The Spanish market only distinguishes two cultivars as such, ‘Marcona’ and ‘Desmayo Largueta’, whilst the rest of cultivars are grouped under the undefined name of ‘Comunas’. Even such important cultivars as ‘Guara’ and ‘Ferragnès’, Spanish production, are not marketed as individual cultivars. Similarly, some new releases with an excellent kernel quality are also marketed in a mixture of kernels. As a consequence, the Spanish production statistics do not reflect the level of activity in the world and those releasing the largest number of new cultivars (Socias i Company et al., 2011). This work has produced a clear penetration of the new plant materials, both cultivars and rootstocks, in the Spanish almond growing regions (Socias i Company et al., 2009).

**Table 1. Average almond world production for the period 2000-2009 (web page of FAO).**

<table>
<thead>
<tr>
<th>Country</th>
<th>Average production 2000-09 (tm in shell)</th>
</tr>
</thead>
<tbody>
<tr>
<td>USA</td>
<td>884,914</td>
</tr>
<tr>
<td>Spain</td>
<td>223,431</td>
</tr>
<tr>
<td>Syria</td>
<td>110,595</td>
</tr>
<tr>
<td>Italy</td>
<td>108,648</td>
</tr>
<tr>
<td>Iran</td>
<td>99,582</td>
</tr>
<tr>
<td>Morocco</td>
<td>78,636</td>
</tr>
<tr>
<td>Tunisia</td>
<td>46,300</td>
</tr>
<tr>
<td>Turkey</td>
<td>45,466</td>
</tr>
<tr>
<td>Greece</td>
<td>45,219</td>
</tr>
<tr>
<td>Algeria</td>
<td>37,526</td>
</tr>
<tr>
<td>Lebanon</td>
<td>27,210</td>
</tr>
<tr>
<td>China</td>
<td>26,247</td>
</tr>
<tr>
<td>Libya</td>
<td>25,400</td>
</tr>
<tr>
<td>Afghanistan</td>
<td>22,299</td>
</tr>
<tr>
<td>Portugal</td>
<td>17,099</td>
</tr>
<tr>
<td>Uzbekistan</td>
<td>17,016</td>
</tr>
<tr>
<td>Australia</td>
<td>12,981</td>
</tr>
<tr>
<td>Chile</td>
<td>10,364</td>
</tr>
<tr>
<td>Israel</td>
<td>7,091</td>
</tr>
<tr>
<td>France</td>
<td>3,712</td>
</tr>
<tr>
<td>Rest</td>
<td>25,708</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>1,901,041</strong></td>
</tr>
</tbody>
</table>

The Spanish market only distinguishes two cultivars as such, ‘Marcona’ and ‘Desmayo Largueta’, whilst the rest of cultivars are grouped under the undefined name of ‘Comunas’. Even such important cultivars as ‘Guara’ and ‘Ferragnès’, representing and important share of the Spanish production, are not marketed as individual cultivars. Similarly, some new releases with an excellent kernel quality are also marketed in a mixture of kernels. As a consequence, the Spanish production statistics do not reflect the level of production attributable to the new cultivars. In addition, the statistics on the surface planted with each cultivar are not
fully reliable and do not give a trustworthy picture of the presence of the new cultivars in the Spanish orchards. The long life of the almond orchards renders updating these figures quite difficult, thus not reflecting the dynamics of cultivar change produced in the Spanish orchards during the last four decades.

Probably the best figure to show the changes produced in the Spanish almond orchards is the production of almond plants by the Spanish nurseries. Therefore, in order to obtain a real figure of the introduction of the new cultivars in the Spanish orchards, we have revised the statistics of the plants marketed by the Spanish nurseries as collected by the Spanish Office of Plant Varieties.

MATERIALS AND METHODS
The Spanish Office of Plant Varieties at the Ministry of the Environment and Rural and Marine Affairs collects the data from the different Autonomous Regions on the production of fruit plants by the Spanish nurseries. The years studied were from the 1995/96 to the 2009/10 seasons. The data collected had to be carefully revised in order to avoid inaccuracies, such as synonyms and incorrect wording. Some clones were identified with acronyms or abbreviations not corresponding to any known selection or breeding clone. The most notable case of synonymy was that of ‘Desmayo Largueta’, also referred to as ‘Largueta’, ‘Desmayo blanco’, ‘Desmayo común’ or ‘Desmayo verde’. The same cultivar could also be identified in different lists by the cultivar name or the trade mark, such as ‘Avijor’ or ‘Lauranne’.

Once the data were refined from any detected inaccuracies, the cultivars were grouped according to their origin (Table 2). These figures allowed obtaining the total production of plants of almond cultivars from the CITA breeding program by the Spanish nurseries.

<table>
<thead>
<tr>
<th>Cultivar</th>
<th>Nº of plants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Guara</td>
<td>6,999,329</td>
</tr>
<tr>
<td>Aylés</td>
<td>25,028</td>
</tr>
<tr>
<td>Moncayo</td>
<td>134,024</td>
</tr>
<tr>
<td>Blanquerna</td>
<td>18,461</td>
</tr>
<tr>
<td>Cambra</td>
<td>31,853</td>
</tr>
<tr>
<td>Felsia</td>
<td>10,663</td>
</tr>
<tr>
<td>Belona</td>
<td>78,036</td>
</tr>
<tr>
<td>Soleta</td>
<td>68,784</td>
</tr>
<tr>
<td>Mardia</td>
<td>4,000</td>
</tr>
<tr>
<td>CITA cultivars</td>
<td>7,370,178</td>
</tr>
<tr>
<td>Masbovera</td>
<td>322,234</td>
</tr>
<tr>
<td>Francoli</td>
<td>80,613</td>
</tr>
<tr>
<td>Glorietta</td>
<td>240,360</td>
</tr>
<tr>
<td>Tardor</td>
<td>2,500</td>
</tr>
<tr>
<td>Constantí</td>
<td>95,020</td>
</tr>
<tr>
<td>Marinada</td>
<td>183,253</td>
</tr>
<tr>
<td>Tarraco</td>
<td>53,416</td>
</tr>
<tr>
<td>Vairo</td>
<td>132,790</td>
</tr>
<tr>
<td>IRTA cultivars</td>
<td>1,110,186</td>
</tr>
<tr>
<td>Almudena</td>
<td>1,560</td>
</tr>
<tr>
<td>Antoñeta</td>
<td>85,778</td>
</tr>
<tr>
<td>Marta</td>
<td>119,309</td>
</tr>
<tr>
<td>Penta</td>
<td>4,304</td>
</tr>
<tr>
<td>Tardona</td>
<td>647</td>
</tr>
<tr>
<td>CEBAS cultivars</td>
<td>211,598</td>
</tr>
<tr>
<td>Marcona</td>
<td>1,659,200</td>
</tr>
<tr>
<td>Desmayo Largueta</td>
<td>1,560,723</td>
</tr>
<tr>
<td>Garrigues</td>
<td>344,906</td>
</tr>
<tr>
<td>Ramillete</td>
<td>269,016</td>
</tr>
<tr>
<td>Atocha</td>
<td>104,561</td>
</tr>
<tr>
<td>Desmayo Rojo</td>
<td>108,124</td>
</tr>
<tr>
<td>Carreró</td>
<td>103,846</td>
</tr>
<tr>
<td>Soft-shell</td>
<td>7,920</td>
</tr>
<tr>
<td>Other Spanish</td>
<td>435,007</td>
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<tr>
<td>Traditional Spanish cultivars</td>
<td>4,593,943</td>
</tr>
<tr>
<td>Ferragnès</td>
<td>2,408,780</td>
</tr>
<tr>
<td>Ferraduel</td>
<td>1,866,750</td>
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<tr>
<td>Lauranne</td>
<td>47,985</td>
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<tr>
<td>Other French</td>
<td>22,101</td>
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<tr>
<td>French cultivars</td>
<td>4,345,616</td>
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<tr>
<td>Tuono</td>
<td>497,816</td>
</tr>
<tr>
<td>Cristomorto</td>
<td>61,832</td>
</tr>
<tr>
<td>Fragiuilo</td>
<td>4,320</td>
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<tr>
<td>Italian cultivars</td>
<td>563,966</td>
</tr>
<tr>
<td>Nonpareil</td>
<td>1,100</td>
</tr>
<tr>
<td>Texas</td>
<td>8,365</td>
</tr>
<tr>
<td>Californian cultivars</td>
<td>9,465</td>
</tr>
<tr>
<td>Others</td>
<td>37,910</td>
</tr>
<tr>
<td>Total</td>
<td>18,095,625</td>
</tr>
</tbody>
</table>
and 'Mardía' in 2009/10. Therefore, for the season 2006/07 there was a sharp increase. The new cultivars 'Belona' and 'Soleta' appeared in the season 2006/07. The trend has been towards a constant slight decrease during this period (Fig. 1). During this period the percentage of these cultivars ranged from 0.2 to 5%, with a global average of 1.17%, showing a lower incidence than the older programs.

The second Spanish breeding program is that of IRTA developed at the Centre of Mas de Bover. The incidence of the cultivars released by this program amounts to 6.14% of total, although their evolution can be clearly differentiated. Thus, their percentage ranged from 0.15 to 6.64% (Fig. 2) until 2007/08, but the following season there was a sharp increase up to 23.36%, mainly due to the introduction of the last releases from this program and the sound recommendations by the main growers associations. Probably the data of the coming years will show if this upturn is seasonal (in 2009/10 this percentage was 12.86%) or is maintained.

### RESULTS AND DISCUSSION

The first observation from the data is the undoubted prevalence of the CITA cultivars during the 14 seasons over the total amount of more than 18 million plants produced by the Spanish nurseries. Over this period, the CITA cultivars amounted to 40.73%, with 'Guara' as the leading cultivar, with 38.68%, which represents 94.97% of the CITA cultivars. Although in 2009/10 the percentage of these cultivars slightly decreased (Fig. 1), during this period the trend has been towards a constant increase. The new cultivars 'Belona' and 'Soleta' appeared in the season 2006/07 and 'Mardía' in 2009/10. Therefore, for the moment the data do not allow establishing the real level of penetration of these new cultivars in spite of the references of their introduction in the new orchards.

The cultivars released by CEVAS-CSIC of Murcia do not appear in the statistics until the season 2001/02 because this program started later than the previous ones (Fig. 3). From that season their incidence has ranged from 0.2 to 5%, with a global average of 1.17%, showing a lower incidence than the older programs.

The traditional Spanish cultivars still represent nearly a quarter of the total, with 24.57%, with significant variations along the period, although any trend can be noticed (Fig. 4). Among these cultivars, 'Marcona' with 9.17% and 'Desmayo Largueta' with 8.62% are the most important, both with a stable presence along these seasons. The other traditional Spanish cultivars are much less present, including 'Garrigues', 'Ramillete', 'Desmayo Rojo', 'Atocha', 'Carreró', 'Pajarera', 'Aspirilla', 'Cartagenera', 'Peralaje', 'Planeta' and many others less important. The presence of soft-shell cultivars, as opposed to the Californian production, is extremely low, with 0.04%.

The French cultivars developed by INRA also represent another quarter of the nursery production, with 24.01%. 'Ferragnés' with 13.31% and 'Ferraduel' with 10.32% are undoubtedly the most important cultivars, although their share is continuously decreasing along this period (Fig. 5), as their presence lowered from 39.69% in the season 1995/96 to 12.85% in the last one. Nearly insignificant is the presence of the self-compatible cultivar 'Lauranne', as well as that of other cultivars, either releases from the breeding program ('Ferralise' and 'Ferrastar') or traditional French cultivars ('Ali', 'Bartre' and 'Princesse').

The presence of Italian cultivars, mainly 'Tuono' and 'Cristomorto', was very important in the 1970s, but during the period under study only amounted to 3.12%, most of them of 'Tuono', with a few plants of 'Cristomorto' and 'Fragiulio', following a decreasing trend. The presence of Californian cultivars is fully testimonial (0.05%), being most of the plants of 'Texas' and a few of 'Nonpareil'. Finally, 0.21% of the plants could not be identified.

Taking into account that most French cultivars produced by the Spanish nurseries are releases from the INRA breeding program carried out by C. Grasselly, as well as the incidence of the releases from the different Spanish programs, it is evident that the Spanish production is every time more dependant on improved cultivars. The share of new bred cultivars amounts to 10.32% are undoubtedly the most important, including 'Princesse').

The presence of Italian cultivars, mainly 'Tuono' and 'Cristomorto', was very important in the 1970s, but during the period under study only amounted to 3.12%, most of them of 'Tuono', with a few plants of 'Cristomorto' and 'Fragiulio', following a decreasing trend. The presence of Californian cultivars is fully testimonial (0.05%), being most of the plants of 'Texas' and a few of 'Nonpareil'. Finally, 0.21% of the plants could not be identified.
The share of self-compatible cultivars is really significant, with 47.52% of total. The weight of the self-compatible cultivars is mainly due to the new Spanish cultivars because the presence of the traditional Italian cultivars such as ‘Tuono’ and ‘Fragedi’ is very low, and that of the French ‘Lauranne’ only testimonial. The trend during this period has been the increase of the presence of self-compatible cultivars (Fig. 7), confirming that the Spanish orchards really represent a success of these cultivars (Socias i Company, 2002).

The productive success of these new cultivars is being fully recognized not only by the growers, but also the market and the industry have valued the physical and organoleptic quality of the kernels of some of these cultivars. It must be emphasized that some CITA releases such as ‘Belona’ and ‘Soleta’ may exceed the quality rating of the best evaluated traditional cultivars ‘Marcona’ and ‘Desmayo Largueta’.

ACKNOWLEDGEMENTS

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REFERENCES


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