**Multiple approaches benefit pest management**

By Meryl Rygg McKenna

Integrated Pest Management (IPM) is a multi-tool kit for handling troublesome invasions in crops, gardens or rangeland. IPM methods respond to the particular pest in question, its life cycle and the ways it interacts with its environment, rather than eliminating all insects or plants.

*Integrated*: various methods are used in combination for the most effective, most economical and least harmful results.

*Pest*: weeds, insects, fungi, bacteria – any problematic intruder.

*Management* is not always eradication. Noxious weeds or insect infestations can take over field upon field if left unchecked. Managing infestations can mean containing or weakening them so they cannot spread, if elimination is not viable.

The emphasis in IPM is on using methods that are less hazardous but still effective. A pyramid shape represents the order of preferred control methods, with the lowest, largest portion of the pyramid being prevention. Higher and smaller on the pyramid are cultural or sanitation methods, physical or mechanical removal and biological control. Chemical controls form the smallest part of the pyramid because of their potential to harm non-target plants or organisms or promote resistance, and because their benefits are generally short-term.

**Prevention**

Prevention of pest invasions is the first and often least costly option.

Applying weed-free seed and cleaning farm equipment after use in an infested field are two ways to prevent weed infestations. Removing weeds before they set seed or collecting their seeds in chaff wagons pulled behind the combine can also help.

A good example for pest and disease prevention addresses the Wheat Streak Mosaic Virus (WSMV). Jeff Farkell, Certified Crop Adviser based in Pondera County, Mont., pointed out that the disease is carried by the wheat curl mite, which lives in grasses, grassy weeds and volunteer small grains. Volunteer grain plants growing from hail-damaged small grain heads or from harvest create a "green bridge" where the mites can survive until a new grain crop emerges. The mites then move into the new crop, dispersed by wind. There is no direct control for the mites or the virus. Volunteer grain should be destroyed two weeks before the new crop emerges – enough time for the mites to die or move elsewhere. See the MontGuide called "Cereal Viruses of Importance in Montana," publication MT200911AG, available at no cost online at msuextension.org.

**Cultural controls**

Cultural practices include maintaining healthy soil for the strongest possible plants. A healthy crop, planted with appropriate density and row width, has a competitive advantage over weeds.

Where irrigation is possible, proper watering is also a cultural control. Keep soil compaction to a minimum because weeds can thrive where other plants will not grow.

Cultural controls could also include choosing solid-stem wheat varieties to decrease stem cutting by the wheat stem sawfly, or using "Egan," a new variety of spring wheat that is resistant to the wheat midge, recently released for northwestern Montana.

**Mechanical/Physical controls**

Tilling weeds or mowing to prevent them from going to seed fall into this category. Care must be taken to know the habits of each weed; breaking up the roots in some cases results in a new plant for each strand of broken root.

**Biological controls**

Whether pests are mobile or rooted, their natural enemies are the focus of biological control in IPM systems. Predators, parasites, pathogens and competitors can all help to control infestations. The small beetles *Aphthona lacertosa* and *A. nigriscutis* have become major players in the biological control of leafy spurge over the past 20 years. Bertha armyworms can decimate a canola crop, but particular species of wasp, fly and virus are control agents being used against them.

Biological controls are not a quick fix, but they can make a big difference over several years' time.

Sheep and goats offer biological control of many forbs and bushy plants. They can help between fields or in pastures, limiting the spread of weeds to nearby cropland.

The release of parasitoids (parasites with deadly results) to help manage wheat stem sawfly and wheat midge are two good examples of biological insect control. However, it is important to know their life cycles and habits.

Based on observation, MSU professor David Weaver recommends swathing wheat such that at least one-third of the standing crop height remains, to preserve the second generation of parasitoids that feed on sawflies in the stems. Swathing height does not matter for wheat midge because the parasitoid action takes place on the grain heads.

**Chemical controls**

Chemical-based pesticides are used in IPM systems in combination with other means, and only when necessary. Pesticides are used selectively so as to minimize any harm to people, animals and other essential organisms, as well as air, soil and water.

Proper timing is essential when chemicals are used. In the case of the wheat midge, there is a very narrow window for insecticide application to control the midge and not kill the parasitic wasp *Macroglenes penetrans* that feeds on the midge larva. The parasitic wasp emerges a few days after the peak emergence of the midge.

Spraying can be costly and proper training in the use of chemical pesticides is important. There are now "precision weed applicators" that can spray anything green in a fallow field, possibly saving 70 percent of herbicide costs.

Where possible, spot-spray small weed colonies before they spread. Post-emergent herbicides work best when applied to young, immature plants.

Farkell noted that herbicide resistance is becoming a real issue on a number of weeds, adding to the need for multiple control methods.

**What is best?**

It is good to discuss IPM goals and options with someone experienced in various methods, to bank on what others have learned. Some methods do well alone; others work even better in combination. The location and severity of infestation will help to determine what methods to pursue.

Often, economics drive management decisions. For example, in the Great Plains and Intermountain regions of the U.S., sheep and goats are employed where chemical, physical or cultural means would be too costly.

An IPM plan for the wheat stem sawfly might include:

- Cultural controls: swathing before sawflies can cut through the stems; using a stripper/header; delayed planting; or crop rotation.
- Biological controls: Parasitic wasps have cut sawfly populations by as much as 80 percent in some studies.
- Chemical controls: So far, insecticides have been ineffective against sawflies. Although a systemic insecticide to control the feeding larva is in current trials, it must be incorporated into the soil prior to the beginning of sawfly flight in the spring.

Take weed control as another example of integrating several types of management methods. Instead of relying solely on herbicides and tillage (with their short-term results), growers can combine methods such as seeding rate adjustment, directed nutrient placement and crop rotation. See Integrated Strategies for Managing Agricultural Weeds, Montana State University Extension's MontGuide MT200601AG.

IPM-related MontGuides are available through Montana State University's Extension Service, http://store.msuextension.org/ or through your local Extension Agent. Certified Crop Advisers are trained and educated to help producers sort through management options to find the best possible solutions.

*For more information on certified crop advisers, or to find one near you, go to http://www.certifiedcropadviser.org.*