

"Comparison of the Fan Design with the Conventional Designs for Spacing Experiments—An Empirical Study"

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In recent years a great deal of stress has been placed on the design of experiments. It is preferred to use that design which gives maximum precision at a given cost or requires minimum cost for a given precision. The agromonomical experiments are conducted in the conventional designs like randomized block design (RBD), split plot design (SPL) etc. The spacing trials is a special group of trials which need large area under each replication for testing a number of spacing treatments in the conventional designs, requiring more cost. Nelder (1962) advocated the use of systematic design (FAN design) having single row plots from the large number of spacing treatments, compacted in a much smaller area as compared to the conventional designs. The systematic design violates the basic principle of random error resulting biased estimate. Since there is single row plots, the treatment effects are likely to be influenced by the border effect also. The present investigation was undertaken to examine the relative utility of the fan design in relation to randomized block and split plot designs for spacing experiments using cotton IAN 579-188.

Layouts with systematic as well as random arrangements following the same spacing

as in fan design were simulated. The plot size considered was on area basis as well as equal number of row basis. In all 6 layouts including split plot design were used to assess border effect as well as bias, if any, in treatment means.

The results revealed the following:

1. The plant height, number of bolls per plant and cotton yield per plant of cotton variety IAN 579-188 were not influenced by the border effects in spacing trials. Therefore, the border effects are absent in spacing trials conducted on cotton IAN 579-188.

The fan design which permits single row plots, can be used for spacing trial on a crop with monopodial growth habit in place of systematic or random arrangements with equal or unequal row plots.

2. The comparison, FAN Vs RBD showed, on overall basis, an overestimation of the treatment means in FAN. Whereas, FAN Vs SPL showed an underestimation of the treatment means in FAN when area per plant was 900 sq cm and above. Fan design therefore, gives biased estimates of the treatment means.

It was observed that the rectangularity had some impact on the plant height, number of bolls per plant and cotton yield per plant. Therefore rectangularity should be given the consideration in planning of the spacing experiments.

3. Intra-class correlations for the number of bolls per plant and cotton yield per plant were positive and significant. Therefore the errors in fan design are correlated.

Analysis of the data in Fan design by the analysis of variance gave over-estimates of F values.

4. Hotelling T^2 approach gave similar results for the data in FAN as in RBD when errors were heterogeneous or correlated or

both. Therefore, Hotelling T^2 approach should be used for analysis of data in fan design.

The investigation leads to the inference that the fan design, though useful for spacing trials on crops with monopodial type of growth habit such as cotton IAN 579-188, gives biased estimates of the treatment means.