Generalized AMMI Models for Assessing The Endurance of Soybean to Leaf Pest

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ABSTRACT

AMMI (Additive Main Effect Multiplicative Interaction) model for interactions in two-way table provide the major mean for studying stability and adaptability through genotype × environment interaction (GEI), which modeled by full interaction model. Eligibility of AMMI (Additive Main Effect Multiplicative Interaction) model depends on that assumption of normally independent distributed error with a constant variance. In the study of genotypes' resistance, disease and pest (insect) incidence on a plant for example, the appropriateness of AMMI model is being doubtful. We can handle it by introducing multiplicative terms for interaction in wider class of modeling, Generalized Linear Models. Its called Generalized AMMI model. An algorithm of iterative alternating generalized regression of row and column estimates its parameters. GAMMI log-link model will be applied to the Poisson data distribution. GAMMI log-link models give us good information of the interaction by its log-odd ratio.

Keywords: AMMI, GEI, GAMMI, log-link

INTRODUCTION

The AMMI model represents observations into a systematic component that consists of main effect and interaction effect through multiplication of interactions components, apart from random errors component. Basically, the AMMI analysis combines both additive analysis of variance for the main effect of treatment and analysis of multiple main components uses bilinear modeling for the interaction effect, by using singular value decomposition (SVD) of its interaction matrix (Mattjik & Sumertajaya 2002, Hadi & Sa'diyah 2004, Mattjik 2005). Sometimes, goodness of fit AMMI models which have normally distributed errors with constant variances cannot be satisfied. Statistical modeling plays the most important role in the providing interpretation of interest phenomenon, and representing it into appropriate language of application field.

Transformation can be omitted if homogeneity of variances can be modeled by multiplication of interactions components in the systematic model. However, for non-normally distributed data which is modeled in the observation scale, multiplication of interactions components maybe represent both homogeneity of variances and true multiplication of interactions. It means that there is no warranty that transformation of data in the observation scale be able to separates them.

Transformation, in the regression analysis and analysis of variance cases, has three goals, i.e., to obtain homogeneity of variances, normally of errors, and additional of systemic effects. It is not easy to obtain a satisfaction transformation for all need. So, after transforming, multiplicative component maybe still represents mixture of heterogeneity of variances and multiplicative effects (Hadi *et al.* 2007).

While, in the additive models, we have widely known generalized linear models (GLM) as a modeling class of non-normally distributed data. In GLM additiveness of systemic effects is given into normally scale. Normally (and homogeneity) of variances is not necessary again. It is because the (quasi) likelihood just need to fix the relationship between mean and variance only.

Multiplicative models (bilinear) bridge the gap between the main effect models (in ANOVA and GLM) and completely interaction models with interaction parameters for each cell in two way table. This models are also give a visually pattern of the main interaction through biplot. Therefore, developing of GLM theory by accommodate the multiplicative component of interaction is very necessary.