APPLICATIONS OF MIXED LINEAR MODEL APPROACHES ON COTTON QUATITATIVE GENETICS

Jixiang Wu
Mississippi State Univ.
Mississippi State, MS
Johnie N. Jenkins and Jack C. McCarty Jr.
USDA-ARS
Mississippi State, MS
Jun Zhu
Zhejiang Univ.
Hangzhou, Zhejiang, China

Abstract

Many practical genetic models have been developed based the idea of analysis of variance (ANOVA) proposed by Fisher (1925). These genetic models include NC I, NC II designs, diallele crosses models. The application of ANOVA approach in quantitative genetic analyses greatly facilitated the development in quantitative genetics. However, ANOVA approach has some limitations: (1) it cannot analyze unbalanced data without bias; (2) it cannot analyze some complicated genetic model. The Mixed linear model approach developed in 1970s can overcome the limitations of ANOVA.

Cockerham (1980) proposed the generalized genetic model which can be used to extend to other complicated genetic models. Zhu has developed several practical genetic models based on Cockerham's (1980) idea (Zhu 1992, 1993a, b, 1994, 1996; Zhu and Weir 1994a,b). Mixed linear model approaches were used to estimate the genetic variance and covariance components and predict the genetic effects.

The applications of mixed linear model approaches in cotton quantitative traits have included following aspects.

- Diallel Model Analyses
- Seed Model Analyses
- Prediction of Genotype Values in Advance
- Developmental Trait Analyses
- Quantitative Trait Loci (QTL) Analyses
- Complex Trait Analyses

The corresponding programs are available and downloadable at web site http://msa.ars.usda.gov/ms/msstate/csrl/jenkins.htm.