

Yield and falling numbers of new wheat cultivars on the south coast of Western Australia

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Abstract

A number of new wheat varieties potentially considered suitable in the south coast environment were tested in 16 agronomic experiments conducted from 1999 to 2001. The experimental sites were primarily located throughout the Esperance port zone on Sandplain (high rainfall > 450 mm) and Mallee soils (low rainfall <350 mm) under rotations including canola, lupins, peas and pastures. Experiments were monitored for growth, foliar diseases, grain yield and quality. In addition, grains were also tested for falling number. The falling number is a measure of the amount of starch breakdown by the alpha-amylase enzyme generally associated with grain sprouting due to high moisture at harvest. Falling numbers of 300 or more are required for premium wheat grades.

Climate and weather conditions greatly influence the performance of new wheat cultivars both for yield and quality (including sprouting, staining, leaf and root diseases) and local adaptation. Farmers may select two or three varieties with varying maturity, disease resistance, and quality characteristics (high falling number) that may reduce weather and climatic risks and provide safer returns. Camm, H45, Wyalkatchem, Mitre, and Giles seem to be the most robust options for south coast cereal growers if combined with appropriate agronomic.

Key Words

Wheat agronomy, cereal, varieties, grain quality, weather tolerance, sprouting

Introduction

Wheat growers in the south coast region of WA are faced with a wide choice of new wheat varieties both from WA and the eastern states, about which there is often little relevant information available in their local environment (1). Climate and weather conditions also greatly influence the performance of new wheat cultivars both for yield and quality (including sprouting, staining, leaf and root diseases), and local adaptation (2 &3). Experiments were conducted to study the effect of climate, weather conditions and sowing date on varietal performance of new wheat varieties for yield, quality and local adaptation.

Methods

Over 40 new wheat varieties considered potentially suitable in the south coast environment were tested in 16 agronomic experiments conducted over three years from 1999 to 2001 (4). The experimental sites were primarily located throughout the Esperance port zone on Sandplain (high rainfall > 450 mm) and Mallee soils (low rainfall <350 mm) in rotations with canola, lupins, peas and pastures. Wheat varieties from WA and the eastern states from early, medium and late maturity groups were tested. Crops were monitored for growth, foliar diseases, grain yield and quality, and grains tested for falling number. The falling number is a measure of the amount of starch breakdown by the alpha-amylase enzyme, which is generally associated with grain sprouting due to high moisture at harvest. Falling numbers of 300 or more are required for premium wheat grades.

Results

The growing seasons of 1999 and 2001 had wet harvest periods and the 2000 harvest was dry on the South Coast. Wheat yields relative to variety Camm are presented in Table 1 for Sandplain and Mallee soils for the three years (1999-2001).

Table 1. Wheat yield (% of Camm) on the Sandplain and Mallee soils in 1999, 2000 and 2001

S.No.	Variety	Year	2001		2000		1999	
			Sandplain	Mallee	Sandplain	Mallee	Sandplain	Mallee
1	Camm, t/ha	APW	4.22	2.69	3.05	2.92	4.03	2.98
2	Ajana	ASW					82	88
3	Anlace	A. SOFT			99	93		
4	Arrino	ASW/ASWN					75	77
5	Babbler	PH in NSW	108	101				
6	Baxter	AH			86	84		
7	Blade	AH/APW			83	87		
8	Brookton	APW					101	106
9	BT-Schmbrk	AH/APW					86	87
10	Calingiri	ASW/ASWN					96	88
11	Carnamah	AH/APW	98	100	110	94	104	103
12	Cascades	AH/APW			98	94	88	83
13	Chara	AH in VIC			97	93		
14	Clearfield JNZ	AH	102	103				
15	Cunderdin	APW					104	104

6	Giles	PH in QLD	90	102	94	98		
17	H45	AH in NSW	98	103	103	99		
18	Karlgarin	APW					79	94
19	Kennedy	PH in QLD			96	89		
20	Krichauff	ASW					101	105
21	Kukri	AH in SA	77	95	88	93		
22	Lang	PH in QLD	87	91				
23	Mira	APW in VIC			98	96		
24	Mitre	AH in VIC	105	107	100	102		
25	Mulgara	AH in NSW	82	85				
26	Pardalote	AH in NSW	91	85				
27	Perenjori	APW					87	92
28	Stiletto	APW					98	91
29	Strezlecki	PH in QLD	76	84				
30	Stylet	APW	110	108				
31	Sunlin	PH in NSW	96	103	83	95		
32	Sunsoft98	A. SOFT			77	74		
33	Thornbill	A. SOFT	96	99				
34	Tincurrin	A. SOFT					75	73

35	WAWHT2179	A. SOFT					83	89
36	WAWHT2281	AH/APW	98	98				
37	Westonia	APW	111	97	106	104	104	104
38	Whistler	ASW			91	80		
39	WI99069	APW	113	106				
40	WI99072	APW	83	110				
41	Wyalkatchem	APW	114	101				
42	Yitpi	AH in SA			99	97		
	LSD (5%)		8	13	7	5	7	6

1999

In the 1999 season wheat yields were generally lower than the following years due to leaf rust, both Septorias, and stem rust late in the season on the South Coast (1). Westonia was susceptible to stem rust in 1999. On the Sandplain, the early varieties Ajana and Westonia yielded relatively less but the mid-season varieties Cunderdin, Perenjori and Karlgarin, and the late varieties Camm and Krichauff, were the highest yielding cultivars (more than 3 t/ha) at mid May sowing. On the Mallee soils, the early variety Ajana, the mid-season varieties Carnamah and Cunderdin, and the late varieties Brookton, Camm and Krichauff, were the highest yielding (more than 3 t/ha) at mid May sowing.

Grain quality problems such as sprouting; staining and low falling numbers greatly downgraded some of the high yielding varieties on the Sandplain compared to the Mallee soils. Brookton, Carnamah, Cunderdin, Krichauff and Westonia yielded well but were downgraded because of low falling number particularly from mid-May and early June sowing. Grain from the mid-June sowing was of comparatively better quality for most of the new varieties. Camm gave the higher falling number (over 300) on all six sites throughout the Esperance port zone. No grain quality problems were found in the Mallee soils at all three sowing dates with all 16 cultivars.

2000

A dry start to the season, followed by consistently dry conditions around grain filling, generally resulted in lower wheat yields (2). High screenings were a problem in some situations. Westonia yielded the highest followed by H45, Carnamah, Yitpi and Camm. Camm was highest in quality (ie. protein, hectolitre weight and falling number) followed by Kukri and Sunlin. These conservative varieties also produced better yield, particularly in Mallee soils in the dry season of 2000. Yitpi was susceptible to stem rust during 2000. Such high-yielding varieties could be a risky option particularly in a high disease season.

In a delayed harvest trial the weather tolerance of new wheat varieties was investigated by measuring the grain falling numbers (3). The crop was left standing in the field and harvested at four different occasions with 2-3 weeks apart. Three out of 17 cultivars (Sunelg, Camm and Wyalkatchem) achieved falling

numbers over 300 when harvested three times between Nov. 24 to Dec. 27. The high moisture environment during November appears to have lead to poor quality of the other cultivars in the coastal environment (3).

2001

In 2001 a dry winter followed by a wet spring and a wet harvest, generally resulted in higher yield than expected (Table 1) but with more problems of low falling numbers (Table 3). Table 2 presents the yield data for nine varieties with three time of sowing at Sandplain soils (Gibson) and Mallee soils (Grass Patch). Table 3 shows the variation in grain quality (falling numbers) of these varieties with time of sowing.

Results indicate that new varieties like Babbler, Camm, H45, Mitre and Giles performed better both for yield (Table 2) and falling numbers (Table 3). Carnamah, Westonia and Wyalkatchem yielded the highest but falling numbers were lower and more variables. In late sown crop in early July 2001, all varieties comparatively yielded less and gave good falling numbers (4).

Conclusion

Based on three years research in years with both wet and dry harvests, farmers may select two or three varieties with varying maturity, disease resistance, and quality characteristics (high falling number) that would reduce weather and climatic risks and provide safer returns.

Camm, H45, Wyalkatchem, Mitre, and Giles seem to be the most robust options for south coast cereal growers if combined with appropriate agronomic management.

Variety choice, time of sowing and harvest strategies (including wet season) are important management factors that will help to achieve better yield and grain quality and falling numbers.

Table 2. Date of sowing and variety yield (% of Camm) during 2001 at Gibson and Grass Patch.

Variety	Maturity*	Gibson			Grass patch		
		TOS 1	TOS 2	TOS 3	TOS 1	TOS 2	TOS 3
		31-May	16-Jun	6-Jul	16-May	13-Jun	2-Jul
Camm, t/ha	L	4.22	4.24	3.74	2.69	1.82	1.42
Babbler	L-M	108	103	120	101	131	94
Carnamah	M	97	102	113	99	102	110
Giles	M	90	95	104	102	120	90
H45	E	98	101	112	103	103	91

Kukri	M	77	93	96	95	111	105
Mitre	E-M	105	105	119	106	112	101
Westonia	E	111	109	124	96	115	108
Wyalkatchem	E-M	114	112	128	101	111	90
Lsd (0.05)							
Variety			7			17	
TOS			3			6	
Variety * TOS			12			29	
CV %			7.7			17.7	

* E = early maturity, E-M = early to mid maturity, M = mid maturity, L = late maturity

Table 3. Date of sowing and falling numbers for different varieties in 2001

Varieties	Time of Sowing (TOS)	Date of harvest 22 Dec. (Falling Nos.)
Babbler, Camm, Giles, H45, Mitre	All 3 TOS (Mid May to Early July)	300 and above
Carnamah, Kukri, Westonia, Wyalkatchem	TOS1 & TOS2 (Mid May to Mid June)	200 and above but less than 300
	TOS 3 (July 4)	300 and above

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