Comparing the Prediction of Greenhouse Insect Populations between Ordinary Point Kriging and Block Kriging with Variogram Modeling Parameters: in Case Study of *Frankliniella occidentalis* on Greenhouse Cucumbers and *Trialeurodes vaporariorum* on Greenhouse Cherry Tomatoes

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Kriging is a very popular technique for interpolation of spatial data between measurement points. It is an optimal linear technique when the spatial covariance structure is known. It has many practical applications to pollution data, geological data etc. Several kriging methods were used to predict unknown value. In this study, we evaluate two common kriging methods, ordinary point kriging and block kriging, for prediction. Ordinary point kriging is a minimum-mean-square-error method that depends on the variogram modeling. Block kriging is similar to the ordinary point kriging system, however, block kriging predict a block estimate or, more precisely, a prediction of the average value of a variable within a prescribed local area. In this study, mapping by ordinary kriging and block kriging were evaluated using 50, 33, 25 and 20% of the test data, which do not used for variogram model estimation, from another greenhouses. Each independent datum used in test data were placed as follows: in thrips population, each actual datum for ordinary kriging was placed about 6 to 10meters apart at 50%, 6 to 12 meters at 33%, 8 to 14 meters at 25%, and over 14 meters at 20% ; in whitefly population, actual datum distance for ordinary kriging was about 5 to 9 meters at 50%, 7 to 12 meters at 33%, 7 to 15 meters at 25%, and over 15 meters at 20%, respectively. Ideally, additional observations for test set on specific spatial position should be taken to validate the spatial prediction. Thus we compared each kriging result by cross validation method. There are slightly difference between the predicted values from ordinary point kriging and block kriging. However, the prediction errors of ordinary point kriging is larger than that of block kriging.