Title Analysis of the insect community in a stored-maize facility

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Abstract

Maize samples were obtained at two depths [0–30 cm (top sample) and 30–60 cm (bottom sample) from the maize surface] at 19–28 locations from a naturally infested maize storage facility in Wisconsin, USA. Based on identification of insects in stored-maize samples from 13 weekly sampling events, four topics were addressed: (i) the seasonal fluctuation in the insect community; (ii) ordination analysis was conducted to examine the association among insect taxa and to determine their distribution along abiotic and geographic gradients; (iii) the demographic characteristics of insect communities in maize samples with high abundance of either *Plodia interpunctella* (*Plodia* samples) or *Sitophilus zeamais* (*Sitophilus* samples); and (iv) to what extent natural enemies were spatially associated with their prey species. We identified a total of 18 different taxa, composed of adults and larvae of 14 determined species, and others identified to genus, family or order. Insect density was significantly higher in top samples compared to bottom samples, and the insect taxa occurred more frequently in top samples compared to bottom samples. In the ordination analysis, the three explanatory variables accounting for eastern, northern and vertical position of maize samples explained the largest part of the total variance. There was a gradual time trend with some of the insect species mainly occurring early or late in the monitoring period. Moisture content of the maize was the weakest of the significant explanatory variables, while temperature in the grain mass did not explain a significant part of the total variance. *Plodia* samples and *Sitophilus* samples had significantly different spatial distribution patterns and had markedly different insect species composition. *Plodia* samples were characterized by low abundance of all granivores and fungivores, except *P. interpunctella*. Conversely, *Sitophilus* samples had high abundance of *T. castaneum*, *A. advena*, and *C. ferrugineus*. Consequently, *Sitophilus* samples seemed to comprise more diverse insect communities than *Plodia* samples. Natural enemies were not significantly associated with their most common hosts. In a highly homogeneous habitat (stored maize), we demonstrated that stored-product insect species had significantly different distribution patterns mainly along geographic gradients. Stochasticity of the initial infestation process or interspecific competition are two of the possible explanations for the spatial segregation of stored-product insects, and the spatial segregation of insects on the same trophic level may have profound implications for the understanding of how these ecosystems

develop over time and thereby how integrated pest management strategies are implemented to control insect pest populations.