Defoliating broad-nosed weevil, *Plectrophoroides lutra*; not suitable for biological control of Brazilian pepper (*Schinus terebinthifolius*)

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Adults of the weevil *Plectrophoroides lutra* were evaluated for biological control of *Schinus terebinthifolius*. No-choice tests conducted on North American and other valued plants indicated the adults fed on all species offered. Thus, it is unlikely that *P. lutra* will be developed as a biological control for *S. terebinthifolius*.

**Keywords:** host range; Anacardiaceae; specificity

Recent exploration for potential biological control agents of the weed, Brazilian pepper *Schinus terebinthifolius* Raddi (Anacardiaceae), has been ongoing in its South American range. During these surveys the weed and its relatives are inspected for herbivores. If a candidate agent is found that appears to be specific and damaging, it is imported into quarantine for further testing. Similar work in Argentina produced a list of 36 species of arthropods associated with *S. terebinthifolius* (Mc Kay et al. 2009). Previous surveys in Brazil (Wheeler and Mc Kay unpublished data) recovered several species of broad-nosed weevils (Coleoptera: Curculionidae) in Bahia state and at other locations. One of the most commonly encountered of this complex on *S. terebinthifolius* is *Plectrophoroides lutra* (Schoenher), a species reported from Brazil and along the Atlantic coast to Venezuela (Wibmer and O’Brien 1986).

During a 2010 survey we returned to many of the Brazilian sites in Bahia where we had previously collected *P. lutra*. The adults were collected near Porto Seguro, Bahia, Brazil (S16.38385; W39.03115), in highly aggregated situations and found only feeding on *S. terebinthifolius* leaves. To examine the host range of *P. lutra*, individuals were imported into the USDA/ARS Invasive Plant Research Laboratory quarantine where they were tested on different plant species that occur in North America.

Male and female adults were maintained in groups of five with four replications inside covered Petri dishes (14 × 2.3 cm) and fed excised leaves for 26 d. The Petri dishes were lined with moistened filter paper. Both the leaves and paper were changed generally every 3 d. To estimate feeding damage we used a twice-weekly damage rating. Damage levels were scored as follows: 1 (1–10%); 2 (11–20%); 3 (21–30%); 4 (31–40%); and 5 (greater than 40% of the total leaf area removed). Additional data were collected on adult survival.

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All plants were grown outdoors in either 4- or 12-L pots under drip irrigation, and fertilized with both liquid (Miracle-Gro for acid loving plants, 30N-10P-10K) and slow-release (Multicote 4, 14N-14P-16K) formulations according to label directions. No pesticides were applied within 3 months of the beginning of these experiments. Selection of the test plant species included close relatives that were representatives of native genera (e.g., Metopium, Rhus, Toxicodendron) that are sympatric with the weed and members of some of the most important North American agricultural genera (e.g., Pistacia, Mangifera) from the Anacardiaceae. The plant species included the target weed, S. terebinthifolius, three North American native species poisonwood (Metopium toxiferum (L.) Krug & Urb), poison ivy (Toxicodendron radicans (L.) Kuntze), and winged sumac (Rhus copallinum L.). We also included the exotic agricultural trees, terebinth pistachio (Pistacia terebinthus L.) and mango (Mangifera indica L.). Young, fully-expanded leaves were clipped and fed to experimental adults.

Survival data for each group of five adults fed leaves of the different plant species were analyzed with a one-way ANOVA. The twice weekly damage ratings were pooled for each of the 3 weeks. Results were analyzed with a repeated measure ANOVA with autoregressive order 1 covariance structure (SAS Institute 2002). Individual contrasts of species and weeks were made with the slice option in the LSMEANS statement; Tukey’s comparisons were made with PROC Mixed.

The leaves of all plant species were eaten by the weevils. The damage rating of S. terebinthifolius ($F_{2, 36} = 18.8; P < 0.0001$) and M. indica ($F_{2, 36} = 19.63; P < 0.0001$) generally increased from the first to the last week (contrasts were both $P < 0.01$; Figure 1). Adult feeding on the last week was greatest for M. indica, S. terebinthifolius, and T. radicans ($F_{5, 36} = 8.48; P < 0.0001$). Contrasts indicated damage to these three species was greater than M. toxiferum, P. terebinthus, and R. copallinum (all $P < 0.01$). Over the entire 3-week period the damage ratings were greatest for T. radicans; which were greater than the least-preferred species P. terebinthus and R. copallinum ($F_{5, 18} = 7.81; P = 0.0005$).

![Figure 1. Mean (± SE) feeding damage rating of plant species presented to adult weevils of P. lutra to determine suitability for S. terebinthifolius biological control.](image-url)
Percent survival of the weevil adults ranged from 92 to 99% and was not influenced by plant species \((F_{5, 18} > 0.5; P > 0.7)\). Eggs were abundantly laid on all species.

These results indicate that this weevil species \(P. lutra\) is not suitable for release as a biological control agent. Differences occurred in the damage caused to each species but none were unharmed. The target weed, \(S. terebinthifolius\), was among the most damaged but the native \(T. radicans\) and the fruit tree \(M. indica\) were similarly damaged.

A standard procedure in the determination of agent specificity is to also conduct choice tests in addition to the no choice tests like those presented here (Van Driesche, Hoddle, and Center 2008). In these tests the candidate agent is offered a choice between the target weed and valued plant species. However, this next step is not justified as the data clearly indicate that if this species were to be released the adults would cause considerable harm to these non-target species. Although larval testing of \(P. lutra\) may indicate a narrow host range, adult damage is likely to occur to these valued plants. Therefore, we destroyed the quarantine colony of \(P. lutra\). Our surveys continue to recover additional broad-nosed weevil genera and species which will be tested as available.

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