

Optimal experimental designs when most treatments are unreplicated

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Abstract

n early generation variety trials, large numbers of new varieties may be compared, and little seed is usually available for each variety. A so-called unreplicated trial has each new variety on just one plot at a site, but includes several (often around 5) replicated check or control (or standard) varieties. The total proportion of check plots is usually between 10% and 20%. The aim of the trial is to choose some (around 1/3) good performing varieties to go on for further testing, rather than precise estimation of their mean yield.

Now that spatial analyses of data from field experiments are becoming more common, there is interest in an efficient layout of an experiment given a proposed spatial analysis. The usual C -matrix is very large, and hence it is time-consuming to calculate its inverse. However, since most varieties are unreplicated, the variety incidence matrix has a simple form, and some matrix manipulations can dramatically reduce the computation needed. Some possible design criteria are discussed, and efficient layouts under spatial dependence are considered.