

Impact of Multicolored Asian Lady Beetles as a Pest of Fruit and People

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In 2000, extension agents in Ohio began reporting that adults of the multicolored Asian lady beetle (MALB), *Harmonia axyridis* Pallas, were feeding on several ripening fruit crops, including peaches, apples, raspberries, and grapes (Fig. 1). Also at this time, judges at state wine competitions noticed that a small percentage of the wines, ~5%, had a defect that was described as a rancid peanut or cooked spinach odor and masked the variety characteristics of the wine. Some judges said that it smelled like the ladybugs that were found in their houses.

The MALB has been in Ohio since the mid-1990s, and many homeowners have complained to extension personnel that this beetle is biting them. After examining 34 state extension fact sheets, I realized that not all extension entomology specialists agree that these beetles bite people. Thirty-two percent of the fact sheets did not mention biting; 26% stated that MALB do not bite humans; and 23% declared that they do bite people (Table 1).

Therefore, I have tried to address these issues and answer several questions about MALB behavior:

- How big a problem is the MALB on fruit grown in Ohio?
- Is this feeding injury primary or secondary?
- How many beetles does it take to ruin wine?
- Do these beetles bite people?

Fruit Studies

In 2002, a grower survey was conducted at the Ohio Fruit and Vegetable Congress in Toledo (22 primarily tree fruit growers) and at the Ohio State University Grape Short Course in Delaware, Ohio (36 primarily grape growers). When asked if they experienced problems with the MALB on fruit crops in 2001, 71% of the growers answered in the affirmative (81% at the tree fruit meeting and 55% at the grape meeting). At the grape meeting, when asked if problems had occurred with the MALB in past years, 20% of the growers reported



Fig. 1. Multicolored Asian lady beetles feeding on grapes. (Photo: J. Kovach)

Table 1. The percentage of extension fact sheets on MALB that discuss or mention adult MALB biting of humans (34 states).

Category	Percent
Not mentioned	32
Don't bite	26
Do bite	23
Pinch	11
Harmless	10

that they encountered problems in 2000 and 55% had problems in 2001. Pooled data from both meetings showed that 50% of the growers reported the MALB feeding on grapes, 29% reported feeding on apples, 28% on peaches, 7% on plums, 5% on pears, and 5% on raspberries. Growers also were asked if they thought that the MALB feeding was the primary cause of the damage or if it was secondary and only occurred on previously injured fruit; 27% of the growers thought that the damage was primary, 12% thought it was secondary, 37% thought that it was a combination, and 15% did not know.

To determine whether MALB feeding was primary or secondary, a small study was conducted in August 2002. Two replicates of 10 fruits each of 'Gala' apples, 'Redhaven' peaches, and 'Red Flame' seedless grapes were used. Each fruit was placed in a single screen-covered container. Five fruits of each type were wounded to simulate bird damage; five fruits were uninjured and served as a control. Two wounds were created on the apples and peaches using a 2-mm diam probe that was inserted about 2.5 cm deep into the flesh (Fig. 2). The same probe was used to injure the single grapes, but the probe was only inserted deep enough to break the skin,

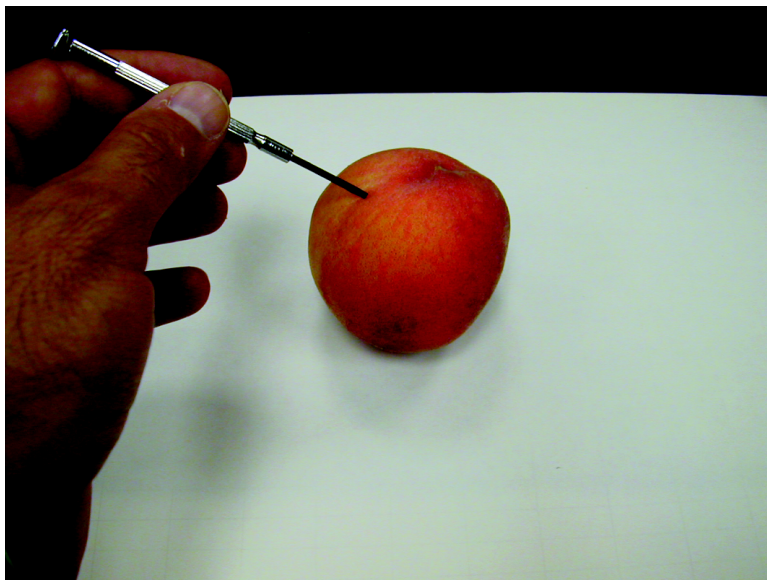


Fig. 2. Probe used to injure fruit to simulate bird damage (2 mm diam). (Photo: J. Kovach)

Table 2. The mean number of adult MALB feeding on injured vs noninjured apples, peaches and grapes*.

Crop (<i>n</i> = 50 beetles)	Injured	Non-injured
Apple	10a	0.6b
Peach	8a	0.0b
Grape	22a	3.0b

*means followed by the same letter within a row are not significantly different (LSD, *P* > 0.05)

about 2mm. Five field collected MALB adults, starved for 2 days, were placed in each container.

The fruits were evaluated 24 h to determine the number of beetles feeding on the fruit. As shown in Table 2, significantly more beetles were observed feeding on the injured sites of the fruit than on the noninjured fruit. About twice as many adult MALB were observed feeding on the grapes as were observed on the wounded apples or peaches. These results are consistent with the growers' observations.



Fig. 3. One hundred MALB crushed in 100 mL of wine. After centrifuging and filtering, this mixture was used to "spike" the test wines for sensory detection limits with consumer panels. (Photo: J. Kovach)

Wine Tasting

When adult MALB are handled or threatened they release a foul-smelling fluid from their leg joints in a reaction called reflex bleeding. This defensive secretion contains compounds that may contaminate wine, if the beetles are present during the grape crush. A preliminary study was conducted to determine the sensory detection limit of a consumer panel and to determine the number of beetles required to reach this limit.

One hundred adult MALB were crushed in 100 mL of white wine (Fig. 3). This beetle/wine mixture was then centrifuged, filtered, and used to "spike" bottles of white wine to create different concentrations of MALB-contaminated wine. Using a duo-trio test (2 coded samples with a reference), 35 consumer judges representing 315 observations evaluated the contaminated wine. Analysis indi-



Fig. 4. A close-up of the MALB biting the author's hand. Note the group of beetles on top of the hand. (Photo: S. Wright)

cated a detection aroma threshold of ~1.25 beetles per liter (about one beetle per bottle), but there was a wide variation among individuals. In the field, this concentration corresponds to ~12 beetles, or one contaminated grape cluster per lug of grapes (14 kg).

There are several possible remedies for removing or masking the lady beetle defect in wine. One method would be to use fining agents to strip the wine of this defect; however, this may also strip the wine of its unique character. Another method could be to blend the wine with a fruity aromatic wine to mask the defect, also not an ideal solution. The best solution may be to find methods to exclude or collect the lady beetles in the field or at the winery before the grapes are processed.

Biting Study

To determine whether adult MALB bite humans and whether one sex is more likely to bite than the other, a study was conducted in the fall of 2002. MALB were collected from multiple locations near Wooster, Ohio, watered, sexed, and placed in 11 plastic containers (4-L). The number of beetles in each container varied (21–185) depending on collection site. Before I inserted my hands into the beetle-filled containers, I washed, surface sterilized with 95% ethanol, and air-dried them. I then placed my hands into each container for about 30 min. I removed any beetles biting my hands, counted, and sexed them (Fig. 4). After I removed my hands from a container, I again washed, surface sterilized, and air-dried them, before inserting them into another container. I continued this process until beetles in all containers had been exposed to the hands.

About 26% of the 641 evaluated beetles did bite my hands. Beetles began walking over the entire hand and wrist area, but preferred to feed in areas with minimal hair, such as between the fingers, knuckles, and on the inside of the wrist (Fig. 5). Once the skin was broken, additional beetles would feed at the same site. This behavior was similar to the injured fruit study. When left undisturbed, some beetles fed for as long as 30 min. Both sexes



Fig. 5. Wounds to hand caused by MALB biting and feeding. (Photo: S. Wright)

did bite, with females being slightly more likely to bite than males (27.6% vs 24.2%).

Conclusions

MALB can injure fruit. In Ohio, grapes were the most affected crop, but apples and peaches were also impacted. Consumer sensory panels were able to detect MALB contaminated wine at sensory limits of about 1 beetle per bottle or about 12 beetles per grape lug. Adult MALB seem to prefer wounded areas for feeding, but they can break the skin of whole fruit and humans. About 25% of the MALB tested in Ohio did bite; and if left undisturbed, they would cause minor bleeding.

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