

S02O01**The triploid mandarin breeding program in Spain**

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Production of seedless citrus fruits is required for the fresh market because consumers do not accept seedy fruits. Development of new seedless mandarin cultivars has a high priority for many citrus industries worldwide. The recovery of triploid hybrids is the most promising approach to achieve this goal, since triploids have a very low pollen and ovule fertility and usually are seedless or produce very low number of seeds, and do not induce the formation of seeds in other cultivars by cross pollination. In Spain we are carrying a triploid breeding program since 1996 based on 2x X 2x, 2x X 4x and 4x X 2x pollinations followed by embryo rescue and flow cytometry, and the use of different approaches to produce new tetraploid parents. The objective is to produce new high quality easy peeling and seedless mandarin cultivars. More than thirty spontaneous autotetraploid apomictic genotypes to be used as male parents have been selected from seedbeds by flow cytometry. Also nine autotetraploid non apomictic genotypes mainly to be used as female parents have been obtained by chromosome duplication with treatments of micrografted shoot tips with colchicine. Symmetric protoplast fusion is also being used to produce allotetraploid genotypes. So far, we have obtained more than 5,500 triploid hybrids from 130 parental combinations by 2x X 2x pollinations, more than 4,300 triploid hybrids from 100 parental combinations by 2x X 4x pollinations, and more than 5,600 triploid hybrids from 103 parental combinations by 4x X 2x pollinations. Recently we have released the first cultivars originated in the program, the seedless late maturing mandarins 'Garbi' and 'Safor', obtained from 2x X 2x crosses. More than 400,000 trees of these varieties have been planted by growers during the last three years.

S02O02**Triploid seedless mandarin breeding in France**

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Small citrus is an increasing component of the world citrus industry. New high quality, parthenocarpic, sterile mandarin varieties will play a pivotal role for its sustainable development. To produce seedless varieties, the CIRAD breeding program is focused on triploid hybrid selection. The first method to develop triploid progenies exploits 2n gametes that are naturally produced by diploid cultivars to obtain triploids in 2x X 2x crosses. The second method is based on interploid crossings (2x X 4x and 4x X 2x). For the last strategy the parental tetraploid gene pool has been diversified by selecting spontaneous tetraploids in apomictic cultivars, generating doubled diploids by colchicine treatments and production of allotetraploids by somatic hybridization. Several thousand triploid hybrids have been created by CIRAD using these strategies with the support of embryo rescue and ploidy evaluation by flow cytometry. This breeding program is supported by basic and methodological research performed in collaboration with IVIA (Spain), DAK (Morocco) and INRA (France) in the following topics: (1) citrus germplasm management and characterization, (2) studies of polyploidization mechanisms, tetraploid meiosis and its implications on the genetic and phenotypic structure of triploid progenies, and (3) studies of the implication of polyploidy on genomic and phenotypic expression.

S02O03**Mechanism of 2n gametes formation and centromere mapping in citrus**

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Citrus triploid hybrids can be recovered by 2x X 2x hybridisations as a consequence of 2n gamete formation. Two main meiotic processes are at the origin of such gametes, the first division restitution (FDR) and the second division restitution (SDR). These two mechanisms lead to very different gamete genetic structures.