Chile Peppers in Spain

By Adrian Rodriguez-Burruezo

In his own diary (January 15th 1493), Cristopher Columbus reported: “Dice que quiere partir porque ya no aprovecha nada detenerse... Allí hay mucho algodón y muy fino y luengo... También hay mucho aji, que es su pimienta... toda la gente no come sin ella... Puédense cargar cincuenta carabelas cada año de aquella España.” In this first contact between Capsicum and the inhabitants of the Western Hemisphere, Columbus reported Capsicum as a fruit, called aji, and eaten profusely by the natives of the Española Island (currently Haiti and the Dominican Republic). These fruits appeared as an alternative to the prized (and spicy) Asian black pepper (Piper nigrum, “pimienta” in Spanish).

As Columbus’ expedition was financed to find an alternative trade route to Asia (avoiding the African route, controlled by Portugal), Columbus sent any goods with potential economic value back to Spain. Thus, Spain became the gateway of chile peppers from America to most of Europe (Nuez et al., 2003). Today, Spain remains an important center of diversity for chile peppers. The common word to refer to Capsicum in Spain is “pimiento” (evolved from “pimienta”). Capsicum annuum is the most common species in Spain, followed by C. frutescens. There is no evidence of cultivation of the other species (C. chinense, C. baccatum, and C. pubescens).

Economic Importance

Chile peppers are one of the most economically important vegetables in Spain after tomatoes. Spain is one of the most important producers of chile pepper in the world and ranks first in Europe. Currently, the national production reaches approximately one million tons per year, that represents more than one billion U.S. dollars (Table 1). Almost half of this production is exported to...
Table 1. Historical record of acreage, yield, production, economical value and exchange of Capsicum peppers in Spain since 1990 (Source: MAPA 2005).

<table>
<thead>
<tr>
<th>Year</th>
<th>Acreage (acre×10³)</th>
<th>Yield (t/acre)</th>
<th>Production (t x 10³)</th>
<th>Total value ($million)</th>
<th>Exchange Imports (t x 10³)</th>
<th>Exports (t x 10³)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1990</td>
<td>70.18</td>
<td>12.83</td>
<td>900.5</td>
<td>578.42</td>
<td>0.91</td>
<td>171.85</td>
</tr>
<tr>
<td>1995</td>
<td>56.59</td>
<td>13.97</td>
<td>790.5</td>
<td>542.16</td>
<td>2.03</td>
<td>322.58</td>
</tr>
<tr>
<td>2000</td>
<td>57.33</td>
<td>16.51</td>
<td>946.7</td>
<td>971.85</td>
<td>3.29</td>
<td>385.68</td>
</tr>
<tr>
<td>2004</td>
<td>53.87</td>
<td>18.67</td>
<td>1,006.0</td>
<td>1,165.60</td>
<td>11.54</td>
<td>454.81</td>
</tr>
</tbody>
</table>

*Estimated on the basis of dollar/euro conversion on August 2007 and price for growers (in the field).

Northern/Central European countries like Germany, the United Kingdom, France, and the Nordic countries. Two southern Mediterranean regions of Spain, Andalussia (in particular the Province of Almeria) and Murcia, with 680,000 and 158,000 tons per year, respectively, are the top producing areas in Spain and represent 85% of the total production in Spain (MAPA, 2005). The most economically important pod types are 'California Wonder' (bell, blocky), 'Lamuyo' (elongated bell), and 'Dulce Italiano' (similar to New Mexican type). These types, grown for fresh market, comprise more than 90% of chile pepper production in Spain. The fruits of these chile peppers have no heat, in accordance with the preferences of the Spanish and European customers. Fruit from 'California Wonder' and 'Lamuyo' are harvested in both green and red stages, while 'Dulce Italiano' is preferred at the green stage (Figure 2). Apart from these three, other economically important types are 'Bola' ('Ball,' 2-inch round-shaped fruit) and 'Cornicabra' ('Goat Horn,' a cayenne type), that are grown to produce oleoresins and powder (called pimentón in Spain). The regions of Murcia and Extremadura are the main producers of these processed products. 'Bola' is grown in Murcia and is the basis for the 'Denominación de Origen Pimentón de Murcia' (sweet powder), while the Cornicabras 'Jaranda' and 'Verato' are grown in the region of Extremadura and are the basis for 'Denominación de Origen Pimentón de La Vera' (different degrees of heat).

**Chile pepper cultivation**

Chile peppers have traditionally been grown in Spain in the open field. However, during the last decades, both F₁ hybrids and greenhouse cultivation has increased. Currently, greenhouse cultivation comprises 60% of the total acreage in Spain. Additionally, many farmers have introduced hydroponic cultivation to increase yield. Thus, although total crop acreage has decreased 25%, total production remains about one million tons per year (Table 1).

In terms of growing seasons, chile peppers were traditionally grown in Spain from February/April until the end of August/September. Today, this growing cycle, with some modifications, is only practiced in the interior of Spain (mostly open field), where the autumn and winter are too harsh to grow chile peppers. In contrast, the
Table 2. Main growing seasons in the cultivation of peppers in Spain.

<table>
<thead>
<tr>
<th>Growing Season</th>
<th>Autumn-Winter</th>
<th>Spring</th>
</tr>
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<tbody>
<tr>
<td>Cultivation areas</td>
<td>Almeria and Southern Murcia</td>
<td>Levante</td>
</tr>
<tr>
<td>Transplanting dates</td>
<td>June</td>
<td>August</td>
</tr>
<tr>
<td>Harvesting dates</td>
<td>September-December</td>
<td>November-April</td>
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</table>

The warm climate of the Mediterranean region and the utilization of greenhouses, allows growers to produce chile peppers year-round, even in winter and early spring, when other European countries cannot. Because of that, Spanish chile peppers obtain high prices in the Northern/Central European markets.

The autumn/winter season is typical of the Almeria and Southern Murcia, because of the relatively high winter temperatures, depending on the varietal type and production area. Transplanting and harvesting differ widely. In the case of ‘California Wonder,’ as its fruit set is sensitive to temperatures below 12°C (54°F), plants grown far from the coast are transplanted in early June and harvested from September until December, while in coastal areas, seedlings are transplanted in August and harvested from January until February. In contrast, ‘Lamuyo’ and ‘Dulce Italiano,’ that set fruit at lower temperatures are transplanted later in August and harvested from November until April. Levante, an area that comprises the Central and Northern Mediterranean coast of Spain, has a typical spring growing cycle. In this area, plants are transplanted in winter and harvested from the end of March, later than Almeria.

**Research and breeding programs**

In Spain, chile pepper research and breeding are diverse and multidisciplinary. Breeding for disease and pest resistance is very important. In terms of pathogens, Tomato Spotted Wilt Virus (TSWV) transmitted by thrips (*Frankliniella occidentalis*) is considered the most severe disease affecting chile pepper cultivation in Spain and causes economic losses every year. This virus dramatically decreases plant development and yield and causes fruit deformation and spots that decrease its economic value. Dr. S. Soler leads an experienced team in TSWV research at the COMAV Institute, with particular emphasis on the search in germplasm collections for new sources of resistance, as an alternative to the *TSw* gene. Pepper mottle mild virus (PMoMV) can cause severe losses, although its incidence is much lower than TSWV. For that reason, in Spain PMoMV breeding research is almost nonexistent. Several commercial *F₁* hybrids carry *Lₙ* and *L₀* resistance genes. Finally, the incidence of *Phytophthora capsici* is lower than reported in other countries because many farmers in Spain use soilless cultivation, and drip irrigation as a way of controlling the incidence and spread of this pathogen. Dr. F. Merino and Dr. J. Díaz, from the Universidad de Coru are working on the characterization of *P. capsici* isolates. Professor M.E. Candela, from the Universidad de Murcia is a specialist in the biological control of this fungus, and Dr. C. Gisbert, from the COMAV Institute is researching resistant rootstocks.

With respect to fruit quality, the main research topics in Spain are nutritional, organoleptic, and extractable color quality. Dr. M.I. Mingeunez-Mosquera from the Instituto de la Grasa (CSIC, Sevilla, Andalusia) and her team are very experienced in the study of carotenoids in *Capsicum* as both nutritional and colorant compounds. Dr. J. Costa, from the Instituto Murciano de Investigación y Desarrollo Agrario y Alimentario.

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Chile Peppers in Spain reached such high regard and fame that they have been cultivated, roasted, fried (unripe), and used in specific regions of Spain, particularly in Galicia, “Festival del Pimiento de Piquillo (ancho)”, in Extremadura). These celebrations are also associated with otherProtected Designation of Origin” and “Protected Geographical Indication.” These labels are currently being conducted.

In Spain, the most important collections of Capsicum accessions are held in two germplasm banks: the “Banco de Germoplasma de la Universidad Politécnica de Valencia,” at the COMAV Institute (Valencia), and the “Banco de Germoplasma de Especies Hortícolas”, at the CITA (Zaragoza). Both institutions are devoted to the recovery of landraces and the study of variability in vegetables.

Diversity and tradition
Although ‘California Wonder,’ ‘Lamuyo,’ ‘Dulce Italiano,’ ‘Bola,’ and ‘Cornicabra’ are the most common pod types, they are not the only ones grown in Spain. Because Spain is an important secondary center of diversity for this crop, one can still find a plethora of traditional varieties and landraces in any Spanish region. Many of the landraces have survived because of their historic origin (e.g., Pimientos de Padrón, introduced in Galicia from Mexico by the Franciscans in the 16th century) and their importance in traditional Spanish cooking and folklore. In this sense, many villages (particularly in Northern Spain) celebrate their own festivals devoted to chile peppers, coinciding with the harvesting season from September to October, (e.g., “Fiestas del Pimiento de Arnoia” and “Fiestas del Pimiento de Padrón” in Galicia, “Festival del Pimiento Morrón de Fresno de la Vega” in León, “Feria del Pimiento de Jaraiz de la Vera” in Extremadura). Some of these chile pepper varieties have reached such high regard and fame that they have been granted quality labels from the European Union (E.U.) like “Protected Designation of Origin” and “Protected Geographical Indication.” These labels are currently being conducted.

Table 3. Traditional varietal types and landraces of Capsicum in Spain.

<table>
<thead>
<tr>
<th>Varietal type / Cultivation area / Most famous</th>
<th>Fruit type</th>
<th>Consumption</th>
</tr>
</thead>
<tbody>
<tr>
<td>Guindillas / All Spain / Guindilla de Ibarra (Vasque)</td>
<td>Cayenne</td>
<td>Pickled (mainly unripe)</td>
</tr>
<tr>
<td>Morron I / All Spain / Fresno de la Vega (Leon)</td>
<td>Bell (large)</td>
<td>Fresh roasted (unripe and ripe)</td>
</tr>
<tr>
<td>Morron II / All Spain / Luesia (Aragon)</td>
<td>Pimento</td>
<td>Roasted and canned (ripe)</td>
</tr>
<tr>
<td>Trompa de Vaca / All Spain</td>
<td>Bell (large)</td>
<td>Fresh or roasted (unripe and ripe)</td>
</tr>
<tr>
<td>Piquillo / All Spain / I.G.P. Lodosa (Navarra)</td>
<td>Piquillo (anco)</td>
<td>Roasted, canned and stuffed (ripe)</td>
</tr>
<tr>
<td>De Padrón / All Spain / D.O. Herbón (Galicia)</td>
<td>Padron (jalapeno)</td>
<td>Grilled slightly (unripe)</td>
</tr>
<tr>
<td>De Arnoia / D.O. Pimiento de Arnoia (Galicia)</td>
<td>Bell (small)</td>
<td>Roasted, fried (unripe)</td>
</tr>
<tr>
<td>Najerano / I.G.P. Pimiento Riojano (La Rioja)</td>
<td>Bell (triangular)</td>
<td>Roasted and canned (ripe)</td>
</tr>
<tr>
<td>Infante o De Litro / Ciudad Real (Castilla la Mancha)</td>
<td>Bell (large)</td>
<td>Fresh or roasted (ripe)</td>
</tr>
<tr>
<td>Bola / All Spain / D.O. Pimentón de Murcia</td>
<td>Round</td>
<td>Pepper powder</td>
</tr>
<tr>
<td>Cornicabra / All Spain / D.O. Pimentón de la Vera</td>
<td>Cayenne (twisted)</td>
<td>Roasted and canned (ripe)</td>
</tr>
<tr>
<td>Bierzoz / I.G.P. Pimiento Asado del Bierzoz (León)</td>
<td>C. frutescens</td>
<td>Dried in soups (ripe)</td>
</tr>
<tr>
<td>Guindilla peque a o pebrera / All Spain</td>
<td>Bell (medium)</td>
<td>Fresh or roasted (ripe)</td>
</tr>
<tr>
<td>Valenciano / Valencia</td>
<td>Mixture</td>
<td>For sauces (Mojo Picón)</td>
</tr>
<tr>
<td>De Mojo / Canary Islands</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Literature


Pepper Spray for Private Citizens

Pepper spray is a chemical compound that is classified as an inflammatory. Pepper spray is also known as Oleoresin Capsicum, OC spray, OC gas, and capsicum spray. It is used in crowd control and personal self-defense against humans and animals. No one has ever died from being sprayed with pepper spray. It will cause tears and pain when sprayed in the eyes. Additional symptoms resulting from exposure include: immediate closing of the eyes, difficulty breathing, runny nose, coughing, unwillingness to take deep breaths and extreme discomfort. In some cases, it can cause temporary blindness.

Pepper spray, along with knowledge of hand-to-hand self defense, is one of the most effective means of self protection for private citizens. It has been gaining popularity since law enforcement professionals have looked unfavorably upon other defense sprays like chloracetaephone and orthochlorobenzalmononitrile because assailants would continue to pose a threat after being sprayed. Pepper spray will instantly stop an assailant. Law enforcement professionals recommend a basic knowledge of sound tactics, movement and training to get the best possible outcome from using pepper spray in self defense. Many law enforcement offices provide short training courses for private citizens.

The duration of pepper spray’s effects depend on the strength of the spray, but the average effect lasts approximately 30 to 45 minutes with diminished effects lasting for hours. There are no reports of long term damage to the eyes or lungs after being exposed to pepper spray and no serious side effects even for asthmatics or emphysemics.

The Journal of Investigative Ophthalmology and Visual Science published a study that concluded that single exposure of the eye to OC is harmless, but repeated exposure can result in long-lasting changes in corneal sensitivity. They found no lasting decrease in visual acuity.

The entire staff of the Chile Pepper Institute recently had the opportunity to take a class provided by the NMSU police department on how to use pepper spray for self defense.

RECIPE: “Esgarraet” (Valencian Recipe)

Ingredients
- Salted and dried cod (50 g = 2 oz)
- 2 red “Valenciano” peppers or any sweet bell pepper
- 3 garlic cloves, finely chopped
- Olive oil (100 ml = 3.50 fl oz)

1. Place the cod in fresh water, cover and refrigerate overnight to remove salt excess and re-hydrate it. Change the water at least once.
2. Roast the peppers directly over flames on a grill or in the oven until it is easy to peel them. (Advice: to remove the skin easily wrap the peppers in aluminum paper after roasting them and let them cool down).
3. After peeled, cut the peppers in stripes.
4. Flake the cod in small thin pieces (2-3 cm).
5. Peel the garlic and cut it in flakes
6. Finally, put the pepper stripes, the cod flakes and the garlic flakes on a serving dish and add the olive oil. (Advice: “esgaraet” has better taste the day after preparing it).
Serves 4.
For more Spanish check out the Chile Pepper Institute's chile shop www.chilepepperinstitute.org.
50 Years Since His Passing

Edward Weston, best known for his photographic image entitled “Pepper #30,” shot the photo in 1930 along with several other chile pepper images. The image consists of a single, sensuously shaped green pepper that fills approximately 90 percent of the image area. The pepper is set against a dark background with the main light source coming from above. The image evokes emotions of form and life for many. Yet when asked about the photo, Weston simply stated “It has no psychological attributes, no human emotions are aroused.” Indeed the pepper is an inanimate object devoid of human emotion yet it defines human life and emotion with its curves and folds.

Born in Illinois in 1886, Weston received his first camera at 16 that was a Kodak Bull’s-Eye #2. He began taking photographs in Chicago area parks and on his aunt’s farm. His talent was soon discovered and some of his work was exhibited at the Chicago Art Institute a mere one year later. He is best known for his still life’s and landscape subjects. Weston made his last photographs in 1948 after being diagnosed with Parkinson’s disease.

Red and Purple as Cancer Fighters

Natural pigments that give certain fruits and vegetables a rich red, purple, or blue color act as powerful anti-cancer agents according to a study in American Scientists. The compounds (anthocyanins) found in red cabbage, blueberries, and purple chile peppers restricted the growth of cancer cells and in some cases killed them off entirely, leaving healthy cells unharmed.

Foods with the highest levels of anthocyanins were most effective at slowing cancer growth and killed 20 percent of those cells, while fruits and vegetables less enriched with the compounds slowed cancer cell growth by 50-80 percent. Source – The Guardian 2007

Pre-Columbian Use of Chile Pepper in the Valley of Oaxaca, Mexico

A recent study from the Smithsonian National Museum of Natural History has shown evidence of the use of chile peppers dating back to between 600-1521 A.D. Excavations at Guila Naquitz and Silvia’s Cave, two dry rockshelters near Mitla, Oaxaca, Mexico, produced relics of 122 chile peppers. Of those 122 chile peppers, 10 different varieties were identified coming from two different species, Capsicum annuum and C. frutescens. The remains collected are in good enough shape to properly identify whether or not they were domesticated or wild species as well as to distinguish between varieties. Chile pepper varieties from the Guila Naquitz had intact calyces and stems and several whole, desiccated pods making them easier to identify. It is also likely that all of the chile peppers collected were domesticated due to the late prehistoric dates of the cave layers where they were found. One characteristic for distinguishing domesticated and wild chile peppers was the presence of a non-deciduous fruit. To facilitate dispersal by birds, wild chile peppers are typically loosely attached to the pedicles; all of the fruits discovered had attached pedicles even when the color of the pericarp was yellow or orange which usually indicates mature fruit. Another characteristic for determining domestication was fruit size. Every recovered intact pod measured well above the mean size of <1cm which is typical for wild chile pepper fruits.
BURNING QUESTIONS

Q. My seedlings seem to germinate fine, yet when they get to be about an inch tall they wilt and die, this happens with most of the different varieties I have planted, any suggestions?

A. You could be experiencing “damping-off.” Damping-off is caused by the fungi, Pythium and Rhizoctonia. Seeds attacked by these fungi usually fail to germinate. Seedlings can be damaged two ways: the roots may rot causing the seedling to wilt and die quickly, or the seedling may be attacked on the stem at the ground line, causing the seedling to collapse. A pasturized starter medium would relieve the damping-off.

Q. Can I plant the seeds from the bell peppers I bought in the grocery store and get plants to grow?

A. It depends on a couple of factors. First, if the bell pepper is green the seeds are immature and will not germinate and grow. Second, many bell pepper varieties are F₁ hybrids and will not breed true in the next generation. It is best to order seeds from a reliable seed company rather than try to save seed from pods in the grocery store.

Q. I have a huge crop of fresh chiletepins. A friend of mine said not to freeze them. Freezing would destroy the heat. Is this true? How do I store them so they will keep.

A. No, chile pepper heat is not destroyed by freezing. The capsaicinoids (chemicals in chile peppers causing the heat sensation) are not destroyed by freezing. Many people actually experience chile peppers to be “hotter” after they have been frozen because freezing actually breaks down the tissues and disperses more of the capsaicinoids. Great ways to keep chiletepins is to either sun dry and store them in an airtight container or pickle them in a vinegar solution.

News continued

The inhabitants of the caves were nomads, carrying much of their food and water with them. Archaeologists believed the chile peppers were carried as a spice for food. The remains seem to confirm that the Mitla people were full-time farmers who also went foraging for wild species of plants into the forest. After observing the fruits from both caves, it appears that both fresh and dried pods were used. Much of the evidence also indicates that three of the ten varieties were harvested fresh, near the caves, while much of the dried chile peppers were brought as a spice or food seasoning.

Starch analysis was performed via mechanical macerations of the chile pepper pericarp tissues and examination of the resulting slurry via compound light microscopy.

Source, Smithsonian Magazine 2008