Adaptation of Decidious Fruit to the Desert Climate of Southwest Arizona

Esmaeil Fallahi, Mike Kilby and Phil Tilt

Abstract

Chilling requirements and maturity of several varieties of peaches and apples were studied at the University of Arizona, Yuma Mesa Agricultural Center (Southwest Arizona) in 1985-1986. Flordared, Flordabelle, Flordabeauty, Flordagold, Desert Gold and Suwanee peaches broke their dormancy earlier than other cultivars and showed full bloom between mid-to-late January. Suwanee and Desert Gold matured earlier than other tested varieties, but they produced small size fruit with low sugar content. Anna and Dorsett Golden apples showed extended blooming period due to insufficient chilling.

Introduction

After a period of growth at the end of summer, levels of abscisic acid (ABA) (a growth inhibitor plant hormone) increase, while levels of cytokinins and gibberellic acid (plant growth promoters) decline in the bud tissue. As a result of this imbalance, trees start their dormancy. Decidious fruit trees require a period of low temperature to satisfy their dormancy. The most effective range of temperature to break dormancy in fruit trees is between 32^{o} F and 45^{o} F.

Insufficient cold periods during dormancy is the most serious limiting factor in decidious fruit production in Southwest Arizona. As a result of extensive fruit breeding programs, low chilling varieties are being developed every year that should be tested in our area.

Our goal in this experiment is to test and introduce varieties of decidious fruits, particularly peaches and apples, which can grow and have satisfactory fruit production under the low chilling conditions of Southwest Arizona.

Materials and Methods

Trees were purchased from different nurseries in Florida, Texas, and California. Peach varieties were grafted on Nemaguard and apples were grafted on Malling Merton (MM) 106 rootstocks. Four trees per variety were planted at a 4.57 x 4.57 meter spacing in the sandy soil at Yuma Mesa Agricultural Station in the spring of 1982.

To determine the chilling requirements, we recorded daily minimum and maximum temperatures, date of first bloom, date of full bloom, date of first leaf and full leaf. Bloom density and fruit set were also measured on various peach and apple varieties.

Results and Discussion

In this article, the results of 1985-86 is reported. We are going to continue this research for at least one more year.

Peach varieties Flordared, Flordabelle, Flordabeauty, Flordagold, Suwanee and Desert Gold bloomed earlier than other varieties (Table 1). These varieties were in full bloom from mid-to-late January. The bloom density and fruit set on these varieties were satisfactory (Table 1). Varieties such as Y5-62 and Y4-55 had little or no fruit set despite heavy blooming. We need further investigation to find if the poor set is due to insufficient and nonharmonious chilling demanded by different tissues of the trees in these varieties or due to a high temperature in early March.

Flordabelle had large round greenish-red skinned, freestone fruit. The flesh of this variety has deep red strips with very desirable flavor. Suwanee and Desert Gold matured earlier than other varieties and their first harvest was May 5, 1986. Suwanee produced small fruits with greenish-yellow skins, which could be limiting factors in using this variety. Desert Gold produced small red fruit. A large number of doubled fruit was observed in the Desert Gold variety.

Sugar content in peaches was mostly proportional to their maturity date, so that Suwanee and Desert Gold, with earliest maturity dates, had low levels of sugar (Table l).

Pointed (bullet shape) fruit, a sign of insufficient chilling, were produced on several varieties. In some varieties, these pointed fruits never developed to a full size and aborted before the "pit hardening" stage. Examples of this group include: springtime and Y5-52. In other varieties such as M-9 and A6-69, these pointed fruits developed to a large size. This later group of peaches could have a good potential in Yuma, since during a mild winter such as in 1985-86, the fruit was reasonably good sized, although pointed. During a cooler winter with more chilling hours, these varieties may produce good, round fruits. We will have better information on these varieties in our further evaluations.

Anna and Dorsett Golden apples started blooming in late January. Their bloom continued until mid-July. This extended and variable blooming is due to insufficient chilling. This type of blooming makes any cultural practices very difficult. For example, applying l0 ppm NAA as a thinning agent in March had little effect. We started our first apple harvest on 5/28/86. Part of the harvested fruit were stored at 39^{o} C for about 3 months to study its storability. All fruit from Anna were softened or rotten, whereas most of the Dorsett Golden fruit were soft, but still edible.

Selection of desirable varieties of decidious fruit for the desert climate of southwest Arizona is a long procedure and a difficult task. Selecting low-chilling or desirable-chilling varieties is only one step. Then we have to select for the best rootstock which has sufficient uptake of mineral nutrients, particularly Fe and Zn. At the same time, application of the same cultural practices as other fruit-producing areas may not necessarily be ideal for our area. We have to investigate ideal tree spacing, pruning, fertilization and irrigation practices for our unique climate and soil condition.

ACKNOWLEDGEMENT

We would like to express our appreciations to Dr. Robert L. Roth and Dr. Bryant R. Gardner for their assistance in establishment of this orchard.

Table 1. Evaluations of chilling requirement, maturity, and yield of various varieties of peaches and apples at the Yuma Mesa Experiment Station.

Fruit	Variety	First Bloom	Full Bloom	Bloom Density (%)	Fruit Set (%)	Harvest Time	Approx. Yield (Kg/Tree)	Solubles Solids (°Brix)	Good Fruit Av. Wt. (gm)
Peach	Desert Gold	1/20/86	1/30/86	53.22	17.04	5/5/86	30.203	9.75	70.49
Peach	Spring Time	3/12/86	3/25/86	—	—	—	—	—	—
Peach	August Pride	2/12/86	2/26/86	38.53	5.65	—	—	—	—
Peach	Y4-55	2/24/86	2/28/86	39.35	2.31	—	—	—	—
Peach	X-9	—	1/29/86	35.11	2.78	5/9/86	8.165	12.30	120.07
Peach	Mid-Pride	2/5/86	2/19/86	48.68	6.50	6/13/86	8.029	13.60	118.04
Peach	June Gold	3/4/86	3/15/86	—	—	—	—	—	—
Peach	M-9	2/6/86	2/25/86	48.78	10.71	5/19/86	36.004	11.77	77.63
Peach	A6-69	2/13/86	2/25/86	36.24	10.85	5/20/86	17.169	12.32	141.04
Peach	Y5-52	2/24/86	3/5/86	—	—	—	—	—	—
Peach	Y5-62	2/21/86	2/28/86	56.63	0.45	—	—	—	—
Peach	Suwanee	1/19/86	1/29/86	48.19	27.25	5/5/86	3.295	10.35	66.48
Peach	Florda-gold	1/20/86	1/30/86	54.59	14.12	5/20/86	20.673	12.00	100.83
Peach	Florda-belle	1/14/86	1/23/86	46.83	15.88	5/27/86	33.283	12.67	150.40
Peach	Flordared	1/10/86	1/19/86	46.24	20.89	5/19/86	27.375	12.32	135.86
Peach	Florda-beauty	1/18/86	1/27/86	50.09	15.42	5/30/86	34.110	12.12	136.30
Apple	Anna	1/29/86	2/12/86	72.81	15.95	5/28/86	12.258	11.97	121.70
Apple	Dorsett Golden	1/25/86	2/7/86	56.01	74.30	6/5/86	27.738	12.30	88.32
Apple	Einshemer	2/14/86	3/1/86	—	—	—	—	—	—