PRECISION OF SOME STATISTICAL PROCEDURES IN EVALUATING THE PERFORMANCE OF COTTON GENOTYPES

By

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To the souls of my mother and father

Thanks
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Thanks to Allah, the most merciful and the most beneficial

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<th><strong>ABSTRACT</strong></th>
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| The present investigation was carried out at the Agricultural Experimental and Research station in Faculty of Agriculture, Cairo University, Giza, Egypt during 2008 and 2009 seasons. In the first experiment; twenty five cotton families, lines and cultivars were used. The balanced lattice design (5X5) with six replications was used as a basic design. All recommended agricultural practices were used. The studied traits were seed cotton yield (g/plot), lint cotton yield (g/plot), seed cotton yield per plant (g), lint cotton yield per plant (g), lint percentage and lint index. The studied statistical procedures were traditional designs (randomized complete block design (RCBD), balanced lattice design (6-replications) and partially balanced lattice with 2,3,4 and 5 replications). Also, non-traditional analyses of restricted maximum likelihood (REML) method as ordinary, spatial and meta models were proceeded, for all replication combinations. All combinations from 6 replications were analyzed. i.e., 57 combinations. Relative precision was calculated for each replication combination in each season. The highest one in relative precision for each combination was identified. Non-traditional methods of statistical analyses were applied to the highest précised data sets. In both seasons, certain genotypes either in F₃ or F₆ showed significantly higher for all studied traits than commercial cultivars under study. Based on results obtained, either quintic or balanced lattices could be recommended instead of RCBD. In general, as long as number of replications increase, the precision increases as in quintic and balanced lattices. The results were extended to detect the most précised REML models using four estimated parameters, i.e., residual variance ($\sigma^2$), $\chi^2$, deviance (DV) and akaike information criterion deviance (AICD). For all data sets, meta REML model was detected as the best REML model for increasing the precision of cotton field trials compared with ordinary and spatial REML models. Except for 2-replications data set, either replications or replications and blocks alternative sub-models revealed their importance in increasing precision of experiments. Precision of REML models compared with the traditional designs were included in the present study. In both seasons, except for 2-replication data set, highest C.V. values were obtained for RCBD followed by lattice design, ordinary-, spatial- and meta- REML models, respectively. Concerning 6-replication data set, based on the averages of C.V. estimates for the two seasons of study, the lowest C.V. estimates were obtained for meta REML model. The same trend of results was detected for other studied traits. Furthermore, the same trend of results was detected for other data sets. Results showed the effect of adjustment of genotype means for unexplained variability in ranks for selection of the best genotype. The second experiment was conducted to study the optimum boll sample size of random sample for upper half mean length (UHM), length uniformity ratio (%), micronaire reading, fiber strength (g/tex) and fiber elongation (%). Concerning the recommended meta REML model analysis, whole plot sample size was considered the most recommended for all fiber traits with exception of fiber elongation which was 100 bolls. Finally it could be concluded that the meta REML model is recommended for analyses of data for cotton field trials and in studying cotton fiber traits.  
**Key words:** Cotton yield trial, RCBD, Balanced and partially balanced lattice design, Relative precision, REML models, Spatial model, Meta model, C.V., R.D., Fiber properties and Sample size.
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