Numerical and binomial optimal samplings of arthropods of wet paddy ecosystem in Malaysia

ABSTRACT

The optimum sample size (OSS) is the smallest sample size with userpredetermined acceptable reliability of estimation. As such, to ensure efficiency of assignments, OSS information is necessary for both numerical and binomial sampling. Data from visual inspection of 204 samples, with 40 hills of paddy plant per sample, were used to determine the OSS numerical and binomial sampling curves for each of the 22 categories of arthropods. To determine the OSS, the data on counts per hill were analyzed to obtain variance (s2) and mean density (xï) at each combination of arthropod category, sampling date and sampling time for each of the 22 arthropod categories (8 pests and 14 predators). Taylorôs a and b coefficients were then obtained, and incorporated into Wilson and Roomôs (1983) algorithms to generate proportions of infestation and OSS information for enumerative and binomial samplings for each arthropod category. The pattern of OSS curves for binomial sampling indicates two groups of arthropods, i.e. those whose OSS increases slowly as xï increases and those showing a rapid increase in OSS. The first group consists of species having clumped distribution while the second group comprises species showing random distribution. The former group shows approximately three individuals a hill where the minimum sample size occurs, whereas the latter shows approximately two individuals a hill. Generally, at a certain population density, binomial sampling necessitates a larger sample size than numerical sampling for optimal characterization. In binomial sampling, the sample size required decreases with increasing population density up to a point, and then increases. In numerical sampling, the sample size required decreases with increasing population density. For each arthropod category, on the binomial OSS curve, there is no P(I) (proportion of infested hills) value below the minimum OSS point. Their spatial distributions were determined, and found to be clumped (most of the pests) and random (most of the predators). Thus, in binomial sampling at similar population densities, a larger number of samples are required to optimally estimate randomly distributed populations than those showing clumped distribution at higher densities.

Keyword: Insecta; Paddy; Rice; Pest; Sampling; OSS; Malaysia