How methodical approaches affects results of pest sampling in stores and counting in laboratory

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Abstract

In this study we analyzed impact of the method of sampling of pests in stores on the subsequent counting of pests in the laboratory. First, we compared results obtained from two methods of sampling a highly infested flat grain store (surface sampling with cup-sampler vs. subsurface sampling with spear-sampler) and two extraction methods (Tullgren apparatus vs. automated sieving machine). For samples collected from the same store and sampling date, we found that pest population density and spatial distribution differed significantly between methods. Sampling method had a significant influence on number of trapped arthropods: surface sampling recovered significantly more arthropods than use of spear-sampler (LR chi-squared test: $\chi 2 = 4.46$, d.f. = 1, P = 0.034). Number of identified arthropod species was not influenced by sampling method (LR chi-squared test: $\chi 2 = 1.91$, d.f. = 1, P = 0.167). The Tullgren apparatus extracted consistently more arthropods from samples than the automated sieving machine, but the difference was not significant (LR chi-squared test: $\chi 2 = 3.55$, d.f. = 1, P = 0.059). The extraction method also did not influence the number of arthropod species (LR chi-squared test: $\chi 2 = 9.5–09$, d.f. = 1, P = 0.99). Different combinations of sampling/extracting methods led to different estimations of infestation levels and their location. The most sensitive approach to estimate arthropod pests' abundance and spatial distribution revealed to be a combination of surface sampling and Tullgren extraction. Using the sieving machine to extract arthropod individuals from sampling spear samples gave the poorest picture of pests' status in the inspected store (Stejskal et al., 2008).

Second, we compared results of counting mites and psocids in samples obtained either by digital image analysis (DIA) or traditional visual direct counting (VDC) under a binocular microscope. Our DIA method estimated the number of arthropod individuals using distinguishing features of size and shape. The accuracy and time required were similar to those of the traditional direct visual counting approach when samples comprise fewer than 100 individuals. However, as the true sample size increased above 100 individuals, the DIA method was significantly more precise and quicker than visual counting. The direct visual counting method always underestimated the number of individuals per sample. As expected, the time required for direct visual counting increased with sample size, while the time required for DIA-based counting remained the same. Thus, the DIA method is 10 times quicker than the direct visual counting method with a sample of 500 mites (Lukas et al., 2009).

Our work shows that different sampling, extraction and counting methods may convey different infestation "pictures" for the same store. The methodological approach used profoundly affects the evaluation of population density and interpretation of obtained results.

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References

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