THE PERFORMANCE OF PROSPECTIVE WHEAT CULTIVARS IN THE SOUTHERN HALF OF THE NORTH ISLAND

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ABSTRACT

Four wheat genotypes showing promise as replacements for Karamu were compared with Karamu and Gamenya over four sites and two years in the main wheat growing areas in the southern half of the North Island. All were early maturing spring wheats of medium height. All yielded less than Karamu but much more than Gamenya, and all were superior to Karamu in baking quality.

INTRODUCTION

Prior to 1972 many wheat cultivars including Tainui (which was selected in New Zealand for spring sowing) and a number of introductions from Australia such as Jumbuck, Gabo, Festival, Raven and Gamenya had been grown in the North Island. Generally, these cultivars had relatively low yields (considering the favourable climate) and most were tall, subject to lodging and sprouting, and susceptible to leaf and stem diseases. With the release of Karamu in 1972, the yield potential of spring sown wheat was considerably increased (Blackmore *et al.*, 1971; McEwan, 1973; McEwan and Vizer, 1970; McEwan *et al.*, 1972) and it quickly became the main North Island cultivar. Unfortunately the baking quality of Karamu, though initially satisfactory, was subsequently found to be variable and in many crops extremely low.

The wheat improvement programme initiated in the North Island in 1966 by the Crop Research Division, D.S.I.R., has had, as a major objective, the development of spring wheats with improved yield and adequate standards of milling and baking quality. Selections have reached the stage of extensive testing for yield and quality. From the number of genotypes tested annually, four showed promise as replacements for Karamu as a milling wheat. The data in this paper cover the regional testing of these genotypes in the southern half of the North Island in comparison with Karamu and Gamenya.

MATERIALS AND METHODS

Plant Description

Karamu/9, reselection of original Karamu (ex Mexico). Short-strawed, early maturing, fully awned, red grained.

Gamenya (ex Australia). Tall, very early maturing, tip awned, white grained.

Pataka/2, (provisional name) formerly tested as II-62-1/2 (ex Minnesota, USA). Medium height, early maturing, fully awned, red grained.

61,01 (Raven x 66RN430 cross). Medium height, early maturing, tip awned, red grained.

Rongotea, formerly tested as 61,03 (Raven x 66RN430 cross). Medium height, later maturing, fully awned, red grained.

Oroua, formerly 74,02 (Skemer x 66RN395 cross). Medium height, early maturing, fully awned, red grained.

Trials including these six wheat genotypes were spring sown in a completely randomized block design at four sites in each of two seasons (1975-76, 1976-77). The sites selected were Kairanga and Halcombe in the Manawatu, Westmere (Wanganui) and Kikokino (central Hawkes Bay). Seeding rate (200 kg/ha approx.) was calculated from seed weights, to obtain a density of 60 seeds per metre of row. Seed was sown through a seven coulter grain drill with 15 cm coulter spacing, with a plot size of 50 m^2. Four replicates were drilled at all sites except at Kairanga in 1976-77, which had three replicates. Maturity was recorded as number of days from sowing to ear emergence. Plant height was recorded at harvest. Plots were machine harvested using a small-plot header harvester. Bulk samples were taken from all replicates for determining moisture content and baking quality, and the grain yields were corrected to 15% moisture.

Statistical analysis for yields followed the usual analysis of variance methods, with disproportionate subclass numbers and mixed effects: where genotypes were considered fixed and the sites and yearly effects considered random (Steel and Torrie, 1960). Stability estimates (Shukla, 1972) were derived for all parameters investigated.

RESULTS

Yields

The individual trial mean yields ranged from 3,200 to 6,800 kg/ha. The analysis of variance (table 1) shows highly significant differences between genotypes, between genotypes x years, between sites x years and between genotypes x sites x years. There were non-significant differences between sites or interactions between genotypes and sites. The pooled means (table 2) show the average performance of the six genotypes over sites and years. Karamu/9 yielded significantly more than Rongotea, 61,01, Pataka/s, Oroua and Gamenya by 380, 600, 610, 700 and 1720 kg/ha respectively. Yield stability estimates (Table 2) indicated Karamu/9 to be rather unstable and 61,01

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TABLE 1: Analysis of variance for yield mean squares $(kg.ha^{-1}) \times 10^4$ of six wheat genotypes in four locations and two years.

Sources	d.f.	M.S.	F
Sites	3	2019.0	0.35 ns
Years	1	1511.2	146.52 ***
Sites x Years	3	5833.1	565.55 ***
Blocks (Env.)	3	541.2	52.47 ***
Genotypes	5	1013.9	7.26 **
G x S	15	37.266	0.45 ns
G x Y	5	139.75	13.55 ***
G x S x Y	15	83.234	8.07 ***
Error	135	10.314	
Total	185		

to be marginally unstable. Inspection of the magnitude of F values (Table 1) suggests that the yearly effect and the interaction of years and sites are the major components of yield variation.

Baking Scores

The pooled means of the Mechanical Dough Development (M.D.D.) baking scores (Table 2) show that all genotypes were superior to Karamu/9. Stability estimates for baking scores amongst all genotypes were non-significant and therefore stable.

Other Agronomic Characters

Plant heights and ear emergence figures (Table 2) were stable over sites and years. All genotypes evaluated during the breeding programme have shown good resistance to lodging, sprouting and leaf and stem diseases.

DISCUSSION AND CONCLUSION

Several wheat genotypes have been bred at the Crop Research Division Substation, Palmerston North as potential replacements for Karamu. In regional trials in the lower half of the North Island Pataka/2, 61,01, Rongotea and Oroua are superior in baking quality to Karamu/9. They were slightly lower in yield than Karamu/9. However the better quality should ensure that very few lines would fail to reach milling grade. These genotypes showed a high level of stability for baking quality and agronomic characters apart from yield. Of the genotypes tested, Karamu/9 showed the greatest environmental response for yield, all others being relatively stable. Although sites were spread over the main wheat growing areas of the southern half of the North Island, the site effect was non-significant, however the yearly effect was very highly significant. Crop Research Division at Lincoln and Gore, and Ministry of Agriculture and Fisheries have also tested these lines over the past two seasons in comparison with Karamu under South Island conditions.

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TABLE 2: Pooled means for the various characters amongst the six wheat genotypes

Genotype	Yield (kg/ha)	Stability Estimate	M.D.D. Bake	Stability Estimate	Height (cm)	Days to 50% Ear emergence
Karamu/9	6220	15.9 ***	13.8	0.94 ns	76	77
Gemenya	4500	1.6 ns	22.8	1.52 ns	105	75
Pataka/2	5610	0.0 ns	24.3	0.00 ns	89	77
61.01	5620	4.0 ns	20.3	0.12 ns	89	77
Rongotea	5840	0.1 ns	20.0	3.00 ns	86	80
Oroua	5520	1.8 ns	23.3	1.52 ns	84	77
L.S.D. 1%	210		1.9		2.0	1.0