

Sequential sampling plans for estimating European corn borer (Lepidoptera: Crambidae) and corn earworm (Lepidoptera: Noctuidae) larval density in sweet corn ears

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We developed a flexible fixed-precision sequential sampling plan for estimating the density of European corn borer, *Ostrinia nubilalis* Hübner and corn earworm, *Helicoverpa zea* (Boddie), larvae, using infestation data collected from 1994 to 2000. The purpose of each sampling plan was to provide statistically sound estimates of larval densities for each pest in sweet corn ears, near harvest, with minimal cost. Sweet corn variety plots and commercial production fields were sampled to obtain a wide range of *O. nubilalis* and *H. zea* densities typically found in sweet corn, in the Midwestern USA. Sampling parameters were estimated from 84 and 68 data sets for *O. nubilalis* and *H. zea*, respectively. An additional 15 independent data sets, for each species, were used to validate the fixed-precision sequential sampling plans with resampling software. Dispersion patterns for *O. nubilalis* and *H. zea* were determined to be random and uniform, respectively, from Taylor's power law. For *O. nubilalis*, at densities of 0.24–4.08 larvae/ear, an average sample number (ASN) of only 38 ears was necessary to achieve a desired precision level (SE/mean) of 0.25. As the precision level was increased to 0.10, average sample size increased to 227 ears. For *H. zea*, at densities of 0.20–2.05 larvae/ear, an ASN of 27 ears was required to achieve a desired precision level of 0.25. As the precision level was increased to 0.10, sample size increased to 160 ears. The sequential sampling plans will be useful to researchers for quantitative assessment of integrated pest management (IPM) strategies, via rapid estimation of larval density per ear, the primary determinant of IPM efficacy and product quality near harvest. Additionally, these plans can be used to determine the background density necessary for estimating the frequency of *O. nubilalis* or *H. zea* larvae found in transgenic Bt sweet corn ears expressing *Bacillus thuringiensis* proteins.

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