

Near-factorial experiments in a partial balanced block design with nested rows and columns for plant protection research

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We present principles for the planning of experiments carried out on heterogeneous experimental material. Such situation occurs in plant protection experiments, where localisation plays an important role. When planning plant protection experiments, one has to consider irregular occurring and spreading of diseases, migration or raid of pests, the possibility of reinfection and other uncontrolled sources of variability. Having such heterogeneous experimental material, one has to use systems of blocks perpendicularly to the directions of occurring variabilities. Just block designs with nested rows and columns ensure eliminating of the heterogeneities described above. A design is said to have nested rows and columns if the set of experimental units is partitioned into b_0 blocks and each block is further partitioned into b_1 rows and b_2 columns.

An important aspect in plant protection experimentation is planning of research for two experimental factors (for example to compare the effectiveness of chosen plant protection products used in various concentrations and terms). To specify the effectiveness of used methods of plant protection, one has to analyse their activity when related to the untreated control. Due to economical reasons, in given examples of research problems, factorial experiments with one control treatment (near-factorial experiments) are considered.

The aim of this paper is studying the efficiency factors estimation of contrasts of effects of two experimental factors, their combination and control. We assumed a mixed linear model resulting from randomization of blocks, rows and columns. We carried out stratum analysis and obtained the efficiency factors estimation of treatment contrasts in the strata. We describe a block design with nested rows and columns having properties facilitating analysis of near-factorial experiments concerning plant protection.