Fruit Varieties Journal 41(3):103-104 1986

Breeding Temperate Zone Fruit Crops for Resistance to Insects and Mites: A Much Needed Goal

CRAIG K. CHANDLER[1]

Fruit growers in the U.S. rely heavily on chemical sprays to control insect pests (7). In fact, chemical spray programs (consisting of from 5 to 15 applications/season) are essential in the production of most temperate zone fruit crops (3). Up to now, entomologists and chemists have been very successful in developing pesticides to adequately control most fruit pests. But these pesticides have generated concern over their effect on human health and the environment.

Pest resistant cultivars could provide an alternative or supplement to chemical control. The use of pest resistant cultivars as a control method has several advantages over chemical control: 1) pest resistant cultivars pose no pollution problem; 2) pest resistant cultivars are relatively cheap. Growers pay only once for a new cultivar—unlike spraying which they have to do again and again; and 3) resistance is built into the plant and is there ready to provide protection, whereas unfavorable weather and mechanical failures can prevent the application of pesticides.

In addition to saving commercial growers thousands of dollars in pesticide and equipment costs, pest resistant cultivars could be of great value to the home gardener who doesn't bother to grow fruit trees (or grows them unsuccessfully) because of the demanding and timely spray schedule that is required. Chemical pest control is just too troublesome for one or a few trees.

Although high levels of resistance to pests are desirable, they are not essential for a cultivar to be of value. If cultivars can supprress pest numbers and conserve natural enemies, pesticides may be used more selectively and less frequently.

Unfortunately, the development of pest resistant fruit cultivars is not an easy task. Many problems are involved, including certain problems not common in other agricultural crops. According to Janick and Moore (5) "The long generation cycle, requiring from two to ten years depending on species, greatly curtails the exploitation of genetic recombination. The long juvenile period results in costly demands on field space and magnifies misjudgments in parental selection and breeding approach. In addition, most fruit species have been maintained in a highly heterozygous condition and large seedling populations are required. The polyploid nature of many fruit species is a complicating factor in genetic analysis; segregation ratios for even monogenic characters become complex in tetraploid, or octaploid plants."

Despite these and other formidable obstacles, fruit breeders can no longer afford the luxury of releasing cultivars with just good horticultural quality; they must also add resistance to major diseases and insects. Dr. Miklos Faust, head of the U.S.D.A. fruit lab at Beltsville, estimates (personal communication, 1981) that it now takes a minimum of $80,000/year to support one fruit breeder. "Because it can take 30 years or more to develop a disease or insect resistant pear cultivar, for example, we must breed for resistance

[1]Department of Horticulture, OSU-OARDC, Wooster, OH 44691.

to more than one pest at a time. It would be foolish to work for 25 years to develop a fire blight resistant pear, and then start over again and work for another 30 years to add resistance to pear psylla, the major insect pest of pears" says Dr. Faust.

Apart from the breeding of pear for psylla resistance (9), strawberries for mite and aphid resistance (10), and raspberries for aphid resistance (10), information on breeding temperate zone fruit crops for insect resistance is scarce. There have been reports, however, of differences in susceptibility for major insect pests in apple (2), peach (4), almond (8), and chestnut (6).

The above examples indicate that development of insect resistant fruit cultivars is possible. But before this can become a reality, insect resistance must become a major goal of both fruit breeders and entomologists.

Literature Cited

1. Adkission, P. L. and V. A. Dyck. 1980. Resistant varieties in pest management systems. p. 233-251. *In* F. G. Maxwell and P. R. Jennings (eds.) Breeding plants resistant to insects. John Wiley & Sons, New York.
2. Brown, A. G. 1975. Apples. p. 3-37. *In* J. Janick and J. N. Moore (eds.) Advances in fruit breeding. Purdue Univ. Press, West Lafayette, Ind.
3. Ellis, H. C. and J. D. Arnett. 1978. Disease and insect control in home orchards. Univ. of Georgia Coop. Ext. Service Circular 552.
4. Hesse, C. O. 1975. Peaches. p. 285-335. *In* J. Janick and J. N. Moore (eds.) Advances in fruit breeding. Purdue Univ. Press, West Lafayette, Ind.
5. Janick, J. and J. N. Moore. 1975. Preface. xiii-xiv. Advances in fruit breeding. Purdue Univ. Press, West Lafayette, Ind.
6. Jaynes, R. A. 1975. Chestnuts. p. 490-503. *In* J. Janick and J. N. Moore (eds.) Advances in fruit breeding. Purdue Univ. Press, West Lafayette, Ind.
7. Johnson, H. W. 1972. Development of crop resistance to disease and nematodes. *J. Environ. Quality* 1:23-27.
8. Kester, D. E. and R. A. Asay. 1975. Almonds. p. 387-419. *In* J. Janick and J. N. Moore (eds.) Anvances in fruit breeding. Purdue Univ. Press, West Lafayette, Ind.
9. Layne, R. E. C. and H. A. Quamme. 1975. Pears. p. 38-70. *In* J. Janick and J. N. Moore (eds.) Advances in fruit breeding. Purdue Univ. Press, West Lafayette, Ind.
10. Moore, J. N. 1979. Small fruit breeding—a rich heritage, a challenging future. *HortScience* 14:333-341.

Apple Performance on M.8 and M.9 Interstems

DAVID C. FERREE

'Empire' and 'Miller Sturdeespur Delicious' with a 6 inch interstem of either M.9 or M.8 on Antonovka seedling rootstock were compared to trees on MM.111 all planted in 1975. The first significant crop occurred in 1979 with trees on M.8 interstems producing less than trees on either M.9 interstems or MM.111. Trees on MM.111 were 61 or 52% larger than trees on M.8 and M.9 interstem trees respectively. Tree height and across row spread of trees on M.9 and yield efficiency of M.8 interstems was lower than interstems on M.9. Thus M.9 would be preferred as an interstem over M.8

'Miller Sturdeespur Delicious' was generally smaller than 'Empire' likely due to its spur habit and compact nature. The larger 'Empire' trees out produced 'Delicious' in this 10 year trial, but there was no difference in tree efficiency.