N O T E

Within-Plant Distribution of European Corn Borer, *Ostrinia nubilalis* Hübner, Egg Masses on Bell Pepper[1]

V. M. Barlow[2] and T. P. Kuhar

Department of Entomology, Virginia Polytechnic Institute & State University, Eastern Shore AREC, Painter, VA 23420 USA

J. Entomol. Sci. 39(4): 670-672 (October 2004)

Key Words *Ostrinia nubilalis,* pepper, sampling, oviposition

The European corn borer, *Ostrinia nubilalis* Hübner (Lepidoptera: Crambidae), is one of the most economically important pests of agricultural crops in much of the eastern and central U.S. *Ostrinia nubilalis* is particularly damaging to sweet peppers, *Capsicum annuum* L., because it causes direct injury to the fruit, premature fruit ripening, and fruit rot resulting from pathogens, such as *Erwinia carotovora* subsp. *carotovora* (L. R. Jones) Berger, Harrison, Breed, Hammer and Huntoon, entering the feeding wound.

Control of *O. nubilalis* in peppers typically relies on multiple preventative insecticide applications, often with little or no knowledge of the pest density in the field. Virginia growers typically make 6 to 11 applications of insecticide per season to protect pepper from *O. nubilalis.* An effective sampling program for *O. nubilalis* could better determine timing of insecticide applications as well as reduce the total number of applications (Welty 1995, J. Agric. Entomol. 12: 145-161). A scouting program based on larval sampling is not feasible for *O. nubilalis* because neonates are difficult to see on plants and they quickly bore into plant tissue, often the fruit, where they are protected from control measures.

Sampling the egg stage of *O. nubilalis* is a more logical strategy for an IPM scouting program. *Ostrinia nubilalis* typically deposits eggs in aggregated masses of 15 to 20 eggs on leaves. However, given the numerous leaves and architectural complexity of a pepper plant, sampling *O. nubilalis* egg masses can be laborious and time-consuming. The objective of our study was to classify likely areas of *O. nubilalis* oviposition within the pepper plant canopy. This information may enable us to optimize an egg mass sampling strategy.

In conjunction with another experiment in 2002 (Kuhar et al. 2004, J. Econ. Entomol. 97: 1209-1216) and further supplemented in 2004, we established 12 spatially-isolated field plots (~0.01 ha) of "Paladin" bell pepper at three locations in eastern

[1]Received 18 June 2004; accepted for publication 11 August 2004.
[2]Address inquiries (email: Vmbarlow@vt.edu).

Virginia. Six plots were transplanted on bare ground with overhead irrigation at the Virginia Tech Eastern Shore Agricultural Research and Extension Center (AREC) near Painter. Four plots were transplanted on bare ground with drip-line irrigation at the Virginia Tech Hampton Roads AREC in Virginia Beach, and the remaining two were transplanted on black plastic mulch with drip irrigation at the Virginia Tech Tidewater AREC near Suffolk. Beginning when plants were in first bloom (mid-Jul) until harvest (Sep) at approximately weekly intervals, we thoroughly inspected 50 to 100 plants for *O. nubilalis* egg masses in each of the plots. Once an egg mass had been located, its location on the plant was classified as either upper third, middle third, or lower third strata of the plant and as either upper leaf surface, lower leaf surface, or other structure. Seasonal location of egg masses was used to reflect the critical period for control of *O. nubilalis* for pepper fruit protection, i.e., first fruit set through final harvest. A chi-square contingency table ($\alpha = 0.05$) was used to determine if the proportion of egg masses found in the three vertical strata of the plant deviated from an expected distribution of 0.33 (indicating a non-uniform distribution among the three strata). Similarly, a chi-square contingency table was used to determine if the proportion of egg masses on the upper or lower surface of leaves deviated from an expected distribution of 0.5.

A total of 426 *O. nubilalis* egg masses was found on pepper plants during our study. Only three egg masses (0.7%) were found on plant structures other than a leaf, including one on a stem and two on fruit. Over 92% of egg masses in both years of the study were found on the lower surface of the leaf compared with the upper surface (Fig. 1), indicating a significant ovipositional preference for the undersides of leaves in 2002 ($\chi^2 = 9.68$; df = 1; $P < 0.05$) followed by similar results in 2004 ($\chi^2 = 4.34$; df = 1; $P < 0.05$). Ovipositional preference for the lower leaf surface by *O. nubilalis* on pepper is consistent with that observed on other plants (Capinera 2001, Handbook of vegetable pests. Academic Press, NY). This may be a strategy to reduce egg mortality from fluctuating environmental conditions as well as predation by natural en-

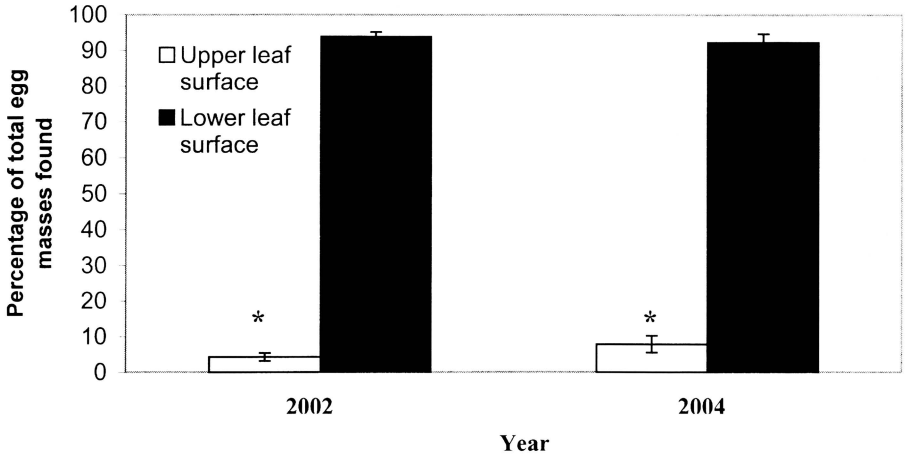

Fig. 1. Mean percentage (±SEM) of *Ostrinia nubilalis* egg masses found on the upper and lower leaf surface of pepper plants.

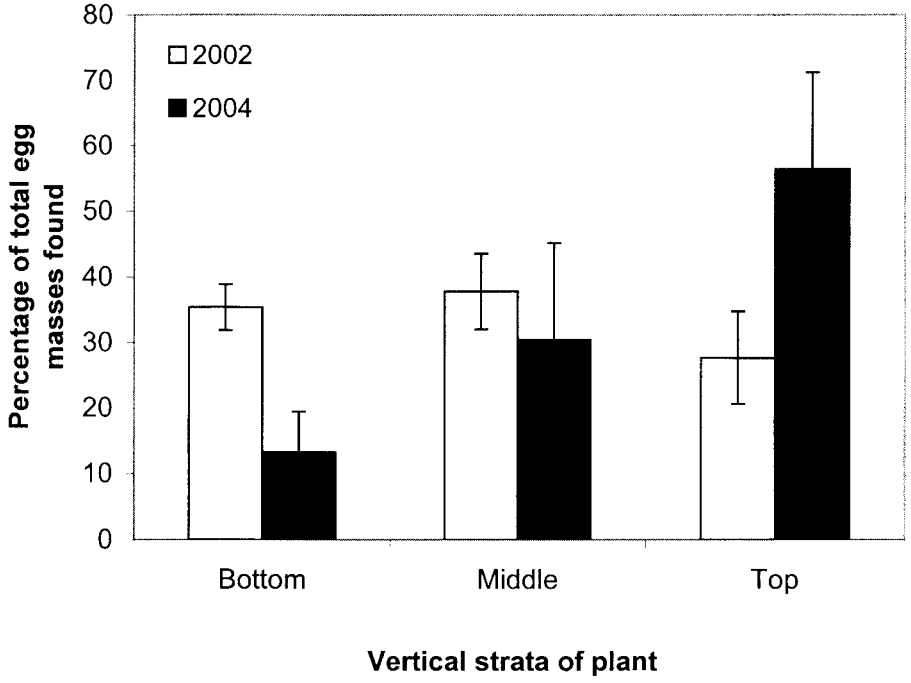

Fig. 2. Mean percentage (±SEM) of *Ostrinia nubilalis* egg masses distributed vertically within the pepper canopy.

emies. No significant differences were found in the observed spatial distribution of egg masses among the three vertical strata (Fig. 2) in either 2002 or 2004 ($\chi^2 = 1.75$; df = 2; $P < 0.05$ and $\chi^2 = 5.69$; df = 2; $P < 0.05$, respectively). These data suggest that *O. nubilalis* does not have a vertical preference for oviposition in the canopy of a bell pepper plant. These data are similar to those collected in sweet corn that showed a uniform vertical distribution of *O. nubilalis* egg masses on plants (Spangler and Calvin 2001, Environ. Entomol. 30: 274-279). Possibly the uniform egg mass deposition within the plant canopy is a strategy to minimize intraspecific competition by *O. nubilalis* for food resources (Harmon et al. 2003, Environ. Entomol. 32: 334-339).

In summary, we conclude that *O. nubilalis* females primarily (>92% of the time) oviposit on the undersides of leaves on pepper plants, but with no apparent preference for vertical region on the plant. An egg sampling strategy for *O. nubilalis* in peppers should concentrate on leaf undersides on all regions of the plant.