Spatial distribution of some major arthropods and sampling procedures for Aphis gossypii Glov. in polyculture system comprising chilli, brinjal and leucaena plants

ABSTRACT

In preventing crop losses due to chilli veinal mottle virus transmitted by Aphis gossypii on chilli plants, a polyculture system is known in many cases to suppress pests through predation by Menochilus sexmaculatus. However,information on spatial distribution of major pests and predators in polyculture crop system is little known. Yet such information is essential in developing sampling plans for pest management. The spatial distributions of two pest species, A. gossypii on chilli and brinjal plants and Heteropsylla cubana onleucaena plants; and one predator species, M. sexmaculatus, were analyzed withrespect to different culture methods and life stages using Taylorôs Power Law (b coefficient) and Iwaoôs mean crowding index (ß coefficient). Subsequently,Taylorôs coefficients were used in developing the Greenôs sequential plan for A. gossypii for each culture method. This study indicates that all arthropod categories were clumped, with ß and b values significantly larger than 1. On regressing the variance on the mean density, Taylorôs Power Law indicates the best fit with higher r2 and lower standard errors compared with Iwaoôs mean crowding. The immobility of aphid nymphs and wingless aphids tends to result in high aggregations, whereas decreasing aggregations in winged aphids are due to the flight ability. In developing a sampling plan, monoculture requires a smaller sample size than that required by diculture and triculture. Population density of insect species in monoculture is higher than those in diculture and triculture. The Greenôs plan required smaller sample size than fixed-sample-size plan. As the precision level is decreased from 0.20 to 0.30, the sample size decreases from 44 to 12 in monoculture, from 41 to 14 in diculture, and from 51 to 17 in triculture. Each type of culture yielded a high percentage of actual precision level lower than the optimal precision level. The result obtained indicates that the Greenôs plan is feasible and applicable in pest management program for A. gossypii with a precision level of 0.30.

Keyword: Aphids; Spatial distribution; Green's plan; Taylor's power law; Iwao's mean crowding; Intercropping; Polyculture; Bootstrap