fireblight	2-spotted mite
Plum curculio	Powdery mildew	European red mite
White apple leafhopper	Rusts	
Woolly apple aphid	Blister spot	
Green apple aphid		
Tentiform leaf miner		
Mullein bug		
Oblique-banded leafroller		

IPM PRACTICES

Cultural

- ▸ nutrition of trees is carefully monitored through leaf analysis to avoid excessive growth and related pest problems (woolly apple aphid and green apple aphid)
- ▸ trees are pruned twice annually to maintain open, easy-to-spray trees, resulting in fewer insect and disease problems
  - ▷ prunings are removed from the orchard to reduce disease
- ▸ apples are picked up from the ground in autumn to remove pest pressure; wild trees growing in close proximity are removed because they can be pest reservoirs
- ▸ scab-resistant cultivars can be grown to lower the need for fungicides

Models

- ▸ used to predict the timing of sprays for some of the major pests
- ▸ degree days and pheromone trap catches are used for insects
- ▸ action thresholds are used to determine when controls are needed
- ▸ scab predictor machine measures leaf wetness and temperature, and indicates whether a scab infection period has occurred

Scouting

- ▸ hundreds of hectares are scouted weekly in all of the major apple-growing areas
- ▸ leaf and fruit sampling is used, as well as tapping trays, pheromone traps and sticky traps
- ▸ controls are based on findings and action thresholds

CASE STUDIES

Pesticides

- ▸ selection is based in part on whether these are benign to beneficial insects
- ▸ resistance management is practised by alternating pesticide families and avoiding multiple applications through better timing

Biological control

- ▸ predatory mite *A. fallacis* is purchased and seeded into an orchard block to help control pest mites
- ▸ in British Columbia, sterile male codling moths have been released

Disruptive pheromone technique

- ▸ synthetic female moth scent is released from pheromone dispensers, making it very difficult for males to find a potential mate

BARRIERS TO FURTHER REDUCTIONS IN PESTICIDES

Dependence on fungicides will continue until a disease-resistant variety that is acceptable to consumers is developed. Also, many existing pesticides don't work well in an IPM program – Canada lags behind the United States by five years, and 15 years behind Europe in pesticide availability. Organic production is not yet supported by the marketplace.

TURFGRASS

Most lawn care companies serve urban customers who want a perfect lawn. At the same time, an increasing number of customers would prefer to reduce pesticide use on their lawns. Currently there are no independent companies that monitor for pests.

Here are treatments typically provided by lawn care companies:

- ▸ fertilizer treatments – (2) spring and late summer
- ▸ herbicides – (1) pre-emergence for crabgrass; (2) applications for broadleaf weeds
- ▸ insecticides – (1) midsummer for chinch bugs
- ▸ cultural practices – core aeration and overseeding.

PEST COMPLEX

INSECTS	DISEASES	WEEDS
Hairy chinch bug	Necrotic ring spot	Dandelion
White grub	Dollar spot	Plantain
Japanese beetle	Rusts	Other grass

CASE STUDIES

IPM PRACTICES

Many IPM principles are new to this industry. However, some companies may be trying some of them.

Nutrition

- ▸ healthy, dense lawns promoted through fertilization and raised mowing height can compete better with weeds

Spot spraying

- ▸ spot treatments of herbicides can replace treatment of the entire lawn
  - ▷ post-emergent crabgrass control allows for spot treatment

Monitoring

- ▸ methods are available for hairy chinch bug and European chafer grubs

Timing sprays

- ▸ plant growth stages can be used to time sprays for some turf pests

Resistant varieties

- ▸ these are resistant to disease and insects, and should be planted
- ▸ varieties are available for different growing conditions (shade, sun, drought)

GREENHOUSE CUCUMBERS

An increasing number of vegetable greenhouses in British Columbia and Ontario are using IPM. Current IPM programs use chemical and biological controls, as well as cultural practices.

The average greenhouse in Ontario is 1.5 hectares. There are approximately 70 hectares in greenhouses in the province. Biocontrol is practised on 28 percent of the area, and 25 percent is monitored. Growers usually plant a spring crop (late December or early January) and a fall crop (July to August).

Growers tend to be well-organized, informed and geographically concentrated, making IPM delivery relatively easy.

CASE STUDIES

PEST COMPLEX

INSECTS	DISEASES	MITES
Western flower thrips Fungus gnats Cotton aphids Greenhouse whitefly Sweet potato whitefly *(also known as silverleaf whitefly)* Cucumber beetle Lepidopteran species	Virus complex Gummy stem blight Root rots Powdery mildew	2-spotted spider mite

IPM PRACTICES

Sanitation

- very important IPM practice – heat is used at end of spring crop; greenhouses are closed for seven days and heated to 54-60° C to kill pests; weeds are removed from inside and outside
- weeds can be a year-round important source of mites and insects
- insect screens are used to keep out pests
- steam sterilization is used to reduce the carryover of thrips, mites and diseases in the growth media

Monitoring

- yellow and blue sticky boards are used to detect populations of whitefly, thrips and fungus gnats
- trap monitoring will detect the pests before they are noticed on the plants
- direct observation of foliage is also used to detect pests such as mites and aphids

Biological control

- use of predators and parasites to control major pests has been successful
- greenhouses are conducive to biocontrol because they are enclosed and environmental conditions are controlled
- predators are introduced to the crop as soon as the pest is detected
  - predator release rates aren't exact, and are customized for each situation depending on the pest, the biocontrol agent and the region

BARRIERS TO IPM

The quality of biological control agents needs further improvement. Also, growers need education in handling the living pest control agents. Finally, there is no registration protocol in place for biological control agents.

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Contact your local ministry office. See the blue pages of your telephone directory for the office nearest you.

References

The following publications are available through the Ontario Ministry of Agriculture, Food and Rural Affairs:

Integrated Pest Management for Onions, Carrots, Celery and Lettuce in Ontario, 1993

Integrated Pest Management for Apple Orchards in Ontario, 1990

Fruit Production Recommendations, Publication 360

Vegetable Production Recommendations, Publication 363

Field Crop Recommendations, Publication 296

Insect and Disease Control in the Home Garden, Publication 64

Guide to Weed Control, Publication 75.

Numerous factsheets that address specific pest biology, controls and integrated pest management strategies are also available. These factsheets are crop- and pest-specific.

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