A classification based approach for characterising genotype drought adaptation for selection for stress adaptation

M. Cooper[1], D.R. Woodruff[2] and D.E. Byth[3]

[1] Department of Agriculture, University of Queensland, St Lucia Q 4067
[2] Queensland Wheat Research Institute, P 0 Box 2282, Toowoomba Q 4350
[3] Queensland Agricultural College, Lawes Q 4343

Classification techniques have been effectively used to characterise genotypic patterns of yield performance over environments'. A classification techniquewhen applied in this way puts individual genotypes into groups on the basis of similarities in genotypic patterns of performance. Therefore group patterns of performance can be studied instead of individual genotype patterns of performance. This technique can be used to firstly summarise large data sets while retaining meaningful information on adaptation and secondly to investigate the nature of differences in adaptation expressed between genotypes within these data sets. Similarly classi.fication may be used to characterise genotypic adaptation in stress, nom-stress environmental comparisons. The utility of this technique as an alternative to relative yield drought susceptibility indices[3] is comsidered. If classification at defined truncation levels retains meaningful biological information on genotypic adaptation then thesummarised genotypic patterns of performance will he useful for selection of genotypes for adaptation to the test environments.

Methods

Forty.nine wheat genotypes were grown under am irrigated and miffed treatment at Brookstead, Queemsland2 during 1986. Grain yield, grain number and grain size data are considered. The grain yield response patterns of the genotypes were summarised by a classification technique'. The utility of the summarised grain yield group patterns of performance in representing genotype adaptatiom was considered in terms of firstly the proportion of the total genotype (G) and genotype by environment (GxE) interaction sum of squares (SSQ) for grain yield expressed among groups at derived truncation levels as a measure of information retained after summarisation and secondly the proportion of the total G and GxE SSQ in the grain yield components explained by the groups.

Results and discussion

Both G and GxE interaction components of variation for grain yield, grain number and grain size were significant ($P<0.01$). At a range of truncation levels classification retained substantial proportions of G and GxE interactiom SSQ among the genotype groups for graim yield, grain number and grain size (Table 1). Therefore the genotype patterns of adaptation have been summarised in a biologically meaningful way and the group yield response patterns can be interpreted in terms of grain yield components[3]. These group responses can be used as a basis for selection of adaptation to both the stress amd non-stress environments. The relative yield drought susceptibility indices[3] characterise the relativity of performance between the environments for individual genotypes but do not retain information on the relative genotype performance within environments, confusing the comparisons between genotypes. Therefore while the relative yield drought susceptibility indices summarise the patterns of genotype adaptation, meaningful biological information on genotype adaptatiom is lost. The summarised patterns of adaptation, identified by classificatiom, allow assessmemt of the absolute amd relative adaptatiom of groups of genotypes. The reduced data set also simplifies comparisons beween genotypes for selection purposes allowing both betweem and within group genotype selection.

Table 1 The proportion of total SSQ for G amd GxE interaction retained at 4 truncation levels for grain yield, grain number and grain size after genotype classification on grain yield

No of genotype groups	Grain yield		Grain number		Grain size	
	Genotype SSQ	GxE SSQ	Genotype SSQ	GxE SSQ	Genotype SSQ	GxE SSQ
2	54.2	36.4	44.3	15.9	13.4	1.5
5	85.0	70.5	51.0	38.0	22.2	6.2
10	95.3	87.2	66.9	56.0	40.3	14.6
15	97.9	95.0	75.8	67.8	55.9	37.7
49	100.0	100.0	100.0	100.0	100.0	100.0

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