Wheat: alternative options for the control of Septoria

Overview

Septoria leaf spot is one of a portfolio of diseases that erodes profit and increases the greenhouse gas emissions per tonne of wheat produced.

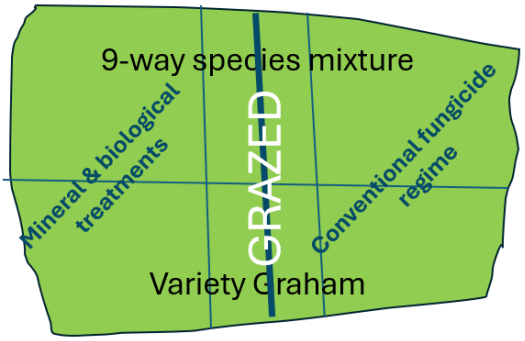
Options for disease control beyond the use of fungicide sprays include (1) combining multiple disease resistance genes from different varieties in a mixture; (2) using livestock to reduce inoculum levels in the young crop over the winter; and (3) improving overall plant defence through adjusting mineral nutrition and biology.

The results presented are from the first year of trials at FNZ Demo Farm, Pensipple, which include comparing a single variety with a cereal mixture; grazing and application of mineral nutrition. It is important to note that the mineral nutrition applications did not include plant sap testing which will be carried out in the future.

Trial methods

The single trial field incorporated two different wheats – the variety Graham and a 9-way variety mixture; grazing with sheep in February; and the conventional fungicide regime compared to the biological and mineral treatments. Foliar applications were determined following plant tissue analysis. Green Leaf Area (GLA) assessments were carried out on the 3rd and 19th of June and the 10th July*. Septoria was the dominant disease throughout the trial. In addition, on the 10th July the plant head count was assessed**. Data was analysed using REML, results were from a single field and therefore data presented is from single treatment blocks. Replication over multiple fields is required for confident conclusions.

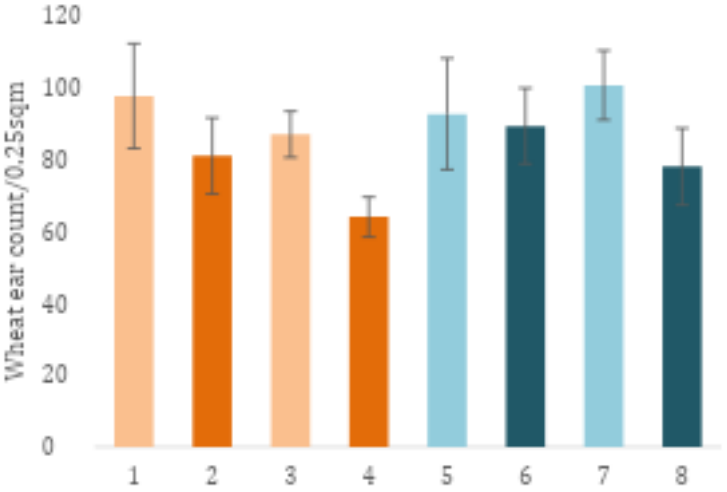
*20 plants per treatment assessed for Flag Leaf, 1st, 2nd and 3rd leaf; **three replicate counts of number of wheat ears in 0.25m^2



Trial layout in a single field at Pensipple Farm.

Results

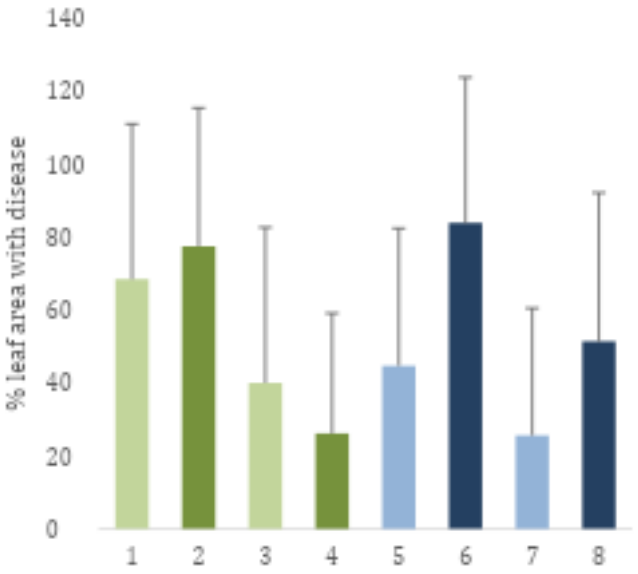
The ear count was higher in the mixture, with grazing and with the biological treatment. Early results would suggest this is significant with replication.



Wheat ear count for variety Graham or the 9-way mixture which was either grazed or ungrazed and had conventional or biological (and mineral) disease management. Error bars indicate standard deviation.

The sheep grazing of the wheat late winter, the mixture and the conventional spray regime were most effective at disease control in early June.

A combination of the cereal mixture, conventional fungicide spray and grazing dropped total diseased leaf area on average by an estimated 33%.



The plot shows average leaf 2 area with septoria leaf spot on the 19th June. Error bars indicate standard deviation.

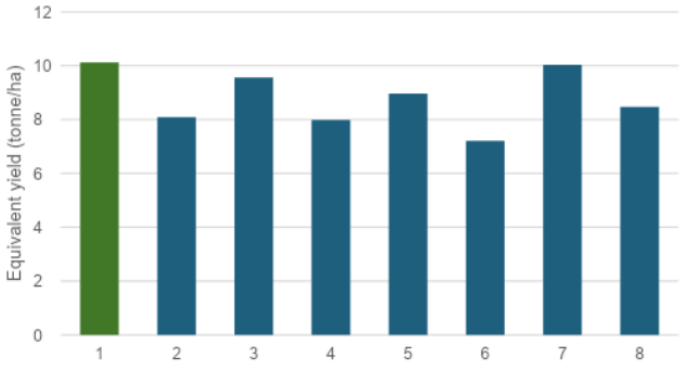
By the 19th June, Septoria had started to infect the flag leaf; but the grazing, the cereal mixture and conventional fungicide treatment had reduced disease across the plant by an estimated 20%. Flag leaves, however, have the greatest contribution to yield and based on these at the last assessment point, it was the grazed plots which had the highest green leaf area on the flag leaf by the 10th July.

The cost of the biological treatment was an estimated £170.49* compared to the conventional fungicide regime of £226.97, giving an overhead saving of £60.62/ha.

The carbon footprint of 100kg of fungicide is 0.83tCO_2e. No comparison can be made yet between conventional fungicide products and biological products due to a lack of emission data on the biological inputs.

Yield

Single sample yields were taken for each plot (so handle the data with caution).



Plot yields based on a single sample yield for the 9-way 'mix', and variety 'Graham' whether grazed or ungrazed late February with 'conventional' disease management or with 'biological' disease management.

*based on brewing products

Finally...

Further work is needed to quantify the effect of the difference in the footprint between the different wheat management treatments. Nevertheless, these results justify the use of cereal mixtures and early-season grazing to manage septoria disease. The biological and mineral spray regime was less effective than conventional fungicides based on the approach used. Further work is required to improve the efficacy of these non-fungicide treatments, and in particular, sap testing to guide foliar applications.

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