

Multiplicative mixed models for the analysis of sensory evaluation data

B.R. Cullis¹, A.B. Smith¹ and R. Thompson²

¹Wagga Wagga Agricultural Institute, NSW, 2650, Australia

²IACR-Rothamsted, Harpenden, Hertfordshire, AL5 2JQ, UK

Multiplicative mixed models have recently been proposed for the analysis of data from series of plant variety trials (see Piepho, 1997 and Smith *et al.*, 2001, for example). Smith *et al.* (2001) apply the model to the two-way table of variety by trial effects in order to accommodate heterogeneity of variety variance between trials (reflecting differences in the spread of variety means) and heterogeneity of correlation between trials (reflecting changes in variety rankings). They also allow for heterogeneity of error variance between trials. The Smith *et al.* (2001) approach is routinely used in many Australian plant breeding programs and has led to a better understanding of variety by trial interactions and accelerated genetic progress. Although formulated for the analysis of variety trial data, the approach may be useful for other applications, including the analysis of data from sensory evaluation experiments. Implicit in these data are two-way tables of product by assessor effects. Several authors, including Brockhoff and Skovgaard (1994) have suggested the need to accommodate heterogeneity of product and error variance between assessors. This provides information on the discriminating ability and reliability of individual assessors. Additionally it is of interest to examine the level of agreement between assessors. There are, therefore, some clear analogies with variety by trial data. In this paper we present a multiplicative mixed model analysis of sensory data from a project conducted to differentiate between ecologically and conventionally produced Riesling wines in Germany (Dupin *et al.*, 1999). A total of 56 wines (28 of each style of production) was evaluated for a number of traits by 22 assessors. We present a detailed analysis of one of the traits.

References

- Brockhoff, P.M. and Skovgaard, I.M. (1994). Modelling individual differences between assessors in sensory evaluation. *Food Quality and Preference*, 5, 215-224.
- Dupin, I., Schlich, P. and Fischer, U. (1999). Differentiation of wines produced by organic or conventional viticulture according to their sensory profiles and aroma composition. *Proceedings of the 24 Weltkongress für Rebe und Wein, Section 1 Viticulture*, p128-133.
- Piepho, H.-P. (1997). Analyzing genotype-environment data by mixed models with multiplicative terms. *Biometrics*, 53, 761-767.
- Smith, A.B., Cullis, B.R. and Thompson, R. (2001). Analyzing variety by environment data using multiplicative mixed models and adjustments for spatial field trend. *Biometrics*, 57, 1138-1147.