

Research Projects

Research Project
Information from
CSIRO
Land and Water

Series No. 2
November 1997



Prediction of Take-all

It is now possible to predict when losses from this disease are most likely to occur. This is when:

- spring rainfall the previous season was average or above average. This allows the build-up of take-all inoculum in susceptible crops or in grassy pastures. The effect is more pronounced if the two previous seasons have had average to above average rainfall in spring
- this is followed by a dry summer-autumn period characterised by rainfall events of less than 25mm
- susceptible cereals are sown immediately after opening rains into paddocks following grassy pastures or other susceptible cereals.

The ability to predict both disease inoculum levels and the potential yield losses in susceptible cereals allows managers and advisers to make informed decisions on the cost-benefit of take-all control strategies and to minimise risk.

Commercial soil assays can also be taken as a further guide on take-all levels.

Background

Take-all is the major soil-borne disease of cereals across southern Australia with an annual average cost of \$100m in lost production. There are no wheat or barley varieties which are resistant to the disease. There is some resistance in triticale but not in the current variety, Tahara.

Take-all can be readily controlled by rotation with non-host crops such as pulses, oilseeds and oats or by early grass removal from pastures. In practical terms this means that control is more difficult to achieve in the rainfall regions below 350mm annual rainfall where the use of non-host crops is more difficult. Significant yield losses from take-all only occur where there is sufficient inoculum present for early root infection, followed by adequate rainfall in the growing season.



CSIRO
AUSTRALIA

CSIRO LAND and WATER

The symptoms

In take-all infected plants, whiteheads develop post flowering. In paddocks with a high incidence of whiteheads yield losses can be in the order of 60-80%. However, yield losses of from 20-30 per cent can occur WITHOUT any visible plant top symptoms and this form of loss is the most common. Do not assume, therefore, that because there are no or few whiteheads in the crop, it is not suffering significantly from take-all.

The influence of rainfall

Examination of long term trial data from Avon in SA has shown that the development of take-all in a current crop year, and its carryover to the following year, is strongly related to rainfall, particularly rainfall in the previous spring. This conclusion has been confirmed by a series of more recent field trials.

A model has been developed to predict the inoculum level based on estimates of the previous disease level and the previous spring rainfall. A range of potential yield losses can also be estimated based on the predicted inoculum level and potential rainfall of the current season.

Take-all assessments have been monitored across SA and Victoria from 1993 to 1996 to evaluate the prediction model. To date, the model has proven to accurately predict the potential severity of take-all for districts with rainfall below 450 mm. (In districts with high rainfall there appears to be other as yet unknown factors that influence take-all.)

Summer rainfall

Field trials have shown that summer rainfall can significantly reduce inoculum levels. However, rain events of about 25 mm are required for any significant decline, with rainfall events of up to 50 mm leading to inoculum reductions of

up to 50 per cent. Stubble cover of 2 tonnes/ha gave a small but useful increase in the rate of inoculum decline.

Time of sowing

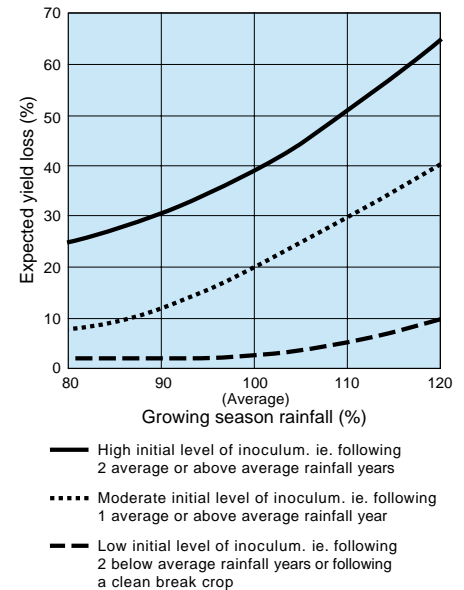
A six-week period of moist conditions before sowing can reduce disease incidence by 50 per cent and this can be very advantageous with an early break to the season. Field trials have shown that following the autumn break, take-all inoculum steadily declines in moist soil. Hence, the later the crop is sown the lower is the incidence of the disease.

With a normal or late break there is a trade-off between timeliness of sowing and disease reduction, but it should be stressed that plants affected by take-all cannot exploit the advantages accruing from early sowing. If paddocks with a moderate to high risk of take-all are to be sown with susceptible cereals then those paddocks should be sown last. Field observation have shown that even a delay of one to two weeks in sowing can dramatically reduce take-all levels.

Recommendations

1. Break crops and grass removal from pastures are the major long term control strategy for take-all.
2. Where these options are not available, use the annual disease predictions to help plan a cropping program. Take-all predictions for the coming season, and associated potential yield losses, are published annually in the rural media and delivered at seminars such as GRDC Research Updates.
3. Commercial soil bioassays to assess take-all levels in particular paddocks are a useful aid to management decisions.

Influence of initial level of take-all and growing season rainfall on yield loss due to disease



For further information contact:

Mr David Roget
CSIRO
Land and Water,
PMB No 2,
Glen Osmond, 5064
ph: 08 8303 8528
fax: 08 8303 8560
email: david.roget
@adl.clw.csiro.au