

Variable intensity and fixed-size sampling plans: comparative analysis using simulated Nephrotettix spp. (Homoptera: Cicadellidae) populations in wet paddy ecosystem in Malaysia

ABSTRACT

This study compares the variable intensity sampling (VIS) and fixed-size sampling (FSS) plans for the green rice leafhopper (GLH), *Nephrotettix* spp., in wet paddy ecosystem. The sampling plans were generated based on a regression model of variance-mean relationship in Taylor's Power Law. In each plan, 100 simulated replicates were generated simultaneously using a bootstrap approach for each of 0.20, 0.25 and 0.30 levels of precision with 2 hoppers/hill as the economic threshold. The simulations were performed on four independent data sets collected from an experimental plot at Universiti Putra Malaysia. Results obtained show that VIS requires the least number of samples compared to FSS, especially at low and high densities of GLH, i.e. when the mean density is greatly different from the threshold. VIS differs from other fixed precision level sampling plans which require large sample sizes to maintain a constant precision, especially at a low population density. The mean densities estimated by both plans are quite similar, though the FSS estimation was closer to the mean density of the actual data. The mean densities estimated by VIS are more variable than those estimated by FSS due to greater variability in sample size generated by VIS. This study indicates that FSS generated 98-100% of actual precision relative to the required precision, at high and intermediate densities. This increases the cost and time needed for decision making. At low densities, FSS required more samples to maintain the actual precision even at levels less than that desired. Hence in comparison, VIS plan is more efficient than FSS for density estimation and decision making, due to the flexibility of sample size required in relation to threshold values.

Keyword: Rice; Sample plan; VIS; Bootstrap; Taylor's coefficients; Simulation; Malaysia