

A Description of Peach Native Populations from Spain

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Abstract

A description of the characteristics of selected clones originating from Spanish native populations, including 'Marujas,' 'Jerónimos,' 'Calabaceros,' 'Calandas' and 'Cofrentes,' is presented. General characteristics of other native populations that have remained unselected also are described. Native populations from Spain may be an excellent germplasm source for improving and broadening the genetic base of North American peaches.

Introduction

Early peach growing in Spain was based on culture of seedlings. Culture of successive generations of seedlings in different locations in Spain has resulted in the existence of genetically distinct local populations, often referred to as 'native populations,' 'naturalized populations,' 'feral populations,' or 'land races.' Historically melting-flesh cultivars were developed and grown in most other European countries, but in Spain, the peach industry was based on non-melting flesh peaches, primarily derived from native populations. However, in recent years, a notable increase in the use of melting flesh cultivars of North American origin has occurred due to the increased emphasis in Spain of exporting peaches to other European countries where melting flesh peaches are preferred. Non-melting flesh cultivars from North America such as 'Babygold 6' or 'Catherina' have gained acceptance because of their superior yield.

Because of the narrow genetic diversity within peaches (6), the incorporation of other germplasm sources into breeding programs is very important to ensure adequate genetic diversity and facilitate future genetic gain. Native populations from Spain are genetically more diverse than North American peaches (data not published) and are an excellent source of traits for breeding. Characteristics such as medium and high chilling requirements,

late flowering, extended harvest season from July to November, and very high flesh quality can be found in these populations. However, in spite of the existence of low chilling zones in Spain, there exists a general lack of early ripening and low chilling traits in these native populations. Low chilling germplasm of Spanish origin exists in South America. It is possible that low chilling native populations do not exist because of the occurrence of alkaline soils in the warm areas of Spain and the lack of adaptation of native populations to such soils.

Unfortunately, in recent years, genetic diversity within the Spanish peach native populations is being lost. The old seed propagated native populations are rapidly being replaced by clonal cultivars, most of North American origin. This replacement is being accelerated by the demands of the European market for melting-flesh cultivars that exhibit similar characteristics throughout the marketing season. Although clonal selections from various native populations have been made, there are still some native populations in which no selection has been conducted. These populations can serve as sources of genetic variability and valuable traits. Characterization of this native peach germplasm is necessary in order to develop effective collection and preservation strategies.

The purpose of this paper is to review the characteristics of some of the major Spanish peach native populations, focus-

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ing on their horticultural performance and future potential for breeding.

Description of Native Populations

Numerous native populations of peach can be found in Spain (Figure 1). Some of them have practically disappeared, in others selection began 25 years ago and selected clones were released, and others still remain unselected. All of them are non-melting flesh types.

Native populations from Murcia

'Marujas.' This population is one of the most widely cultivated in Spain. It is been grown in various peach growing areas of Spain, including Murcia, Valencia, and Catalonia. Selection and seed propagation by different growers has resulted in variants with different names such as 'Maruja Tejar,' 'Maruja Tradición,' and 'Maruja Perfección.' Flowers are showy and medium size. Leaf glands are globose. Time of bloom, depending on the clone, extends from the beginning of March to the first week of April in Murcia, suggesting a range in chilling require-

ments from moderate to very high. Clones that ripen at the end of June through the end of July can be found in its native area. This population and 'Cotiguas,' a native population from Valencia that has disappeared, represent the earliest ripening native populations. 'Catherina,' a North American cultivar developed at Rutgers University in New Jersey and named and released in France, is replacing 'Marujas' in many areas. Fruits of 'Maruja' are medium size. A red blush overcolor ranging from 10 to 50% of the fruit surface overlays an attractive yellow ground color. Pubescence is very dense and the suture is pronounced. Selected clones derived from 'Marujas' have size similar to 'Catherina' (1), but have higher sugar content and acidity, which confers better taste (Tables 1 and 2).

Several clonal selections from 'Marujas' have been made in Aula Dei (Zaragoza) and CEBAS (Murcia). Characteristics of some released clones (5) are shown in Table 2. Figures 2 and 3 show the flowering time and the ripening date, respectively, of selected clones in their native area.

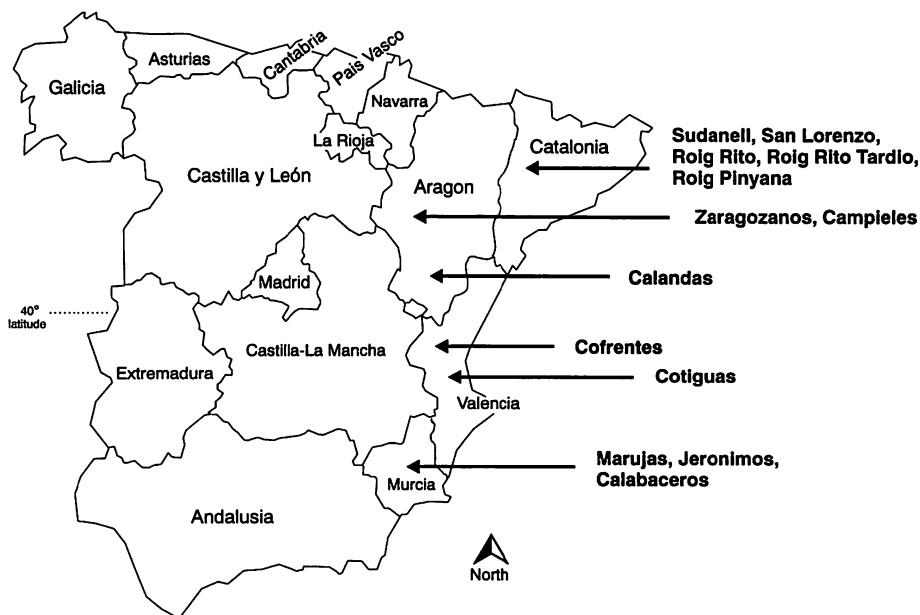


Figure 1. Locations of Spanish native peach populations.

Table 1. Characteristics of fruits of clones selected from Spanish native populations tested at IVIA.

Cultivar	Fruit weight (g)	Fruit diameter (mm)	Firmness (Kg/cm ²)	Skin color(1) ^z	Skin color(2) ^y	Flesh color ^x	°Brix	TA (g/l) ^w
Maruja	199.8	69.8	2.1	30.8	2.4	0.4	12.4	7.0
Jeronimos	177.4	67.4	1.1	19.2	1.0	1.0	11.4	6.1
San Lorenzo	205.0	69.8	1.1	17.4	2.3	0.6	13.2	4.9
Cofrentes 1	262.0	75.3	1.5	16.1	2.0	1.0	14.3	7.0
Cofrentes 3	238.9	75.0	1.8	15.8	1.3	2.5	12.4	4.8
Cofrentes 5	189.2	68.6	1.8	53.6	3.8	1.6	14.6	6.0

Data obtained from an average of a minimum of fifty fruits per clone. Mean of two crop years (1995 and 1996).
^zIndex color (1) measured on the blush overcolor using a Minolta colorimeter. Index calculated as (L x a)/b.
^yIndex color (2) measured on the ground color using a Minolta colorimeter. Index calculated as (L x a)/b.
^xFlesh color index measured using a Minolta colorimeter. Index calculated as (L x a)/b.
^wTA = titratable acidity. Expressed as malic acid equivalents.

‘Jerónimos’ or ‘Jeromos.’ Fruit of ‘Jerónimos’ ripen later than ‘Marujas.’ Flowers are showy and medium size. Leaf glands are globose. Average fruit size is greater than ‘Marujas,’ and fruits are asymmetric in shape. Skin color is bright yellow to orange, with greater red blush than ‘Marujas’ (3). Flesh color is a deep orange-yellow, and the skin has medium pubescence. Fruit have similar °Brix but less acidity than fruit of ‘Marujas’ (5) (Tables 2 and 3).

‘Calabaceros.’ Fruit of ‘Calabaceros’ ripen after ‘Jerónimos.’ Flowers are showy, and leaf glands are globose. Fruit size is similar to ‘Marujas’ and smaller than ‘Jerónimos’ (3). Fruit shape is round, with a pronounced suture. Fruit have a bright yellow ground color and a blush covering 25-30% of the fruit surface. Pubescence is very dense. ‘Calabaceros’ has higher total soluble solids content and lower acidity than both ‘Marujas’ and ‘Jerónimos’ (Table 2). Some red pigmen-

tation around the pit makes this cultivar less suitable for canning.

Native Populations from Aragon
‘Amarillos Tardíos de Calanda.’

These peaches are native to a small area named ‘Bajo Aragón Turolense’ in the Aragon region (Figure 1). About 2,000 ha of ‘Calandas’ peaches are under cultivation in this area. This population is one of the latest of the season, ripening through October. A clonal selection program (4) in ‘Calandas’ peaches was conducted at SIA (Servicio de Investigación Agraria) in Zaragoza. The objectives of this program were to select clones of high quality fruits and good horticultural performance.

According to Espada-Carbo et al. (4), 11 clones belonging to three categories were selected:

Category A: Full bloom on March 22-24 and 211 days from phenological stage D (balloon stage) to ripening. Clones selected were AL-2, CA-3, and MM-12.

Table 2. Characteristics of fruits of clones selected from Spanish native populations and released by Aula Dei and CEBAS.

Cultivar	Fruit weight (g)	Fruit volume (cc)	Firmness (Kg/cm ²)	°Brix	TA (g/l) ^z
Maruja 2249	118.0	121.8	6.8	11.6	10.9
Maruja 2261	108.6	112.1	—	12.2	7.1
Jeronimos 2254	121.0	125.0	4.7	13.3	3.8
Jeronimos 2285	101.2	97.7	4.9	11.1	8.4
Calabacero 2244	142.0	140.7	—	11.7	5.8
Calabacero 2247	133.5	132.2	—	12.2	2.1

^zTA = titratable acidity. Expressed as malic acid equivalents.
Data from Rodríguez-Navarro (5).

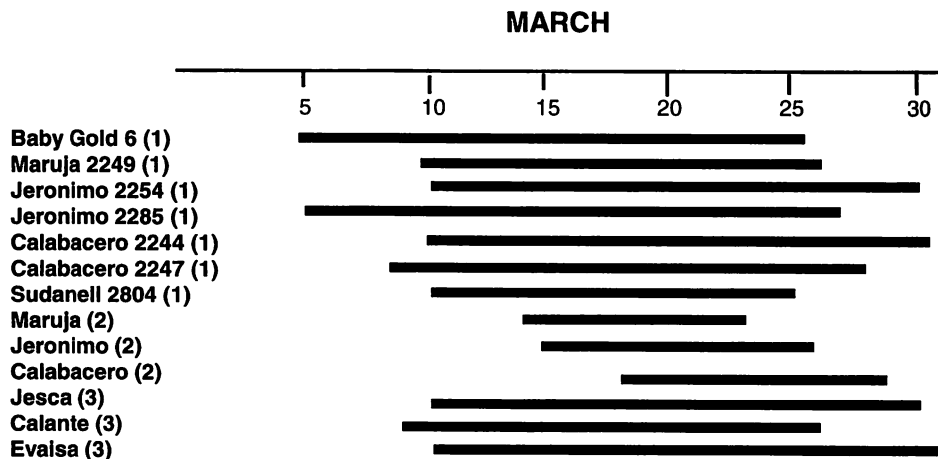


Figure 2. Flowering time of selected clones in their native area. (1)–Data from Rodríguez-Navarro et al. (5). Clones located in Murcia. (2)–Data from Egea et al. (3). Average flowering time of 9 clones per population measured in Murcia. (3)–Data from Espada-Carbo et al. (4). Clones measured in Alcaniz.

Category B: Full bloom on March 25-28 and 222 days from phenological stage D to ripening. Clones selected were CA-7, CA-8, MM11 and AL-3.

Category C: Full bloom on March 25-28 and 229 days from phenologic stage D to ripening. Clones selected were MM-7, MM-14, MM-3 and AI-4.

From this selection program, one clone from each category has been released: CA-3, released as 'Jesca,' CA-7 released as 'Calante' and MM-7 released as 'Evaisa.'

Fruits of this native population have a perfect round shape. In its native area, fruits are wrapped in a paper bag early in

development, protecting them from insects and resulting in fruit with a uniform yellow skin color and no red blush. Fruits are large sized and have dense pubescence. Yield per tree is higher than 'Redhaven' (used as reference variety) and cropping is very reliable. (Table 3 and Figures 4.1, 4.2 and 4.3). Crosses between 'Calandas' and North American freestone germplasm result in late ripening progeny of excellent quality.

Other native populations from Aragón are 'Miraflores,' which is grown in Northern Aragón and the Rioja area. Fruit ripens before 'Calandas.' Other native populations from Aragón are 'Zaragozano' and

Table 3. Characteristics of fruits of clones selected from Spanish native population 'Amarillos de Calanda'.

Cultivar	Fruit weight (g)	Fruit diameter (mm)	Firmness (Kg/cm ²)	Skin color(1) ^z	Skin color(2) ^y	Flesh color ^x	°Brix	TA (g/l) ^w
Jesca CA-3	215.7	71.9	1.2	3.6	1.0	1.4	12.8	4.0
Calante CA-7	252.9	75.2	2.0	6.7	1.8	1.0	14.2	2.5
Evaisa MM-7	226.1	73.4	2.6	3.7	1.7	1.9	13.6	2.7
Kolenda CA-8	265.4	74.9	1.7	3.0	1.9	0.9	15.8	3.4

Data obtained from an average of a minimum of fifty fruits per clone. Mean of two crop years (1995 and 1996).

^zIndex color (1) measured on the blush overcolor using a Minolta colorimeter. Index calculated as (L x a)/b.

^yIndex color (2) measured on the ground color using a Minolta colorimeter. Index calculated as (L x a)/b.

^xFlesh color index measured using a Minolta colorimeter. Index calculated as (L x a)/b.

^wTA = titratable acidity. Expressed as malic acid equivalents.

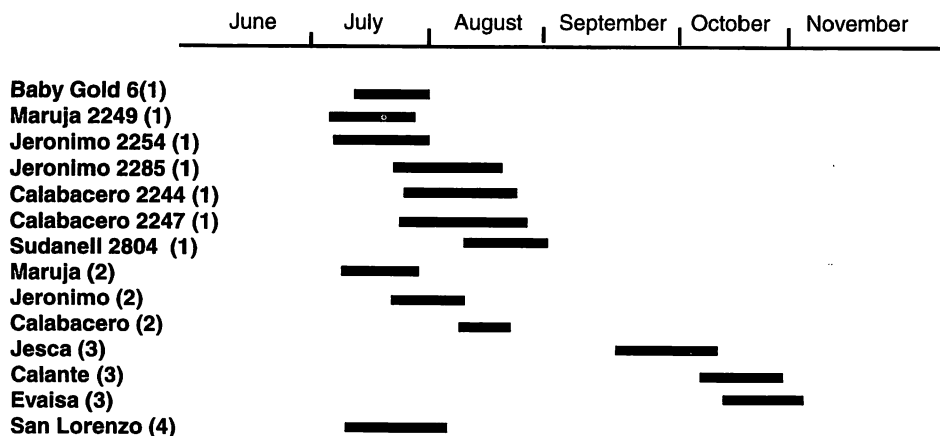


Figure 3 Ripening time of selected clones in their native area. (1)—Data from Rodríguez-Navarro et al. (5). Clones located in Murcia. (2)—Data from Egea et al. (3). Average ripening time of 9 clones per population measured in Murcia. (3)—Data from Espada-Carbo et al. (4). Clones measured in Alcaniz. (4)—Data from Badenes et al. (1). Clones measured in Bugarra (Valencia).

'Campieles' which also ripen before 'Calandas.' Fruits from these populations are medium size, have dense pubescence and yellow skin color with limited red blush overcolor. No selected clones are available from these native populations.

Native populations from Valencia

'Cofrentes.' 'Cofrentes' is a native population from a small area of inland Valencia called 'Valle de Ayora.' The peach acreage in this area is decreasing and most of the peach genetic resources have been lost. However, five clones have been pre-selected by IVIA (Instituto Valenciano de investigaciones Agrarias). Clones that ripen from the beginning to mid October are under selection. Fruits have round shape, yellow to orange ground color and red blush overcolor. (Table 1 and Figure 4.4.)

'Cotiguas.' 'Cotiguas' is a very old native population from the town of Carlet in southern Valencia. This population has disappeared and has been replaced by North American melting-flesh cultivars in this area. Fruits ripened earlier than 'Marujas.' Fruits had good color and good quality, but they lacked size.

Native populations from Lleida.

Several native populations that ripen from mid September to the end of October, including 'Roig del Rito,' 'Roig del Rito Tardío,' 'Groc Pinyana,' 'Roig Pinyana' have originated in the Lleida region. Skin is yellow with limited red overcolor and has dense pubescence. Clonal selection has not been practiced in these populations. Selection for reliable cropping, high fruit quality, and some variation in ripening time would be valuable.

'San Lorenzo.' 'San Lorenzo' is a very old population whose acreage has decreased in recent years. It ripens at about the same time as 'Catherina.' A clone from this population selected by growers in Valencia has been included in the IVIA collection. Data from last two crop years indicated that this selection has better size, more attractive color and higher total soluble contents than 'Catherina.' (Table 1).

'Sudanell.' This population is also called 'Amarillo de Agosto.' It is widely cultivated in Aragón, Lleida and eastern Andalusia. It ripens in August. Average fruit size is large, but the shape can

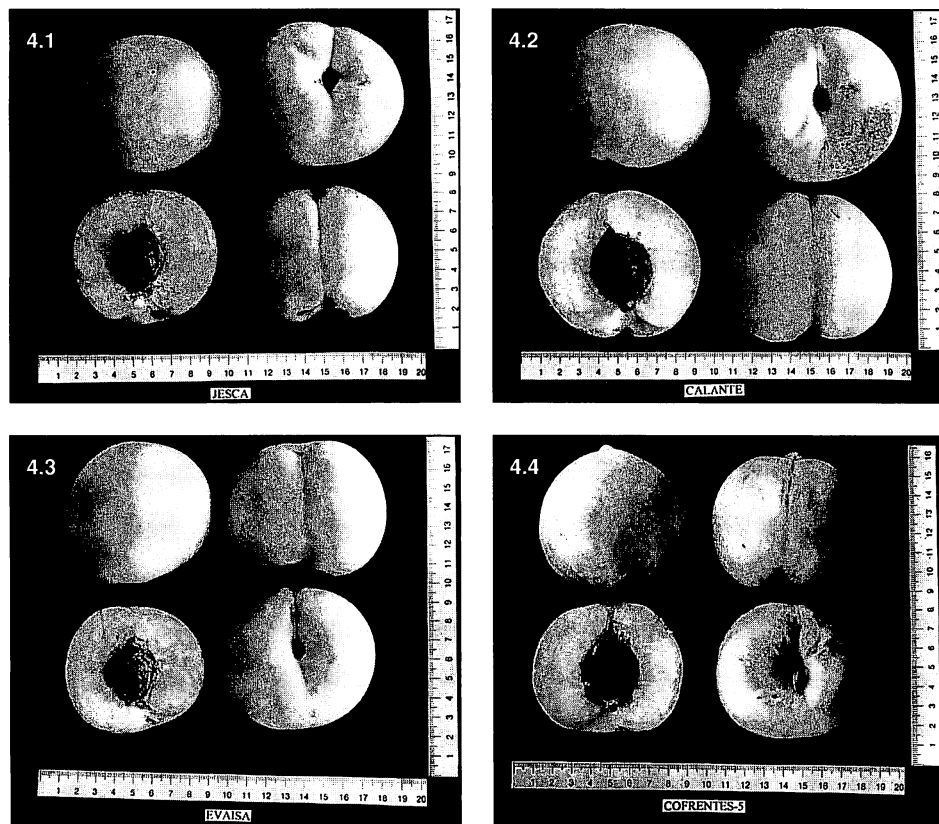


Figure 4. Fruits of selected clones from Spanish native populations. 4.1—Typical fruit of 'Jesca'. 4.2—Typical fruit of 'Calante'. 4.3—Typical fruit of 'Evaisa'. 4.4—Typical fruit of a pre-selected clone from 'Cofrentes'.

range from completely round to round-oval depending on the clone. Skin color is yellow with little red blush over color (5 to 10% of the fruit). Medium to high chilling requirements are found in this population (2).

Conclusions

Native peach germplasm from Spain is characterized by non-melting flesh, medium and high chilling requirements, with ripening ranging from the end of June to mid November. Fruits have yellow ground color, skin with dense pubescence and limited red overcolor, varying from none to 50% of the fruit surface. Most have excellent size and good postharvest keeping ability. Several clonal selections

from native populations of Spain have been made and some other populations remain unselected. However, genetic diversity within Spanish peaches is decreasing very rapidly because of replacement of traditional varieties by introduced ones from North America. In order to avoid loss of these important genetic resources, a detailed characterization of peach germplasm from Spain is essential as a prelude to efficient collection and preservation activities.

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Strawberry Varieties for Fresh Market in Denmark

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Abstract

Testing 9 varieties for the fresh market for 2 years yielded the results given here by measured yield and berry size and assessed taste and product quality of each variety. All varieties could grow successfully in Denmark. 'Honeoye' as an early productive variety with a good quality, and 'Onebor' (syn. 'Marmolada') as a productive mid season variety with a quality similar to 'Elsanta,' which had a lower yield. The late ripening varieties, 'Dania,' 'Pegasus' and 'Rhapsody,' had a medium quality. 'Rhapsody' was somewhat low in yield. The latest variety, 'Pandora,' produced a high yield and a medium quality.

Introduction

Danish strawberry growers cultivates 'Zefyr,' 'Elsanta' and 'Dania,' but the growth habit and state of health is not satisfactory (1). 'Zefyr' (3) is prone to mildew, 'Elsanta' is prone to winter frost and 'Dania' (4) is in some years attacked by gray mold. Moreover 'Elsanta' is often without any taste, when harvested before ripening because of the bright and glossy appearance. To find more convenient varieties, these varieties were compared to others in a trial 1990-1991 (2). To continue this work on selecting new strawberry varieties for Danish conditions, nine varieties were investigated during 1993-1995.

Material and Methods

The varieties were planted in the field during autumn 1992 on raised beds covered with plastic. All plants were trained at the institute and each plot consisted of 2 rows of 15 plants spaced 0.4 m apart and surrounding a drip irrigation line below

the cover. There were 3 replications and plants in the row were spaced 0.25 m apart. Spacing between beds was 1.35 m, yielding 403.500 plants per ha. In 1993 all flowers were removed from the plants. During the growth season the plants were fertigated in dry periods. Approximately 3 mm of water per day was applied, and it contained 24.5 mg per litre of nitrogen. Fertilisation was controlled by leaf analyses each year. In order to ensure pollination in 1994, flowering, potted plants were placed in the field during the period, when 'Pandora' flowered. This was not necessary in 1995, as other varieties satisfactorily overlapped the flowering period of 'Pandora.'

The soil between the beds was kept clean by herbicides and the plants were sprayed against pests and diseases as recommended, especially during bloom against gray mold (*Botrytis cinerea*). The plants were protected by covering with Agryl (synthetic mulch) during the winter

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