

*Citrus aurantium* hybrid. *Poncirus trifoliata* (Tri22 Australian strain), *Citrus sinensis* and (*Citrus sinensis* x *P. trifoliata*) were used as Australian standard rootstocks for comparison purposes. The trial was established in October 1999 to evaluate the horticultural performance of new rootstocks grafted from single-node cuttings to Navelina oranges. Five years of data (2002-2007) were collected on tree growth, fruit yield and quality to identify superior rootstocks for the next phase of semi commercial plantings. Chinese *Poncirus trifoliata* types, Donghai and Houpi produced higher yield efficiencies of 2.8 and 2.9 kg.cm<sup>2</sup> respectively at this site and both rootstocks had smaller trunk circumference of 20 and 22 cm respectively. While one of the erythroa types, Anjiang Hongju also showed promise in terms of yield, quality and fruit size. Data on tree growth, fruit quality and fruit size distribution are presented for all the other rootstocks.

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#### A Program of the Diversification of Mandarin and Orange Varieties in Morocco

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Morocco has nearly 81.500 ha of citrus, of which 51, 17% (41.730 ha) are devoted to the growing of various orange cultivars. The principals orange cultivars are Maroc late, W. sanguine and Salustiana. Also, Clementine and mandarins are most horticulturally important. A normal annual production of citrus about 1, 33 millions tons of which over than 50% intended to export. There is tendency to increase the number of citrus cultivars with the high quality because of domestic or export market in the future. The citrus variety improvement program of Morocco was based on clonal selection from germplasm or after genetic variability induction. 35 clone's variants were identified in Afourer germplasm and formed the subject of many varieties screening trials. Three promising oranges clones were identified as the best variants showing commercial interest. In the other hand, more than 1000 hybrids from crosses between Clementine and mandarin were tested in the trial field. Many diploid hybrids, having promising fruit quality attributes, are recommended for larger trials to evaluate yield potential and commercial acceptance of fruit. In addition, three triploids hybrids with seedless fruits was selected for high qualities and entered in production evaluation.

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#### Recent Advances in Aurantioideae Taxonomy

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More than 60 years have passed since Swingle (1943) reviewed Aurantioideae taxonomy and more than 40 since the minor revision of Swingle and Reece (1967). In this time period, various genera within the Aurantioideae have been revised or new species published. Revised genera include *Clymenia*, *Poncirus*, *Luvugna*, *Wenzelia*, *Monanthocitrus*, *Oxanthera*, *Clausena*, and *Murraya*. In some cases, it has been proposed to split genera and in others to consolidate genera. New species have been described and published within specific genera. This paper reviews recent work in this area from a horticultural perspective. Comments regarding specific genera are presented based upon observations made in *ex-situ* germplasm collections

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#### Research Program of Genetic Diversification on Citrus Rootstocks in Inra Morocco

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INRA Morocco was and still a privileged partner of the Moroccan citrus Industry, who goes along with the private sector during the last 60 years. This permitted to develop the citrus sector in all aspects. Due to tristeza virus threats in the sixties, many research programs were undertaken to look for disease resistant rootstock to substitute sour orange tree. For that, experiments were carried out at different citrus fruit farming regions using the main commercial varieties. Meanwhile, at El Menzeh experimental station, trials were conducted to evaluate root stock resistance to *phytophthora* disease. Results encouraged "Citrange" use. However, its susceptibility to calcareous soils and to "exocortis" viroidal disease pushed our laboratory to find out alternative adequate rootstocks. During the last ten years, our Institute gave citrus producers new technologies to face globalization challenges and selected new citrus rootstocks obtained from crosses and

characterized by better precocity and production than sour orange rootstocks. Moreover, for medium term rootstock breeding, we develop biotechnological tools such as callus induction, somatic embryogenesis management and protoplast fusion. New methods are implemented for physiological characterization facing biotic and abiotic constraints and for early screening. By the end, molecular tools will be used to identify and protect the new varieties.

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**Evaluation of New Rootstocks for Tarocco and Washington Navel Oranges and for Common Clementine in Italy**

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In 1968 in Italy at CRA-ACM started a programme in rootstock genetic improvement crossing the monoembryonic *C. latipes* as female parent and trifoliolate orange and sour orange as male parent. Some hybrids were selected considering the following characteristics: polyembryony, mal secco and *Phytophthora* tolerance, vigour. The performance of Washington navel and Tarocco oranges and Common clementine on some of these hybrids compared with standard rootstocks is referred. Three hybrids (68-IG-26-F5-P12, F6-P12, F6-P13) derived by trifoliolate orange male parent induced a cumulative yield and a canopy volume comparable with Swingle citrumelo, the rootstock standard impressing the best characteristics on the grafted scions.

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**Resistance to Citrus Canker: Field Evaluation of Sweet orange and Mandarins Germplasm**

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*Xanthomonas axonopodis* pv *citri* the Asian strain of the citrus canker bacteria, was first time registered in Brazil, in 1957. The disease have been maintained under control in the São Paulo State citrus industry for several decades,

through program of eradication of focus, interdiction of contaminated areas, control of nursery trees and budwood production and quarantine. Citrus leafminer improves dissemination of the disease and was as an important cause of resurgence of citrus canker in the State in recent years. We describe here the results obtained of in field evaluation of canker resistance in 213 different citrus germplasm. The experiment was installed in 2003 in Paraná State in randomized blocks, with two repetitions and 4 plants per plot. The citrus varieties evaluated involving sweet oranges, mandarins and hybrids, introduced after 1982 from EUA, South Africa, Morocco, Turkey, Cuba, Australia, Italy, Egypt, Hawaii, Puerto Rico, Israel, Philippine, Corsica, Spain, Portugal and Uruguay and incorporated in the IAC Citrus Germplasm Collection, in Cordeirópolis, SP. Evaluation of symptoms on leaves and fruits have been carried out monthly, from 2006 to 2008. Based on number of lesions on leaves and intensity of symptoms in the plant, 6,6% of the germplasm can be considered resistant, 38,49% moderately resistant, 46% susceptible and 8,9% high susceptible. The accesses of mandarins and hybrids Satsuma Hachimoto, Muscia, Ponkan, Harris and Rosehaugh Nartijee, showed higher resistance to citrus canker, that was also observed in varieties of sweet oranges, Diva, Shamout, Valência Mutaçao, Valencia Folha Murcha, Valencia Campbell, Sanguino, Do Céu, Tarocco 23, Navelina, Paulista, Pêra EEL, Pêra Ovo, Lima Verde, and Valencia Temprana. Preliminary results of symptoms on fruits of Diva confirm the potential this sweet orange and in addition others as Valencia Precoce, Clanor, Yoshida Navel, and Barlerin. Financial Support: Fapesp, CNPq and Fundecitrus

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**Comparative Performance of Daisy and Nova Mandarin From 1999 – 2008 Grafted to Valencia Orange**

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The Australian Citrus Crop Improvement program evaluated 62 new citrus varieties between 1992 and 2003, with the majority being public access. Another 31 are currently under evaluation or still held in Australian Plant Quarantine. This next group of citrus varieties are a mix of both public varieties and private varieties protected by Plant Breeder's Rights. Daisy mandarin is a hybrid of Fremont and Fortune mandarins and Nova is a cross between Fina clementine and Orlando tangelo. Both varieties entered Australia as part of the citrus crop improvement program. Part of the evaluation strategy in Australia has been to rework Valencia trees to new