

JALISCO FLY¹ AS A PARASITOID OF THE MEXICAN RICE BORER²
ON DIFFERENT HOST PLANTSBenjamin C. Legaspi, Jr., Jesusa Crisostomo Legaspi, Isabelle Lauzière,
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The Mexican rice borer, *Eoreuma loftini* (Dyar) (Lepidoptera: Pyralidae) damages about 20% of the sugarcane internodes in south Texas, and causes \$10-20 million annual loss (Legaspi et al. 1999). Growers do not treat sugarcane with insecticides, which are largely perceived as ineffective and uneconomical. To mitigate losses, over 20 parasitoid species have been released as biological control agents since 1982, but current seasonal parasitism levels are only about 6% (Meagher et al. 1998). The most promising parasitoid to date is the Jalisco fly, *Lydella jalisco* Woodley (Diptera: Tachinidae), initially collected from a commercial sugarcane field near Ameca, Jalisco, Mexico in 1988. A large-scale survey for stalkborer natural enemies in Mexico indicated that *L. jalisco* was restricted geographically to the Ameca Valley and in its host range to *E. loftini* (Rodriguez-del-Bosque and Smith 1996). Furthermore, *L. jalisco* was reared only from *E. loftini* collected from sugarcane (J. W. Smith, Jr. pers. comm.).

In 1989, over 3,000 flies were released in south Texas sugarcane fields with small numbers recovered in subsequent surveys (Pfannenstiel et al. 1990). In April 1998, the Beneficial Insects Research Unit of the USDA-ARS Kika de la Garza Subtropical Agricultural Research Center and the Texas Agricultural Experiment Station, both in Weslaco, Texas, initiated a three-year research project to import and evaluate *L. jalisco* as a biological control agent against *E. loftini*. One area of research is the efficacy of *L. jalisco* against *E. loftini* using different graminaceous host plants. This information may prove useful should *E. loftini* become a significant pest of graminaceous crops in the U.S. other than sugarcane.

A greenhouse experiment was performed to evaluate *L. jalisco* on five species of host plant: a) sugarcane, *Saccharum* hybrid var. 'CP70-321'; b) corn, *Zea mays* L. var. '3050 Pioneer'; c) sorghum, *Sorghum bicolor* (L.) Moench var. '5319 Garst'; d) rice, *Oryza sativa* L. var. 'Jefferson'; and, e) johnsongrass, *Sorghum halepense* (L.) Pers., a weed which may act as an alternative host. For each host plant, seeds were placed into 16 plastic pots (16 cm-diam, Nursery Supplies, Orange CA) containing Metro Mix® 300 Growing Media (Scotts-Sierra, Marysville, OH). Four pots of each host plant were placed randomly into four large walk-in screened cages (192 x 191 x 264 cm) located inside a greenhouse (21±1 °C; 95±5% RH). After 3 months, third-instar *E. loftini* larvae weighing 27.8±5.6 mg ($\bar{x} \pm$ SD; $n = 25$)

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were placed on the plants at the rate of five larvae per pot. Larvae were given 3 days to establish on the host plants. Newly-emerged female flies were held for 7 days in screened cages (25 x 25 x 25 cm) together with male flies and fed diluted honey (20♂ and 20♀ per cage). Ten of the presumably-mated female flies were then released into each walk-in cage, together with five male flies. Food was provided in the form of cotton balls soaked in a honey solution contained in an 18.5-ml plastic cup and tied to each upper corner of each cage. After 7 days, the plants were harvested destructively. All borers recovered were placed into 18.5-ml plastic cups (Fill Rite, Newark, NJ), containing artificial diet, and covered with 37.5-mm polycoated pull tab caps (Stanpac, Lewiston, NY). The borers were placed in environmental chambers at constant conditions (28±5°C; 40±10% RH; 0:24 [L:D] photophase) until their outcome could be determined.

Borer larvae were recorded as: a) killed by experimental procedures (e.g., handling), b) killed during the experiment (due to parasitism or other factors as it was not always possible to determine if dead borers had been parasitized), c) unparasitized, or d) parasitized. Total numbers of borers recovered were calculated as: $R = M_b + M + U + P$; where R = borers recovered, M_b is mortality before the experiment (i.e., category 'a' above), M is mortality during the experiment ('b'), U is unparasitized borers ('c'), and P is parasitized borers ('d'). Percentage mortality ($M\%$) was calculated as: $M\% = (M / (M + U + P)) \times 100$. Percentage parasitism ($P\%$) was calculated as: $P\% = (P / (P + U)) \times 100$. Data were pooled among identical host plant species within a cage. Analysis of variance (ANOVA) was used to test for effects of host plant; means were separated using Tukey HSD ($P < 0.05$). Percentage parasitism data were transformed prior to ANOVA using the arcsine-square root method, but are presented as nontransformed means.

Results of the experiment are presented in Table 1. Total number of larvae recovered was significantly different among host plants ($F = 5.5$; $df = 4, 15$; $P < 0.01$). Few borers were recovered in johnsongrass relative to the other host plants. Numbers of borer killed did not differ among the host plant treatments ($F = 0.8$; $df = 4, 15$; $P = 0.6$). Parasitism was significantly different among the hosts, both in terms of numbers of hosts parasitized ($F = 5.8$; $df = 4, 15$; $P < 0.01$) and percentage parasitism ($F = 5.9$; $df = 4, 15$; $P < 0.01$). Parasitism was highest on sugarcane, lowest on johnsongrass, and intermediate in the other plants. Johnsongrass was used as a host plant in this experiment because it can act as an alternative host for *E. loftini* and may have facilitated entry into Arizona in the 1970's (Johnson 1984). However, the low numbers of borer larvae recorded on johnsongrass,

TABLE 1. Effect of host plant on *L. jalisco* as a parasitoid of *E. loftini* in the greenhouse ($\bar{x} \pm SE$ per cage). Total initial $n = 20$. Means followed by common letters within a column are not significantly different (Tukey HSD, $P < 0.05$).

Host plant	Recovered	Mortality (M)	Parasitized	Parasitism (%)
Sugarcane	12.2 ab ± .08	2.2 a ± 0.8	7.5 a ± 0.6	81.4 a ± 7.9
Corn	15.8 a ± 2.6	1.2 a ± 0.6	6.2 ab ± 2.5	54.6 ab ± 20.2
Sorghum	13.2 a ± 1.0	1.5 a ± 0.3	2.2 abc ± 0.9	22.0 ab ± 8.3
Rice	14.0 a ± 1.0	1.0 a ± 0.4	1.8 bc ± 0.5	14.9 b ± 5.3
Johnsongrass	7.0 b ± 0.4	1.0 a ± 0.7	0.5 c ± 0.5	10.0 b ± 10.0

together with the low levels of parasitism, suggest that the plant is not attractive to the borer or its parasitoid. We have shown that the Jalisco fly can successfully parasitize Mexican rice borer larvae on alternative graminaceous host plants such as corn, sorghum or rice despite its documented geographical and biological specificity.

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