American Pomological Society U. P. Hedrick Award for research paper by a student: (1983 Second Place Award)

Breeding Early-Ripening, Low-Chilling Peaches in Florida[1]

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Low-chilling, melting flesh peaches were introduced as seed into Florida, primarily by Spanish conquerors. These seedlings were characterized by small, soft fruit, with mostly white flesh. Most have fruit development periods (FDP) of 120 to 150 days, in order to have seed that will germinate readily without the use of special techniques. Cultivars resulting from grower selection of Spanish types failed in Florida because they lacked large, firm, yellow fleshed, early-ripening fruit. Breeding of low-chilling peaches at the University of Florida, was initiated by R. H. Sharpe in the early 1950's, well after breeding in more temperate areas had produced cultivars with high quality fruit.

The Florida breeding program was begun with the goal of producing low chilling, early ripening cultivars with commercially acceptable fruit qualities (2). Cultivars with chill units of 150 to 500 are needed from central to north Florida, respectively. Cultivars that have a 50-90 day FDP are needed in order to escape fruit disease problems associated with moist conditions during Florida's summer rainy season, which begins in early June.

One problem that has been encountered in breeding early ripening peaches is low percent seed germination. There is a large amount of genetic variability for the length of the FDP; however, much less variability has been found for the time required for embryo maturity (1). The techniques in table 1 have been used to increase percent germination in early ripening peaches. Embryo and ovule culture have been continually refined and used increasingly in recent years to obtain larger populations of early ripening selections. These techniques allow the use of short FDP seed parents in breeding, in combination with their traditional use as pollen parents.

There have been several significant developments in the breeding program at the University of Florida which have aided greatly in achieving the objectives of the program. One of these was the observation that a short FDP is associated with 2 red leaf characters that appear as the leaves approach senescence in the fall (5). This observation has allowed selection of 1-year-old seedlings for early ripening before they fruit.

Development of the high density fruiting nursery (6) has greatly increased the selection efficiency, allowing the fruiting of about ½ of the seedlings in 2 years. Seedlings are planted at a spacing of 10 to 13 cm x 1 m which allows the handling of large populations of seedlings in approximately 1/40 as much land as seedlings grown at conventional spacing. The nursery site is fumigated with methyl bromide before planting to aid in the control of weeds and root-knot nematodes. The reduced land area also facilitates irrigation, pesticide application, and frost protection during bloom.

Another practice used in the Florida program is the introduction of new

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germplasm from diverse sources. The desired low-chilling characteristic was obtained through crosses with germplasm obtained from Okinawa, South China, and new world sources of the low chilling Spanish types. High fruit quality was then obtained by crossing these low chilling sources with prominent northern cultivars. In order to achieve this, it has often been necessary to store pollen for up to 10 months (2). Pollen shipped from South Africa and Brazil has also been used as a source of new germplasm.

The quality of low chilling cultivars has improved greatly since the program began in the early 1950's. Progress was slow in the beginning when compared to other United States peach breeding programs, due to the poor fruit quality of the initial low chilling germplasm (3). Succeeding generations were low chilling selections intercrossed or crossed to more recently developed, high fruit quality temperate zone cultivars. The first cultivar released (Flordawon) originated as a third generation seedling from the original crosses (2). Flordawon was recommended for homeowner use only. The first cultivars recommended for commercial production (Flordasun, and Sunred) were fourth generation seedlings of the same type parentage. It took 5 to 6 generations to obtain cultivars equal in size and quality to the better temperate zone cultivars (4). Each year between 4000 and 8000 seedlings are grown for evaluation. After approximately 200,000 hybrids and F_2 seedlings, the breeding program to date has produced what is currently considered 2 excellent, 2 marginal, and 6 outdated cultivars. These form the basis of the 6,000 acre peach industry in Florida and some cultivars, like Flordaking, are grown along the Gulf Coast to Texas. Flordagold and Flordaprince are also successful in other subtropical countries. Many selections now on test appear to be equal to, or better than, the standard cultivars now grown in Florida. Some advanced selections have been named in other countries with low chill areas where market standards accept smaller fruit size or poorer shaped fruit than United States markets.

Table 1. Embryo age based on fruit maturity and type of seed handling required to obtain greater than 50 percent germination.

Embryo age (days)	Techniques used to achieve >50% germination
> - 110	dry storage of pits
90 - 110	non-dry pits
80 - 90	cracked pits
70 - 80	embryo culture (25 yrs. ago)
60 - 70	embryo culture (5 yrs. ago)
50 - 60	ovule culture

Temperate-climate peaches have been developed in Florida for areas with warmer winters, such as found in the sub-tropics and tropical highlands. The main incentive for improvement in Florida is to provide early fresh fruit for the northern United States market. However, the development of low chilling peaches could be more important for other countries with similar climates. R. H. Sharpe had the vision of high quality peach cultivars for sub-tropical and tropical areas and assembled the low chilling germplasm used in the University of Florida breeding program. He made crosses for 23 years, providing the basis for today's germplasm, and received the Wilder Medal from the American Pomological Society for his work. Breeding low-chill, early-ripening peaches and nectarines in Florida continues with advanced selections and cultivars now on test in over 50 countries, 8 of which are growing them commercially.

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An Assessment and Illustration of Winter Injury to Selected Apple Cultivars in Nova Scotia, 1980-81

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Abstract

Of nine apple cultivars grown commercially in Nova Scotia, Gravenstein, Wayne and Northern Spy were the most sensitive to low temperature stresses of December, 1980. Injury occurred on the trunk below the lower limbs and in the crotch area of the main limbs. The extent of damage to the trees was evident following removal of dead bark and adjacent tissue where it had not exfoliated. The percent of healthy tissue lost was recorded and is illustrated in a series of photographs. No injury could be found in the rootstock at or just below the soil line.

Introduction

Apple trees are generally hardy to mid-winter weather in Eastern Canada. The attainment of maximum hardiness is gradual, beginning with certain physiological changes within the tree, triggered by the photoperiod (9). The distal or terminal portions of the tree are the first to harden; the trunk portions, last (1). Low temperature extremes in early winter may subject the unhardened lower portion of the tree to stress beyond its recovery capability.

Extensive damage to apple orchards was reported after late fall or early winter cold extremes in Eastern Canada in 1933 (2) and in 1980 (8). The present paper presents an analysis of the impact of this latter cold stress on orchard plantings in Nova Scotia.

Study Area and Method of Investigation

The Morristown area of the Annapolis Valley was selected for this study for two reasons. It is a concentrated centre of fruit growing representative of the soil and climate in the area. A Nova Scotia Department of Agriculture & Marketing survey of damage revealed that this locale had as much damage as any other area in the fruit growing district. In July 1982, representative rows were selected from two commercial orchards planted in 1964 and 1965. The combined area was 36 hectares. Each tree in the row was carefully examined for evidence of injury. A 15 cm bar tool was used to remove dead bark, phloem and cambial tissue down to dry xylem wood. A sharp knife was used to cut through bark, phloem and cambium around

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