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BEST MANAGEMENT PRACTICES

CHAPTER 3

IPM Solutions to Pest Management for Corn Production

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Integrated pest management (IPM) is not new but has gained interest as growers attempt to reduce production costs while simultaneously reducing the risk of pest resistance to chemical and biological agents. IPM activities may include using crop rotation, early harvesting, rotating pest control mechanisms, adjusting planting dates and populations, conducting mechanical cultivation, applying appropriate fertilizers, using crop varieties with disease or insect resistance, minimizing planter and chemical application skips, and using biological control agents. All IPM tactics require using the labeled rate. The adoption of IPM is important because: 1) pests are becoming resistant to chemical control agents, 2) most of the new chemical control agents are reformulations of old chemistries, and 3) chemical and biological control mechanisms also kill beneficial organisms. This chapter discusses the role of IPM and how adopting IPM practices can improve long-term sustainability.

What is IPM?

Integrated pest management (IPM) is a sustainable decision-making process that requires continued assessment of the crop situation and knowledge of the pest being controlled. A critical component of IPM is the use of a record-keeping system. A good field record system includes information such as field location, rotation, scouting date, genetics used in the field, fertilizers applied, soil test numbers, current field conditions, previous pest infestations, and previous pesticides applied. Mapping of the present pest locations in the field makes future management decisions easier (Chapter 4).

Enough information should be collected when scouting to make an accurate recommendation. Scouting should note the plant growth stage, pest growth stage, size of the infestation, type and density of the infestation relative to the economic threshold, health of the pest, and whether the pest population is increasing or decreasing. In addition, an image of the pest should be collected and placed in the scouting book. In general, the ability to respond effectively to a pest increases with scouting frequency. However, the scouting intensity should be balanced against costs. Scouting information is needed to determine the appropriate control measures. When the pest population approaches economically damaging levels, the producer will need to monitor more frequently and be prepared to make a decision.

Before applying a pest treatment, the agronomist should ask: is treatment necessary? The presence of a pest may fall below the economic threshold value. Most plants have internal mechanisms to control pests. For example, plants may grow faster in response to shading, whereas other plants may release chemicals that

attract beneficial insects. Most plants can tolerate at least some pest damage before economic yield loss occurs. The point where the control costs are equal to the yield loss is the economic threshold.

If treatment is necessary, does the entire field or just part of the field need to be treated? Depending on the pest and crop involved, a border treatment may reduce costs while preventing further damage. And finally, when should an action be taken? Timing is very important because the damage is different for different growth stages.

IPM is based on Prevention, Suppression, and Eradication

Prevention: The first line of defense.
In prevention, a treatment is implemented in response to known problem. Preventative approaches include hybrid selection, rotations, modifying row spacing, adjusting plant populations, using cover crops, using pest-free seed, preventing weeds from reproducing, using insect trap crops, and using maturity dates that avoid pest problems. Other possible cultural tactics include elimination of alternate hosts or sites for insect pests and disease organisms, such as clearing field borders or waterways, and practicing good sanitation measures, such as cleaning tillage and harvesting equipment when moving from field to field.

Suppression: The second line of defense.

1. 1) In suppression, corrective solutions are used after a problem has been detected. The goal of suppression is to reduce the economic impact of the problem. Common examples include cultivation, mowing, flaming, flooding, and plastic mulches. Keeping a weed from going to seed by mowing, clipping, or plowing the infested area is an example of physical control. The biological controls work best where the long-term impacts are the primary objective.
2. 2) Chemical control techniques are widely used to reduce pests. When using chemical control, consider the economic threshold, do not use partial rates, and make sure the applicators are calibrated. Faulty or worn-out equipment should be replaced. When applying chemicals it is important to rotate the chemistries if possible. Pests are resilient, and in many situations, the routine use of any given control mechanism can result in the development of resistant populations. Precision technology provides the opportunity to reduce this risk by actually applying pesticides to areas of the field where the pest populations usually exist. Safety of the pesticide being used should always be a concern.

Eradication: The third line of defense.
Eradication is the complete elimination of the pest and generally it is used for exotic pests that produce dire consequences. Draining a lake to control an invasive plant or fish would be considered eradication. In most agricultural activities, eradication has produced short-term successes. An example is Plum Pox virus eradication in plums in Pennsylvania and New York.

Pest Monitoring

The pest monitoring process is referred to as field scouting, and specific scouting methods have been developed for different pests and crops (Chapters 5 and 45). Scouting tools include sweep nets, sticky traps, aerial images, and pheromone traps. The plant growth stage (Chapter 5) is a common technique used to assess plant development. Proper identification of the pest, plant growth stage, soil conditions, and climatic conditions is extremely important in the monitoring process.

Scouting frequency varies with temperature, crop growth, developmental stage, and pest population potentials. If a pest population is approaching economically damaging levels, the field may require more intense scouting. Cost of scouting may impact scouting intensity and frequency. A general guideline is to scout each field at least weekly during the growing season.

A good field-scouting program should provide the following information about the field:

1. What pests are present and level of infestation.
2. Stage of growth of each pest and the crop.
3. If the pests are parasitized or diseased.

4. If aphids look mummified.
5. If pest infestation level is increasing or decreasing.
6. General physical field conditions.

Checklist for scouting:
1. Camera/smartphone.
2. Sweep net.
3. Measuring tape.
4. Gumboots.
5. Pocketknife/scissors.
6. Shovel/spade.
7. Insect/weed/disease pocket guidebooks.
8. Recent pest alert report.
9. Plastic bag, paper towel.
10. Notebook and pen/pencil or iPad.

In summary, IPM is not a single product that can be purchased, like a drum of pesticide, and it does not rely on one "silver bullet" method to solve all problems. Successful IPM programs require planning and knowledge of the crop pests.

References and Additional Information

Bissonnette, S.M., N.R. Pataky, E.D. Nafziger, V. Davis, K.A. Estes, D. Jones, M.E. Gray, C.A. Bradley, T. Niblack, and A.G. Hager. 2010. Field crop scouting manual. X880e. University of Illinois, University of Illinois Extension, Champaign, IL.

Clay D.E., S.A. Clay, C.G. Carlson, and S. Murrell. 2011. Mathematics and Calculations for Agronomists and Soil Scientists. International Plant Nutrition Institute.

Edwards, C.R., J.L. Obermeyer, T.N. Jordon, G.E. Shaner, J.M. Ferris, J.S. Loven, and L.W. Bledsoe. Revised 2001. Field crops pest management manual. Purdue University, Purdue University Cooperative Extension Service, West Lafayette, IN. Available at https://extension.entm.purdue.edu/fieldcropsipm/.

Fishel, F., W. Bailey, M. Boyd, B. Johnson, M. O'Day, L. Sweets, and B. Wiebold. Revised 2009. IPM: Introduction to crop scouting. IPM1006. University of Missouri, University of Missouri Extension, Columbia, MO.

Tilmon, K. and B. Hadi. 2014. The Northern Plains IPM Guide. 2014.

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