



FORENSIC AGRONOMY – DIAGNOSING FIELD CROP DISORDERS

J.C. (Jack) Payne P.Ag. CCA
Agronomy Instructor Olds College

Introduction

Investigating crop disorders is one of the most challenging aspects of agronomy. Dead, dying or abnormal plants can pose urgent questions from producers. Investigating a crop can be intimidating for the novice. This paper will provide a suggested systematic method to diagnose crop related problems. By using a systematic process, the agronomist will approach the investigation in an unbiased way looking for all possible agents that could cause the disorder.

Step One: Collect field records and determine the history of the problem

Agronomists are often pressured to go directly to the affected field and begin the investigation. This approach may over look some of the key information needed to diagnose the problem. Doctor's will often examine a patient's case history and ask questions prior to doing an examination. An agronomist should approach an investigation in the same way. Ask when the problem was first noticed.

All information related to the cropping history of the field should be examined prior to going out to the field. Hence the investigation should start at the producer's office or kitchen table. Determine the dates and rates of fertilizer application. Record seeding information such as variety, seed source, planting depth, date of seeding and type of equipment used. Soil test reports can provide invaluable information related to soil characteristics.

Be sure to record herbicide applications from both the current and previous year. Weather conditions prior to or after the appearance of symptoms should also be recorded.

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**Step Two: Identify all symptoms affecting the leaves, roots, stems**

All parts of an abnormal plant should be examined when investigating a crop disorder. Often the point of injury is not where the symptoms occur. For example, root rot will result in prematurely ripened plants. By only examining the above-ground plant parts, one might not see the discolored crowns.

Examine individual plants in detail and determine the location of symptoms on the plant. For example, are symptoms on old or newer leaves, upper or lower stems, roots or on the fruit and seeds? Look for insects or insect feeding injury. Also cut the stems to check for tissue discoloration or insect feeding damage. Look for lesions on the leaves. Carefully dig up roots and examine them. Also take note of the seeding depth, fertilizer placement or any seed bed problems.

Step Three: Estimate the number of affected plants or percentage of the field that is affected

Does the damage appear on all of the crop, or only on a small area or a small number of plants? This estimate may influence whether or not a treatment is warranted.

Step Four: Determine the pattern of the problem in the field

Examine the field from several different angles. Does the problem occur in patches or is it randomly scattered throughout the field? If there is a pattern, is it irregular in shape or does it have geometric shapes? It is generally accepted that improper fertilizer or chemical applications will appear as strips or arches.

Certain insects may only affect the margins of the crop. As well, herbicide injury symptoms could be due to spray drift from a neighboring field. Inspect plants in ditches and fencerows and determine if symptoms also occur on these.

Examine the field to see if there is a relationship to topography. Do symptoms occur only on knolls? Is there a correlation of symptoms to soil type or drainage patterns?

Step Five: Examine weeds or other plants for symptoms

Examine weeds in the area where the crop is damaged. Diseases are usually host-specific and the weeds will not be affected. However, a non-selective herbicide would affect both the weeds and the crop.

Step Six: Collect samples and take photos

Just as a crime scene investigator collects physical evidence, so should an agronomist. A digital camera is invaluable for taking pictures of affected plants and patterns in the field. Sometimes plant samples may deteriorate and it may be difficult to identify symptoms later on. An agronomist should have sample bags on hand to collect plant samples for further diagnosis or to send to a lab for tissue testing. If soil problems or nutrient deficiencies are suspected, then soil samples should be taken from affected and unaffected areas.

Step Seven: Formulate a theory or diagnosis

After collecting all of the evidence the agronomist can now formulate a cause for the crop disorder. If the evidence doesn't support the theory, then reject it and try to find another possible alternative. Look for more than one cause. Often crop disorders are due to two or more stressors. Don't hesitate to get a second opinion from another agronomist. Often we focus only on those disorders which we are familiar with and try to make the evidence fit the problem.

Summary

Often agronomists feel pressured to make a quick diagnosis. Investigating a crop disorder takes an integrated approach, looking at all aspects of crop production. By following the suggested protocol in this paper, an agronomist will thoroughly investigate a crop and not jump to conclusions.