The usefulness of some soil properties and plant traits for the estimation of spatial variation in a 3⁵ field experiment with pea

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The main limitation on the broader use of advanced factorial or fractional designs in agricultural experimental practice is the problem of effective control of soil variability. The objective of the study was to assess the usefulness of some soil (pH, P, K, Mg, organic C) and plant characteristics (plant height, seed yield) for the estimation of spatial variation of the experimental field with pea. Spatial parameters were determined by geostatistical methods. All of the studied soil and plant characteristics showed distinct spatial variation, generally more pronounced horizontally (width of the field) than vertically. The semivariances were differentiated in space, so the anisotropic semivariogram models were fitted. An analysis of the parameters of semivariogram models indicated that observations were highly correlated spatially; the contribution of structural variance to the sill was over 80% and the range of spatial correlation depended on the characteristics studied. Kriging of the characteristics was applied for given semivariogram parameters to visualize spatial variation, and to predict these characteristics for each experimental plot. The predicted data, included into analysis of covariance as concomitant variables, significantly reduced the experimental error in relation to the classic analysis of variance. Organic C content and plant height measured on the check plots were found to be the most useful of all soil and plant characteristics examined in the study.