Comparing Several Data Treatments for Appropriate Variogram Modeling with Aggregated Spatial Data: in Case Study of *Frankliniella occidentalis* on Greenhouse Cucumbers and *Trialeurodes vaporariorum* on Greenhouse Cherry Tomatoes

Jung-Joon Park, Key-il Shin[1] and Kijong Cho

Division of Environmental Science and Ecological Engineering, Korea University

[1] Department of Statistics, Hankuk University of Foreign Studies,

Spatial distribution of target organism is one of the most describing unique ecological properties of species and yields characteristic parameters that segregated species. Thus, the analysis of spatial distribution is recognized as an indispensable procedure for ecological studies. Traditional analyzing methods for spatial distribution, which using the relationship between species' means and variances, ignore the spatial heterogeneity with knowledge of spatial location. However, the variogram modeling, that describing the spatial dependence of target species with knowledges of spatial locations. Several scientists, however, showed that the variogram modeling if often erratic and unreliable when highly aggregated and lots of outlier data like insect population. *Frankliniella occidentalis* and *Trialeurodes vaporariorum* are most serious insect pest populations in greenhouses. Two species showed highly aggregated and lots of outliers in traditional methods of analysis of spatial distribution. In this study, we evaluated variogram modeling with several data treatments, which are robust variogram modeling, median polishing methods, and outlier cleaning methods. After data treated, the scale of value would not be comparable. Thus we compared mathematical restricted variogram model parameters and correlation coefficients between actual and predicted values by leave-one-out cross validation with treated and untreated independent data that do not using variogram modeling. Outlier detecting and cleaning procedure improved variogram modeling especially by reducing nugget effect that greatly affects the prediction variance of kriging. Thus we recommended outlier detecting and cleaning procedures when variogram modeling with highly aggregated and extremely fluctuated data.