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DIAGNOSING PLANT DISEASES: WHA ...

Diagnosing plant diseases: What do we ask and why do we ask for it? (https://communities.grdc.com.au/field-crop-diseases/diagnosing-plant-diseases-ask-ask/)

PUBLISHED - 15 SEPTEMBER 2017

BY DANTE L ADORADA (USQ), LUISE SIGEL (AGRICULTURE VICTORIA), LISA KELLY (QDAF), ADAM H SPARKS (USQ)

Diagnosing a plant disease or other injury is like going to a medical doctor who must ask several questions before making an accurate diagnosis and recommending a treatment. If you withhold information, it can lead to a misdiagnosis. The same goes for crop diseases. Plant pathologists, specifically diagnosticians, are often asked: "What is wrong with my plant; followed by, what can I do to manage the problem?" In most cases, it may be too late to save the specific plant, but a correct diagnosis is important to prescribe methods that prevent the problem on other plants or in the future.

So how do we go about diagnosing plant diseases? Proper identification of diseases and of the causal agents is vital in prescribing a sound disease management strategy, avoiding further losses and preventing the waste of time and money.

Often, we rely on symptoms for the identification of a disease. As similar symptoms can be produced by different causal agents, the use of symptoms alone in most cases is an inadequate method for disease identification. While other methods for identification are available, it may also take a week or more to accurately identify the disease-causing agent.

So, what can diagnosticians do? Asking many questions related to the plants' environmental and cultural factors to help eliminate or identify possible causes of the problem. To help gather this information we provide disease diagnosis request forms for you to fill out when requesting our free diagnostic services. It is important that you use the form relevant to the laboratory you are submitting a sample to.

- QDAF Plant Disease Enquiry Form (https://www.daf.qld.gov.au/plants/health-pests-diseases/plant-pest-diagnostic-services/broadacre-crop-protection-diagnostics/broadacre-plant-pest-or-disease-enquiry)
- USQ Centre for Crop Health Plant Disease Diagnosis Submission Form (https://communities.grdc.com.au/field-crop-diseases/wp-

content/uploads/sites/5/2017/09/USQ-CCH-Diagnostics-1.pdf)

- Disease testing services around Australia (https://communities.grdc.com.au/field-crop-diseases/disease-testing-services-australia/)

Information gathered from these forms is crucial in helping narrow the problem down to a few suspects, which will require further study in the laboratory before making a final diagnosis. Regardless of the outcome, a recommendation will be given as to what should be done with the problem. Below is a list of the information we ask for and reasons why we ask for them.

Information required for an accurate diagnosis

1. **Proper plant name**. Both the common names and scientific name (if known) of the affected plant should be provided. The use of common names can cause confusion in identification and recognition of the problem.
2. **Specific variety or cultivar name, if known.** Susceptibility to a specific disease may vary within different cultivars of a plant species. Knowing the susceptibility of a cultivar to different diseases can narrow down the possible cause of the disease to consider. It also helps to identify if there has been a change in pathotype that the industry needs to consider.
3. **Plant growth stage.** Crops have different susceptibility stages for different diseases. The growth stage when disease infection occurred will assist in disease management decision making.
4. **Plant part affected.** Symptoms on the roots, leaves, stems, flowers, or fruits should be noted. Is the entire plant affected? The symptoms of some diseases are most commonly seen on specific plant parts and this observation can be important in diagnosis.
5. **Plant symptoms observed**. Provide a thorough description of the individual plant symptoms of concern. Examples of such are stunting of plants, shortened internodes, malformation of leaves, gall on roots, profuse flowering, wilts, diebacks, leaf blights, leaf spots, fruit rots, etc.
6. **Disease progression in plants.** This is one of the most important characteristics associated with problems caused by biotic agents.

For example, root rots on a plant may be a primary symptom while leaf necrosis is a secondary symptom. At a later stage of the disease, opportunistic saprophytes may hide the original disease symptom, so in turn, symptoms observed at the later stage of the disease are atypical of the symptoms developed by the initial pathogen.

7. **Symptom variability in diseased plants**. Differences in symptoms expressed by diseased plants may lead to an improper diagnosis. Differences can result from the presence of more than one problem, and in some cases, there may be more than one pathogen infecting a plant. Symptoms resulting from infection by more than one pathogen may be different from the symptoms in response to the individual pathogens acting separately. This is commonly observed in multiple infections due to viruses.
8. **Presence of signs of biotic causal agents**. Signs of biotic causal agents are the observable structures of the actual disease-causing agent. For fungi, signs may include the mycelial growth (usually fluffy white masses), spores, sclerotia, and spore-producing structures.
9. **Symptom distribution in the paddock.** Distribution of the diseased plants over the affected area should be noted. Are they distributed uniformly across an area or are they localized? Is there a definite pattern to the distribution? Does it occur in low spots of a field, along a planted row, or is it affecting plants at random in a paddock? This information is important in looking at the possibility of non-infectious problems, such as various soil factors or herbicide injury.
10. **Prevalence of the problem**. Take note of the incidence and severity. Are all plants affected? In general, infectious problems occur over time and symptoms progress. It is also rare that all of the plants will be affected. A 100% infection is more commonly a result of factors such as toxic chemicals, adverse climatic factors, or soil conditions.
11. **Host specificity check**. Indicate if the problem occurs in only one plant species or in different plant species. Affecting different crops suggests the possibility of a noninfectious problem which could be related to environmental or cultural problems. But in some cases affecting more than one crop does not completely eliminate infectious agents, such as in the case of Phytophthora and Pythium root rots.

12. **Paddock history**. What crops were planted/rotated previously that may be contributing to the problem. This includes any chemical treatment (see 14).
13. **Notes on the growing environment.** The problem may not be due to the grower's activities; it could be related to what his/her neighbour has done. It is imperative to document changes in the environment, such as extreme temperatures (freezing and heat), hail, rainfall, prolonged drought, lightning, temperature reversals (important in possible air pollutant damage and pesticide drift) and prevailing winds. Site factors such as soil pH, soil type, and possible drainage problems are also necessary to be evaluated.
14. **Cultural and maintenance activities**. Information on these can be significant and must be supplied: pesticides or other chemicals applied; rate and when applied; who applied; equipment used in the application; other farm activities such as mowing and irrigation.
15. **Grower's contact details**. For the diagnostician to follow up with for additional information if required.
16. **Paddock location.** Historical records of disease outbreaks or abiotic stresses can help determine what the problem is and provide other useful information to help with diagnosis.

Plant disease diagnosis is an investigation by itself. All clues should be investigated, where some clues may lead down a dead end, others will lead down the correct path. The diagnosis request forms that we provide will help us gather the necessary information and clues to give an accurate diagnosis. Filling them out completely and accurately helps us provide you with the most accurate answers possible.

Further Information

How to send samples for diagnosis in Australia: Plant disease and insect identification (http://www.pir.sa.gov.au/__data/assets/pdf_file/0020/236234/Packaging_Brocl – CRC Plant Biosecurity Brochure

Plant disease diagnosis. The Plant Health Instructor (http://www.apsnet.org/edcenter/intropp/topics/Pages/PlantDiseaseDiagnosis.
M.B., M.R. Williamson, and O. Maloy. 2002.

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