1984

Foliar disease of wheat

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WESTERN AUSTRALIA

SUMMARY OF EXPERIMENTAL RESULTS 1984

FOLIAR DISEASE OF WHEAT

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Wheat leaf diseases were at much reduced levels in 1984. This may have been caused by prolonged summer rain prematurely setting off dispersal of spores and also initiating microbiological breakdown of stubble residues. No survey was carried out in 1984 but a good indication of the seasonal effect can be gained by noting that in the spray-timing experiment at Badgingarra disease levels were extremely low until the end of August some 90 days after sowing.

Timing of fungicide for Septoria and Yellow Spot control. 84BA32, 84GE59.

Given that only one or two applications of a fungicide can be entertained on economic grounds, and that their effect is of limited duration, is it more effective to apply early to contain an epidemic or later to protect the upper canopy and ear? Generally it appears preferable to wait; if little disease develops there may be no need for fungicide, also a reduction in inoculum of necrotrophic pathogens is often difficult to achieve since they can frequently remain semi-dormant in dead leaf tissue, only to sporulate when the fungicide has broken down.

The experiments used 10 x 0.9 m hand-sprayed plots, each separated by barley buffers which were also harvested and used as a covariate to adjust yields for soil variation. Fungicide was Tilt® at 250 g a.i. ha^{-1} (1 L product) in 300 l/ha^{-1} water except treatment 10 (Sportak®). Applications were made according to the treatment schedule of Table 1. Additionally the experiment was treated with three seed dressings: Nil, Tilt and Phenyl mercuric acetate at 150 ml product/100 kg seed.

Results

84BA32

At Badgingarra disease was confined to lower leaves until 90 days after sowing. Growth was excellent and at this time the crop had reached Zadok stage Z39. Septoria nodorum then developed rapidly (see Figure 1) and in the nil plots had caused 56% leaf death on leaf 2 by 120 days after sowing. A very favourable season allowed the 'complete protection' treatment (7) to retain green leaf area until well after the last disease rating at 145 days after sowing. Consequently yields were very high.

As usual at this site, control of disease resulted in substantial yield increases. Three sprays either 'early' (Z13, 23, 32) or 'late' (Z32, 39, 57) were sufficient to produce control only marginally less or equal to that obtained with five sprays. Yield responses were also equal and suggest that this year virtually complete control of economic damage was obtained. A single early spray (Z13) was not as effective as a single late spray (Z39) in controlling disease but yields were not significantly different.

Assessment of early growth associated with the effect of seed dressings indicated that Tilt was slightly phytotoxic but no effect on germination or leaf disease was apparent from either treatment. Seed treatment did not affect yield.

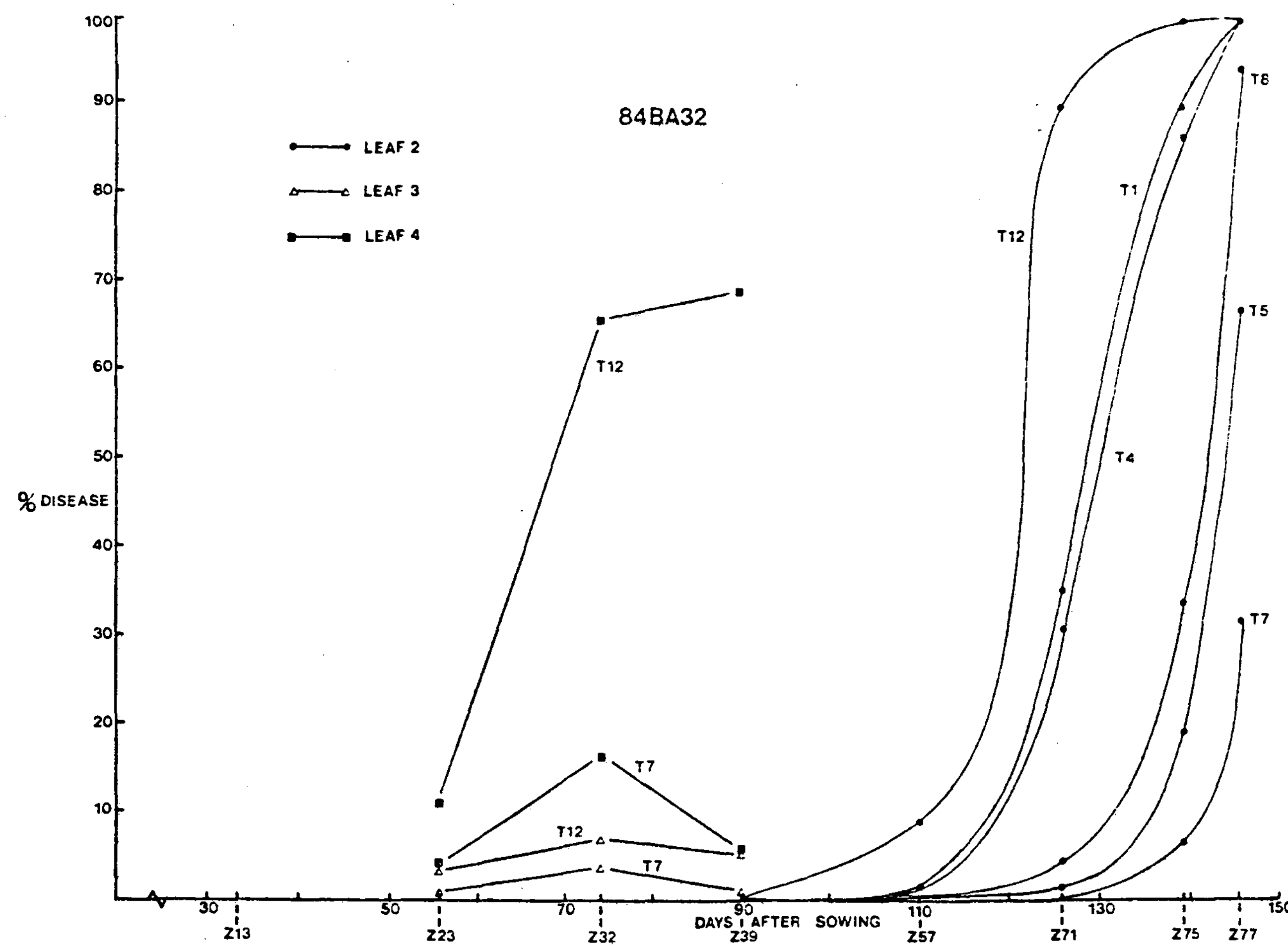
TABLE 1. 84BA32 Fungicide on *Septoria nodorum* disease of wheat.

Growth stage at treatment	% Disease at Z70/71	Biologic yield* at anthesis t/ha	Biologic yield* at harvest	Ears/m²	Grains/ ear*	Grain* wt/mg	Yield** t/ha	Harvest index*	Yield % nil
1. Z13	44		10.58	294	40.7	3.34	3.57	0.372	118
2. Z13, 23	39	11.10	12.16	337	40.3	3.53	3.79	0.392	125
3. Z13, 23, 32	9		13.82	378	36.3	3.87	4.60	0.382	152
4. Z32	40		12.39	363	36.9	3.45	3.91	0.370	129
5. Z32, 39	13	11.26	12.23	316	39.2	3.89	4.32	0.393	143
6. Z32, 39, 57	13		13.28	354	37.5	4.00	4.72	0.400	156
7. Z13, 23, 32, 39, 57	3	12.11	14.16	346	40.8	4.18	4.78	0.414	158
8. After Z37 and rain	26		13.41	367	37.8	3.75	3.82	0.388	126
10. Sportak Z39	31		12.41	340	38.7	3.76	3.87	0.396	128
11. Z39	27		13.41	363	39.2	3.77	3.65	0.398	121
12. Nil	66	9.64	11.50	355	35.5	3.10	3.02	0.336	
LSD	9.6		NS	NS	NS	0.244	0.487	0.0224	

* 1 m²/plot

** Yield adjusted for soil variation in barley buffer

Figure 1

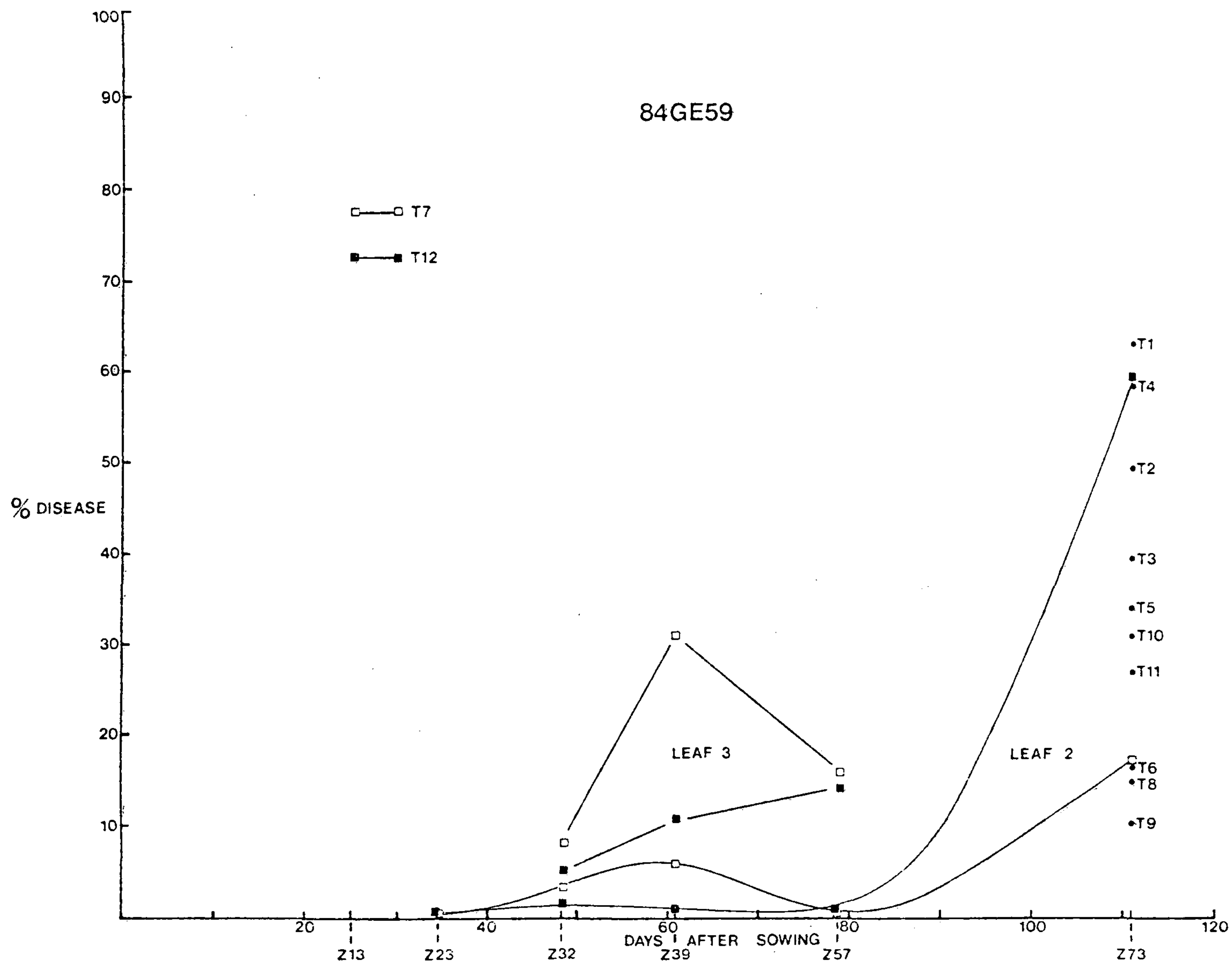


84BA32
LEAF 2
LEAF 3
LEAF 4
% DISEASE
100
90
80
70
60
50
40
30
20
10
30
50
70
90
110
130
150
DAYS AFTER SOWING
Z13
Z23
Z32
Z39
Z57
Z71
Z75
Z77
T12
T7
T12
T7
T12
T1
T4
T8
T5
T7

TABLE 2. 84GE59 Fungicides on wheat leaf disease.

Growth stage at treatment	Disease at Z73	Biologic yield at harvest	Ears/m²	Grains/ear	Grain wt mg	Yield t/ha
1. Z13	55	6.44	279	32.3	3.86	2.01
2. Z13, 23	51	5.32	276	31.6	3.88	2.04
3. Z13, 23, 32	42	6.54	287	32.1	4.00	2.01
4. Z32	50	6.15	271	32.3	3.93	2.03
5. Z32, 39	39	6.06	298	31.0	3.97	1.96
6. Z32, 39, 57	27	6.55	315	32.3	4.05	2.28
7. Z13, 23, 32, 39, 57	28	6.61	272	33.1	4.09	2.13
8. After Z37 and rain	31	6.00	278	32.7	4.03	2.16
9. After Z39 and rain	18	6.31	336	32.5	4.09	1.98
10. Sportak Z39	39	7.23	257	31.8	3.92	2.06
11. Z39	35	6.99	292	30.2	3.95	2.10
12. Nil	54	6.91	273	32.7	3.94	1.98
LSD	12.2	NS	NS	NS	NS	NS

Figure 2


84GE59
T7
T12
% DISEASE
100
90
80
70
60
50
40
30
20
10
LEAF 3
LEAF 2
T1
T4
T2
T3
T5
T10
T11
T6
T8
T9
20
40
60
80
100
120
DAYS AFTER SOWING
Z13
Z23
Z32
Z39
Z57
Z73

84GE59

This experiment, identical to that at Badgingarra (except for the "extra" seed treatments) showed very low disease levels (Figure 2) until 80 days after sowing. At this site Tilt sprays caused variable leaf yellowing indicating some degree of phytotoxicity at the 250 g ha^{-1} rate used. By Z57 yellow-spot and Septoria nodorum damage on the nil, equalled phytotoxic damage on the spray treatment which by then had received 4 x 250 g ha^{1-} a.i. Tilt. Disease on leaf 2 rose sharply after Z57 in the nil and was substantially controlled in treatment 7 (5 x 250 g ha^{-1}). At Z73, 48% of leaf damage on the nil was attributed to yellow-spot (8%) and S. nodorum (40%). Yields were good at around 2 t/ha^{-1}. There were no effects of fungicide (Table 2) on yield.

Fungicides to control wheat leaf disease

The investigation into the possible use of Tilt[R] (propiconazole) to control wheat leaf disease was concluded in 1984. Twenty trials comparing six treatments were placed in wheat crops in the Geraldton area. Ten were second wheat crops and ten wheat after lupins. Application of treatments 1-4 was by CDA equipment following its successful use at Badgingarra in 1983.

Treatments were:-

1. Tilt at 250 g a.i. ha^{-1} + Ulvapron (spraying oil) 1.5 L at Zadoks 23, 32, 39, 57.

2. Tilt at 250 g a.i. ha^{-1} + Ulvapron at Z39.

3. Tilt at 125 g a.i. ha^{-1} + Ulvapron at Z39.

4. Tilt at 63 g a.i. ha^{-1} + Ulvapron at Z39.
   Treatments 1-4 applied via CDA with water added to give 15L ha^{-1}.

5. Tilt at 125 g a.i. ha^{-1} by hydraulic hollow cone nozzles at 50 L/ha^{-1}.

6. Nil

Disease and biologic yield were recorded for Treatment 1 and 6 at Zadoks 23, 32, 39 and 57. At Z71 disease was recorded in all treatments and at harvest quadrats were removed from all treatments for biologic yield and harvest data.

The main results are shown in Tables 3 and 4.

As in previous years, disease was partially controlled by fungicide with variable effects on yield. The correlation between disease control and yield increase was significant but low.

In the four spray treatment, second wheat crops showed a 12% yield response to fungicide but wheat after lupins only 5%.

The effects of fungicide on biologic yield were minimal however, especially up to Z57, confirming the late development of any significant leaf disease. Soil type was the biggest factor affecting biologic yield, followed by prior cropping to lupins.

MEAN DISEASE ON LEAVES 1,2,3, YIELD AND YIELD COMPONENTS GERALDTON 1984 TABLE 3

FARM	PREVIOUS CROP	YIELD T/HA^{-1} +	YIELD T/HA^{-1} -	EARS/M² +	EARS/M² -	GRAINS/ EAR +	GRAINS/ EAR -	GRAIN WT.MG +	GRAIN WT.MG -	% LEAF DAMAGE NIL AT'Z39'	NIL AT'Z57'	NIL AT'Z71'	SPRAY Full	SPRAY 1@Z39 1L	SPRAY 1@Z39 0.5L	% DISEASE AT 'Z71' (NIL PLOTS) SN	ST	YLS	STRESS	'Z39 SPRAY' 1L YIELD T/HA^{-1}	'Z39 SPRAY' 0.5L YIELD T/HA^{-1}
1	Wheat	2.14	2.22	177	184	30.2	31.4	39.7	38.6	7	10	34	18	27	19	1.3	0.1	54.0	44.6	2.08	2.42
2		1.61	1.73	179	181	24.4	24.5	36.6	39.1	5	7	50	42	40	42	0.2	0.9	26.2	72.7	1.79	1.86
4		2.23	2.37	216	224	25.5	25.8	40.7	41.2	3	9	59	40	38	49	0.5	0	76.5	23.0	2.36	2.68
5		2.53	2.43	211	226	31.9	29.1	37.6	36.8	8	17	51	24	48	32	23.4	0	43.2	33.4	2.22	2.05
6		2.70	2.16	219	199	27.6	25.9	44.4	41.8	4	20	64	14	23	35	17.3	0.1	38.8	43.8	2.64	2.25
8		3.27	2.53	305	266	29.8	29.7	35.8	32.2	1	3	28	19	23	10	29.1	0	27.0	43.9	2.30	2.63
12		1.80	1.52	190	169	22.8	22.2	41.0	40.1	3	20	62	36	38	38	6.8	0.1	73.3	19.8	1.54	1.52
18		1.56	1.29	196	196	23.6	23.7	33.6	27.7	4	18	53	44	43	44	17.3	0.1	35.5	47.1	1.39	1.55
19		5.95	5.56	337	339	45.2	45.8	39.1	35.8	3	6	46	22	30	21	9.2	0.2	32.0	58.6	5.74	6.17
23		3.70	2.70	190	171	45.7	41.3	42.7	38.2	1	13	91	38	72	82	37.3	0	25.4	37.3	3.54	3.38
	$\bar{X}$	2.75	2.45	222	216	30.7	29.9	39.1	37.2	4	12	54	30	38	37	14.2	0.2	43.2	42.4	2.56	2.65
	%	122		103		103		105					56							104	108
3	Lupin	3.25	3.19	305	285	36.8	38.7	28.9	29.0	2	16	47	42	49	43	3.0	0.1	11.1	85.8	3.26	3.46
7		3.65	3.40	319	304	30.8	32.8	36.5	34.0	1	4	37	15	24	31	11.8	0	25.0	63.2	3.29	3.41
10		1.58	1.00	185	171	25.6	21.5	33.3	27.3	1	26	57	19	34	32	44.0	0.7	5.8	49.5	1.36	1.19
13		1.29	1.58	112	149	32.6	33.7	35.5	31.3	2	14	64	57	60	49	4.3	0	38.0	57.7	1.38	1.57
15		2.94	2.68	279	262	27.1	26.7	38.8	38.3	.4	2	53	46	54	43	1.8	0	22.2	76.0	2.74	2.60
16		2.79	2.79	244	232	26.6	28.4	43.0	42.4	7	22	58	58	62	51	2.6	0	27.0	70.4	2.97	3.17
17		1.45	1.48	144	156	28.6	30.9	35.3	30.9	2	15	63	59	53	65	1.1	0	27.0	71.9	1.68	1.51
20		4.82	5.11	362	413	32.1	32.2	41.5	38.7	1	3	30	21	31	30	12.9	1.3	16.5	69.3	4.72	5.24
21		4.49	4.57	454	459	34.5	36.0	28.7	27.7	4	11	60	51	60	63	20.2	0	19.0	60.8	4.16	4.47
22		4.09	3.17	214	179	42.3	41.1	45.2	43.3	.5	2	77	26	26	45	14.8	3.2	46.5	35.5	3.02	3.76
	$\bar{X}$	3.04	2.90	262	261	31.7	32.2	36.7	34.3	2	12	55	39	45	45	11.7	0.5	23.8	64.0	2.86	3.04
	%	105		100		98		107					71							99	105
GRAND MEAN		2.90	2.68	242	239	31.2	31.1	37.9	35.7	3.0	12.0	54.3	34.5	41.5	41.0	13.0	0.35	33.5	53.2	2.71	2.85

NOTE:- + = Fungicide, - = Nil

SN = *Septoria nodorum*, ST = *Septoria tritici*, YLS = Yellow Spot

BIOLOGIC YIELD - GERALDTON 1984 TABLE 4

TRIAL	DRY MATTER T/Ha^{-1}										SOIL TYPE*
	Z23		Z32		Z39		Z57		Z71		
	SPRAY	NIL	SPRAY	NIL	SPRAY	NIL	SPRAY	NIL	SPRAY	NIL	
1	0.13	0.13	0.46	0.53	1.17	1.17	2.10	2.61	3.57	3.75	L
2	0.13	0.15	0.59	0.60	1.20	1.08	2.40	2.56	3.12	3.69	L
4	0.20	0.17	0.63	0.56	1.91	1.56	3.16	3.13	5.45	5.22	L
5	0.18	0.20	0.48	0.56	0.87	1.04	1.74	2.29	3.78	4.26	S
6	0.36	0.34	0.58	0.55	0.83	1.02	1.59	1.41	3.89	2.73	S
8	0.15	0.16	0.55	0.45	1.56	1.56	2.97	2.53	4.56	4.11	S
12	0.15	0.19	0.28	0.36	0.63	0.86	1.52	1.42	2.68	2.89	L
18	0.10	0.07	0.24	0.24	0.59	0.49	1.06	1.25	2.32	2.33	S
19	0.37	0.32	0.89	0.76	1.78	1.48	5.64	4.79	9.27	7.82	L
23	0.33	0.33	0.53	0.51	0.99	1.02	1.87	1.79	4.73	4.21	L
Mean W/W	0.21	0.21	0.52	0.51	1.15	1.13	2.41	2.38	4.34	4.10	
3	0.19	0.17	0.82	0.90	2.39	2.26	3.97	4.67	5.90	6.15	L
7	0.17	0.16	0.76	0.73	1.65	1.68	3.57	2.96	5.85	5.85	S
10	0.27	0.25	0.34	0.29	0.77	0.68	1.69	1.43	2.88	2.41	S
13	0.11	0.10	0.33	0.31	0.97	0.95	1.80	1.97	3.11	3.69	S
15	0.21	0.16	0.58	0.46	1.45	1.25	3.12	2.68	5.11	5.00	L
16	0.28	0.28	0.58	0.61	1.05	1.08	2.15	2.29	5.54	5.50	L
17	0.08	0.07	0.32	0.35	1.14	0.93	1.62	1.56	2.92	3.34	S
20	0.22	0.20	1.03	1.27	2.61	2.67	5.71	5.80	7.60	8.56	L
21	0.26	0.27	1.40	1.34	2.57	2.57	6.05	6.23	7.58	7.38	L
22	0.29	0.29	0.60	0.47	1.09	0.91	1.34	1.71	5.89	4.84	L
Mean W/L	0.21	0.20	0.68	0.67	1.57	1.50	3.15	3.13	5.24	5.27	
L Mean		0.21		0.69		1.49		3.30		5.42	
S Mean		0.17		0.43		1.04		1.93		3.59	

* L = red sandy loam S = deap sand

It seems clear that at present the fungicides available to control both S. nodorum and P. tritici-repentis are too costly at their level of efficiency to consider as a viable means of increasing yields in the Geraldton environment. However the results indicate the magnitude of probable losses to these diseases in the region, particularly where wheat is double cropped.

1984 was a low leaf disease year in the Geraldton area though good finishing rains may have resulted in disease producing larger than usual effects.

Practically, the ability to elevate mean yields in these experiments is not a necessity so long as there are criteria available to identify those crops which will respond. Unfortunately it appears that likely paramaters such as disease level and biological yield at spraying, sowing date, soil type and soil moisture status have not as yet allowed any useful predication to be made.

Effect of Mercuric seed dressings on leaf disease and yield.

Possible reasons for the upsurge in yellow spot in Western Australia could include the phasing out of organo-mercurial seed dressings formerly used routinely for bunt control. It has been suggested also that they may have given some control of common root-rot. The experiment compared treated with untreated seed sown in 50 x 50 m plots with three replications. Large plots were used to attempt to separate yield effects resulting from epidemiological differences which might be brought about by the fungicide.

The results are shown in Table 5. There were no significant effects of seed treatment at Badgingarra and Eradu but at Wongan there were transitory differences in leaf disease percentage, presumably of a phytotoxic nature since the nil plots were less affected by leaf disease than the treated. At Eradu the experiment was repeated on a wheat on wheat site and a wheat after lupin site and this resulted in large differences in early growth and leaf disease. Leaf disease differences disappeared by Z63 but biologic yield and grain yield increases in wheat after lupins were similar to those associated with rotation experiments at this site.

Effect of Yellow-spot at Merredin (with S. Trevenen) 84ME57

Yellow-spot is common though not usually severe on second wheat crops in the Merredin area. Unlike in the Geraldton area the disease is not frequently seen on first crops.

Since many farmers sow wheat continuously, an experiment using repeated sprays of Tilt was set up to determine whether the disease was affecting yields.

Sprayed plots received 4 x 250 g a.i. Tilt at 2-4 weekly intervals immediately following a rainfront. Tilt caused a phytotoxic yellowing of the foliage from which the plant usually recovered over the space of a week.

Disease levels were measured at Z22 and Z59. Disease was generally low or insignificant and both sprayed and unsprayed plots showed symptoms of water stress from flowering on. Spraying increased grain yield by 3%.

	Grain yield t/ha^{-1}	% Disease* on 3RD leaf at Z22	Z59
No spray	1.366	6.7	10.1
Tilt (4 x 1L)	1.408	28.0	15.3
LSD P < 0.01	0.038	Y. spot Trace *S. nodorum*	30% Y. spot 60% *S. nodorum*

* including phytotoxic chlorosis.

The season finished dry at Merredin in 1984 and it seems unlikely that a reduced leaf area would have affected yield. Conceivably early leaf disease may have affected root exploration and thereby reduced slightly water available to the crop. Since disease was only partially controlled (and phytotoxicity was observed) a 3% loss from leaf disease is a minimum likely penalty for continuous wheat growing.

Table 5: Organo mercurial seed dressings on leaf disease and yield

	BA 34			GE 60				WH 36		
		PMA	Nil			PMA	Nil		PMA	Nil
% Disease (1)	Z21+	3.3	2.3	Z23	w/w	25.3	27.0	Z12	28.9	9.6
					w/l	9.9	10.6	(42)		
(2)	Z23	11.7	12.6	Z31	w/w	14.3	17.2	Z22	22.0	12.2
					w/l	3.2	2.7	(56)		
(3)	Z61	56.6	54.2	Z63	w/w	39.6	38.1	Z50	16.7	6.8*
					w/l	33.1	36.1	(90)		
Plants/m²	Z21	218	270	Z31	w/w	169	165	Z12	137	110*
					w/l	178	175			
Ears/m²		237	261		w/w	252	262		178	162
					w/l	315	301			
Biological yield (1)	Z23 (56)	45.2	42.6	Z31 (56)	w/w	32.5	33.0	Z22 (56)	13.5	10.1
					w/l	68.0	68.0			
(2)	Z61 (100)	238	223	Z63 (100)	w/w	310	341	Z50 (100)	113	123
					w/l	479	521			
(3)	Z73 (125)	346	339	Z85 (125)	w/w	542	499	Z73 (125)	217	205
					w/l	659	664			
Grain weight		3.43	3.45		w/w	2.99	3.30			
					w/l	3.04	3.20			
Yield $kg.ha^{-1}$		1790	1870		w/w	2182	2483		-	-
					w/l	2992	3141			

+ Zadoks growth stage
days after sowing

* Significant $p < 0.05$

Control of stem rust with fungicide on Canna wheat at Geraldton, Western Australia

A late epidemic of stem rust (race 21-2,3,7 R.H. Luig pers. comm.) on the very susceptible new variety Canna resulted in large losses on early sown crops in 1984.

Because stem rust only rarely causes significant damage in Western Australia much of the wheatbelt is sown to susceptible varieties. An effective and economically viable fungicide would allow protection of crop yields in years when rust breaks out.

Materials and Method

Suitably uniform areas of crop were selected for experiments at 6 sites.

Plots 4 x 20 m were treated or not treated with Tilt (propiconazole) at 125 g a.i. ha^{-1} applied in 100 $l.ha^{-1}$ water at 200 Kpa pressure using solid cone nozzles at 50 cm intervals on a vehicle mounted boom. Plots were separated by equal sized buffers of untreated crop.

There were four replications arranged as randomized blocks. Date of fungicide application and Zadoks growth stage for each crop are shown in Table 1. Rust infection was recorded as per cent area of the flag leaf sheath apparently occupied by pustules on 10 main tillers per plot. Rust infection of peduncles and heads also occurred but as this was closely related to flag leaf sheath infection, only this parameter is presented.

Yield data was recorded by hand harvesting 1 m^2 from each plot to give heads/m^2, grains/head, grain weight and yield. Bulk density measurements were obtained by pooling replicate plots to obtain sufficient grain. At a single site (E) two extra treatments were included: Bayleton (triadimefon) at 125 g a.i. ha^{-1} and 250 g a.i. ha^{-1}.

Results

Results are presented in tables 1 and 2. A single spray of Tilt gave substantial control of stem rust at every site, including site C at which infection had already reached 7% at the time of application. Variation in the degree of control between sites was minimal except again for site C where inoculum pressure would have been markedly greater than at any other. Combined analysis indicated significant reduction in rust was achieved at most sites 14 days after application and at all sites 28 days after. Bayleton at 125 g a.i. was inferior to Tilt at site E (Table 2). Tilt increased grain weight and possibly may have had some effect on the number of grains per head though significance was not attained. Examination of the magnitude of increase in grain weight indicates that larger increases were associated with the more severely affected crops except for site B. At this site the farmer decided to apply an aerial spray of Tilt at 125 g a.i. so that the treatments at this site effectively became: Tilt 125 g versus 250 g. Rust in the 125 g treatment was similar to that at sites A and E but grain weight at 2.50 mg was low and similar to site C (2.54 mg). This may indicate that fungicide applied by air was not as effective as by boom-spray.

Bulk density measurements (which could not be statistically analysed) indicate that measurable increases in grain quality were probably obtained at sites A, B and C which would have resulted in increased financial return from fungicide application.

TABLE 6 EFFECT OF TILT AT 125 g a.i. ON STEM RUST OF CANNA WHEAT

Site	Treatment n = nil f = fungicide	Rust % on flag leaf sheath At Spraying		At Soft dough	Grains per ear	Grain wt mg	kg/hecto litre	tonnes per Ha	Farmers Harvested yield t/ha
A		7/9 Z 70	20/9 Z 75	9/10 Z 85					
	n	1.7	11.6	65.8	19.9	2.34	69.9	0.80	0.5 - 0.6
	f	-	1.4	22.7	27.0	2.99	78.1	1.57	
B		12/9 Z 70	26/9 Z73/75	23/10 Z85					
	n	0.6	9.9	72.0	34.1	2.50	73.0	1.76	1.32
	f	-	0.8	42.5	32.9	3.98	86.8	2.94	
C		12/9 Z73	26/9 Z77	9/10 Z85					
	n	7.0	39.5	75.2	25.9	2.09	63.6	1.17	N/A
	f	-	20.2	46.7	30.6	2.54	72.4	1.66	
D		12/9 Z73	26/9 Z75/77	9/10 Z83/85					
	n	1.3	14.8	28.9	20.9	3.07	N/A	0.87	N/A
	f	-	1.2	7.1	21.8	3.63	N/A	1.18	
E		20/9 Z71	5/10 Z75/77	23/10 Z91					
	n	2.0	16.5	72.2	42.3	2.75	76.8	2.71	1.61
	f	-	2.4	25.8	45.3	3.98	83.8	4.31	
F		26/9 Z65/69	9/10 Z75	23/10 Z80					
	n	0.4	1.9	37.4	37.2	3.10	78.6	1.96	N/A
	f	-	0.3	14.5	35.9	3.56	81.7	2.24	
G (ECRS)		27/9 Z65/69	9/10 Z73/75	23/10 Z83/85					
Gamenya	n	0.1	0.7	8.9	29.0	3.00	77.4	1.90	1.10
	f	-	0.3	2.1	31.0	3.38	79.9	2.18	
	LSD	$p<0.05$	7.69	8.45	N.S.	0.228		0.422	

Discussion

There are very few recent reports on the efficacy of new fungicides against stem rust. In Australia Mayfield in South Australia obtained partial control with Tilt and Bayleton at 125 g a.i. ha^{-1}, but not sufficient to be economically justified. At a probable cost of \$32 ha^{-1} Tilt at 125 g a.i. would have been worthwhile at sites A, B, C and E but because the experiments were sited in well grown areas in the crop actual paddock yields would have been lower and returns less. Based on four farm yields obtained, experiment yields in the nil treatments were a mean 54% above reality. Tilt would have prevented dockages of \$10 tonne (site A), \$6 (site B) and \$14 (site C). No dockage would have been incurred on crops at sites E, F and G.

In the USA Bayleton at 280 g a.i. produced responses of only 180, 270 and 420 kg ha^{-1} between 1977-79 (Rowell, J.B., 1981 Plant Disease 65.235-7) in crops which at Zadoks 85 had 75, 100 and 85% rust. Results at Geraldton are thus the most optimistic obtained for either Tilt or Bayleton. However when considering the positive return at sites A, B, C and E it should be borne in mind that at sites D, F and G rust failed to develop to such severe levels and consequently financial losses would have resulted. At site D a loss could reasonably have been expected because of the low yield potential of this crop. At site G the variety was Gamenya, also susceptible to race 21.2,3,7 but presumably with minor resistances absent in Canna. To this extent the responses obtained to Tilt strictly only apply to Canna but would probably be transferrable to a less susceptible variety in a more favourable environment.

Table 7 Effect of fungicide on stem rust

Site		Rust % on flag leaf sheath			Yield measurements			
E	Treatment	20/9 Z 71	5/10 Z 75/77	23/10 Z 91	Grain/ ear	Grain wt mg	Kg/hecto litre	t/ha
	Nil	2.0	16.5a	72.2a	42.3	2.75c	76.8	2.71c
	Bayleton 125g	-	6.6b	45.4b	44.8	3.59b	82.4	3.66bc
	Bayleton 250g	-	3.9b	35.9c	47.9	3.73ab	82.4	4.21ab
	Tilt 125g	-	2.4b	25.8d	45.3	3.98a	83.75	4.31a
	LSD	P < 0.05	7.70	7.51	N.S.	0.358	N.A.	1.060

* N.S. not significantly different
N.A. not analysed