Integrated Pest Management

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What is Integrated Pest Management?

Integrated pest management (IPM) is an approach to managing pests in an effective, economical, and environmentally conscious manner. It combines cultural, physical, biological, and chemical tools to prevent, manage, and control pests throughout the entire cropping cycle (Fig. 1). A pest is any organism that is harmful to humans or human interests. They include weeds, insects and other invertebrates, bacteria, fungi, viruses, and in some cases vertebrates, such as mice in a grain elevator.

The steps to creating and using an IPM program are:

1. Prevention and Planning
2. Monitoring
3. Decision Making
4. Implementation
5. Monitoring and Evaluation

The goal of IPM is not to eliminate the use of pesticides. By implementing an IPM program, you provide effective crop protection while reducing human and environmental health risks associated with the use of pest control products. By using all available information, tools, and practices available, you may see: improved yields, longer lasting pest control solutions, a delay in the onset of pest resistance to pesticides, an overall reduction in crop input and time spent spraying, and an increase in pollinators and beneficial insects.

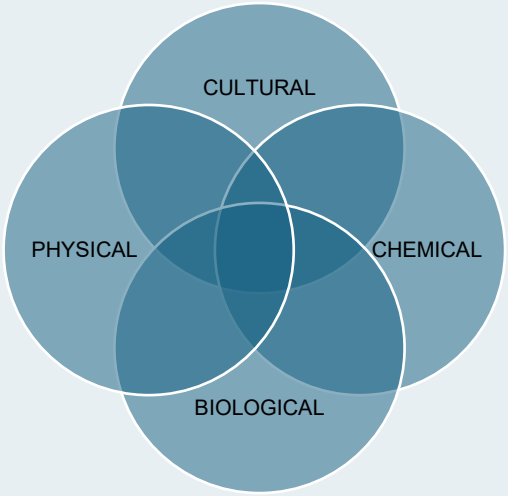

Fig. 1 Components of integrated pest management

Prevention and Planning

In the first step of implementing an IPM plan, you should become familiar with susceptible stages of your crop, the pests associated with your crop, and potential pest control options. Recognize beneficial insects, reflect on past seasons, and consider cultural controls. **Cultural controls** are methods that prevent the pests from becoming established or causing damage and should be considered through the entire cropping cycle.

Monitoring Methods:

Visual – walk the crop to look for crop damage from pests, weedy sections, disease incidence, and insect pests such as aphids and mites.

Sweep nets – sweep the crop canopy to catch highly mobile pests such as leaf hoppers or flea beetles.

Traps – use traps for early detection of a pest, or to find adults when larvae or eggs are difficult to find such as spotted wing drosophila.

Forecasting – use growing degree day models, weather stations, or spore monitoring systems to predict pest emergence or infectivity periods.

Sample collection – collect disease samples, or hard to identify pests to be identified by a professional. In PEI, weed, insect and disease samples can be dropped off at the PEI Analytical Laboratories for identification.

Examples of **cultural controls** include selecting sites that have low pest pressure, choosing resistant cultivars, extending crop rotations or choosing rotational crops to break up pest life cycles, cleaning equipment between farms or fields to prevent moving pests, choosing seeding rates or row spacings to be competitive with weeds, and using precision fertilizer applications to feed the crop and not the weeds.

Monitoring

Crop scouting, or field monitoring, is an important part of making data-based decisions for pest management. To manage a pest, you will need to identify the pest to know which management approaches will be effective. For example, most fungicides are ineffective against a bacterial disease such as fire blight (*Erwinia amylovora*).

Understanding pest life cycles will help you understand how and when to monitor the crop. Each pest has a different life cycle, will thrive in different conditions, attack different plant parts, and cause different types of damage at different development stages. For example, aphids have an incomplete life cycle where all life stages look similar, and can all be found in the same location on the plant. Pests like spotted wing drosophila (*Drosophila suzukii*) have complete life cycles where life stages look different and are found in different places. Use traps to monitor the adults as they move around laying eggs and examine fruit to find the larvae.

Ensure the information that you collect while scouting is **measurable** so you can compare pest levels between scouting days or from year to year. Examples of ways to measure pest levels could be: recording the average number of caterpillars per plant, the number of plants infected with a disease, or the approximate size of an area with weeds present. **Record** the date, time, weather, and crop stage as well. Drawings of field maps can be helpful to monitor the size and location of pest outbreaks.

Decision Making

The goal of pest management is not to completely eradicate the target pest. Pest management should occur at critical periods, action thresholds, or when a disease is forecasted, depending on the nature of the pest. Tools that can be used to make data-based decisions include: weather monitoring and forecasting, pest modelling, knowing critical or susceptible crop stages, crop scouting, or spore trapping.

Pests should be controlled after they surpass the action threshold, but before they reach the economic injury level. **Action thresholds** can be determined through local research or field observations for each pest. The action threshold is the pest density at which management action should be taken so the pest doesn't reach the **economic injury level** (Fig. 2). Once pest levels pass the economic injury level, the value of the yield loss is higher than the cost of the management strategy. When pest levels are below the action threshold, the solution is more expensive than the economic loss expected by pest damage.

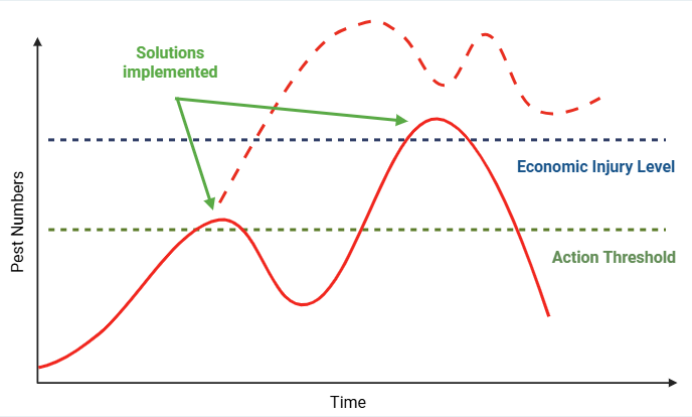

Fig. 2 Example of pest numbers over time, showing economic injury levels and action thresholds

Implementation

Continue using **cultural**, **physical**, and **biological** tools along with chemical controls to manage pests. **Physical controls** use barriers or physical means to exclude or remove pests and diseases. Physical controls that can be used at this stage include installing insect netting, cultivating for weed removal, or roguing (i.e., removing) affected plants or plant parts. **Biological controls** involve the use of live organisms or biological processes to manage pests. Examples of biological controls include releasing sterile insects, releasing beneficial insects or nematodes, using mating disrupters, or applying biopesticides.

Apply pesticides only when necessary, and according to pest monitoring or action thresholds. When using chemical controls, choose low-risk products when possible to protect pollinators and the environment. **Always read the product label; it is a requirement by law.** Please visit the Health Canada Pesticide Label Search for the most up to date labels: https://pr-rp.hc-sc.gc.ca/ls-re/index-eng.php.

Rotate between pesticide products with different modes of action, (i.e., pesticide group), to reduce the chance of developing **pesticide resistance**. Pesticide resistance occurs when pests become less susceptible to pesticide control products that once controlled them. Other ways to prevent pesticide resistance include tank mixing more than one pesticide group, following label rates and number of applications, incorporating refugees (untreated plants), rotating between chemical and non-chemical controls, and crop rotation.

Monitoring and Evaluation

At this stage pf your IPM plan, you are assessing how well your control methods worked. Continue to scout for pests, monitor weather conditions, and troubleshoot for equipment calibration or **resistance development**. Use the data that you've collected to plan for the entire cropping cycle, thinking about incorporating new cultural control methods, forecasting pest problems, and adjusting action thresholds.

If you notice a decline in control when using pesticides, ensure that the correct rate was mixed, the equipment is properly calibrated, and the product was properly distributed. Ask yourself: are there live and dead organisms following the application? Did this same rate previously control the pest? Has the same mode of action been repeatedly used? If you suspect pesticide resistance, contact local government extension specialists to find out more about having suspected resistant pests tested by a qualified laboratory.

Multiple provincial funding streams can help support the purchase and implementation of integrated pest management tools. To learn more about IPM and the provincial support provided, see the remaining IPM series factsheets or contact Shauna Barry (Agri-Environmental Specialist) at slbarry@gov.pe.ca or (902) 314-0388.