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RESEARCH ARTICLE

# Historical evidence of the Spanish introduction of date palm (*Phoenix dactylifera* L., Arecaceae) into the Americas

**D. Rivera · D. Johnson · J. Delgadillo · M. H. Carrillo · C. Obón · R. Krueger · F. Alcaraz · S. Ríos · E. Carreño**

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**Abstract** America's date palm (*Phoenix dactylifera* L.) groves can be found from 36°N Lat. (USA) to 21°S Lat. (Chile) and from 63°W Long. (Venezuela) to 117°W Long. (USA), at elevations from sea level to 2,000 m (Colombia). However, successful production of ripe dates is possible only in the arid regions of Peru, Chile, Baja California (Mexico) and the southwestern USA. At present, the major extant palm groves of Spanish origin in the Americas are situated in Baja California, Mexico and Peru. A study of the origin and diversity of the date palms of Spain and the Americas revealed abundant historical documentation permitting a historical picture of the introduction of date palm to the Americas. It can also shed light on the areas of origin of the plant material involved. Dates arrived in the Americas very soon after European contact (1492), and in the early sixteenth century there were numerous date palms on the islands of the Caribbean and on the mainland, as evidenced by the chroniclers of the Indies. Date palms reached the coasts of Peru and Chile in the late sixteenth century, and in some places still produce edible dates. The date palm appears to have come later to California and Baja California, from the beginnings of the eighteenth century, and its cultivation was established and has continued in Baja California (Mexico) in oases near former Jesuit missions. Spain and the Barbary Coast (Morocco, Algeria and Tunisia) were the places of origin of seeds for the Americas; beginning in the late nineteenth century offshoots were introduced from Iraq and North African countries directly to the Americas, especially the USA.

**Keywords** Biodiversity · Crop introduction · Gene flow · Geographic distribution · Palm groves · Phoenix dactylifera · Traditional knowledge

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## Introduction

As of October 12, 1492, contacts between Europe and America led to numerous exchanges of organisms

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(crops, weeds, pests, agents of epidemic diseases). Intentional or accidental, the exchanges took place in both directions. To a notable extent, the entire migration of Spaniards, Portuguese, and the others who followed them across the Atlantic, and the successful exploitation of the New World by these people depended on their ability to "Europeanize" the flora and fauna of the New World. This transformation was well under way by 1500, and it was irrevocable in both North and South America by 1550 (Crosby 2003).

The history of European horticulture in the Americas begins with the second voyage of Columbus, when he returned to Española with seventeen ships, 1,200 men, and seeds and cuttings for the planting of wheat, chickpeas, melons, onions, radishes, salad greens, grape vines, sugar cane, and fruit stones for the founding of orchards (Crosby 2003). In the Antilles wheat and other European grains failed, as did grape vines and olive trees (although later on prospered in mountains and temperate areas of the Americas). But many of the garden crops and fruits–cauliflowers, cabbages, radishes, lettuce, melons, bananas, oranges, lemons, pomegranates, citrons and figs–prospered. Most of the important European settlements in the tropical and subtropical zones of America historically raised a certain few crops—sugar cane, cotton, rice, indigo, coffee, tobacco—on large plantations for export to Europe (Crosby 2003).

Development of the slave trade from Africa created another way of introducing species in America, African food plants already known and used in Medieval Europe—cowpeas, sorghum, millet—were introduced directly by Europeans. But many others—taro, plantain, Guinea yam—were introduced as vital foodstuffs of the transatlantic African slave trade (Carney and Rosomoff 2009) or directly introduced by African slaves themselves (Esquivel et al. in Hammer et al. 1992).

However references to the introduction of the date palm (*Phoenix dactylifera*) are rare or nonexistent in the works consulted (Carney and Rosomoff 2009; Crosby 2003).

This joint paper originates from a shared interest in date palm uses, taxonomy and diversity by the different research entities involved. During the study of the origin and diversity of the palm in Spain and the Americas, we found abundant historical documentation that allows us to construct a detailed historical account of the introduction of date palm into the Americas. Documentation has also shed some light on the provenance and type of propagules involved. It is indeed fortunate that the Spanish kept such extensive and detailed records of their arrival, exploration and conquest of the New World.

We considered two related subjects that have a bearing on historical references to date palm. The Canary Islands date palm, *Phoenix canariensis*, is endemic to the island group off the northwestern coast of Africa. Until it was described by Wildpret in Chabaud as a distinct species in 1882, based upon cultivated plants, *P. canariensis* was considered a variety of the date palm, and shared the common palm name and the designation in Spanish for the fruits as well, with some inconsistent distinctions being made. The true date palm was introduced to the Canary Islands in the fifteenth century where it has become naturalized in populated areas. Voyagers to the New World, beginning with Columbus, stopped in the Canary Islands for final provisioning before crossing the Atlantic Ocean. The question our research faced is: could certain historical accounts that do not relate specifically to fruit production, be referring to what we now call *P. canariensis*? Also, there is some suggestion that *Phoenix* palms were first introduced by the Spanish to the Americas as a source of palm leaves for Easter religious ceremonies. What is the evidence concerning these issues?

The study of the introduction and of the origins and development of date palm cultivation in America is made possible by the extensive historical documentation available and can generate hypotheses applicable particularly for the dispersal of the date palm and to similar phenomena in other species.

The aim is to determine the zones of origin of the date palm germplasm introduced in America since the 16th century and assess the value of the oldest palm groves in America as reservoirs of date palm diversity.

## Materials and methods

### The study area

Historically, and in several instances to the present day, populations of date palms are found in North America, South America and the Caribbean. In latitude they extend from 36°N (USA) to 21°S (Chile)

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and in longitude from 63°W (Venezuela) to 117°W (USA), with an elevation range from sea level to 2,000 m (Soatá, Colombia). However, successful production of ripe dates is achieved only in arid regions of Peru and Chile and in Baja California (Mexico) and the SW of the USA. Elsewhere, the date palm is grown for ornamental purposes.

### Data sources

The online lexical databank (CORDE) housed at the Real Academia Española furnished a large number of historical references from a search of the word *dátiles* (Spanish for dates) (RAE 2008). The Portal de Archivos Españoles (PARES 2009) is the gateway to the catalogue and digital documents of the National Archives of Spain, including the *ArchivoGeneral de Indias*. Within these archives, we searched for and consulted documents which referred to *dátiles* (dates), *palmas* and *palmeras* (date–palm). Digital editions of different *Cronistas de Indias* were also consulted (Table 1). For information on the present status of the main fruit-producing palm groves in Table 1 we visited those in Baja California, Chile and Brazil; and have contemporary reliable published information on the status in Peru (Pavez et al. 2007). Latitude and longitude for all localities are standardized using Google Earth (2010).

The maps in Figs. 1a, b and 2a, b were constructed using GMT (2010) and show the various locations referred to in Tables 1 through 3.

The specimens preserved in the United States National Herbarium (Washington DC) (US 2012) and the Muséum National d'Histoire Naturelle (Paris) (P 2012) give a complementary overview of the cultivation of date palm in the Americas during the nineteenth and twentieth centuries.

## Results and discussion

### Evidence for commerce of date fruits in and from Spain

The manuscripts of Cristobal Colón (Christopher Columbus) mention the continuous requirements of *provisiones* to be imported from Spain into the new colonies, but there is no one explicit reference to date fruits (Colón 1892). *Bastimentos y vituallas* thus provisions and food, were imported into the American colonies, either from the Iberian Peninsula or the Canary Islands. Alain Liogier (Hammer et al. 1992) mentions date palm as a plant brought from Spain according to the chronicles of the first voyages of Columbus. León (2000) records La Gomera in the Canary Islands as the supply point where Columbus provisioned livestock and fruits in his second voyage, that would be the source of future livestock and crops in America, however no mention is found in the chronicles to either dates or date palms.

We found no evidence in the *Archivo General de Indias* for date fruit imports. However there is abundant evidence for commerce in date fruits in Spain, before and after European contact with the Americas. For instance:

1. An incident is reported in 1477 of Juan de La Torre's complaint by letter to the Catholic Monarchs, that someone had stolen his dates and other goods from his ship anchored in the port of Puerto de Santa Maria in 1471 (Aznar 2003).
2. Pablo Mercado, a Valencia merchant, lodged a complaint in 1488 before the *Corregidor de Vizcaya* against Pedro Jiménex (from Bilbao) for barrels of dates not delivered to the consigner in Flanders (Simancas 2010).
3. John Brugge, an English merchant living in Seville in 1492, demanded payment of a debt of 7,231 doubloons from Cervanis Jacome. By a ruling of the judge, Cervanis Jacome had to pay in the form of 306 quintals, 2 arrobas and 20 pounds of dates, valued at 65,764 maravedíes (Bello 1993).

### Date palms in Spanish America

In his writings, Columbus does not mention the trading of date fruit, or the cultivation of date palms. However, these palm trees soon appeared in various Spanish island colonies of the Caribbean and the mainland. Already in 1526, there was documented the introduction and cultivation of date palms on the islands of Cuba, Jamaica, Puerto Rico and Hispaniola (Haiti and Dominican Republic) (Table 1 and Fig. 1a) (Fernández-de-Oviedo (1526, 1535): "By the work of Christians, there are many palm trees in cities and towns and tenements, which the stones from the dates that they brought from Spain was the initial origin" or "The

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**Table 1** Date Palm Groves in America and the historical evidence on their origins

| Locality | Lat. | Long. | *Main cultivars and notes* | El | CNr | Key dates | TY | Prov. | Ref |
|---|---|---|---|---|---|---|---|---|---|
| Barbados | | | | | | | | | |
| Barbados | 13°11′N | 59°34′W | – | 300 | HG | 1750 | T | | 1, 2 |
| Brazil | | | | | | | | | |
| Pernambuco | 8°03′S | 34°52′W | Arruda da Camara, plantations in Permanbuco province | 9 | SP | 1810 | T, E | | 2 |
| Petrolina, Pernambuco | 9°23′S | 40°31′W | Cvs: Zahidi, Khadrawy, Medjool (Estação Experimental de Bebedouro) | 365 | SP | 1980 | T, E | Seeds and offshoots from California, USA and N Africa | 3 |
| Piracicaba, São Paulo | 22°43′S | 47°38′W | Escola Superior de Agricultura Luiz de Queiroz | 517 | SP | 1928 | T | | 4, 5 |
| Florianópolis, Ilha Santa Catarina | 27°35′S | 48°32′W | *Klein & Bresolin* 9379 (US) | 20 | SP | 1971 | H | | 40 |
| Chile | | | | | | | | | |
| Arica | 18°24′S | 70°12′W | Lluta, Azapa, Chaca, Codpa and Camarones valleys (Arica) | 1200–1500 | HG | 2007 | E | | 6 |
| Iquique | 19°10′S | 69°41′W | Suca, Miñi-Miñe, Camiña and Tarapacá gorges (Iquique) | 1200–1500 | HG | 2000 | E | | 6 |
| Pica | 20°29′S | 69°19′W | Pica, on the Tamarugal Pampa | 1300 | SP | 2000 | E | | 6 |
| Colombia | | | | | | | | | |
| Medellín | 6°16′N | 75°33′W | Two Date Palms in the Botanic Garden | 1470 | | 1935 | T | | 7, 8 |
| Soatá | 6°20′N | 72°41′W | – | 2012 | HG | 2009 | E | | 9 |
| Cuba | | | | | | | | | |
| Camagüey | 21°23′N | 77°54′W | *J.A. Shafer 787* (US) | 100 | SP | 1908 | H | | 40 |
| Cuba | 20°01′N | 75°49′W | – | 38 | HG | 1526–1535 | T | DSP | 8, 10, 11, 12 |
| Curaçao | | | | | | | | | |
| Curaçao | 12°10′N | 68°59′W | *Curran & Haman* 265 (US) | 22 | SP | 1917 | H | | 40 |
| Dominican republic | | | | | | | | | |
| Santo Domingo | 18°28′N | 69°53′W | Dates not good | 10–50 | HG | 1526–1535 | | DSP | 8, 10, 11, 12 |

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**Table 1** continued

| Locality | Lat. | Long. | *Main cultivars and notes* | El | CNr | Key dates | TY | Prov. | Ref |
|---|---|---|---|---|---|---|---|---|---|
| Santo Domingo | 18°28′N | 69°53′W | "Lots of date palms and other trees and plants that have been brought from Spain" | 10–50 | HG | 1526 | | Seedlings from Spain? | 8, 10 |
| Santo Domingo | 18°28′N | 69°53′W | Dates ripen, but are not good (Francisco López de Gomara) | 10–50 | HG | 1554 | T | DSP | 13 |
| El Salvador | | | | | | | | | |
| San Salvador | 13°41′N | 89°11′W | *Salvador Calderón* 881 & 1111 (US) | 705 | SP | 1922 | H | | 40 |
| Haiti | | | | | | | | | |
| St. Domingue | 18°34′N | 72°17′W | *Poiteau* (P) | 68 | SP | c. 1804 | H | | 41 |
| Gonaives | 19°27′N | 72°41′W | *V. Jacquemont* 1834 (P) | 8 | SP | 1827 | H | | 41 |
| Artibonite | 19°21′N | 72°25′W | *Zanoni, Mejía & García* 35203 (US) | 900 | SP | 1985 | H | | 40 |
| Jamaica | | | | | | | | | |
| Hope gardens | 18°01′N | 76°44′W | In November 1899, 75 plants were sent from Algiers to Jamaica… | 209 | SP | 1899 | T | Plants from Algeria | 14 |
| Saint Ann's bay? | 18°02′N | 77°11′W | Some | 10–50 | HG | 1526–1535 | T | DSP | 8, 10, 11, 12 |
| Crescent plantation | 18°01′N | 76°52′W | Some | 230 | SP | 1725 | T | | 2, 15 |
| Guanaboa | 18°03′N | 77°04′W | Some | 230 | HG | 1725 | T | | 2, 15 |
| Spanish town | 17°59′N | 76°57′W | Some in a garden at Spanish Town, bear every year | 30 | HG | 1774 | T | | 2, 16 |
| Mexico | | | | | | | | | |
| San Luis Rio Colorado, Sonora | 32°28′N | 114°45′W | Alonso de la Mota y Escobar on the region of Nueva Galicia. (also Date palms in 2009 at Ejido de las Cachoras) | 35 | HG | 1605 | T, E | | 17 |
| Guaymas, Sonora | 27°56′N | 110°55′W | Large plantings of old seedlings near Guaymas | 17 | P | 1900? | T, E | Seedlings | 18 |

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**Table 1** continued

| Locality | Lat. | Long. | *Main cultivars and notes* | El | CNr | Key dates | TY | Prov. | Ref |
|---|---|---|---|---|---|---|---|---|---|
| Cedros island, BC | 28°11′N | 115°12′W | *J.N. Rose* 16147 (US) | 100 | SP | 1911 | H | | 40 |
| San Ignacio Kadakaamán, BC | 27°17′N | 112°53′W | Exported c. 23,000 kg of figs and dates (in 1882). Along 1 km in the valley of Kadakaaman (in 2005) | 115 | SP50 (1793), P50000 (1908) | 1728–1882 | T,E | DSOSI | 18, 19 |
| Mulegé, BC | 26°53′N | 111°58′W | Several farmers at Mulegé produced dates | 10 | SP | 1894 | T,E | DSOSI | 19 |
| Misión Santa Rosalía de Mulegé, BC | 26°53′N | 111°58′W | Cvs: Criollo, Caramelo. Along 2 km in the river and oasis (in 2005) | 9 | P20000 | 1705–1828? | E | DSOSI | 20, 21 |
| La Conejera, Mulegé, BC | 26°53′N | 111°59′W | Palm groves | 13 | SP | 1705–1828 | | DSOSI | 22 |
| San José de Gracia, BC | 26°35′N | 112°44′W | Along the river banks | 823 | SP500 | 2004 | E | DSOSI | 22 |
| La Purísima–San Isidro, BC | 26°11′N | 112°03′W | Along 9 km in the valley of river Cadegomó (in 2005) | 100 | P10000 | 2010 | | DSOSI | 22 |
| La Purísima Concepción de Cadegomó, BC | 26°10′N | 112°04′W | River Cadegomó (in 2005) | 94 | SP | 1718–1825 | | DSOSI | 23 |
| Viña Don José, San José de Comondú, BC | 26°03′N | 111°48′W | River and oasis (7 km) (in 2004) | 310 | SP500 | 1708–1827 | E | DSOSI | 23 |
| Nuestra Señora de Loreto Conchó, BC | 26°00′N | 111°20′W | An 18th century drawing depicts several date palms in the outskirts. A few palms around the buildings (in 2005) | 5 | P1000 | 1697–1829? | I | DSOSI | 24 |
| San Francisco de Javier Viggé-Biaundó, BC | 25°51′N | 111°32′W | Juan de Ugarte produced rice, dates, and olives. A few scattered palms (in 2007) | 409 | HG | 1699–1817? | I | DSOSI | 17, 25 |
| Comondú, BC | 25°19′N | 111°38′W | Three palms | 50 | HG | 1774 | T,E | | 26 |
| Comondú, BC | 25°19′N | 111°38′W | Several farmers produced dates | 50 | SP | 1894 | T,E | | 19 |

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**Table 1** continued

| Locality | Lat. | Long. | *Main cultivars and notes* | El | CNr | Key dates | TY | Prov. | Ref |
|---|---|---|---|---|---|---|---|---|---|
| San Juan de la Costa, BC | 24°23′N | 110°42′W | A new plantation | 34 | P | 1955 | E | Seedlings? | 21 |
| San Josef de los Coras (del Cabo), BC | 23°05′N | 109°42′W | Date palms (Tarabal father founded the mission in 1730) | 40 | HG | 1740 | T | | 8, 27 |
| Cape San Lucas, BC | 22°53′N | 109°54′W | *L.J. Xantus* 112 (US) | 100 | SP | 1859 | H | | 40 |
| Rancho San Joaquín, Mayapán, Yucatán | 20°32′N | 89°17′W | *Schott* 749 (US) | 20 | SP | 1865 | H | | 40 |
| Cuernavaca, Morelos | 18°58′N | 99°14′W | Palms have also "been made of dates" brought from Spain and a shortly have come to bear fruit | 1790 | HG | 1536 | | DSP | 8, 28, 29 |
| Cuernavaca, Morelos | 18°58′N | 99°14′W | In Morelos… even date palms | 1790 | HG | 1530 | T | | 17 |
| Copainalá (Copanaztla), Chiapas | 17°05′N | 93°12′W | Other palms which the Castilian introduced, produce good dates, and after eight years bear fruits… | 440 | HG | 1530 | T | | 8, 30 |
| Panamá | | | | | | | | | |
| Panamá | 8°32′N | 80°47′W | By 1550 groves had sprung up on the islands, in tropical Mexico, and Panama | | HG | 1550 | T? | | 17 |
| Perú | | | | | | | | | |
| Valle de Zaña | 8°24′S | 78°46′W | (dates) ripen perfectly | 57 | HG | 1653 | T | DSP | 8, 31 |
| Valle de Zaña | 8°24′S | 78°46′W | A 16th century ghost town 46 km SE of Chiclayo in the Zaña valley. | | HG | 2007 | E | | 6 |
| Lima | 12°05′S | 77°02′W | – | 98 | HG | 1580 | | DSP | 8, 31 |
| Hoyas de Chilca (Lima?) | 12°31′S | 76°44′W | Particularly dates, and the wine of pits surpass those from irrigated orchards, " | 9 | HG | 1630? | T | DMTA | 8, 31 |

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**Table 1** continued

| Locality | Lat. | Long. | *Main cultivars and notes* | El | CNr | Key dates | TY | Prov. | Ref |
|---|---|---|---|---|---|---|---|---|---|
| Hoyas de Chilca | 12°31′S | 76°44′W | Río Chilca valley | 9 | HG | 2007 | E | | 6 |
| Pisco | 13°42′S | 76°12′W | The palms grown in irrigated gardens, give many dates but do not ripen well, and dates from the palms in wells of the same valley, mature as well as those brought from Barbary | 19 | HG | 1653 | T | DMTA | 8, 31 |
| Paracas, Ica | 13°50′S | 76°14′W | A few palms among the buildings (2007) | 6 | HG200 | 2007 | E | | 6 |
| Villacurí, Ica | 13°53′S | 75°53′W | Production zone | 377 | P | 2007 | E | | 6 |
| Ica | 14°00′S | 75°45′W | Production zone | 400 | P | 2007 | E | | 6 |
| Cachiche, Ica | 14°05′S | 75°44′W | Nobody can go to Cachiche, for tasty dates, without going back damned. Cachiche from times past was synonymous with witchcraft | 400 | HG200? | 1883 | | | 8, 32 |
| Cachiche, Ica | 14°05′S | 75°44′W | The palm of the seven heads, with seven prostrate trunks. People of Cachiche always cut the seventh head of this palm in order to protect Ica, according to a local tradition | 400 | HG | 2009 | E | | 22, 33 |
| Ocucaje, Ica | 14°21′S | 75°40′W | 300 km south of Lima | 314 | HG | 2007 | E | | 6 |
| Valleys between Cuzco and Lima | 14°30′S | 75°12′W | Dates ripen, and make wine and sugar | 336 | HG | 1653 | T | | 8, 31 |
| Río Grande, Palpa, Ica | 14°30′S | 75°12′W | 300 km south of Lima. Scattered palms | 336 | HG | 2007 | E | | 6 |
| Nazca (La Nasca) | 14°50′S | 74°56′W | Dates ripen perfectly | 578 | HG | 1630? | T | DSP | 8, 31 |

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**Table 1** continued

| Locality | Lat. | Long. | *Main cultivars and notes* | El | CNr | Key dates | TY | Prov. | Ref |
|---|---|---|---|---|---|---|---|---|---|
| Nazca | 14°50′S | 74°56′W | Río Nazca valley | 578 | HG | 2007 | E | | 6 |
| Acarí | 15°26′S | 74°37′W | Río Acarí valley | 157 | HG | 2007 | E | | 6 |
| Yauca | 15°39′S | 74°31′W | Río Yauca valley | 25 | HG | 2007 | E | | 6 |
| Camaná, Arequipa | 16°37′S | 72°42′W | Dates ripen perfectly | 16 | HG | 1630? | T | DSP | 8, 31 |
| Camaná, Arequipa | 16°37′S | 72°42′W | Río Camaná, valley | 16 | HG | 2007 | E | | 6 |
| Tambo | 17°5′S | 71°45′W | Río Tambo de Arequipa valley | | HG | 2007 | E | | 6 |
| Ilo | 17°37′S | 71°19′W | Río Ilo valley | 30 | HG | 2007 | E | | 6 |
| Yarada-Tacna | 18°08′S | 70°25′W | Río Yarada-Tacna valleys | 130 | HG | 2007 | E | | 6 |
| Puerto Rico | | | | | | | | | |
| Puerto Rico | 18°27′N | 66°05′W | In towns and plantations | 1 | HG | 1526–1535 | | DSP | 8, 10, 11, 12 |
| Near Ponce | 17°59′N | 66°35′W | *Underwood & Griggs* 723 (US) | 8 | SP | 1901 | H | | 40 |
| Near Cabo Rojo and Puerto Real | 18°04′N | 67°09′W | *O. Truele s.n.* (P) | 20 | SP | 1885 | H | | 41 |
| Trinidad and Tobago | | | | | | | | | |
| Tobago | 11°10′N | 60°47′W | *W.F. Broadway* 4876 (P) | 30 | SP | 1911 | H | | 41 |
| Uruguay | | | | | | | | | |
| Montevideo | 34°45′ | 56°21′W | Near Montevideo splendid trees (*P. canariensis*) planted c. 1790 | 15 | | 1790? | T | Date fruits from the Canary islands | 33 |
| USA | | | | | | | | | |
| California | 35°48′N | 116°11′W | China Ranch Date Farm. Planted from seed in the 1920′s by Vonola Modine | 377 | P | 1920 | | | 22, 35 |
| Coachella Valley (Coachella & Indio), California | 33°43′N | 116°14′W | Cvs: Deglet Noor and Medjool | 0 | P200000 | 1904 | | Offshoots from Algeria, Egypt and Arabia | 36 |
| Salt River Valley, Arizona | 33°23′N | 112°18′W | Cvs. Black Sphinx | | P75000 | 1861 | | Seedlings, offshoots | 18, 37, 38 |
| Bard Valley, Imperial County, California | 32°47′N | 114°33′W | Cvs: Khadrawy, Zahidi, Saidy, and Medjool. | 41 | P55000 | 1933 | | Offshoots | 37 |

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**Table 1** continued

| Locality | Lat. | Long. | *Main cultivars and notes* | El | CNr | Key dates | TY | Prov. | Ref |
|---|---|---|---|---|---|---|---|---|---|
| Jamul Creek and Jamul Valley, San Diego | 32°42′N | 117°06′W | *E.A. Mearns* 461 and *L. Schonnfeld* 3856 (US) | 40 | SP | 1894 | H | | 40 |
| Mission San Diego de Alcalá, San Diego, California | 32°47′N | 117°06′W | Those near the mission are reputed to be the oldest in California. None of the palms produced good edible dates | 31 | HG | 1769? | | Seedlings brought by the Franciscans from Lower California | 18 |
| Kosay, San Diego, California | 32°45′N | 117°11′W | The Serra Palm was one of two Old Town Palms or Mission Palms | 30 | SP2 | 1769 | T, I | Seedlings brought by the Franciscans from Loreto, Lower California | 42 |
| Yuma area, Arizona | 32°42′N | 114°37′W | Medjool plantation | 63 | P60000 | 1990 | E | Offshoots | 37 |
| Venezuela | | | | | | | | | |
| San Juan Bautista, Isla Margarita | 11°01′N | 63°57′W | – | 60 | HG | 2009 | E | | 39 |

*BC* Baja California, *Cvs* Main cultivars, *El* Elevation (m a.s.l.), *CNr* context and number of palms, *HG* home gardens, *SP* small plantations, *P* plantations, *TY* Type of evidence, *T* texts, *H* Herbarium specimens, *I* images, *E* extant palm groves, *Prov* provenance, *DMTA* date fruits from Morocco, Tunisia and Algeria. *DSP* date fruits from Spain, *DSOSI* date fruits from Sonora and Sinaloa,? with doubts, *Ref* references

1 Hughes (1750), 2 Martius (1838), 3 Oliveira and Assis (1999), 4 Gomes (1975), 5 Romero (2007), 6 Pavez et al. (2007), 7 Carrasquilla (1935), 8 RAE (2008), 9 Soatá (2010), 10 Fernández-de-Oviedo (1526), 11 Fernández-de-Oviedo (1535), 12 Fernández-de-Oviedo (1851–1855) 13 Caballero (2000), 14 Morton (1987), 15 Sloane (1725), 16 Long (1774), 17 Dunmire (2004), 18 Popenoe (1973), 19 Trejo and González (2002), 20 Bain (2009b), 21 Jordán (1997), 22 Google Earth (2010), 23 Loyola (2010), 24 Wikipedia (2009), 25 Bain (2009a), 26 Aschmann (1957), 27 Abad (1783), 28 Baudot (1991), 29 Motolinía (1536), 30 Herrera (1615), 31 Cobo (1653), 32 Palma (1883), 33 Joel Lode (pers. comm.), 34 André (1893), 35 China Ranch (2010), 36 Lee (1963), 37 Hodel and Johnson (2007), 38 Popenoe (1913), 39 Portal de Info (2010), 40 US (2012), 41 P (2012), 42 Trent and Seymour (2010)

stones of dates, which were taken from here, was its origin, or principle". "There are palms which were planted in this city (Santo Domingo) and in many estates and parts of this island, from the stones of dates, but they do not know how to cure here".

Around 1550 date palms were grown in various locations in Mexico (Baudot 1991; Dunmire 2004; Motolinía 1536) (Fig. 1a).

Throughout the seventeenth century, date-palm cultivation was expanded to many localities in Peru (Table 1 and Figs. 2a and 3) (Cobo 1653): Valle de Zaña, Hoyas de Chilca, Pisco, La Nasca and Camaná, e.g. "Very early, in the founding of this city of Lima. They probably planted palms, as appears by the ancient palm trees so tall, which I found myself in the same fifty-three years ago (1600), which no doubt were born of seeds of dates that they brought from Spain. Because I have seen them sown and be born very soon. in this city of Lima, carry some much fruit, but not reach perfect maturity, because once the dates have grown throughout the thickness should have and are taking color, comes the winter, which causes that do not ripen entirely, but some in every bunch ripen and are very sweet and tasty, but most are half mature,

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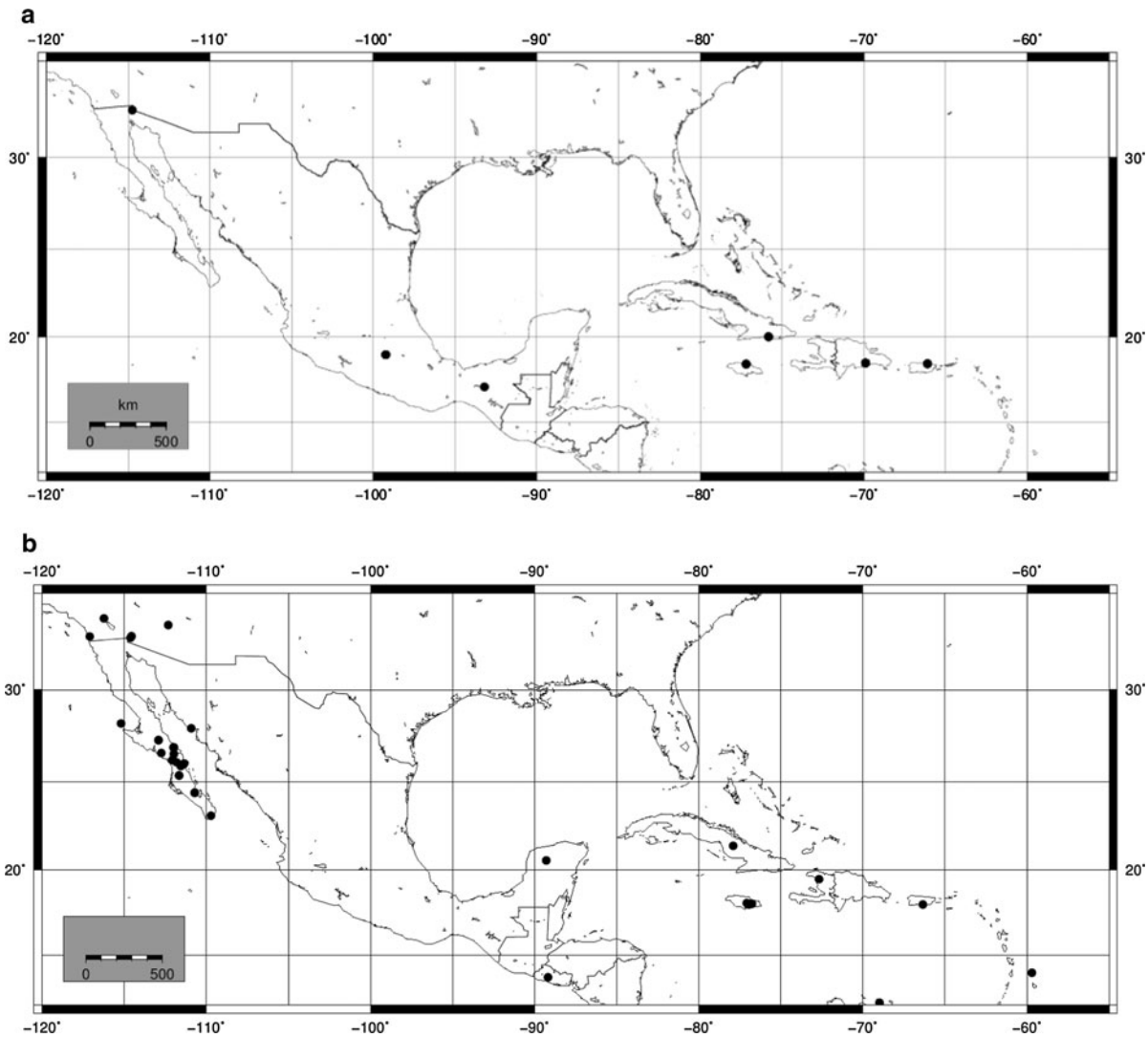


**Fig. 1** **a** Location of the date-palm groves in North America and the Caribbean, 1492-1700 (Table 1). **b** Location of the date-palm groves in North America and the Caribbean, 1701–2010 (Table 1)

which are usually eaten cooked, and roasted, or canned" "In other hot and dry valleys of these plains, the fruits ripen perfectly, as it is in all the valleys of the province of Ica, which belong to the archbishop of Lima, particularly in the Nazca and Pisco".

There are references to small-scale cultivation of date palms in various parts of Colombia, Panama and Venezuela (Table 1). Failure to produce a regular harvest of dates led to abandonment of cultivation in the Caribbean areas, where it was introduced early (Fig. 1a, b). However cultivation of *Phoenix* palms as ornamentals in gardens is frequent in the Americas. Arias et al. (1918) (Hammer et al. 1992) report cultivation of *P. dactylifera, P. canariensis* and *Phoeni roebelenii* in Cuba.

Date palm cultivation has remained somewhat successful in the areas along the Pacific coast of Peru and Chile; most populations being derived from seed (Fig. 2b). Deserving special mention are the date-palm oases in Baja California, Mexico and the irrigated areas of the USA (Fig. 1b).

## Baja California and California palm groves

At present, the major extant palm groves of Spanish origin in the Americas are situated in Baja California,

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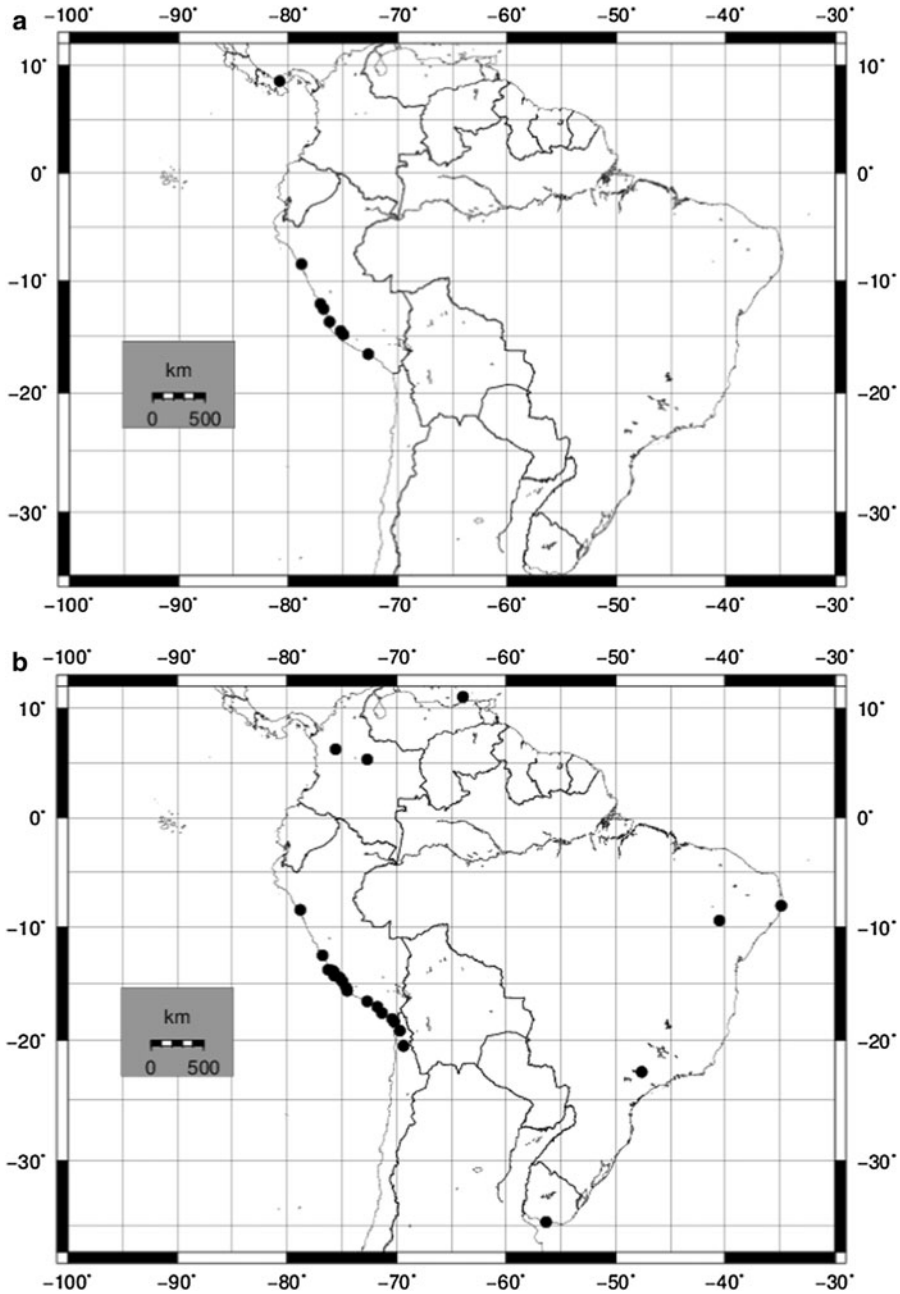


**Fig. 2** **a.** Location of the date-palm groves in South America, 1492–1700. (Table 1) **b.** Location of the date-palm groves in South America, 1701–2010 (Table 1)

Mexico (Fig. 4). Documentary evidence about the introduction of date palms during the first century of the missions (i.e. the eighteenth century) in Baja California is contradictory. Abad (1783) mentions date palms in the mission of San José del Cabo, at the extreme south end of the Peninsula, presumably grown there after the mission founding in 1730.

Del Barco (1988), in his *Natural History and Chronicles of the Old California*, reports on the plantings made in San Francisco Javier, San Luis Gonzaga, Santa Gertrudis, and Santa Maria missions. Wheat, vegetables, fruit trees and grape vine were the main crops, but no date palms are mentioned. However this lack of references to date palm can be interpreted as a result of not reporting on those missions presently with large palm groves (San Ignacio, Mulegé, etc.). Dr. Michael W. Mathes (pers. comm.), a specialist in history of the Missions, states:

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**Fig. 3** One of the heads belonging to the magic "Date Palm of the Seven Heads", which is supposed to protect Cachiche (Ica, Peru). Photo: Joel Lode

**Fig. 4** Processing of sun-dried dates, La Purísima (Baja California, México). Photo: J. Delgadillo

"I do not know any document which specifically cites the introduction of date palm into Baja California." Aschmann (1957) speculates that dates "may have been a secondary introduction from the coastal desert of Peru."

Peter Masten Dunne (1952) in *Black Robesin Baja California* and Peter Gerhard in his *Lower California Guide Book* (Gulick and Gerhard 1962) mention the date palm, in relation to San Ignacio and the activities of Father Ugarte. It is well known that Ugarte had a farming background in Honduras on his uncle's ranch, and he is acknowledged as the father of the agriculture in both Alta and Baja California. He introduced grape vine, citrus, etc. and determined the animals and plants best adapted according to climate and soil features, etc. The agricultural contributions of Father Ugarte are cited by Venegas (1757) in his manuscript *Empresas Apostólicas*, completed in 1739 and finally published in 1757 as *Noticia de la California*. The missions were regularly receiving food aid, possibly including dates, by boat from Sonora and Sinaloa through Loreto (Trejo and González 2002). An eighteenth, or possibly nineteenth, century drawing depicts several date palms near the Loreto mission (Fig. 5).

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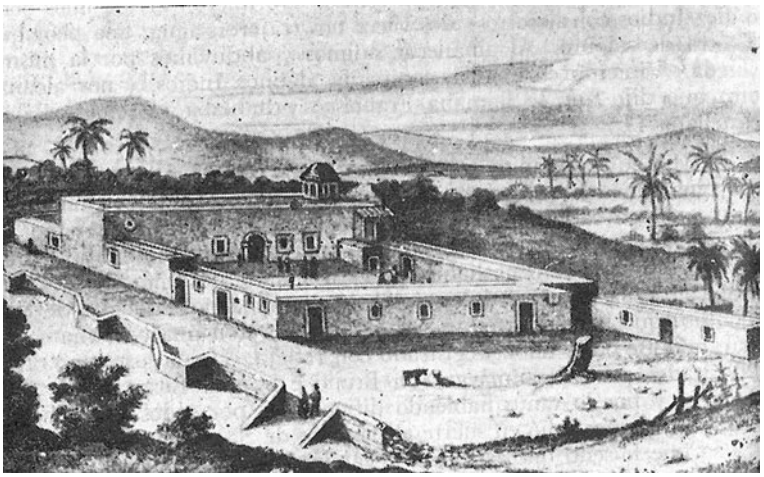

**Fig. 5** Depiction of Misión de Nuestra Señora de Loreto, dated eighteenth or nineteenth century. http://es.wikipedia.org/wiki/Archivo:Misión_de_Nuestra_Señora_de_Loreto._Siglo_XVIII.jpg

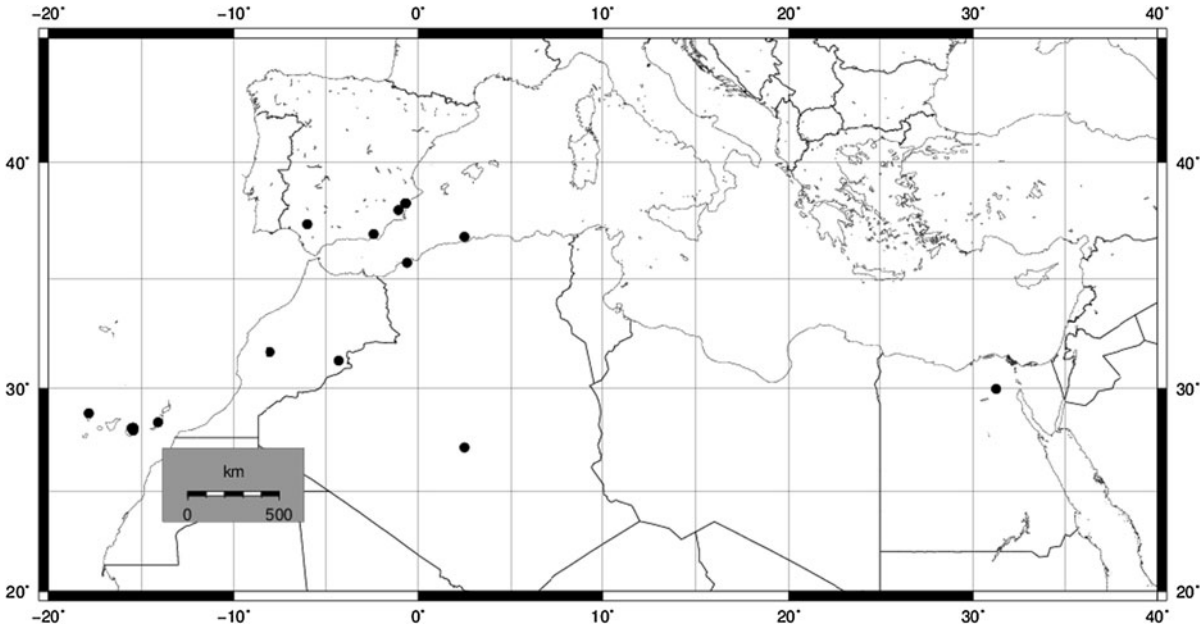


**Fig. 6** Map of the sources of planting material (dates) in Western Europe and North Africa, likely involved in the origins of the Americas' palm groves (Tables 2, 3)

We explored other alternatives for the introduction after the expulsion of Jesuits in 1768, either in the short period of the Franciscans (1768–1773) or by the Dominicans (1774–1834). Economic activities were promoted by Governor José Gálvez beginning in the 1760s and 1770s. In an exhaustive inventory of the missions, written in 1774 by the Dominican missionaries who had succeeded the Franciscans the preceding year, the presence of three date palms at Comondú is mentioned (Aschmann 1957).

In the southern Baja California peninsula, the mission San José del Cabo, on the coast, was designated by Sebastian Vizcaino as the *Puerto de San Bernabé* in the sixteenth century, when he was seeking a suitable and secure port for the Nao (ship) de China, as the Manila galleons were called, which often

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**Table 2** Historically documented Palm Groves, from Spain and the Canary Islands, which were a likely source of dates consumed, and of seeds sown in the Americas

| SP | Province | Locality | Lat. | Long. | El | Key dates | Notes | Ref |
|---|---|---|---|---|---|---|---|---|
| CD | Fuerteventura | Río de las Palmas | 28°23′36″N | 14°05′12″W | 239 | 1422 | And there may well have 800 palm trees that give shade to the valley, fountains and streams… Are as long as masts of a ship, more than 20 arms up. So green and so leaved, and so loaded with dates, that it is a very nice thing to watch (J. Bethencourt) | 1 |
| CD | Gran Canaria | Arucas | 28°7′11″N | 15°31′22″W | 268 | 1484 | Is all populated by palm trees. In a place called Tamrasaite we have removed more than sixty thousand palms and infinite elsewhere, and all the Telde and Arucas (Pedro Gómez Escudero) | 2, 3 |
| C | Gran Canaria | Tamaraceite | 28°5′57″N | 15°28′21 W | 212 | 1484 | As above | 2, 3 |
| CD | Gran Canaria | Telde | 28°0′14″N | 15°24′54″W | 110 | 1484 | As above | 2, 3 |
| D | Alicante | Elche | 38°16′9″N | 0°41′53″W | 85 | 1492 | First written reference to the export of white palm from Elche to Valencia | 4 |
| D | Alicante | Elche | 38°16′9″N | 0°41′53″W | 85 | 1494 | In no other I've seen so many palm trees as in this, but the dates they produce are not sweet or edible as in Africa, because this country is less hot (Hyeronimus Münzer) | 5 |
| D | Almería | Pechina | 36°50′38″N | 2°28′36″W | 58 | 1494 | We left Tabernas. … in a sunny valley watered by a stream, on whose shores extend lush gardens and green fields where grows the palm, olive, almond, fig (Hyeronimus Münzer).. | 5 |
| D | Gran Canaria | Las Palmas | 28°7′36″N | 15°25′50″W | 7 | 1497 | Smaller lots… went to Ibone Darmas,.. next to the lot of Gonzalo de Burgos as far as a very tall, thin palm tree | 6 |
| D | La Palma | La Palma | 28°49′40″N | 17°49′39″W | 402 | 1501 | The Island of La Palma, The island has no water, except (which is picked up) by a date palm, which has dates, on their palms (Antonio de Lalaing) | 7 |
| CD | Gran Canaria | Las Palmas | 28°7′36″N | 15°25′50″W | 7 | 1503 | Royal letter on the exploitation of palm trees of that Island and to inquire why one particular tree had been burnt (Fernando de Aragón) | 6 |
| D | Sevilla | Sevilla | 37°22′59″N | 5°59′24″W | 12 | 1506 | Palms' street (now Jesus-del-Gran-Poder) named for the palm trees that grew there, felled in 1535 | 8 |
| D | Alicante | Elche | 38°16′9″N | 0°41′53″W | 85 | 1672 | Where there is nothing more than palm trees laden with fruit, like large olives (A. Jouvin) | 9 |
| D | Almería | Between Sorbas, Tabernas and Almería | 36°57′27″N | 2°23′51″W | 390 | 1688 | Palma major CB. (J.P. Tournefort) | 10 |
| D | Alicante | Elche | 38°16′9″N | 0°41′53″W | 85 | 1716 | Elche is among a forest of palm trees, and nowhere else have I seen more abundant, even in San Remo (J. Salvador) | 11 |

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**Table 2** continued

| SP | Province | Locality | Lat. | Long. | El | Key dates | Notes | Ref |
|---|---|---|---|---|---|---|---|---|
| D | Murcia | Murcia | 37°59′40″N | 1°5′0″W | 37 | 1716 | The Huerta is very fruitful with many trees, mulberries and palm trees (J. Salvador) | 11 |
| D | Alicante | Elche | 38°16′9″N | 0°41′53″W | 85 | 1750 | "Palma major" in all southern provinces of Spain. But where it most abundant, is in Elche. There is a forest with more than fifty thousand palm-trees… The dates are thicker than olives, and hang in clusters of ten and fifteen pounds. The taste is less sweet and less cloying than the dates of Barbary (Bowles) | 12 |

Table sorted in chronological order, from the oldest key dates to the latest

*SP* Species: C *Phoenix canariensis*; D *P. dactylifera*; CD both, *El* Elevation (masl)

References: 1 Bethencourt (1874), 2 Morales (1993), 3 Naranjo (2006), 4 Galiana and Agulló (1983), 5 García-Mercadal (1999a), 6 Fernández-Armesto (1982), 7 Campoy (1963), 8 Elías (2009), 9 García-Mercadal (1999b) 10 de Bolós (1930), 11 Folch (1972), 12 Bowles (1775)

suffered from pirate attacks. The port had great importance for that reason and because it possessed a fresh-water spring that could provide a reliable supply of the vital liquid to ships sailing to Asia. Date fruits are not listed in the inventories of American and Asian plant products (230 species) traded on the Acapulco-Manila galleons (1565–1815) (Pacheco 2006). However, dates, apparently from Europe, were trade products going between America and Asia (Pacheco 2010) and date palms were grown in the San José del Cabo mission after 1730 (Abad 1783). Still, these fruits had great appeal and were being exported to the mainland from Baja California in 1837 (Morton 1987), presumably collected from local palm groves. In 1882, the village of San Ignacio alone exported about two thousand arrobas (23,000 kg) of figs and dates. Several farmers at Mulegé recorded production of dates in 1894 (Trejo and González 2002) and still continue to produce (Fig. 4).

The Serra Palm was one of two Old Town Palms or Mission Palms as these were known at San Diego. Californias's first Thanksgiving service was held July 1, 1769, in a Southland park—now Presidio Hill—; and during the ceremony the planting of two palms followed, the trees coming from dates Fr. Junipero Serra had brought from the village of Loreto in Baja California. Whether the famous palms were planted by Father Serra's own hands or were accidently dropped by a Spanish soldier may never be known. Nonetheless, the Serra Palm represents a symbol of the Spanish period in California. This palm finally died and was cut in sections the June 6, 1957. There is still much controversy about whether these palms were actually *P. dactylifera* or *P. canariensis* (Trent and Seymour 2010). Of the date-palm plantings established from seed by the Spanish in the missions of the current state of California only a few descendants have survived. Date palm cultivation in the USA was revolutionized in the late nineteenth and early twentieth centuries with selected offshoots of known varieties imported from North Africa and the Near East (Table 2).

## American date palm groves outside Spanish America

Several attempts were made to grow date palms in Jamaica, e.g. Sloane (1725): "There grew some of these at Colonel Bourden's Plantation beyond Guanaboa, from the common Date Stones, one very large and high between Passage-Fort and the Town, in the Crescent Plantation, and several other places of this Island. The fruit that I tasted seemed not so good as those Dates that come from beyond Sea, …" In November 1899, 75 date plants were sent from Algiers to Jamaica and kept in a nursery until February 1901 and then 69 were planted at Hope Gardens, Kingston. The female palms ultimately bore large bunches of fruits but they reached maturity in October during the rainy season and, as a result, the fruits rotted (Morton 1987).

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**Table 3** Other Countries of origin of the dates consumed in Spain and the Americas in the early stages of discovery, conquest and colonization

| Country | Locality | Latitude | Longitude | *Main cultivars and notes* | El | Key dates | Author | References |
|---|---|---|---|---|---|---|---|---|
| Morocco | Marrakesh? | 31°41′36″N | 8°01′21″W | Many dates, and jars of butter... on ships of the Moors | 399 | 1431 | Gutierre Díaz de Games | Beltrán (1994) |
| Algeria | Oran | 35°41′49″N | 0°37′17″W | Dates of Oran | 112 | 1521 | Fray Antonio de Guevara | Cossio (1950)–(1952) |
| Morocco | Tafilalt | 31°17′59″N | 4°17′59″W | Plenty of dates and meat | 762 | 1575 | Diego Torres | Garcia-Arenal (1980) |
| Egypt | Lower Nile? | 29°58′44″N | 31°15′09″E | Dates from Egypt and acorns in Spain | 20 | 1589 | Juan de Pineda | Meseguer (1963)–(1964) |
| Algeria | Barbary | 27°11′52″N | 2°28′45″E | What is good in Barbary, who did not enjoy Cartagena?… Dates | 290 | 1597 | Francisco Cascales | Ortiz (1999) |
| Algeria | Barbary | 27°11′52″N | 2°28′45″E | One of them sold Barbary dates | 290 | 1604 | Lope de Vega | Giuliani (1997) |
| Algeria | Barbary | 27°11′52″N | 2°28′45″E | That's like wanting to be fed with dates that went to Barbary | 290 | 1618 | Vicente Espinel | Carrasco (1972) |
| Algeria | Barbary | 27°11′52″N | 2°28′45″E | I do not want to have to stop eating... dates of Barbary | 290 | 1664 | Blas Fernández de Mesa | Vázquez (1997) |

Table sorted in chronological order, from the oldest key dates to the latest. Barbary (or Barbary Coast) was the term used by Europeans from the 16th until the 19th century to refer to the middle and western coastal regions of North Africa what is now Morocco, Algeria, Tunisia. As a reference for this zone we selected In-Salah in Algeria whose dates were exported to Europe through Oran and Algiers (Algeria)

*El* Elevation (m a.s.l.)

Popenoe (1973) (written in 1924), states that there was interest in the date palm in Brazil before 1912, from a reference he cited of that date in time, but includes no details about any organized program to establish the palm in the semiarid northeastern region. On the campus of the School of Agronomy, Federal University of Ceará, Fortaleza, one of us have seen a planting of about 15 or 20 date palms, but nothing has been done with them (Note: The agronomy school existed from 1918, and was incorporated into the University in 1955). In the 1990s, there again was interest in date palm by a research center on semiarid lands located at Petrolina, Pernambuco, in the interior (Fig. 2b). From what we understand, the rainfall regime in the northeastern region is the barrier to successful date fruit production.

## Provenances of dates introduced into the Americas before 20th century

Several writers in the early days of the conquest and colonization (Cobo 1653; Fernández-de-Oviedo 1526, 1535; Motolinía 1536) mention that the dates consumed in the Americas came from Spain and only one, Cobo (1653), refers to dates from the Barbary Coast (NW Africa) (Fig. 6).

In the fifteenth century Spanish palm groves were concentrated in the southeastern Iberian Peninsula (from Elche to Almeria) and in the Canary Islands on Gran Canaria, Fuerteventura and La Palma. Both in Elche and in Gran Canaria, palms were counted in the tens of thousands (Table 1). Subsequently, in the early

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eighteenth century, there are references to the presence of date palms in the gardens of Murcia.

Concerning the Canary Islands, the identity of the native palms before the arrivals of Europeans is problematic: *P. canariensis* alone or with *P. dactylifera*? In Cueva Pintada (Gáldar, Gran Canaria) carbonized fruits were recovered from archaeological pre-Hispanic levels (Before 1400 AD). A single kernel fragment and a perianth were recovered from archaeological levels with Hispanic influence c. 1600 at La Cerera (Gran Canaria). Numerous date-kernels were recovered from pre-Hispanic levels of Alto de Garajonay (La Gomera), burnt as sacrificial food offerings, suggesting that the fruits were an important food item of the time (Morales et al. 2011). The kernels are shortly ellipsoidal, rounded and small c. 12 × 6 mm, corresponding to the main morphological features of *P. canariensis* kernels (Morales-Mateos 2006, 2009).

Date palms of the Iberian Peninsula, derived from seed, are composed of an extremely diverse ensemble of populations within the aggregate of *Phoenix dactylifera* L., which were called *Phoenix excelsior* Cav., in the case of those grown in the orchards at Elche and *Phoenix iberica* D. Rivera, S. Ríos and Obón (Rivera et al. 1997) in the case of wild or feral populations typically growing in river valleys (*P. excelsior* is considered a synonym of *P. dactylifera* by Barrow 1998 and *P. iberica* a synonym of *P. dactylifera* by Govaerts and Dransfield 2006). The date palms of the Canary Islands have the peculiarity of the presence of an endemic Canary Island date palm, *P. canariensis*, which occurs in palm groves and forests of the coast, often mixed with populations of *P. dactylifera* L. and forming pure stands at higher elevations. However, the massive destruction of the Canary Islands date palm began with the very process of conquest and colonization by Europeans (Morales 1993; Naranjo 2006) but there is no specific evidence of the exportation of *P. canariensis* date fruits. By the 1800s the *P. canariensis* dates were in La Gomera Island given as food to the pigs because the tender stones are easily broken and improve the quality of pig's flesh and lard (Arias et al. 1818). However, for the same time, late 18th century, Viera y Clavijo (1982) mentioned as the best dates in the Canary Islands, those which were collected in La Gomera, and in Gáldar and Guía in Gran Canaria, and the "Moorish" palm trees of La Gomera, with black dates, whose center is only fibrous.

African sources of dates are in the northern oases of the Sahara desert. In the period of conquest and colonization of the Americas, we find a specific reference to one of these oases, the Tafilalet near Errachidia in Morocco (Table 3) (García-Arenal 1980). Except for a reference to the dates of Egypt, most of the texts mentioned generically the dates of Barbary. These were collected in the North African oases (e.g. Salah, Merzouga, Tafilalet, Timimoum, Tozeur, Umm al-Maa, etc.) and exported to Spain from the ports of Oran, Algiers, Bejaia and others located in what was known at the time as the Barbary Coast (now in Algeria).

## Conclusions

Dates arrived in the Americas very soon after the first European contact (1492), and in the early sixteenth century there were numerous date palms growing on the islands of the Caribbean and on the mainland, as evidenced by the chroniclers of the Indies. The palm trees were grown from seeds brought from Spain. However, it seems that most of the palm trees did not produce edible dates due to unsuitable climatic conditions, especially humid conditions during the ripening period. There is no evidence that *Phoenix* palms were first introduced by the Spanish to the Americas as a source of palm leaves for Easter religious ceremonies.

Date palms reached the coasts of Peru and Chile in the late sixteenth century and in some places produced and still produce edible dates. The palm trees seem to have come later to California and Baja California, from the beginnings of the eighteenth century, and its cultivation was established and has continued in Baja California, México in the oasis near the Jesuit missions. In California and other states in the USA the palm trees introduced by the Spanish were replaced by offshoots of plants from North Africa and the Near East, beginning in the late nineteenth century.

Spain and the Barbary Coast (Morocco, Algeria and Tunisia) were the places of origin of *Phoenix dactylifera* planting material for the Americas, until the late nineteenth century that were introduced in the USA plants from Iraq and other Middle East countries. For the most part, the palm trees were planted in the Americas by seeds and seedlings exceptionally, until the late nineteenth century, when offshoots were introduced into the USA from selected named cultivars.

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