

SPRING-SOWN FIELD TRIALS WITH WHEAT IN THE NORTH ISLAND

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SUMMARY

An outline of results obtained from field trials with wheat selections and cultivars sown in the spring in southern districts of the North Island is given. In recent years the Australia cultivars Gamanya and Raven were the highest yielding wheat although more recently the Mexican Short Strawed selection Wagga Wagga 15 proved to be superior to both Gamanya and Raven.

INTRODUCTION

For a number of years some seven to ten percent of the New Zealand wheat crop has been grown in the southern North Island districts Rangitikei, Manawatu, Wairarapa and Hawkes Bay. Virtually all of the North Island wheat crop has been sown in the spring.

Prior to the establishment of the Crop Research Division, D.S.I.R. substation at Kairanga in the Manawatu in 1966 there was no well defined policy covering the importation, breeding and selection of wheats suitable for sowing in southern North Island districts. As a consequence wheat cultivars were introduced from other countries by various interests and often sown by farmers before having been adequately tested in field trials. In some seasons therefore, growers suffered severe crop losses from heavy infestations of disease. A notable example of this were the losses resulting from the widespread sowing of the cultivar Mendes which proved to be wholly unsuited for the region.

Wheat cultivars suited for spring sowing in the southern North Island districts are those which mature early enough to avoid the unfavourable autumn harvest conditions, have short strong straw capable of minimising the risk of lodging which is common under conditions of high levels of soil fertility, have strong resistance or tolerance to diseases and pests and are capable of producing high yields of grain having satisfactory milling and baking characteristics.

For a number of years wheat cultivars brought into the southern North Island districts were tested, although in some cases belatedly, in field trials put down by Advisory Officers of the Department of Agriculture. This paper reviews their work together with that carried out more recently by officers of the Field Research Section, Research Division.

METHODS

In general fungicide-treated seed 200 kg/ha of the wheat cultivars to be tested was drilled in plots each 1.25 m or 1.6 m wide and 40 m long in replicated randomized blocks. Superphosphate 300 kg/ha was drilled with the seed. When mature the experimental crops were harvested with a header harvester adapted for the work. Occasionally the sampling technique described by Lynch (1960) was used. Observations were made on the incidence of diseases and pests.

RESULTS

1951-60

In the decade ending 1960 the New Zealand-bred wheat cultivars Tainui, Cross Seven 37, Aotea, Hilgendorf 47 and Arawa were compared with the Australian wheat Gabo. As the numbers of cultivars included in each field experiment varied it is not possible to compare directly all five cultivars. However, in ten field experiments which included Tainui, Hilgendorf 47 and Cross Seven 37, Tainui significantly ($P > 0.01$) out yielded Cross Seven 37 while the grain yields of Hilgendorf 47 were intermediate. In nine field trials which included Tainui and Gabo the later significantly ($P > 0.01$) out yielded Tainui.

From these results it was concluded that Gabo was the wheat best adapted for spring sowing in southern North Island districts. Initially Gabo being resistant to the prevalent races of stem rust (21ANZ/0) and early maturing produced satisfactory yields of good milling and baking quality grain. It became a commonly sown cultivar. However, its popularity declined when it proved to be non-resistant to later races of stem rust and as experience showed that the threshed grain would sprout readily.

1961-70

In the decade following 1960 a number of cultivars introduced from Australia were included in field trials. These included Festival, Mengavi, Gamenya, Triple Dirk, Heron, Raven, Gamut, Eureka and Pembina.

Mengavi, Festival and Gamenya proved to be resistant to prevalent races of stem rust initially but subsequently proved to be non-resistant to more recently established rust races (21ANZ/2,3) and 21ANZ/2,4).

The mean grain yields of five Australian cultivars compared in field experiments are given in Table 1.

TABLE 1 : Mean Grain Yields kg/ha of Australian Cultivars Obtained in Seven Field Trials.

<u>Cultivar</u>	<u>Grain Yield</u> <u>kg/ha</u>
Raven*	4970 aA
Gamenya	4700 abA
Falcon	4450 bcAB
Gamut	4060 cBC
Heron	3580 dC
C.V.	9.0 %

* The line of seed identified as cultivar Raven is believed to have been a mix of Raven and Triple Dirk.

Overall Gamenya and Raven gave higher grain yields than Gamut and Heron.

The cultivar Mendos which was included in a few experiments gave low yields being susceptible to Barley Yellow Dwarf virus disease.

The grain yields of Aotea and Hilgendorf 61 did not differ significantly in nineteen field trials. Because of differences in times of maturity excessive bird damage occurred and it was not possible to obtain reliable comparisons of the yields of the earlier maturing cultivars Gamenya and Raven with those of the later maturing cultivars Hilgendorf 61 and Aotea.

In Table 2 the mean grain yields of Gamenya and Raven obtained in districts are compared.

Table 2 : Mean Grain Yields kg/ha of Gamenya and Raven in Three Districts

Number of Experiments	16	8	6
District	Manawatu	Wairarapa	Hawkes Bay
Cultivar			
Raven	4960aA	4080a	4990aA
Gamenya	4730bA	4150a	4330bA
C.V.	5.3%	9.5%	Non-parametric test.

Table 3 summarises other important agronomic features of the cultivars Gamenya, Raven and Aotea.

TABLE 3 : Agronomic Features of the Cultivars Gamenya, Raven and Aotea.

	<u>Gamenya</u>	<u>Raven</u>	<u>Aotea</u>
Stem Rust	Moderately susceptible	More susceptible than Gamenya	Moderately susceptible
Lodging	Tends to lodge where favourable conditions for growth occur	Lodges more freely than Gamenya	Strong straw fairly resistant to lodging
BYDV	Moderately susceptible	Moderately susceptible	Fairly susceptible
Milling Quality	Fair	Better than that of Gamenya.	
Baking Quality	Good	Good	Good

In the 1969/70 season a range of cultivars obtained from Kenya, Germany, Mexico and South Africa were compared with Raven and Gamenya in a single field experiment. Details of grain yields kg/ha are given in Table 4.

TABLE 4 : Grain Yields kg/ha of the Cultivars Raven, Gamenya, Skemer, Nadadores 63, Opal, Fronthatch and Romany 1969/70 at Ohakea.

<u>Cultivar</u>	<u>Origin</u>	<u>Grain Yield</u>
Raven	Australia	5070aA
Gamenya	Australia	5030aA
Skemer	South Africa	5070aA
Nadadores 63	Mexico	4890aA
Opal	Germany	4290bb
Fronthatch	Kenya	4170bB
Romany	Kenya	3880cC
	C.V.	4.5%

In the 1970/71 season in six field experiments the cultivars Gamenya and Raven were compared with the selection Wagga Wagga 15 which was derived from Mexican short strawed material. Mean grain yields kg/ha are given in Table 5.

TABLE 5 : Mean Grain Yields kg/ha Obtained from Gamenya, Raven and Wagga Wagga 15 on Five Sites in 1970/71

<u>Selection</u>	<u>Grain Yield</u>
Gamenya	3180bB
Raven	3190bB
Wagga Wagga 15	4120aA
Biometric Analysis	Logrithmic transformation.

DISCUSSION

New Zealand bred wheat cultivars have not proved to be well adapted to conditions experienced in the southern North Island districts where wheat is normally sown as a spring crop. Although many of the cultivars introduced from Australia and elsewhere have also proved to be poorly adapted to local conditions a few such as Gamenya and Raven have proved to be superior.

The widespread introduction for commercial use of cultivars not tested in local field experiments resulted in grower confusion and tended to undermine confidence in wheat as a commercial crop. A limited number of field experiments carried out by officers

of the Department of Agriculture identified promising and superior cultivars. Had a more adequate system of field testing been operative the waste of time, money and effort resulting from the unrestrained commercial induction of the cultivars Mendos, Ureka, Pembina and Opal could have been avoided.

Diseases have been important factors influencing grain yields of wheat in southern North Island districts and yield potentials of cultivars can only be realised if disease is effectively controlled. Of the two techniques of disease control plant resistance through breeding is preferred as it gives a "no cost" advantage to the farmer while effective chemical control is not only difficult to achieve but a recurring expense. Fortunately, the wheat derived from Mexican short strawed material have combined in their genotype resistance to both leaf rust and stem rust. McEwen and Vizer (1970).

It is significant that all wheat cultivars tested in field experiments in the southern North Island districts lack resistance to barley yellow dwarf virus. While the incidence and severity of BYDV damage which tends to vary from year to year and from district to district it nevertheless occurs in most seasons.

If the cultivars derived from Mexican short strawed wheat continue to prove to be high yielding when spring sown they may well become an alternative and competitive crop to barley for late spring sowings on the wetter soils of the area.

ACKNOWLEDGEMENTS

Our special thanks are due to J.S. Bircham, Field Research Office and W.J.P. Mitchel, Technical Officer both of Palmerston North for information supplied and assistance, and to all other technical staff associated with these trials.

Thanks are also due to Dr M. McEwan, Crop Research Division, Palmerston North for information supplied and useful discussions. Also to C. Dyson, Biometrics, Wellington for all biometric analyses.

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