

FIELD EVALUATION OF ZEPHYR BARLEY

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SUMMARY

The field performance of the barley cultivar, Zephyr, was evaluated in sixty-three large split-block trials in six seasons. Uniform areas of a range of selected soil types were used for trial sites. Each of the three established standard cultivars, Carlsberg II, Kenia and Research was outyielded by Zephyr. Zephyr appeared suitable for commercial malting and brewing.

INTRODUCTION

Since 1924 the Canterbury (N.Z.) Seed Co. Ltd, and latterly since 1950 the Canterbury (N.Z.) Malting Co. Ltd have conducted field scale block trials of promising barley cultivars. This work has added to the information obtained from replicated trials conducted by the Department of Scientific and Industrial Research and the Ministry of Agriculture and Fisheries and has provided sufficient produce for commercial malting and brewing tests.

Kenia and Research have been the standard commercial malting barleys since just before 1950. In all types of trials conducted after 1955 Carlsberg II significantly outyielded Kenia and Research but showed malting and brewing defects of the kind shown overseas. For six seasons Zephyr was tested as a more promising cultivar.

METHODS

Barley cultivars are normally imported from overseas by the Cereal Section of Crop Research Division, D.S.I.R. Promising material resulting from their trials was grown in selected farmers' fields in split block trials and compared with commercial standards. Each block trial site was selected for

uniformity of soil type, topography and previous agricultural history. Trials were sited on selected soil types in the important barley growing regions. The area of each block was measured accurately and the crops were drilled by the farmers. The farmer harvested each block separately, and the produce from each was sampled, tested, weighed, stored and micromalted separately. The trial samples were screened over a 6A (6/64 in.) screen and barley total nitrogens determined by the Kjeldahl method. Later separate batches of commercial malts were sometimes made and compared for quality, and finally commercial batches were brewed if considered worthwhile in the light of the other tests.

The best known way to assess the malting quality of a barley is to make malt and analyse the produce. After screening, barley grain 250 g (dry basis) was malted from each trial sample and the finished malt assessed as follows:-

- i. Extract (E): The percentage of material made soluble after controlled mashing of a given weight of malt (European Brewing Convention method).
- ii. Diastatic Power (D.P.): An empirical measure of enzymatic activity in a malt.
- iii. Total Nitrogen (T.N.): of the malt by Kjeldahl.
- iv. Soluble Nitrogen (S.N.): the amount of nitrogenous material made soluble in the extract after mashing.
- v. Kolbach Figure (Index): the percentage of S.N. to T.N.

Yield and quality parameters were statistically analysed by the "t" test from paired comparisons.

MATERIALS

During the past twenty years commercial split-block trials included the following European cultivars:

Carlsberg, Carlsberg II, Union, Wisa, Volla, Domen, Proctor, Ingrid, Hunter, Delta, Swallow and Zephyr.

Zephyr was derived from a cross between Heine 2149 and Carlsberg II, The Netherlands 1965.

Carlsberg II was a selection from Carlsberg (Prentice x Maja), Denmark 1953.

Kenia came from a cross between Binder and Gull, Denmark 1932.

Research was originally released in Australia, 1943 from a cross, Prior x Plumage Archer. A re-selection was made in New Zealand in 1946 to obtain an even ripening strain with more consistent yielding ability (Malcolm, 1952).

RESULTS

Agronomic Characteristics:

Zephyr, having shorter straw, proved to be more resistant to lodging than Research, Kenia and Carlsberg II. Zephyr showed a slight weakness in the straw approximately one inch below the neck, but a significantly high loss of heads occurred in only one season when gale force winds were experienced at harvest time. The standard cultivars suffered some neck-break losses.

All cultivars showed moderate levels of leaf rust and rhynchosporium infections. The standard cultivars were susceptible to powdery mildew. Zephyr was resistant to mildew for the first five years, but this resistance broke down in the 1971/72 season.

Grain Yields:

Zephyr outyielded Kenia in over 90% of trials, Research in over 85% of trials and Carlsberg II in 66% of trials. Zephyr mean grain yields were highly significantly (1% level) better than those of Kenia and Research but the difference between Zephyr and Carlsberg II did not reach statistical significance.

The percentage yield difference between Zephyr and Carlsberg II was similar in Field Research Section trials (Cottier et al, 1971) to that obtained in the commercial block trials (Table 1) even though these trials covered more barley growing districts of North, Mid and South Canterbury.

TABLE 1 : GRAIN YIELDS (KG/HA) OF KENIA, RESEARCH,
CARLSBERG II EACH COMPARED WITH ZEPHYR

Cultivars	Number of Trials	Mean Yield kg/ha	Mean Difference from Standard	Percentage Difference
Kenia	} 21	3301		
Zephyr		3946	645**	19.0
Research	} 21	3481		
Zephyr		4047	566**	16.2
Carlsberg II	} 21	4462		
Zephyr		4747	285 n.s.	6.4

Grain Qualities

Results of screening and total nitrogen determinations are given in Table 2.

TABLE 2 : SCREENINGS % AND TOTAL NITROGEN % OF STANDARD BARLEYS AND EACH COMPARED WITH ZEPHYR

Cultivars	Screenings	Total Nitrogen
Kenia	8.4	1.76
Zephyr	8.4 n.s.	1.66 n.s.
Research	11.8	2.00
Zephyr	9.7 n.s.	1.85 n.s.
Carlsberg II	8.7	1.68*
Zephyr	5.1*	1.78

The only statistically significant differences in barley tests were that Zephyr had a lower screening percentage than Carlsberg II while Carlsberg II had a lower total nitrogen percentage than Zephyr, potentially a good attribute for malting. Zephyr was at least equal to Kenia and Research on the basis of these tests.

Malting Qualities

Results of micro-malting determinations are given in Table 3.

TABLE 3 : MEAN ANALYSES OF MICROMALTS FROM STANDARD BARLEYS AND EACH COMPARED WITH ZEPHYR

Cultivars	Extract	Diastatic Power	Total Nitrogen	Soluble Nitrogen	Index
Kenia	79.3	66	1.73	0.669	39
Zephyr	79.9*	90**	1.64**	0.715**	43**
Research	79.3	99	1.83	0.825	46*
Zephyr	80.0*	97 n.s.	1.67**	0.692	42
Carlsberg II	78.9	71	1.69	0.636	37
Zephyr	79.8**	83*	1.70 n.s.	0.699*	42**

Extract should be high, 80% is a good figure. In Table 3 Zephyr gave the best extract.

D.P. should be reasonably high for brewing malts, and higher for distilling malts (minimum 120). Zephyr was better than Kenia and Carlsberg II and equal to Research, which is inherently high.

T.N: Should be relatively low as this is negatively correlated with high extract. Zephyr was better than Kenia and Research but did not differ from Carlsberg II.

S.N. should be adequate to provide yeast nutrients in brewing and also to give a good modification index (Kolbach figure). Zephyr was better than Kenia and

Carlsberg II but inferior to Research in these tests.

A reasonable Index is required for brewing (Minimum 38). Kenia and Carlsberg II always tended to be low, more especially in commercially produced malts. Research normally produces a high Index. Zephyr fell midway between the two levels.

CONCLUSIONS

Zephyr was significantly higher yielding than Kenia and Research, and tended to outyield Carlsberg II.

The grain quality of Zephyr was comparable with that of the standard malting cultivars, but was superior to that of Carlsberg II in screenings % and inferior in total nitrogen %.

Zephyr was superior in malt characteristics to Kenia and Carlsberg II. While Zephyr was superior to Research in extract and total malt nitrogen, it was inferior in soluble nitrogen and index.

For commercial malting and brewing Zephyr appeared satisfactory.

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