# New Challenges for the Mandarin/Mandarin-Hybrid Industry in the Mediterranean Basin 

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#### Abstract

Citrus output in the Mediterranean Basin (17 Mt) is much lower than in North and South America (30 Mt), although consumer markets in these regions are of similar size. It is predicted that by the year 2020 the population of the southern rim of the Basin will hàve expanded by $78 \%$, with a probable marked increase in the domestic market demand for citrus fruits in these countries. European consumers are increasingly attracted by new seedless easy-peeling citrus fruits. The Mediterranean citrus industry will thus have to be substantially restructured to address the new challenges.


## specific trends

in Mediterranean and European citrus markets compared to those in North and South American markets

World citrus production has increased considerably over the past 20 years. Total output is currently some 75 Mt , with oranges ranking first, followed by mandarins, lemons and grapefruits (Table 1).

Historically, the initial citrus-producing areas were Asia and the Mediterranean Basin, where various types were first domesticated. Citrus growing has long been a traditional occupation in the Mediterranean area; Pliny the Elder, for instance, described citron cropping at the

## Table 1

World citrus production for 1992/93 (thousand tonnes, FAO statistics).

|  | 55122 | $73.0 \%$ |
| :--- | ---: | ---: |
| Oranges | 8257 | $11.0 \%$ |
| Mandarins \& hybrids | 6624 | $8.8 \%$ |
| Lemons and limes | 4981 | $6.6 \%$ |
| Grapefruits | 74984 |  |
| Total |  |  |

beginning of the present era. It is thus an important centre of secondary genetic diversification, and several different local types are known to originate exclusively from this region, e.g. blood oranges, willow-leaf mandarin (Citrus deliciosa), clementines, etc.

This diversity could be explained by the local horticulturists' practice of selecting natural mutations. Mediterranean consumers thus gradually came to appreciate fresh citrus fruit as a delicacy, and then as a common and easy-to-eat product.

Nowadays, the wider Mediterranean area includes 20 countries with overall citrus output of 17 Mt in 1992/1993 (Table 2), with:

- $58 \%$ marketed as fresh fruits on domestic markets in the producing countries ( 400 M consumers); citrus is the main type of fruit consumed in these countries; $-29 \%$ exported as fresh fruit to markets in Northern Europe (west and east); these non-producing countries represent a market of 330 M consumers (excluding Russia);
$-13 \%$ only is destined for juice processing.
Comparatively, 30 Mt of citrus fruits are produced in North and South America,
mainly oranges, to a lesser extent grapefruits and lemons, and very few mandarins. Of this output:
$-6 \%$ is exported as fresh fruit,
$-12 \%$ is absorbed by domestic fresh fruit markets,
$-81 \%$ is used for juice processing.
This breakdown highlights that New World consumers are as a whole more oriented towards juices than fresh fruits, whereas the trend is reversed for Mediterranean consumers. There are 302 M consumers in the North American market, i.e. USA and Canada, whereas there are 460 M consumers in the Latin American market, spread throughout 35 countries.
With an output of only 17 Mt , the Mediterranean area obviously cannot meet the demand of its 730 M consumers (Mediterranean countries, Europe, excluding Russia). Comparatively, the 30 Mt citrus output in the Americas (almost twice that of the Mediterranean) provides a better supply for their 762 M consumers.
Mediterranean citrus producers have clearly focused most of their efforts on the fresh fruit market, especially oranges and lemons and recently on mandarins and other seedless easy-peelers that are very attractive to European consumers. Mediterranean imports of 1.2 Mt of frozen concentrated orange juice (FCOJ) and 0.15 Mt of grapefruits and lemons from North and South America (chiefly from Brazil and Florida) compensate for the low output of the Mediterranean juice industry. 15 Mt of fresh fruits are required to produce this quantity of frozen concentrated juice.


## Mediterranean citrus production over the last 20 years

Mediterranean citrus production for exports and processing is summarized in Tables 3 and 4.
General trends over the past 20 years are presented, comparing the Mediterranean situation with that of other citrus producing areas in the world.

Table 2
Citrus output and population of the Mediterranean area for 1992/93 (FAO statistics).

| Country | Citrus <br> (thousand $\boldsymbol{t})$ | Population <br> (M) |
| :--- | :---: | :---: |
| Northern Mediterraean rim | 9536 | 199 |
| Albania | 14 | 3 |
| Spain | 4704 | 38 |
| France | 30 | 58 |
| Greece | 1202 | 10 |
| Italy | 3440 | 57 |
| Portugal | 138 | 10 |
| ex Yougoslavia | 8 | 23 |
| Southern Mediterranean rim | 7795 | 208.8 |
| Algeria | 295 | 26 |
| Cyprus | 345 | 0.7 |
| Egypt | 1820 | 60 |
| Gaza | 165 | 0.8 |
| Israel | 1460 | 5 |
| Jordan | 111 | 4 |
| Lebanon | 450 | 3 |
| Libya | 104 | 5 |
| Malta | 1084 | 0.3 |
| Morocco | 206 | 26 |
| Syria | 273 | 13 |
| Tunisia | 1482 | 8 |
| Turkey | 17331 | 57 |
| Total |  | 407 |

- The Mediterranean area now supplies $62 \%$ of world fresh citrus fruit exports (oranges, lemons, mandarins, etc.), as compared to $73 \% 20$ years ago. Cuba and China are newcomers to the club of nonMediterranean citrus exporters, i.e. South Africa, Argentina, Australia and Uruguay.
- Between 1973 and 1993, Mediterranean Basin orange production for fresh fruit exports decreased by $12 \%$, while that of mandarins and easy-peeler hybrids increased by $112 \%$.
- World exports of fresh grapefruits increased by $226 \%$ during the same period; USA, Cuba, Argentina and South Africa are the top producers in this area. Surprisingly, grapefruit exports from the Mediterranean Basin decreased by $22 \%$, despite the tristeza-free status of most countries in this area.
- Conversely, the Mediterranean Basin has consolidated its leading world position with respect to exports of mandarins and hybrids ( $95.6 \%$ of world exports).

Table 3
World exports of fresh citrus fruits $\left(^{*}\right)$ (thousand $t$ ).

| 1992/1993 output | All citrus <br> fruits | Oranges | Mandarins <br> \& hybrids | Lemons <br> \& limes | Grapefruits |
| :--- | ---: | :--- | ---: | :--- | ---: | :--- |

() ) these figures only take official fresh-fruit exporting countries into account.

Table 4
Total utilization of citrus for processing (*) (thousand $t$ ).

| 992/1993 output | All citrus fruits | Oranges | Mandarins <br> \& hybrids | Lemons \& limes | Grapefruits |
| :---: | :---: | :---: | :---: | :---: | :---: |
| Northern hemisphere | 12564 | 9385 | 773 | 802 | 1604 |
| USA | 9675 | 8000 | 125 | 300 | 1250 |
| Mediterranean region | 2346 | 1385 | 338 | 362 | 261 |
| Cuba | 370 | - | 310 | - | 60 |
| China | 173 |  |  | 140 | 33 |
| Southern hemisphere | 13014 | 12354 | 26 | 456 | 178 |
| Argentina | 750 | 220 | 20 | 417 | 93 |
| Brazil | 11610 | 11588 | - | - | 22 |
| Uruguay | 45 | 45 |  |  | - |
| Australia | 366 | 326 | 6 | 16 | 18 |
| South Africa | 243 | 175 | - | 23 | 45 |
| World output | 25578 | 21739 | 799 | 1258 | 1782 |
| Comparison with world 1972/73 output | 14093 | 10602 | 1000 | 789 | 1694 |
| Mediterranean region | 1543 | 1077 | 68 | 229 | 168 |

[^0]Out of an overall production of 2.3 Mt of these citrus fruits in 1992/93:
-1.5 Mt was exported as fresh fruit to European markets,
-0.34 Mt was processed for juices and segments, an area that was formerly dominated by Asian countries, especially Japan and China. In 1992/93, $44 \%$ of mandarins and hybrids destined for processing was produced in the Mediterranean area, as compared to $6.8 \%$ in 1972.

Mediterranean and European consumers are generally very attracted to fresh fruit aromas and flavours. This is a critical factor for defining future strategies:

- for the fresh fruit market, the marketing season should be extended by the introduction of late varieties that ripen in April and May;
- mandarins and hybrids contain limonin precursors - this flavonoid can produce a bitter taste in heat-stabilized juices; new technological advances are paving the way to novel potential uses of mandarin and hybrid juices, with new aromas and more colour;
- new dual-purpose varieties (fresh fruit/juices) could soon be available with the development of new hybrids.


## Mediterranean constraints and new challenges

Citrus production in the Mediterranean Basin largely relies on traditional cropping techniques. On the southern rim, this activity is still often developed in old orchards, although production systems are now being modernized in Israel, Morocco and Turkey. In contrast, modernization is quite advanced in the five main citrus producing countries of the European Union (Portugal, Spain, France, Italy and Greece).

Nevertheless, $60 \%$ of Mediterranean citrus orchards are owned by smallholders, with an average orchard size of $0.5-2$ ha; only $10 \%$ are citrus estates exceeding 10 ha.

Urbanization and water resource deficits are seriously limiting citrus production through the loss of suitable orchard land. More than $60 \%$ of citrus trees in the Mediterranean Basin are grafted on salttolerant Sour Orange, which unfortunately is being threatened by the spread of tristeza in the region.
Citrus production in the Mediterranean Basin will have to increase by 5.3 Mt in the coming $10-15$ years to meet the expected demand from domestic markets and export markets in eastern Europe. An additional 65 M citrus trees will thus be needed overall. Moreover, about 30 M trees should be replaced with certified disease-free, tristeza-tolerant rootstock.

In all, 100 M trees will have to be provided by certified nurseries. In addition to the new salt- and tristeza-tolerant rootstocks that are needed, new cultivars will have to be developed to supply export markets with high quality fruits.

## conclusion

Biotechnological advances should help in meeting these challenges, especially through efficient breeding and extension of elite citrus material.

Programmes to breed new cultivars for rootstocks and scions will be introduced progressively and involve techniques that are more specifically targeted than standard breeding procedures.
New interesting traits such as tolerance to salinity and different viruses, insect resistance and better fruit quality could soon be obtained with higher efficiency.

Quality will also be improved by the development of seedless fruits (triploid) with high juice content, very sweet deeply-coloured pulp and possibly lower limonin content. This new generation of cultivars will provide a basis for restructuring the Mediterranean citrus industry, to address the challenges that will arise with the coming of the third millenium.


[^0]:    (*) these figures only take official fresh-fruit exporting countries into account.

