Rupela albinella (Lepidoptera: Pyralidae) Oviposition Behavior and Egg Distribution on Rice Plants[1]

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ABSTRACT Oviposition by a rice stem borer, *Rupela albinella* (Cramer), was studied on rice plants. Moths preferred to oviposit on plants older than 50 days. Foliage was highly preferred over stems as oviposition sites. Three times as many egg masses were deposited on the abaxial leaf surface as compared with the adaxial leaf surface. Leaves two and three were preferred for oviposition. Of eight cultivars tested Viflor was preferred for oviposition, while Tapuripa, another Peruvian line, had fewer egg masses.

KEY WORDS Insecta, rice stem borer, *Rupela albinella,* rice, *Oryza sativa,* oviposition, preference.

A rice stem borer, *Rupela albinella* (Cramer), is a sporadic rice pest (Vargas 1988) but is capable of causing important damage during localized infestations (King and Saunders 1984). Although the economic importance of the insect has not been established, it is listed as a rice pest in Mexico, Central and South America. The larvae bore stems causing dead hearts, unfilled grains, and weakened plants (Cardona and Troche 1965, CIAT 1980). Farmers attribute infestation by stem rot to the damage caused by the larvae and often apply insecticides to manage the pest. Furthermore, farmers typically do not discriminate between the damage caused by *R. albinella* and *Diatraea saccacharalis* (F.), a much more serious pest. This confusion often results in unnecessary chemical applications to control *R. albinella.*

In order to develop effective and well-targeted borer management practices, pest management decision makers must be able to distinguish egg masses and estimate the level of attack by parasitoids. *R. albinella* may be effectively controlled by natural enemies because 96% of *R. albinella* eggs may be affected by parasitoids (CIAT 1980). An important step is to identify the precise site of oviposition on the rice plant. This will save sampling time while inspecting egg masses for parasitoids. The objectives of this study were to determine the preferred rice plant age and oviposition sites and determine if there is oviposition preference among rice cultivars.

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Materials and Methods

Plant Age Preference Test. Adult *R. albinella* used in the experiment were collected from the field at Palmira, Colombia 1 day prior to the trial and confined on plants of Oryzica 3, a popular rice variety in Colombia. Twenty, 30, 35, 40, 45, 50 and 60-day-old plants were tested. Rice was planted directly on flooded soil in concrete benches (4 m long × 12 m wide × 1.3 m deep) in the screen house. The benches and plants were covered with a nylon screen cage to prevent escape of moths.

A constant infestation rate of 2 adults per plant was maintained for 5 days. Dead insects were replaced daily for 5 days. A completely randomized block design with 6 replications was used. Each replication consisted of one row with 10 plants of each age. Plant rows were 10 cm apart. The experiment was repeated three times over time. After the five-day oviposition period, the number of egg masses per plant, position of each mass on the upper or lower leaf surface, and leaf number were recorded. Leaf numbers were assigned following the method described by Yoshida (1981) where leaf one is the first leaf to emerge.

Varietal Preference Test. Eight varieties commonly grown in Latin America were planted on concrete benches as previously described. When plants reached 50 days, adult *R. albinella* moths were released inside the cage. In the previous test this plant age was found to be preferred by adults for oviposition. A constant infestation of 2 insects/plant was maintained for 5 days by replacing dead insects daily. Egg masses were counted daily, then removed using a moist cloth (Pitre et al. 1983). Varieties were arranged in a completely randomized block design with 6 replications which consisted of 10 plants/variety. Varieties were planted 10 cm apart. The experiment was repeated three times over a one-year time period. The number of tillers/plant was recorded at harvesting.

Statistics. Counts of the number of egg masses by plant age and variety and number of tiller/plant were transformed [Square root (Mean + 1)] and subjected to the General Linear Models (GLM) procedure of the Statistical Analysis System (SAS 1985). Means were separated by Duncan's Multiple Range Test at the 0.05 level of probability (Duncan 1955). Counts on the position of the egg masses (abaxial or adaxial leave surface) were subjected to Chi-square analysis. The number of tillers was correlated with the number of egg masses.

Results

Plant Age Preference Test. The number of egg masses per plant increased significantly ($P < 0.05$) with plant age (Table 1). Twenty-day-old plants only received 0.05 egg masses/plant while 3.3 egg masses/plant were observed on 60-day-old plants. Eighty-six percent of the egg masses were deposited on the foliage, while 14% were collected from the stem (Table 2). Sixty-seven percent of the egg masses were located on the lower third of the foliage. Leaves two and three received a similar percentage of the egg masses (22%). Only 5% of the total number of egg masses were found on leaves 7-10.

Three times as many egg masses were deposited in the abaxial leaf surface (77.5%) as compared to the adaxial leaf surface (22.5%; Chi Square = 19.9; df = 2; $P < 0.01$).

Table 1. *Rupela albinella* oviposition on rice plants of different ages, Colombia, 1989-90.

Days after planting	Egg masses/plant*
20	0.06 ± 0.17 a
30	0.28 ± 0.06 a
35	0.52 ± 0.07 bc
40	0.69 ± 0.06 ab
45	0.86 ± 0.07 ab
50	1.35 ± 0.11 c
60	3.3 ± 0.28 d

*Means (± SEM) followed by the same letter are not significantly different according to Duncan's Multiple Range Test ($P < 0.05$). Data were transformed [Square root (Mean + 1)] for statistical analysis; means presented are observed values.

Table 2. Intraplant distribution of *Rupela albinella* egg masses on rice, Colombia, 1991.

Leaf number	Egg masses/leaf		% Egg masses
	Mean ± SEM	n	
1	1.15 ± 0.05	121	9.6
2	1.21 ± 0.04	278	22.0
3	1.37 ± 0.05	280	22.2
4	1.28 ± 0.05	167	13.2
5	1.40 ± 0.11	108	8.6
6	1.28 ± 0.10	69	5.5
7	1.18 ± 0.10	20	1.6
8	1.44 ± 0.28	26	2.1
9	1.50 ± 0.22	9	0.71
10	1.33 ± 0.21	8	0.63
Stem	1.01 ± 0.04	177	14.0

Varietal Preference Test. Although egg masses were recovered from all cultivars tested, there were significant differences among cultivars (Table 3). Viflor, a Peruvian improved variety, received a significantly greater amount of egg masses per plant. With the exception of Tapuripa which received only 0.33 egg masses/plant, there were no significant differences in egg masses laid on the other seven cultivars. The correlation analysis indicated no significant ($P < 0.05$) relationship between the number of egg masses/plant and the number of tillers.

Table 3. *Rupela albinella* oviposition on eight rice varieties, Colombia, 1991.*

Variety	Egg masses/plant	Tillers/plant
Viflor	1.90 ± 0.26 a	1.6 ± 0.07 ab
CICA 9	0.90 ± 0.13 b	1.2 ± 0.05 c
Oryzica 1	0.92 ± 0.14 b	1.5 ± 0.07 ab
Oryzica Llanos 5	0.88 ± 0.13 b	1.2 ± 0.05 c
Oryzica 3	0.75 ± 0.13 b	1.2 ± 0.05 c
CICA 4	0.72 ± 0.12 b	1.8 ± 0.07 a
Oryzica Llanos 4	0.72 ± 0.13 b	1.2 ± 0.06 c
Tapuripa	0.33 ± 0.07 c	1.4 ± 0.06 bc

*Means (± SEM) within a column followed by the same letter are not significantly different according to Duncan Multiple Range Test ($P < 0.05$). Data were transformed for statistical analysis [Square root (Mean + 1)]; means presented are actual values.

Discussion

R. albinella preference for the lower section of the rice plant is similar to oviposition preference by *Spodoptera frugiperda* (J. E. Smith) on rice (Pantoja et al. 1986). The low oviposition on leaf one is probably related to leaf age due to experimental design. At the plant age moths were allowed to oviposit, leaf one was dried out and presented a small or unfavorable oviposition area.

Preference by *R. albinella* for older plants for oviposition is not clear. However, the higher oviposition rate on older plants is probably related with adult eclosion time. The preference for older plants along with the high level of parasitism explains the low economic importance of the pest (Galvis et al. 1988). In Colombia, *R. albinella* adult populations start to build up 50 days after planting. Adult *R. albinella* are weak fliers, and most eggs are deposited close to the eclosion site (A. Pantoja, personal observation). By 60 days, most Latin American short cycle varieties have initiated panicle elongation, thus providing insufficient time for larvae to damage the panicle.

Although *R. albinella* rarely causes economic damage to rice, the use of preferred varieties for oviposition may result in unusually high populations which may induce farmers to apply insecticides for adult and larval control. Additional studies are needed to correlate oviposition preference with larval development and also to study larval survival on different plant ages. Rambajan (1979) indicated that although *R. albinella* moths showed ovipositional preferences among rice varieties, the number of eggs is not correlated with larval damage. The impact of insecticides on parasitoid survival also need further testing. The information on adult oviposition preference and precise oviposition sites combined with egg mass examination for parasitoids may help farmers and technical personnel in determining whether the use of chemical insecticides is necessary.

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