Leaf disease scoring on winter wheat

Protocol submitted by:

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Objectives of the protocol:

To estimate the attacks of the four main leaf diseases (Septoria Leaf Blotch, Brown Rust, Yellow Rust, Powdery Mildew) on wheat at the field scale.

Brief description of the protocol:

This protocol presents a sampling method and a scoring scale to assess leaf disease development in field experiments on wheat.

Possible uses of this method/protocol:

This protocol is used to assess and rank cultivars regarding to cultivar disease-resistance or to assess the development of diseases during a cultural season in farmers' fields.

Protocol:

Observation period and frequency

Observations are made during the whole cultural season. Period and frequency are adapted to the objectives of the experiment.

Sampling

In small plot experiments: 5 subplots of 0.25 m² per plot and per modality, avoiding the 2 border-rows.

In large plot experiments or in farmers' fields (more than 0.5 ha):
The experimenter crosses the field diagonally and determines 8 subplots of 0.25m² (squares of 50*50cm), distributed approximately every 15-20 m (depending on the size of the field).

NB: subplots can be georeferenced using a precise global positioning system (GPS) to be able to perform a spatial analysis at the intra-field scale.

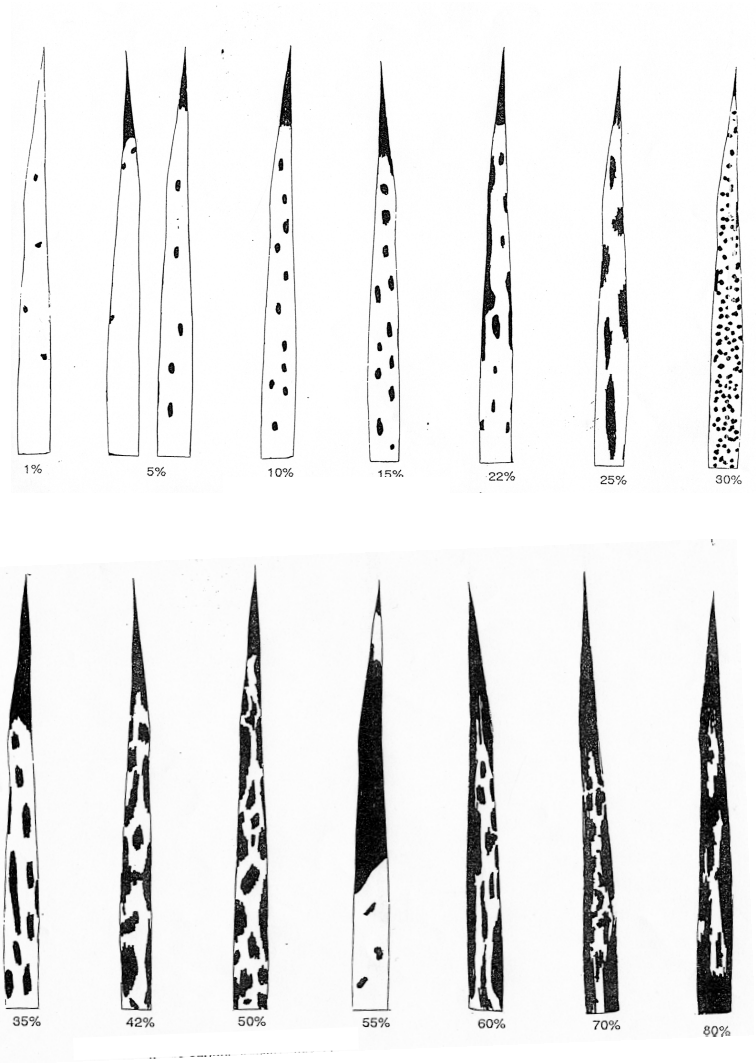
Notation of leaf diseases

In small plot experiments:
In each subplot, 5 tillers (main shoot when identifiable) are observed, on the 3 top-leaves.

In large plot experiments or in farmers' fields:
In each subplot, 10 tillers (main shoot when identifiable) are sampled. All leaves with a ligule and not totally senescent are observed.The percentage of leaf surface (without considering leaf sheath) with symptoms of each disease is estimated and scored using a scale 0, 1, 2, 5, 8, 10, 15, 20, 25, 30, 40, 50, 60, 70, 75, 80, 85, 90, 95, 99, 100.

NB : for training on disease assessment, one can use the computer-aided program DISTRAIN or the leaf disease scoring scale below.

To distinguish the symptoms of Septoria Leaf Blotch from leaf senescence, only areas with pycnidia are considered as infected by Septoria Leaf Blotch.



Calculations and result analysis

For each disease and for each plot,

- incidence at the leaf scale = number of diseased leaves in the plot/number of observed leaves. A leaf is considered as diseased when the percentage of leaf surface with symptoms is different from zero.
- incidence at the tiller scale = number of diseased tillers in the plot/number of observed tillers. A tiller is considered as diseased when at least one of the leaves is diseased.
- mean severity for each disease = mean of the disease scores in the plot calculated on all the sampled leaves.
- conditional severity at the leaf scale = mean of the severity calculated only on diseased leaves

Remark :
All of these variables can also be calculated at the subplot scale if the intra-field information is needed.

Advantages / Disadvantages of the method/protocol:

The method requires 3-5 minutes to score each subplot, depending, by order of importance, on the development stage of the wheat, and on the extent of the diseases.

It is important to limit the number of assessors because there is an “assessor effect” in the evaluation of the percentage of diseased leaf surface. To take this effect into account in the statistical analysis of the results, the assessor of each observation has to be identified.

References or examples of studies carried out by using this method/protocol:

This protocol is currently used in a project which aims at studying the pest profiles and interactions between cropping systems in a landscape (ongoing project: references are not available yet).