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Czech J. Genet. Plant Breed.

Hartmann J., Piepho H.-P.:

Multiplicative main cultivar effects in Czech official winter wheat trials 1976–2005

Czech J. Genet. Plant Breed., 43 (2007): 117-124

98 winter wheat cultivars, tested by the Czech Plant Variety Office in 554 trials between 1976 and 2005, were analysed for breeding progress, yielding capacity and behaviour in particular environments. The trials were grouped by yield level, years, altitude, precipitation, temperature and ecological regions. Within each group, least squares (LS) adjusted cultivar means and variance components were estimated. The cultivar means within groups were used as primary data for the subsequent analysis across groups. Genetic variance (V_g) increased with increasing yield level while residual

variance (V_r) slightly decreased. Although V_g within groups was very different, phenotypic correlations between the cultivar means of the groups were very high. The cultivar yields, plotted against environment yield, followed a funnel-like distribution, expanding from the origin. The data fitted better to the assumption of multiplicative main cultivar effects than to the assumption of additive main cultivar effects, implied by standard models. Standardised relative yields (SRY), assuming multiplicative main cultivar effects on the original scale, were therefore used to analyse the data. The SRY were obtained by standardisation of cultivar means within trial groups to the variance expected from the cultivar means across the trial groups, subtraction of additive environment effects and division by the general mean. The SRY had a smaller relative error, as measured by the V_g/V_r relation, than cultivar means calculated under the assumption of additive main cultivar effects. The SRY were surprisingly consistent over environments. $G \times E$ interactions, usually found under the assumption of additive main cultivar effects, may partly

Keywords:

trial series; cultivars; variance components; adaptation; multiplicative model

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