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A Presence/Absence Sampling Plan For Pink Bollworm Eggs in Cotton

W. D. Hutchison, T. J. Henneberry, and J. M. Martin
Western Cotton Research Laboratory, USDA-ARS, Phoenix, AZ
and C. A. Beasley, University of California, Riverside, CA

Summary

A new monitoring approach for the pink bollworm (PBW) was developed where only the presence or absence of one or more viable eggs/boll must be determined. Since individual eggs do not have to be counted, an experienced checker can examine a 25-boll sample in approximately 12 minutes. To use egg sampling for making treatment decisions, it is recommended that 3 to 4 25-boll samples be taken per field.

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Although the adult PBW moth is generally considered the target stage (see preceding article; Hutchison et. al. 1986), consultants must primarily rely on larval boll infestations to determine when to spray in mid- to late-season. This approach is hindered by a 6 to 10 day lag time between increasing adult populations and the detection of subsequent larval infestations. In this report we present a sampling plan for PBW eggs that provides a more recent index of moth activity and should allow for more timely treatment applications.

Methods

Data used to develop the egg sampling plan were obtained during 1984 from two untreated 0.87-ha fields of Deltapine-61 cotton located at Tempe and the Maricopa Agricultural Center. The Tempe

field was planted 5 April, and the Maricopa field was planted 21 April, both to 40-inch rows. At the Tempe location, a stratified random sampling plan was used where 25 bolls, ranging from 2.2 to 3.2 cm in diameter (12 to 21 days old), were taken at random from each of six quadrants for a total of 150 bolls/sample.

At Maricopa, a total of 100 bolls, equally allocated among four quadrants, were taken at random/sample date. Eggs in both fields were sampled twice weekly from 15 July to 20 October. Eggs were counted using a stereomicroscope at 12X and the number of bolls infested with one or more viable eggs per 25-boll sample was recorded.

Results and Discussion

The relationship between the proportion of bolls infested with PBW eggs and mean egg density is given in Fig. 1 ($\log_{10}$ avg. no. + 1); the $\log_{10}$ model fit the entire range of data well (R_2 = 0.94). The relationship in Fig. 1 allowed us to develop a sampling plan for PBW eggs where only the presence or absence of eggs on bolls must be determined. For field application, Table 1 provides predicted mean egg densities (based on Fig. 1.) for the number of bolls infested/25-boll sample. In addition, 95% prediction intervals based on four 25-boll samples are included to illustrate the degree of variability associated with these estimates.

Since individual eggs do not have to be counted, an experienced checker can estimate the proportion of bolls infested for a 25-boll sample in 11 to 14 min., or 0.44 to .56 min./boll. These rates are potentially 3X faster than the estimate of 0.5 to 1.5 min. boll reported by Slosser and Watson (1972) for estimating the proportion of bolls infested with larvae.

Although individual PBW eggs are only 0.25 by 0.5 mm in size, field experience in 1985 indicated that eggs could be initially detected on bolls with the unaided eye. A 10X hand lens was necessary only for egg confirmation (e.g., to distinguish PBW eggs from Orius tristicolor (White) nymphs or eggs of other insects). The relatively surprising ease with which eggs could be observed is attributed to the following: (1) ca. 66% of the eggs encountered on a given sample date were orange (2-3 days old) which contrasts well against a green background, and (2) 63% of all eggs counted (16 July to 7 October) were laid in clusters of 2 to 8 eggs each; 25% were laid singly and mean egg mass size was 4.43.

For most egg densities observed in commercial fields thus far, it is recommended that three to four 25-boll samples be examined per field. This sample size is usually sufficient to provide standard errors within 25% of the mean, a precision level acceptable for pest management purposes. Sampling plans for a range of precision levels, and validation studies of such plans are in preparation.

Fig. 1. Log_{10} (avg. + 1) transformation of average PBW egg density/boll in relation to the proportion of bolls infested.

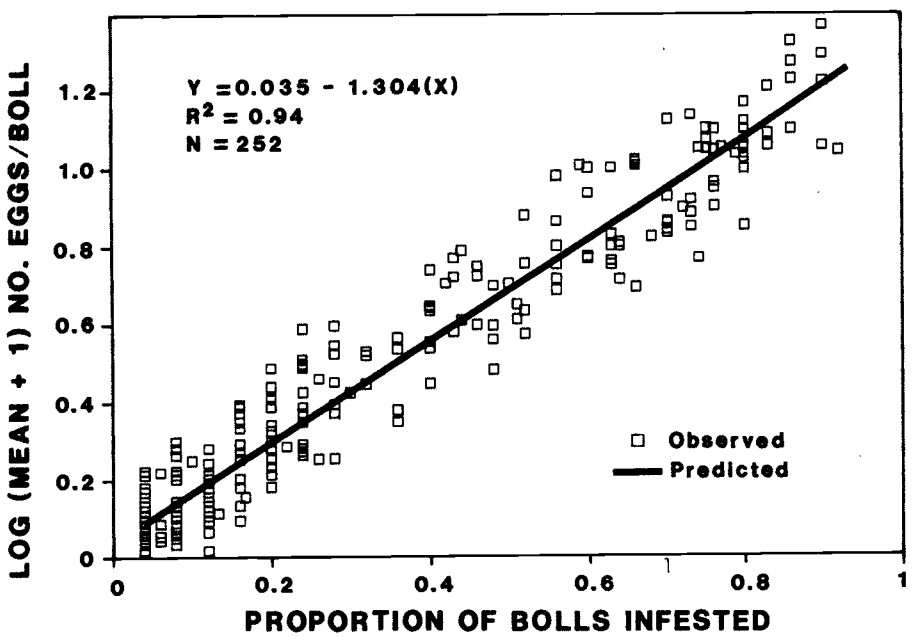

Table 1. Relationship Between Number of Bolls Infested with Pink Bollworm Eggs per 25-Boll Sample and Mean Egg Density per Boll (± 95% Prediction Interval)

Number bolls* infested	Mean number eggs/boll	95% P.I.** Lower	Upper
1	0.22	0.00	0.51
2	0.37	0.12	0.70
3	0.56	0.26	0.91
4	0.75	0.42	1.16
5	0.98	0.61	1.43
6	1.23	0.82	1.74
7	1.52	1.05	2.09
8	1.84	1.31	2.48
9	2.21	1.61	2.93
10	2.61	1.94	3.43
11	3.06	2.31	3.99
12	3.58	2.73	4.64
13	4.18	3.21	5.35
14	4.83	3.74	6.18
15	5.58	4.35	7.09
16	6.41	5.03	8.14
17	7.36	5.78	9.30
18	8.42	6.64	10.64
19	9.64	7.61	12.12
20	10.99	8.71	13.83

* Refers to bolls infested with one or more viable eggs.
** Prediction interval is based on an average infestation obtained from four 25-boll samples.

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