# BIOTECHNOLOGY FOR LONG TERM BREEDING OF SEEDLESS MANDARINS IN URUGUAY

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Production of seedless citrus fruits is required for the fresh market because consumers do not accept seedy fruits. In 2015 new hybrids were released from the Uruguayan Citrus Breeding Program. These new hybrids are easy peeling mandarins with good color and peel quality, parthenocarpic ability, outstanding flavor, high °Brix and are tolerant to major citrus diseases (i.e. Citrus Canker and Alternaria alternata). In addition, we are using biotechnology to generate new combinations and obtain novel parental lines for completing a long term and comprehensive breeding program, with a clear objective: seedless mandarins.

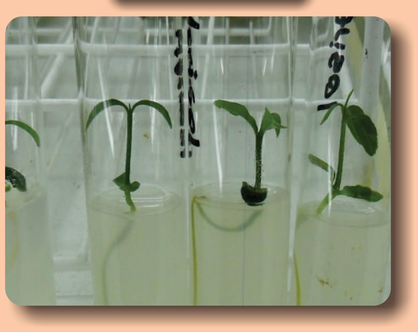
## Novel germoplasm generation strategies

### Gamma Irradiation

Objective: seedless mandarin.
More than 10,000 plants in field evaluation.


### Rescue triploid embryos of empty seeds

Objective: seedless mandarin.
The technique was adjusted. The first 3x plants began blooming recently.

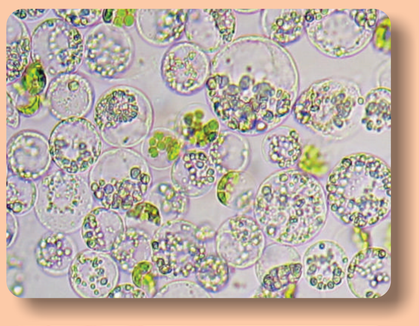



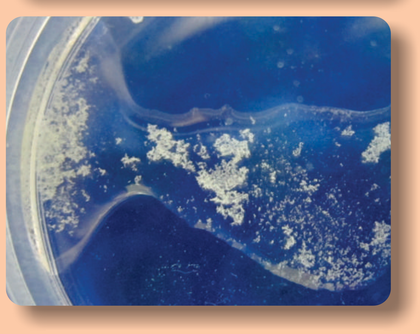
### Obtaining autotetraploid

Objective: Obtain parental 4x.
We have obtained more than 50 autotetraploid plants.

### Obtaining allotetraploid

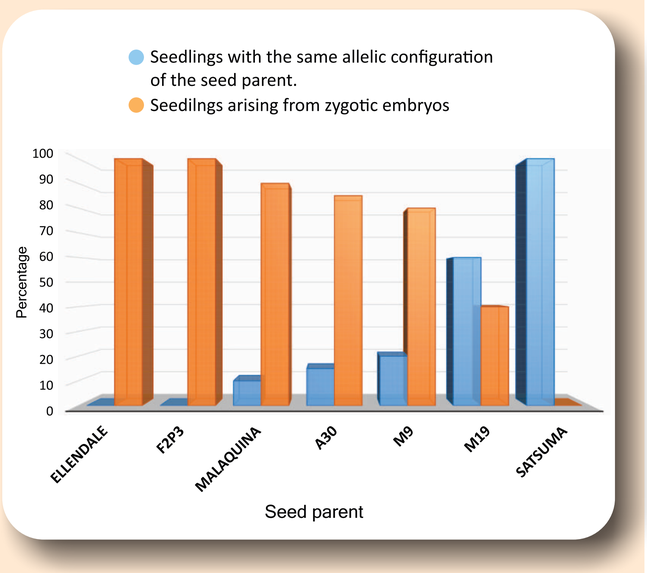
Objective: Obtain parental 4x.
We are adjusting the protoplast fusion technique.





### Using molecular markers

Objective: molecular studies. Nuclear (19) and cytoplasmic (6) SSR are routinely used to characterize new hybrids. We have studied:
- Reproduction type (polyembryony)
- Origin of 2n gametes
- Paternity




## Uruguayan Citrus Breeding Pipeline

| 2015 | 2020 | 2025 | 2030 | 2035 | 2040 |
|---|---|---|---|---|---|
| Release of 10 varieties of mandarins 1st generation, 2x x 2x crosses | Variety release from irradiation | Release of mandarins varieties 2nd generation, 2x x 2x crosses | Release of triploid mandarin varieties, from embryo rescue | Release of triploid mandarin varieties, from 4x x 2x crosses (autotetraploid) | Release of triploid mandarin varieties, from 4x x 2x crosses (allotetraploid) |