

Petal Fall is the Most Attractive Development Stage of McIntosh Apple Trees to Plum Curculio Adults

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In the 1996 winter issue of *Fruit Notes*, we reported the results of laboratory assays conducted in 1995 aimed in part at examining plum curculio responses to odors emitted from McIntosh apple trees. We obtained some evidence indicating that attractive volatiles were emitted from all parts of McIntosh trees (not just fruit) and were emitted in the most attractive form at petal fall. Here, we report on 1996 laboratory bioassays of curculio responses to extracts of McIntosh twigs, leaves, and fruit at eight different tree- developmental stages, using different solvents.

Materials & Methods

Hexane and water extracts were made from twigs, leaves, or fruit of McIntosh at each of the following stages of development: pink, bloom, petal fall, and 2, 3, 4, 5, and 6 weeks after bloom.

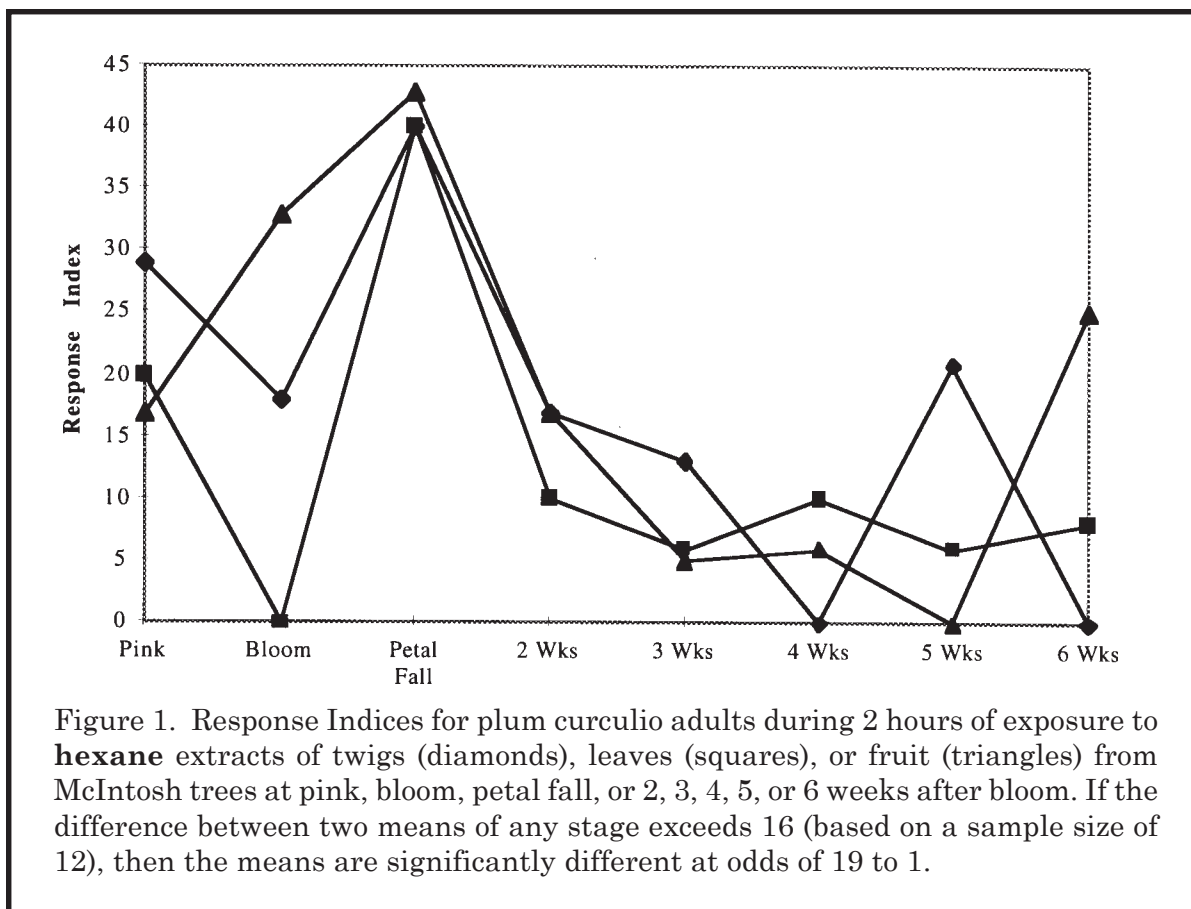
Curculios used in bioassays were collected from unsprayed wild plum and apple trees and sexed in the laboratory. For all tests, curculios were starved for 24 hours prior to testing. Tests were conducted at the beginning of darkness. One curculio was placed into each petri dish bioassay chamber and allowed to move toward odors emitted from a hexane or water extract of McIntosh tissue (the treatment) or toward hexane or water alone (used as a control). Hexane was allowed to evaporate before testing and curculios were given 2 hours to respond.

To measure the power of a McIntosh odor extract to stimulate curculio response, we used a response index. The response index was calculated by subtracting the number of curculios responding to the control from the number responding to the treatment, dividing this amount by the total number of curculios tested, and multiplying by 100. The greater the value of the index, the more attractive was the McIntosh odor extract. We consider an index of 25 to be the minimum for suggesting attractiveness.

Results

Hexane extracts of McIntosh twigs, leaves, or fruit at petal fall were more attractive than hexane extracts made at any other developmental stage (Figure 1). Hexane extracts of fruit at petal fall (index = 43) were similarly attractive to extracts of twigs or leaves at petal fall (index = 40 for each). These response indices are nearly identical to those recorded in 1995 for curculio responses to hexane extracts of McIntosh fruit, twigs, and leaves at petal fall. Finally, both males and females responded equally well to extracts made with hexane.

Water extracts of McIntosh twigs, leaves, or fruit at pink, petal fall, and two weeks after bloom were the most attractive developmental stages (Figure 2). At petal fall, extracts of McIntosh fruit (index = 71) were slightly more attractive than extracts of McIntosh twigs



(index = 58), whereas extracts of McIntosh leaves were marginally attractive (index = 25), most likely because the waxy layer on leaf surfaces prevented water from extracting volatile components. Again, both males and females responded equally well to extracts made with water.

Conclusions

From these results and from what we observed in 1995, we conclude that petal fall is the most attractive developmental stage of McIntosh trees to plum curculio adults. Further, we believe that all McIntosh plant tissues (twigs, leaves, and fruit) contain the attractive odor components at this time. These results further strengthen our hope that synthetic equivalents of these attractive McIntosh plant odors can be identified and

synthesized, providing tools to enhance trap effectiveness for monitoring and possibly even controlling plum curculios. Further, we believe that if synthetic host odors can be used in conjunction with synthetic male-produced pheromone identified in 1996 by Eller and Bartlett of Illinois, the curculio-capturing power of traps will be enhanced further. Our next step will be to examine curculio responses to host-plant odors used in combination with male-produced pheromone.

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