CEREAL DISEASE SURVEY AND CONTROL IN THE WAIRARAPA

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Summary

Cereal diseases in the Wairarapa were surveyed in the 1975-76 growing season. Net blotch caused by *Drechslera* (*Helminthosporium*) *teres* was present in 96% of the barley crops inspected while leaf stripe caused by *D. (H.) graminea* was not found. An attempt was made to estimate yield losses. Eight fungicides were evaluated for control of seed-borne diseases of oats and barley. Carboxin alone or mixed with thiram or captan gave good control of *Drechslera* diseases of both oats and barley, and of loose and covered smuts (*Ustilago* spp) of oats.

INTRODUCTION

Apart from the disease survey of barley crops by Arnst and Fenwick (1973) in the 1972-73 season and the more restricted survey of barley, wheat, and oats by Spencer (1975) in the 1974-75 season, there is little recent information available on diseases in cereal crops in New Zealand and their effect on yields. Regular surveys are needed because the currently used seed-dressings may not be as effective as the organo-mercury seed-dressings and hot-water treatment in controlling seed-borne diseases (Sheridan and Spencer 1975), and new cultivars may differ in their susceptibility to disease.

In the 1975-76 season an intensive survey of cereal crops in the Wairarapa was completed, a number of fungicides were compared for their effectiveness in controlling seed-borne diseases of oats and barley, and an attempt was made to estimate cereal crop yield losses in the Wairarapa due to disease.

METHODS

Disease survey

Seventeen percent of the barley crop, 50% of the wheat crop and 65% of the oat crop in the Wairarapa region of the North Island was inspected in the 1975-76 growing season. Prevalence, incidence and severity of disease were assessed. Prevalence was based on the number of crops found to be infected. Incidence was assessed by taking four samples of 25 plants at random along a diagonal of the paddock up to ear emergence (Feekes growth stage 10). Disease severity on individual tillers was assessed from ear emergence onwards. Ten plants were taken at random intervals along the diagonal and percentage area of the top (flag), second and third leaf affected by disease was assessed using standard keys (James 1973).

Estimates of yield loss due to leaf diseases were made by applying the formula for *Rhynchosporium* scald (*Rhynchosporium secalis*) which Proc. 29th N.Z. Weed and Pest Control Conf.

relates loss in yield to the percentage area infected on the lamina of the top or second leaf at Feekes growth stage 11.1 (James *et al* 1968). The assumption was made that the relationship for other leaf diseases found in the survey is the same as for *Rhynchosporium* scald. In a survey of leaf diseases of spring barley in south-west England, Melville and Lanham (1972) also made this assumption.

Seed-dressing trials

Eight seed-dressings were tested in laboratory, glasshouse and field for the control of seed-borne diseases of barley and oats. An organo-mercury seed-dressing was included as a standard. In the field trials in the Wairarapa treatments were randomized, there were three replicates and three sowing dates, namely Trial 1, 7 October, Trial 2, 21 October and Trial 3, 12 November 1975.

RESULTS

Disease survey

Net blotch was the most prevalent disease of barley, being found in 96% of the crops surveyed. Mildew, leaf rust and *Rhynchosporium* scald were also common. Stem rust was relatively uncommon. A comparison is made in Table 1 of the prevalence of diseases in cereal crops in the Wairarapa in the 1974-75 and 1975-76 seasons. Net blotch and mildew

TABLE 1: DISEASE PREVALANCE IN CEREAL CROPS IN THE 1974-75 AND 1975-76 SEASONS

Barley	Percentage of crops infected	
	1974-75	1975-76
*Net blotch (<i>Drechslera</i> (H.) <i>teres</i>)	83	96
brown rust (<i>Puccinia hordei</i>)	25	24
stem rust (<i>P. graminis</i>)		
* <i>Rhynchosporium</i> scald (<i>Rhynchosporium secalis</i>)	38	18
mildew (<i>Erysiphe graminis</i>)	5	31
*loose smut (<i>Ustilago nuda</i>)	27	10
*covered smut (<i>U. hordei</i>)	0	5
Total number of crops inspected		120
Wheat		
*loose smut (<i>U. nuda</i>)	80	28
leaf rust (<i>P. recondita</i>)	—	28
stem rust (<i>P. graminis</i>)		
mildew (<i>E. graminis</i>)		
Total number of crops inspected		32
Oats		
crown rust (<i>P. coronata</i>)	—	29
stem rust (<i>P. graminis</i>)	—	24
*covered smut (<i>U. hordei</i>)	—	11
*loose smut (<i>U. avenae</i>)	—	30
Total number of crops inspected		19

* Seed-borne

— Data not collected

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of barley increased while *Rhynchosporium* scald and loose smut decreased. Covered smut, not found in the previous season, affected 5% of the crops.

There was a higher level of net blotch on barley leaves than of any other disease. The average diseased area of the top two leaves was 3.6% this season and 0.3% last season.

Diseases found in wheat crops were loose smut, stem rust, brown rust and powdery mildew. Loose smut was less prevalent this season than last season (Table 1).

Diseases found in oat crops were loose smut, covered smut, crown rust and stem rust.

Barley yellow dwarf virus (BYDV) was present in a high proportion of cereal crops but figures are not given because of difficulty of confirmation of identification.

The estimated overall yield loss from leaf diseases in barley crops in the Wairarapa was 2.1%. Losses in wheat and oats would have been smaller. In individual crops with a high incidence of smut yield losses would be high, e.g. in one oat crop the incidence of smut was 50%.

Seed-dressing trials

Carboxin alone or mixed with thiram gave best control of smuts, leaf spot and seedling blight (*D. (H.) avenae*) of oats in both glasshouse and field trials (Table 2). The mixture of carboxin and captan gave good control of oat smuts in field trials but was less effective under glasshouse conditions. It was also less effective than the carboxin and thiram mixture in controlling leaf spot of oats in the field.

TABLE 2: EFFECT OF SEED DRESSINGS ON SMUTS AND LEAF SPOT OF OATS, AND NET BLOTCH OF BARLEY IN FIELD TRIALS

Seed-dressings	g/100 kg	Oats	Barley	
		* % smutted heads (both loose and covered)	** % leaf spot	** % net blotch
pyracarbolid (50% & 75%)	400 & 600	0	0	0.4
benomyl (20%) + mancozeb (50%)	105	0.1	0.4	1.5
†mancozeb (80%)	480	12	0.6	0.3
carboxin (37.5%) + thiram (37.5%)	150	0.3	0	0.1
carboxin (37.5%) + captan (37.5%)	150	0.3	0.3	0.6
carboxin (75%)	150	0	0	0.6
organo-mercury	6 as mercury	0.2	0	0
captan (75%)	188	7	1.2	5.9
untreated	—	32	3.5	8.0
experimental material (50%)	100	15	0	0.7

* Mean of 3 trials

** Trial 1. Assessed on 5 November 1975

† Slurry with 3 litres water

Benomyl plus mancozeb gave complete control of loose smut of oats in both glasshouse and field. It gave complete control of covered smut in glasshouse and one of the three field trials. It was, however, less effective than carboxin and its mixtures in controlling leaf spot. Mancozeb and the experimental material gave very little control of smuts of oats: the

former was also not very effective against leaf spot while the latter gave complete control. Captan was the least effective of any seed-dressing tested in controlling leaf spot of oats and did not give good control of oat smuts. Pyracarbolid was phytotoxic.

All seed-dressings, apart from captan and benomyl plus mancozeb, gave good control of net blotch of barley. The mixture of carboxin and thiram gave best control of both net blotch and foot rot (*D. (H.) sativa*).

The effect of the materials in controlling loose and covered smut and *Rhynchosporium* scald of barley could not be assessed because the diseases did not develop in the untreated checks.

DISCUSSION AND CONCLUSIONS

During the past two seasons, the most prevalent disease of barley was net blotch. Leaf stripe was not found although Sanderson (1973) stated that it is a comparatively common disease in New Zealand. Arnst and Fenwick (1973) reported that in their survey in 1972-73 net blotch was seldom seen and that leaf stripe was one of the two most prominent diseases of barley*, being found in all crops in the Manawatu/Wanganui districts. However, during a survey by Spencer (Sheridan and Spencer (1975) two years later, leaf stripe was not found but net blotch was prevalent. Both diseases are primarily seed-borne and the pathogens may differ in relative susceptibility to seed-dressings currently used. Further, the pathogens are not readily distinguished although disease symptoms are distinct. The only isolation of *D. (H.) graminea* in the course of this work was from a sample of 'Kopara' wheat seed grown in the Wairarapa. Identity was confirmed by the Commonwealth Mycological Institute in England. Isolates from diseased barley leaves diagnosed as net blotch consistently produced *D. teres*. Further studies are clearly necessary.

The overall loss in yield of barley in the Wairarapa in the 1975-76 season due to fungal leaf diseases was calculated to be 2.1%. Smuts and stem rust were excluded. In an eight hectare paddock this represents a loss of \$50.00; thus the total loss in the Wairarapa would be of the order of \$21,000. The calculation is based on a formula used for assessing yield losses due to *Rhynchosporium* scald and has been applied overseas (Melville and Lanham 1972). Arnst and Fenwick (1973) using a similar formula found a much higher yield loss of between 6 and 8% in barley in the 1972-73 season the greater part of which resulted from mildew. Melville and Lanham (1972) reported an even higher figure of around 20% for barley growing in south-west England. The calculated figure, 2.1%, may be too low because considerable experience is needed to decide whether chlorotic or dead tissue not directly associated with the pustule or lesion is caused by the presence of the pathogen or by some other factor. Further work along these lines is needed.

It is concluded that carboxin and its mixture with thiram are effective in controlling *Drechslera* diseases of oats and barley and loose and covered smut of oats. The mixture with captan, while not as effective as that with thiram, has given acceptable control of these diseases. There is no reason to suspect that carboxin and its mixtures will not be effective against loose smut of barley and wheat. Captan cannot be relied upon as an effective seed-dressing for oats and barley.

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