

Preliminary Evaluation of Low-Chilling Peaches and Nectarines in Warm-Winter Areas of Chile¹

C. Muñoz,² J. Valenzuela,³ A. Ibacache,³ and W. B. Sherman²

Chile is the fourth most important peach producing country in the southern hemisphere, harvesting more than 120,000 tons of peaches and nectarines annually (1). Approximately 40% of these are clingstone, non-melting-flesh types used by the processing industry. The other 60% are 1/3 peaches and 2/3 nectarines sold for fresh consumption both on the national and on the international markets (1).

The main peach growing area of the country is located in the Central Valley between latitudes 32° and 34° S, where chilling accumulation (hrs. below 7°C) varies between 400 and 1,200 hours.

A wide variety of cultivars provide a 22 week harvesting season, starting in early November and finishing by April (5). Early-ripening cultivars, despite their poor quality, usually provide the grower with higher returns because of the high prices obtained on the markets. Therefore, production of high quality peaches and nectarines for the early market has been a goal for Chilean growers for many years.

Early fruit ripening can result either from early flowering, or from a short interval between bloom and fruit maturity, or both. These two characteristics are under genetic control, but are also subject to strong environmental influences. Flowering time is mainly determined by chilling requirements of the cultivar; however, once chilling requirements have been satisfied, temperature becomes the dominant factor. Similarly, the interval between bloom and fruit maturity is affected by temperatures and water availability during the fruit development period (7).

In Chile, attempts to grow commercial peach cultivars north of latitude 32°S have failed because of high temperatures occurring during winter, which result in insufficient chilling to break dormancy of cultivars commonly grown in the Central Valley. Peach growing north of latitude 32°S is therefore limited to cultivars requiring less than 400 hrs. chilling.

Development of cultivars adapted to areas with mild winters was started in the early 1950's at the University of Florida to obtain improved cultivars for commercial production in north Florida (6). Similar programs have been started since then in Brazil (3, 4) and South Africa (2). Some of these programs are selecting not only for low-chilling types but also for cultivars which ripen in less than 110 days from bloom, thus avoiding the disease problems associated with hot, rainy summers (2, 7).

In 1978 the Chilean Institute for Agricultural Research (INIA) started testing some cultivars and selections released from these breeding programs in warm-winter valleys of northern Chile getting less than 400 hrs. of chilling. Experimental plots were established in three areas that offered potential for peach growing. Some of the climatic characteristics of the areas under evaluation are listed in Table 1. Agriculture in these areas is entirely dependent on irrigation. Rainfall occurs exclusively during winter months and averages less than 200 mm annually. Land use is intensive so crops grown have high value.

Cultivars and selections under test came from all three breeding programs. Brazilian cultivars, mainly

¹Florida Agricultural Experiment Stations Journal Series No. 4967.

²Fruit Crops Department, IFAS, University of Florida, Gainesville, FL 32611.

³Instituto de Investigaciones Agropecuarias, Casilla 5427, Santiago, Chile.

Table 1. Climatic characteristics of locations where low-chilling peach and nectarine cultivars and selections are being tested in northern Chile.^z

Location	Altitude (m)	Hours below 7°C	Mean temp. (°C)		Max. mean temp. during fruit development period (°C)				
			Coldest month	Warmest month	Jul.	Aug.	Sept.	Oct.	Nov.
Vicuña									
30°02' S	730	150	13.1	29.5	21.2	23.5	22.0	25.9	26.8
70°44' W									
Ovalle									
30°36' S	220	150	13.2	28.0	17.5	18.4	20.5	22.4	24.3
71°11' W									
Salamanca									
31°46' S	502	350	11.3	27.7	15.5	17.5	18.9	21.2	24.0
70°57' W									

^zClimatic data are an approximation of the average during the years under test.

non-melting-flesh types, ripened too late to compete with better quality peaches produced in the Central Valley so they are not included in this report. Due to unavailability of propagation material at the time experimental plots were established, not all cultivars were planted in all locations, nor were all plots established simultaneously. Information reported here is, therefore, partial and includes data for those selections and localities for which there were three or more years of fruiting data.

Some of the characteristics evaluated are shown in Table 2. Time of ripening is one of the most important because of its implications in commercialization of the fruit. For comparison, in Table 3 are listed some of the major cultivars harvested in the Central Valley for the early market.

Fruit size, although genetically determined, is affected by crop load and cultural management. Since cultural practices were homogeneous for all cultivars tested, size reported is a good estimation of their genetic potential.

Fruit development period of some cultivars, for example Flordaking, appear to be longer than in other countries (7). This may be due to lower

temperatures during the fruit development period. Not only are maximum mean temperatures low (Table 1) but there is also a larger fluctuation between day and night temperatures in Chilean locations. A similar trend for longer fruit development periods has been observed with some grape cultivars in these same areas.

Flordaking is one of the most promising of the cultivars and selections so far evaluated because of its early ripening and good fruit size and quality. This cultivar showed some tendency to produce double fruits and split pits, but to a lesser degree than other early ripening clones. It also developed a pronounced tip when grown at locations where it received less than 400 hrs. of chilling. Flordaprince is lower chilling (150 hrs.) and should be considered as an alternative for areas with less than 400 hrs. of chilling.

Orion appeared to be the earliest ripening cultivar. It has good size for an early peach, but because it is soft, it has no potential as a shipping peach, and should only be considered as a fruit for local markets.

Despite the wide variation in chilling requirements of the cultivars evaluated (150 to 400 hrs.) they all flower-

Table 2. Performance of some low-chilling peach cultivars and selections in mild-winter areas of northern Chile.

Cultivar or selection	Type*	Origin	Fruit weight [†] (g)	External color (% red)	Flesh color	Ripening	
						Location	Date
Flordaking	P	Florida	120	50	yellow	Vicuña	Nov. 5
						Ovalle	Nov. 10
						Salamanca	Nov. 8
Flordaprince	P	Florida	79	70	yellow	Vicuña	Nov. 11
						Ovalle	Nov. 16
						Salamanca	Nov. 10
Flordagem	P	Florida	94	80	yellow	Vicuña	Nov. 15
						Ovalle	Nov. 22
Fla. 6-3 N	N	Florida	104	70	yellow	Vicuña	Nov. 20
						Ovalle	Nov. 16
Earligrande	P	Texas	117	70	yellow	Vicuña	Nov. 11
Maravilha	P	Florida	77	70	white	Vicuña	Nov. 11
Sunlite	N	Florida	85	60	yellow	Vicuña	Nov. 29
Fla. 5-13 N	N	Florida	89	100	yellow	Vicuña	Nov. 29
Fla. 5-15 N	N	Florida	88	70	yellow	Vicuña	Nov. 29
Ingwe	P	South Africa	123	60	white	Vicuña	Nov. 29
						Ovalle	Dec. 1
Orion	P	South Africa	118	70	white	Vicuña	Oct. 31
Earlibelle	P	South Africa	78	70	white	Vicuña	Nov. 9
Albatros	P	South Africa	73	90	white	Vicuña	Nov. 20
Rhodes	P	South Africa	93	70	white	Vicuña	Nov. 29
Culenburg	P	South Africa	63	70	white	Vicuña	Nov. 29

*P = peach, N = nectarine.

†80 g fruit corresponds to about 5 cm diameter.

Table 3. Main commercial cultivars grown in the Central Valley of Chile for the early market.

Cultivar	Type*	Fruit size	Fruit quality	Week of commercial harvest in November [†]			
				1	2	3	4
Royal Gold	P	medium	fair	+	+		
Mayred	N	small-medium	fair		+		
Springgold	P	small	good		+	+	
Springtime	P	small	fair-to-good		+	+	
Armking	N	small-medium	fair			+	+
Springcrest	P	medium	fair-to-good				+
Mayflower	P	small	Poor				+
Blazing Gold	P	medium	good				+

*P = peach, N = nectarine.

†After Rosemberg and Gardiazabal (4).

ed almost simultaneously within a four week period. There was also little variation in flowering time among locations. Flower development in these climates seems to occur as a response to a rise in late winter and early spring temperatures rather than to the completion of the chilling requirement. One implication of this phenomenon is the low risk of getting late frost damage when using very low chilling cultivars. This is a major concern in other peach growing areas of the world.

As far as vegetative growth is concerned, none of the cultivars tested showed any of the typical symptoms associated with inadequate chilling such as delayed foliation, and/or irregular sprouting of vegetative buds along the shoot, or sprouting and rosetting of only the apical bud of a shoot.

Data on other cultivars and selections will be available in 2 to 3 years and include Florida cultivars Sunripe, Sunred, Flordagold, selections Fla 7-9N and Fla 5-14N, South-African cultivars Safari and Imperani.

It can be concluded that some of the cultivars and selections under evaluation have potential as commercial cultivars, mainly for the national market since they have better quality and shipping characteristics than most of

the early-ripening cultivars currently grown in the Central Valley. Their potential as peaches for the export market, however, has yet to be evaluated.

For future introductions, emphasis should be placed on selections with a short bloom to ripening period, since there seems to be little hope to advance the flowering period of the cultivars under these climatic conditions.

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