New Zealand Institute for Crop & Food Research Limited
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CROP & FOOD RESEARCH
Mana Kai Rangahau

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2000/2001 wheat sprouting nurseries

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Project code COO/11

A report prepared for
**Foundation for Arable Research and the
New Zealand Flour Millers Association**

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Contents

1 Executive summary

- Three sprouting nurseries were conducted, using the winter and spring wheat Foundation for Arable Research management trials or New Zealand Cereal trial entries, in Southland (winter and spring sown, with winter and facultative lines), and Palmerston North (spring sown, with facultative and spring lines).
- The nurseries were sited in areas where summer rainfall is usually high, and the lines were sequentially harvested from normal harvest time onward.
- There was insignificant sprouting in any of the nurseries, so only a sub-sample of the cultivars and harvest samples were tested for falling number (FN) tests and presented in this report.
- Given this non-result, and previous season's inconsistencies between cultivars and nursery sites, a completely new proposal has been developed for FAR and NZFMA which should deliver more consistent and reliable pre-harvest sprouting information.
- Although there was no sprouting in this year's nurseries, there were reports of low Falling Number commercial wheat crops and low Falling Number results for some cultivars and sites in the New Zealand Cereal trial series. It is speculated that these low Falling Numbers were caused by inherently high α-amylase and/or induced late maturity α-amylase in some wheats.
- The lack of any sprouting meant the relative effect of strobilurin fungicide could not be determined.
- No further progress has been made with evaluation of the Australian Wheat quality CRC monoclonal antibody test kit.

2 Introduction

This report continues the series of wheat sprouting nurseries previously reported. The series is jointly funded by Foundation for Arable Research (FAR) and the New Zealand Flour Millers Association (NZFMA).

Wheat sprouting resistance may be determined in regular grain trials if harvest conditions are conducive to sprouting. However, for more reliable sprout resistance evaluation the wheats must be placed in conditions conducive to pre-harvest sprouting. For this project, and in previous years for the sprouting nurseries, data was collected from plots grown in areas where summer rainfall is usually high and, therefore, where sprouting occurs regularly. The plots were sequentially harvested starting at, or just before, normal harvest time.

The project involved three nurseries: winter (winter and facultative wheats) and spring (facultative and spring wheats) nurseries in Southland (long days, cool summer temperatures); and a spring nursery in Palmerston North (shorter days, warmer temperatures). These sites also allow the interaction of plant maturity and environmental temperature on grain sprouting to be measured and removed from the final characterisation of sprout resistance for any particular line. All wheat entries in the 2000/01 autumn and spring Foundation for Arable Research (FAR) management trials and New Zealand Cereal trials (NZCT) were included in at least one of the nurseries.

The project also involved a late season strobilurin fungicide treatment. These fungicides are known to delay flowering and final harvest maturity, and the treatment included in this project will allow a comparison of pre-harvest sprouting in plots treated with strobilurin and conventional triazole fungicides.

However, these nurseries still rely upon natural summer rainfall to induce pre-harvest sprouting, and results between seasons and locations have been highly inconsistent. Furthermore, the temperature interaction introduced by locating the nurseries in Southland and Palmerston North has contributed to this inconsistency rather than allowing a clear monitoring of the effect of temperature. The weather during the harvesting season in 2001, see Table 5, was such that no pre-harvest sprouting at all was recorded in any commercial crops, wheat trials or these sprouting nurseries, despite the final harvest date being left until well into March.

Given this result, the full set of materials from the sprouting nursery were not analysed, and only a subset of data is presented in this report to confirm the lack of pre-harvest sprouting. Sprouting data from the 2000 NZCT is also presented.

A review of the sprouting nursery project with FAR confirmed the value of generating reliable pre-harvest sprouting information on new wheat cultivars and advanced breeding lines. However, clearly a more reliable methodology than the current nursery design is required. A new proposal to FAR and NZFMA outlines an approach which we believe will deliver consistent and reliable pre-harvest sprouting information (Appendix I).

3 *Method*

In Dunearn, Southland, the nurseries received Daconil and Opus at 1st node (400 and 300 ml/ha respectively) and at flag leaf emergence (300 and 750 ml/ha respectively). The cultivars receiving the strobilurin treatment then received Folicur and Amistar at flowering (300 and 250 ml/ha respectively). In Palmerston North the nursery received Folicur SC at late tillering (440 ml/ha), and then the cultivars receiving the strobilurin treatment received Amistar at heading (750 ml/ha).

The wheats were grown as single plots in each of the three nurseries. Four samples per line were harvested at between weekly and fortnightly intervals from the winter and spring nursery at Palmerston North, starting just before or at normal harvest time. The spring nursery in Southland was finally only harvested twice due to the very settled weather and the desire by the cooperating farmer to clean up the field ready for early autumn wheat planting.

Samples were harvested on the following dates:

Harvests	1	2	3	4
Winter, Dunearn	14 March	21 March	27 March	10 April
Spring, Dunearn	27 March	10 April	-	-
Spring, Palmerston North	5 February	20 February	5 March	21 March

Falling number (FN) values were determined for all harvest samples, across both fungicide treatments, for a range of cultivars and lines from each nursery with known susceptibility and resistance.

A single FN measurement was made on a wholemeal sample prepared using a Cyclotec mill with a 1 mm sieve. Where there was any doubt about the result, the test was repeated.

4 Results and discussion

FN values are given in Table 1 for the lines and cultivars tested. There was no evidence of any significant pre-harvest sprouting in any of these lines or cultivars, in either of the fungicide treatments. The FN value was reduced between the first and last harvest of Otane in the Palmerston North nursery, but was finally still within high grade specification. Conversely, Kotuku, another sprout susceptible cultivar, showed no reduction in FN over the four sequential harvests. The only cultivar with unacceptable FN values was Impact which, as in previous nurseries and seasons, showed highly inconsistent results between harvest dates. It is likely that Impact has inherently high α-amylase contents, or at least late maturity α-amylase, see Appendix I, which would explain these inconsistent results.

Table 1: Falling numbers for a range of cultivars and harvest times in the 2000-01 nurseries.

Sample	CULTIVAR	A(cut1)	B(cut2)	C(cut3)	D(cut4)	E(+amistar cut1)	F(+amistar cut4)
P2	KARAMU	327	360	362	367	296	305
P4	KOTUKU	301	318	313	295	311	287
P5	OTANE	335	359	325	247	297	256
P9	DOMINO	317	333	372	364	330	342
P12	MONAD	331	366	368	371	325	372
P40	1632.9	360	362	358	375		
P43	I5325.1		278		364		
P70	00sb10				250		
P73	00sb19				291		
P75	00sb27				280		
P76	00sb28				286		
P92	5531.06				366		
P116	5027.37				232		
P117	5452.04				300		
P118	5501.17				326		
P119	5502.03				353		
P120	5505.04				345		
P121	5506.35				295		
P122	5523.02				280		
P123	5540.16				297		
GW5	MONAD	323	321	300	331		
GW8	IMPACT	298	141	162	293		
GW15	DOMINO	304	304	299	260		
GW24	5397.03	287	360	373	364		
GS2	KARAMU	363	361				
GS4	KOTUKU	287	250				
GS5	OTANE	288	277				
GS9	DOMINO	281	350				
GS12	MONAD	306	354				
GS40	1632.9	342	353				

The Amistar treatments delayed maturity by about 7 days, and for most cultivars appeared to have no influence upon relative FN values. Only one cultivar, Karamu, had relatively lower FNs with Amistar treatment, although these were still well within acceptable limits.

There was no significant sprouting damage reported for the 00/01 commercial crop from any of the major wheat growing districts, Southland, Canterbury and Manawatu (Mike Smith, pers. comm.). However, there were some reports of low FN crops in Canterbury, particularly those harvested early. This effect was observed in several cultivars, most notably in Monad for which previous results have shown high pre-harvest sprout resistance. The weather during this harvesting period was very hot and dry, and a possible explanation at the time was that these early crops had dried very quickly in advance of normal crop maturity. Premature harvesting is known to cause relatively low FN, which under normal ripening returns to higher acceptable levels. It was hoped that a repeat FN test on these lines after several weeks storage would show more acceptable FNs. However, repeat testing indicated no change in FN levels on these samples, so a more likely explanation is that a cold snap earlier in January (Table 2) induced late maturity α-amylase (LMA) (Appendix I). In Australia this effect is induced by night temperatures below 14°C and day temperatures below 23°C for a period of around a week at mid doughy grain development. Table 2 indicates that such conditions during early to mid January are probably not uncommon in Canterbury, thus we have probably been routinely selecting against LMA just by monitoring final grain FN. However, LMA has a relatively complex genetic control, and is not an all or nothing response. Thus this season, when temperatures during this critical period in January were colder than usual, cultivars such as Monad, which normally are acceptable, have shown a LMA response.

Table 2: Summer temperatures (°C) in Canterbury 2001.

	Lincoln (January)		Winchmore (January)		Temuka (February)	
	Min	Max	Min	Max	Min	Max
1	4.5	16.2	4.1	19	2.7	22.6
2	7.9	16	7.4	17.6	10.5	21.1
3	7.4	19.9	5.6	17.6	7.3	24.3
4	10.9	19.2	12.1	21.2	10	36.6
5	12.3	25	9.8	23.2	11.3	16.9
6	12.5	19.4	13.8	27.1	5.3	18.8
7	9.1	22.5	12.1	21.5	4.9	25.8
8	13.3	24.2	14.5	25.4	11	26.2
9	13.4	19.6	14	26.2	6.9	22.2
10	13.2	14.7	11.3	19.7	8.4	28.6
11	7	18.8	10.6	13.9	11.5	27.1
12	8.8	20	8.9	19.2	10.1	20.7
13	11.5	15.8	10.4	25	8	22.9
14	6.6	16.5	7.4	14	12.2	27.6
15	7.9	20.1	7.8	15.5	12.8	22.2
16	13.3	23.5	12.1	22.8	11	15
17	7.4	22.2	7.4	22.7	8	22.5
18	10.3	18.4	9.8	22	11.4	22.6
19	10.4	20.5	7.8	17.5	12.3	17
20	8	14.7	9.1	22	7.5	21.4
21	9.4	27	8.7	12.9	9.4	24.7
22	5.6	25.4	5.4	26.7	9.3	22.2
23	10.5	22.7	10.3	28.2	10.1	17.7
24	13.4	18	11.7	28.4	6.7	17.7
25	10.9	18.3	7.5	18.6	11.4	17.1
26	4.2	18.1	7.8	19.6	12.5	19.1
27	5.9	17.5	5.3	19.4	13.8	25.4
28	8.3	17.3	8.9	16.8	10	23.9
29	11.2	21.1	11	19.5		629.9
30	7.3	22.5	9.8	22.2		
31	14.6	26.3	13	25.8		
Mean	9.6	20	9.5	21	9.5	22.5
20 yr mean	11.4	22.6	10.5	22.2		

Tables 3 and 4 give FN results for the autumn and spring NZCT respectively. Although very little rain fell in the period immediately before and during harvest (Table 5), and there was no evidence of any visible sprouting, some cultivars had low FN in at least one site. These results confirm that some cultivars (Impact, DW918321-557, triticale 4723.4) have inherently high α-amylase. For others, such as 5388-96 and Centaur, the evidence is less clear-cut, with perhaps a combination of a slightly higher inherent level and LMA. At Springbank, Holster, Belfield, 91264, 4906.96 and Era, and at Balfour, Era, Claire, Buster, Hussar, KRCWW9 and Z8082-517, all had relatively low FNs, indicating a susceptibility to LMA. Temperatures in

Southland during the critical grain-fill period (Figure 1) were below average this season, as they were in Canterbury. The new application to FAR and NZFMA (Appendix I) includes a proposal for measuring this effect in New Zealand wheats following a test procedure developed in Australia. Given the results this year, an evaluation of LMA would provide valuable extra information on the final FN status of New Zealand wheats.

Table 3: Falling numbers for the 2000-01 autumn NZCT.

	Canterbury				Southland	
	Highbank	Hilton	Irwell	Springbank	Balfour	Dunearn
Monad	241	278	324	245	242	287
Holster	282	320	258	177		
Morph	308	305	280	234		
Regency	288	331	313	313		
Rata	329	316	343	278		
4520.28.5	301	329	328	288		
Belfield	344	362	321	167		
91264	330	310	321	180		
92184-1	312	333	347	274		
Transit	371	369	378	334	320	350
4906.96	314	313	259	216		
3576.95	371	375	352	323		
3601.95	381	366	358	305		
Era	199	223	241	142	186	239
Claire	267	290	284	247	188	295
Buster	277	331	247	269	124	306
Centaur	192	198	229	181	134	260
5388-96	176	217	132	113	63	214
Hussar	253	314	251	222	136	263
DW918321-557	152	119	65	76	65	135
KRCWW9					192	255
Z808882-517					62	217
Harvested	13/2	30/1	20/2	22/2	24/2	12/3

Table 4: Falling numbers for the 2000-01 spring NZCT.

	Canterbury				North Island		Southland
	Courtney	Eiffleton	Methven	Temuka	Kairanga	Marton	Dunearn
Endeavour	365	329	244	390			
Kohika	340	277	294	347	328	287	
5200.3	324	355	344	352	324	339	
CRSW82	331	353	319	337	301	309	324
Torlesse	329	323	337	363			362
SG-S43-95	340	358	336	353			
PG-LO	349	349	354	364			
Otane	341	319	320	352	325	299	
KRCAW1	-	348	-	65	298	348	323
Morph	339	351	356	253	333	359	276
KRCSW8	340	355	340	355	309	365	
KRCSW10	352	340	345	349			
KRCSW11	314	263	328	128			
KRCSW12	332	343	302	341			
Sapphire	278	352	369	341			298
Commando	316	335	353	315			
4723.4	85	62	72	62	115	80	62
Impact	170	195	283	168			206
5592					296	328	
4430.10.5					333	308	
KRCSW3					324	375	
Karamu					358	378	
Monad							260
KRCSW13							336
Harvested	5/2	1/3	22/2	20/3	8/2	22/2	9/4

Table 5: 2001 summer rainfall (mm) in Southland, lower North Island and Canterbury.

	Southland				Lower NI (Aorangi)		Canterbury					
	Dunearn		Balfour				Lincoln		Winchmore		Temuka	
Intervals	March	April	January	February	January	February	January	February	January	February	February	March
1 (Days 1 – 10)	4.4	41.2	49	6	30	47	29.9	10	23.2	12.4	5	3
2 (Days 11 - 20)	1.2	14.4	15	30	6	2.5	19	0.2	22.4	5.2	3	6
3 (Days 21 – 30)	17.8	9.6	42	14	0	0	6.2	0	11.2	2.2	2	0
Total	23.4	65.2	106	50	36	49.5	55.1	10.2	56.8	19.8	10	9
20 yr mean	87.4	74.8	113	102	60.6	63.5	50.3	51.3	56	45.1	-	-

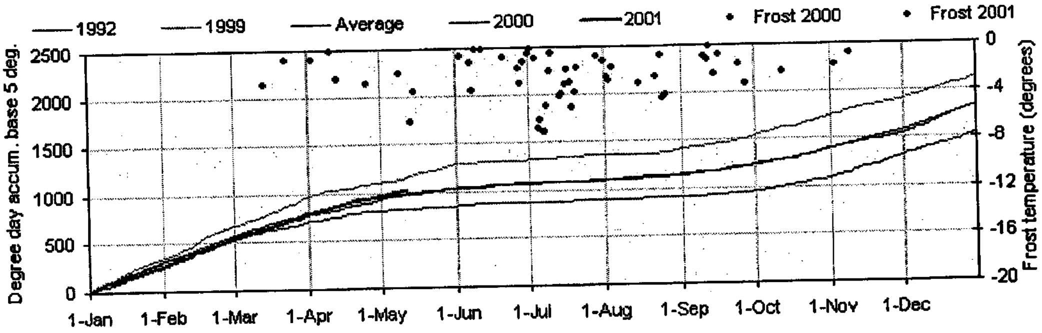

Figure 1: Temperatures at Balfour (Lumsden).

No further evaluation of the Australian Wheat quality CRC monoclonal antibody test kit has been carried out this year. A portable card reader which should improve the reliability of reading the colour intensity developed by the test is meant to be available. However, despite repeated requests, we have been unable to determine the availability of these card readers. Enquires in the UK (John Innes Institute) and Canada (Agriculture and Agri-Food Canada Research) have confirmed that this monoclonal antibody test, and FN, remain the only applied tests for pre-harvest sprouting used by the wheat industry.

5 Conclusion

A series of wheat sprouting nurseries were operated in Southland (winter and spring sown), and Palmerston North (spring sown) over 2000/01 growing season. All autumn and spring wheats in either FAR management trials or the NZC trials were included. The level of sprouting damage in all nurseries was very low, so only a sub-sample of the cultivars were processed and presented in this report.

The nurseries included a treatment designed to measure the effect of strobilurin fungicide on sprout resistance potential. However, although noticeably delaying grain maturity, the lack of any spouting also meant the effect of this fungicide on sprouting resistance could not be determined.

Anecdotal evidence from the commercial harvest, supported by FN results from the NZC trials, suggests that some low FN crops and cultivars observed this season were caused both by inherently high -amylase and LMA. A new application to FAR and NZFMA includes a proposal to investigate the extent and importance of this LMA trait in New Zealand wheats.

No further progress has been made with evaluation of the Australian Wheat quality CRC monoclonal antibody test kit. We will continue to attempt to obtain the portable card reader which should now be available, and then we can continue with the test kit assessment.

6 Acknowledgement

Funding from the Foundation for Arable Research and New Zealand Flour Millers Association to operate these sprouting nurseries is gratefully acknowledged.

Appendix

Appendix I Application for Research Funds from the Foundation for Arable Research and New Zealand Flour Millers Association: Wheat Sprouting Resistance Nurseries 2001/02

Full Application for Research Funds from the Foundation for Arable Research

Name of organisation: **Crop & Food Research**

Address: **Private Bag 4704, Christchurch**

Phone: **03 325 6400** Fax: **03 325 2074**

Date: 24 May 2001 Year funding requested for: **2001/02**

Title: Identification of Falling Number potential in wheat

Background:

New Zealand has a maritime climate where summer rainfall is relatively common. Resistance to pre-harvest sprouting in wheat is therefore of real concern to the wheat industry, and down-grading due to weather damage occurs to a greater or lesser extent every season. Genetic sprout resistance in the wheat is the only effective long-term mechanism to avoid this damage and is therefore a high priority objective within NZ wheat breeding projects.

Sprout resistance has been tested within NZ wheat breeding materials and commercial cultivars in a series of specialist sprouting nurseries jointly funded by FAR and NZFMA over the past several seasons. However these nurseries have relied upon natural summer rainfall to induce pre-harvest sprouting, and although they have been located in regions where such rainfall is likely, results between seasons have been highly inconsistent. By locating the nurseries in Palmerston North (spring) and Southland (autumn and spring), the critical interaction between temperature and summer rainfall was also meant to be monitored, but which in fact has contributed to the inconsistency between seasons and cultivars.

In last season's nurseries, a late summer drought meant insignificant rain fell during the period the nurseries could be left after normal harvest-time, so in fact only a few representative lines within the nurseries were tested to confirm the almost complete absence of pre-harvest sprouting in that season.

A review of the sprouting nursery project confirmed the value of generating reliable pre-harvest sprouting information on new wheat cultivars and advanced breeding lines. However, clearly a more reliable methodology was required than the current nursery design. This proposal outlines a new approach which we believe will deliver consistent and reliable pre-harvest sprouting information.

Another variable possibly affecting sprouting is the use of modern late season fungicides. These fungicides are known to slow senescence and delay final harvest maturity, which may in turn affect pre-harvest sprouting. Last season's nursery included a treatment which would have tested this effect if there had been any sprouting. The possible effect of these fungicides could be tested again in a variation of the proposed new approach.

Late maturity α-amylase (LMA) is another cause of low falling numbers, independent of pre-harvest sprouting. This problem has been identified and extensively researched in Australia in recent years. Some cultivars show inherently higher levels of α-amylase, irrespective of the environment under which they are grown. These are easily identified by routine α-amylase or FN screening. In New Zealand, cultivars such as Impact and some of the newer European feed cultivars appear to show this characteristic. More difficult to identify and define are other cultivars which only show this late season α-amylase after a period of cool temperature during the middle stages of grain fill. In Australia this cool temperature period has been defined as 10-14°C night and 18-23°C day at mealy dough ripe stage. This phenomenon has not been clearly identified in New Zealand, although reports of low FN lines in some early harvested crops from last season, following an unseasonally cold snap during January, may have been caused by this LMA. To assess cultivars for LMA requires that the lines are exposed to this cool period during their grain development, and that they are not exposed to conditions that might induce pre-harvest sprouting. A test protocol has been developed and is successfully applied in several of the Australian state breeding programmes.

Previously the NZFMA has jointly funded the sprouting nurseries, by covering the falling number test costs. This new proposal will be submitted to the NZFMA, as well as to FAR, with the recommendation that the total funds required be equally split. The cost for the nursery will be based upon testing all current commercial and FAR management trial entries. The private companies involved with introduction of new wheat cultivars into NZ and/or the NZCT system will be approached to add further advanced breeding materials at their own cost.

Objectives of the Project:

❑ To establish a specialist evaluation system for the generation of accurate and reliable pre-harvest sprouting information on current NZ commercial wheat cultivars, FAR Management Trial entries and NZ Cereal Trial entries.

❑ To recommend relative risk of pre-harvest sprouting in commercial NZ wheat cultivars and therefore allow appropriate pro-active management of harvest decisions should crops be at risk.

❑ To identify sprouting resistance weaknesses in advanced breeding lines, before they are commercialised, and to ensure that the best sprout resistant materials are included in the crossing programmes generating new segregating populations.

❑ To investigate the effect of a late applied strobilurin fungicide on levels of pre-harvest sprouting.

❑ To establish the potential for LMA damage in NZ wheats.

Proposed treatments and trial design:

A. Materials

This funding application covers all current commercial wheat cultivars and other FAR Management Trial entries. Other breeding companies will be approached about funding their own NZCT entries or other advanced breeding lines. The spring entries will not be confirmed until these trials are finalised in late winter.

B. Nursery design

A single autumn and spring planted nursery will be located at Lincoln consisting of two replicates of short (1.5 m) double row plots, containing approximately 100 plants.

The whole nursery will be protected from disease by a full-protection fungicide (triazole) treatment programme.

Each cultivar/line will be individually assessed for relative maturity and individually harvested at "physiological maturity". Physiological maturity will be defined when at least 50% of the plot has lost any "green tissue" and grain moisture has dropped to at least 20%, whichever occurs first.

At least 60 heads per plot will be harvested.

- 10 of these will be stored at room temperature for 6 weeks
- 50 will be immediately placed into a -18°C freezer

C. Sprouting resistance potential estimation

1. Assessment after artificial sprout inducement

- 40 heads removed from the freezer
- 20 left at room temperature
- 20 placed into the artificial glasshouse misting treatment. This treatment will consist of racks of heads in an upright position, each set of 20 heads/cultivar in a randomised block, set on a glasshouse bench receiving an overhead misting every hour for 4 - 6 days (see below). The heads will then be dried at 40°C for 2 days and threshed. At the same time the other 20 heads taken from the freezer and left at room temperature will be dried and harvested in the same way.
- 100 random seeds will be visually assessed for sprouting
- 20 g sample will be ground and tested for FN
- before the full nursery is tested through the misting treatment, a subset consisting of a sprouting susceptible and resistant, early and late maturity cultivars will be misted and sampled every two days. The test will stop when the susceptible cultivars first show signs of visual sprouting (estimated to be between 4 – 6 days).

2. Germination potential at physiological maturity

- 6 weeks after harvest (and storage in the freezer)
- individually thresh 5 heads that were stored at room temperature
- individually thresh 5 heads from the freezer
- measure germination potential of each head by putting 20 seeds per head on filter paper, adding 5 ml distilled water (with 5% bleach to control fungal contamination), placing at 20°C, then assessing visual germination every 2 days for a maximum of 10 days.

D. Interaction with late season strobilurin fungicide application

10 cultivars covering the range from very good sprouting resistance to fully

susceptible will be added to the above nursery set of cultivars/lines. The last fungicide application in the protection regime followed in section B will be replaced by a strobilurin.

The plots will then be treated and harvested in the same way as above in sections B and C.

E. Late Maturity α-amylase

The cultivars/lines will be grown in individual pots (5 pots per cultivar at 1 plant per pot) in the glasshouse until flowering. Individual tillers will be tagged at flowering, then after 25 days 4 pots/cultivar will be transferred into a controlled environment growth room (night temperature 10-14°C; day temperature 18-23°C) for 10 days. They will then be transferred back to the glasshouse for final grain development and ripening.

Grain from the tagged tillers will be harvested in bulk for each cultivar and levels of α-amylase measured and compared for the samples from the glasshouse and the cool treatment.

Time scale:

- ❑ Field nurseries, autumn planting in May, spring planting in August 2001
- ❑ Application of a late season strobilurin fungicide, October/November 2001
- ❑ Harvesting, starting January 2002
- ❑ Glasshouse misting tests, late March 2002
- ❑ Seed germination potential from mid March 2002
- ❑ LMA test August-October 2001.

Location: Lincoln

Expected benefits to NZ arable industry:

This proposal will benefit the NZ wheat industry by:

- ❑ minimising sprouting damage through clear recommendations for relative cultivar harvesting options should sprouting conditions threaten
- ❑ allowing more efficient and effective selection of new breeding materials with known pre-harvest sprouting characteristics, and the generation of segregating populations in the breeding projects containing the best sprout resistant materials
- ❑ measurement of the effect of a late season strobilurin fungicide application on pre-harvest sprouting
- ❑ indicating the potential of NZ wheats to suffer from LMA, and allowing more efficient and effective selection of new breeding materials with known resistance to this undesirable trait.

The recommendations could be implemented immediately with immediate realisation of the benefits.

Information transfer:

- ❑ field-days
- ❑ pre-harvest reports should conditions indicate a danger of sprouting
- ❑ final written report for dissemination via FAR Newsletter

Project Leader and Key Personnel:

WB Griffin, SC Shorter, CA Munro

Linkages to other FAR funded or other research projects (e.g. PGSF funded).

This proposal:

- ❑ extends previous wheat sprouting resistance work funded by FAR
- ❑ extends work carried out in earlier generations within the PGS&T funded wheat breeding programme at Crop & Food Research
- ❑ compliments cultivar/line performance characterisation, including sprouting resistance, carried out within other FAR Management and NZ Cereal Trials.

Reporting dates:

Interim: Early February 2002
Final: 31 May 2002

Funding requested:

1.	**Full nursery**	
	❑ Field costs	**$3,000**
	❑ Artificial sprout inducement	**$3,500**
	❑ Germination potential	**$2,400**
2.	**Strobilurin treatment**	**$3,500**
3.	**LMA**	**$5,400**
TOTAL		**$17,800**

This proposal will also be put to the NZFMA. It is recommended that FAR and NZFMA fund the proposal 50:50.

The private breeding companies will be invited to add further advanced breeding lines or cultivars not covered by FAR at their own cost.

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