1979

Septoria diseases of wheat

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SUMMARY OF RESULTS

SEPTORIA DISEASES OF WHEAT

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Fungicide Control of Septoria Diseases of Wheat

The fungicide Difolatan was applied as follows:-

Early: At growth stage 9-10 (Feekes scale).

Late : At stage 10.1 - 10.4.

Both : At both stages.

Plots were split for cultivars Gamenya and Egret or Gamenya and Darkan depending on location of the experiment site. Disease and "physiological stress" (water stress and N deficiency) was assessed at 1st spray, late spray and at stages 10.54 and 11.1 - 11.2.

Results

No response to fungicide application was obtained at any site either in yield (Table 1) or disease reduction (Table 2).

Last season, a maximum 18% increase was obtained at Katanning with no detectable disease control when assessment ceased. The increase was attributed to a late glume blotch epidemic. This season fungicide applied 2 weeks later has also failed to achieve any detectable control with no significant yield response either.

An examination of Septoria assessments indicate that the disease was potentially a significant factor in growth of the crop at 5 of the 7 sites.

Lack of adequate control can be attributed to the amount and timing of fungicide protection. In order to demonstrate the potential for economic use of fungicides it seems that we require more effective fungicides or "better" timing for currently available products or both. With good control achieved the effects of locality and season can be elucidated.

Table 1: Fungicide control of Septoria diseases of wheat.
Yield is $K_g Ha^{-1}$ from early and late sprays of Difolatan.

Site		Regans Ford	Pia-wanning	Cun-derdin	Wood-anilling	Borden	Esp. (14)	Esp. (15)
Gamenya	Nil			711	1558	897	2382	2551
"	Early			899	1870	1056	2292	2494
"	Late				1645	1286	2281	2573
"	Both				2147	1151	2449	2483
Egret	Nil				2476	992	2135	2180
"	Early				2286	849	1989	2258
"	Late				2234	897	2157	2225
"	Both				2113* N.S.	968	2180	2135
Darkan	Nil	852	1407	907				
"	Early			941				
"	Late	805	1361					
"	Both							

* Only trial analysed.

Table 2: Fungicide control of Septoria diseases of Wheat
Total loss of photosynthetic area. Flag & 2nd leaf at final assessment.

Site	Regans Ford 10.10.78 11.1	Piawanning 10.10.78 11.1	Cunderdin 21.9.78 10	Woodanilling 6.10.78 10.4	Borden 13.10.78 10 5 4	Esperance 14 3.11.78 11.1	Esperance 15 3.11.78 11.1
Nil	20 81	4 40	0 4	7 30	2 8	7 59	8 46
Early				8 33	1 10	10 69	6 57
Late	22 85	4 39			3 10	12 63	7 52
Both					2 10	11 64	7 58
Gamenya			1 7	6 30	2 12	7 71	8 64
Egret				10 31	1 9	8 56	5 42
Darkan			0 1				
% stress G			0	5	55	26	33
E				0	55	40	46
D	36	45					

Resistance to S. nodorum as measured in buffered plots v hill plots.

In breeding for resistance to S. nodorum considerable use has been made of hill plots. Because of variation in resistance, maturity and height it seemed likely that considerable interference in epidemic development for any given cv. would result from contiguous plots.

In this experiment 16 cvs. were sown in 5 x 1.25 m plots surrounded by 5m wide buffers of oats. The 16 cvs. were arrayed as sub-plots in main plots comparing a Difolatan cover spray with a natural epidemic of Septoria following a single inoculation at Feekes stage 3. Immediately alongside, the same cvs. were sown as contiguous hill plots. The experiment was sown at Badgingarra and Jerramungup but the latter was lost to take-all.

Results

Table 3 illustrates unanalysed means for 8 selected cvs. representative of the range of resistance and maturity. In table 4 the hill plot results can be compared.

Hill plot assessment of Septoria infection is based on the percentage of non-photosynthetic tissue present on the flag leaf only. Nevertheless, it is clear that disease levels were much lower than in the drilled plots, probably because of a drier microclimate caused by this sowing format. As a result, disease had little or no effect on yield in the hill plots.

The buffered plots were intended to isolate susceptible from resistant cultivars thus maximising the effect of resistance and presenting an estimate of its effect on yield which would more closely reflect results to be expected in a farmer's paddock. Because of differences in the general infection level, comparison with the 1978 hill plot estimates is not possible but on past estimates of resistance (1976,77), there is no evidence that the buffered plots have accentuated differences in resistance. It would appear that contiguous sowing does not preclude the detection of 'low' levels of resistance (horizontal resistance sensu Van der Plank 1962). Alternatively, the buffers may have been inadequate to prevent cross contamination. After analysis (yields will require adjustment by covariance on the oat buffer yield) it may be possible to investigate this further.

Table 3: Septoria damage and yield parameters for 8 selected cultivars, Badgingarra.

		63W12.1	Egret	Darkan	Gamenya	Idaho	Iassul	Kondut	Oxley	Mean
Yield (t/ha^{-1})	F*	2.36	3.42	2.56	2.52	2.28	1.13	2.94	2.37	2.45
	N	1.42	2.42	2.94	2.67	2.35	1.46	2.60	2.72	2.32
Loss	%	40	29	0	0	0	0	12	0	5.3
1000 KW	F	33.5	29.6	44.4	36.1	33.0	41.3	42.1	30.9	36.36
	N	25.3	28.3	40.5	27.7	31.0	39.5	42.3	30.1	33.09
Loss	%	24	4	9	23	6	4	0	3	9.0
Ears/m row	F	87	130	103	91	167	127	148	113	120.8
	N	100	155	160	121	142	130	186	127	140.12
Grains/ear	F	31.4	32.0	24.0	23.4	29.0	28.4	27.8	32.8	28.6
	N	24.8	28.0	22.6	21.2	22.2	26.8	25.0	28.6	24.9
Septoria % at 25.10.78		F* N	F N	F N	F N	F N	F N	F N	F N	
Ear	Ear	65 48	0 1	1 8	4 39	2 6	0 2	0 0	0 0	
Flag	to Flag	40 84	60 40	17 87	29 83	26 32	59 58	10 4	28 11	
L1	L2	91 100	88 98	66 100	82 100	72 100	88 90	37 35	74 62	
L2	L3	100 100	94 100	96 100	100 100	100 100	100 100	89 90	94 90	
% infected seed		28	3.6	2.8	21.8	3.4	0	0.8	0.6	

* F Fungicide protected. N Unprotected: inoculated once at G.S. 4

Table 4: Septoria damage and yield parameters for 8 selected cvs sown in hill plots - Badgingarra.

		63W12.1	Egret	Darkan	Gamenya	Idaho	Iassul	Kondut	Oxley	Mean
Yield (g/plot)	F*	36.5	39.6	39.9	28.8	29.6	32.7	45.9	39.0	36.5
	N	25.5	30.9	30.9	35.6	19.6	28.7	49.7	36.8	32.2
1000 KW	F	30.3	29.2	40.9	33.6	33.9	40.2	44.1	31.5	35.4
	N	29.5	24.8	41.8	33.0	31.6	40.2	44.7	29.9	34.4
Septoria % at 25.10.78	F	11	16	16	14	8	18	6	12	12.6
	N	30	22	21	15	12	19	5	13	17.1

F* = Fungicide protected. N = unprotected : inoculated once at G.5.4.

Use of Hill plots to survey the effect of disease on yield.

Four experiments were sown to investigate diseases constraining yield. Hill plots were used and treatments compared fungicide protection v. nil, Nemacur v. nil and ammonium v. nitrate forms of nitrogen, the object being to investigate possible effects of foliar disease, nematodes and take-all.

All but one experiment failed because of poor germination, weeds or waterlogging. At Badgingarra yields increased 20% with fungicide protection but there was no effect of Nemacur or nitrogen form.

Experience with sowing hill plots indicates that they are an unsuitable format for use in District trials.

Effect of seed mixtures on Septoria and Yield (with Dr B. Shearer, University of Western Australia.

Experiments elsewhere with multiline seed mixtures have indicated that susceptible cultivars may be "protected" by admixtures of resistant cvs. The opportunity is thus created for 'blending' high yielding susceptible lines with lower yielding resistants or mixing lines resistant to only one species of Septoria for use in areas prone to severe attack by either species.

Because no seed of a highly resistant line is available, barley was substituted and mixtures made up with the susceptible cv. Gamenya and the partly resistant Kondut in various proportions.

Plots were assessed for disease nine times at fortnightly intervals starting at G.S. 4 and extending to senescense.

Results

Figure 1 illustrates the increase in green leaf area brought about by admixture with barley. The effect is slight but increases with increased barley and is more pronounced with Gamenya than Kondut. Since the effect appears not to have influenced yield (Table 5) it seems that either a multiline approach has little to offer where protection of susceptible types from Septoria nodorum is concerned or that the size and arrangement of plots (6.2 x 10 m without buffers and sown as a single row running N $\longrightarrow$ S) allowed interference between plots which would have been greatly lessened or eliminated in a paddock situation.

There may be a number of reasons for the absence of any useful reduction in disease level. The process which was investigated is basically a barrier or "fly-paper" effect. If susceptibles are diluted by increasing numbers of resistant individuals then the chances of a propagule moving from susceptible to susceptible are increasingly lowered. Propagules are "wasted" by germinating on resistant individuals. If the number of propagules is large then a "flypaper" effect may not be evident - even though a barrier is presented sufficient get through. This implies that some other parameter limits epidemic development - the frequency of suitable infective periods could be more important. On the other hand, incoming ascopore inoculum might have constantly and evenly inoculated all plots, masking any barrier to pycnidiospore inoculum.

Table 5: Effect of resistant (barley) admixture on Septoria incidence and yield of Gamenya.

Gamenya	10	25	50	75	90	100
Barley	90	75	50	25	10	0
% necrosis						
Flag leaf	54	41	58	62	58	61
2nd "	83	82	99	99	100	100
3rd "	90	90	100	100	100	100
at 25.10.78						
1000 KW	35.8	35.5	36.1	35.0	37.2	39.5
Grains/ear	34.6	31.7	30.2	32.6	31.1	29.5

FIGURE 1

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EFFECT OF SEED MIXTURES ON SEPTORIA