



Limette

Newsletter Citrus Friends Europe

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Cold Hardy Citrus and Hybrids

Historical Background

After devastating freezes in California with large tree losses, Walter T. Swingle tried to incorporate the cold hardiness of the trifoliolate orange (*Poncirus trifoliata*) into the sweet orange. The hybrids of these cross were the first Citranges. Dr. Swingle hoped to develop a sweet orange with the cold hardiness of the trifoliolate orange, which could resprout from its roots after freeze damage. But the fruits of the Citranges were of inferior quality compared with the leading sweet orange varieties.

Also a cross of Trifoliolate Orange with Grapefruit (*Citrus paradisi*) was made, resulting in the Swingle Citrumelo, but also here the fruit quality did not reach the leading Grapefruit cultivars.

Also some crosses with Kumquat (*Fortunella* sp.), the SourOrange (*Citrus aurantium*) and Mandarines (*Citrus reticulata* sp.) were made, but none was a considerable replacement for the commercial planted varieties.

But these crosses resulted in the use of these hybrids as valuable rootstocks for the existing citrus industry, and the program was never really abandoned.

Today with the genetic programs, it may be possible to incorporate the genes of cold-tolerance of the *Poncirus trifoliata* into the typical cultivars, making the dream of Walter T. Swingle possible. But still without genetic technology, many Citrus or *Poncirus* Hybrids had been developed by common cross breeding practices.

The first hybrids

As mentioned before, Citranges and Citrumelos were the first man made crosses. Those

hybrids exhibit a great cold tolerance, but not as tolerant as the parent *Poncirus trifoliata*, but several degrees centigrade below zero they withstand without damage.

The most common today found Citranges are Rusk, Carrizo and Troyer. Those are used as rootstocks for cold-intolerant scion varieties and do not act as a replacement for commercial sweet orange varieties as considered. Swingle Citrumelo is the today most found Grapefruit x *Poncirus trifoliata* Hybrid, but as the Citranges it is used as citrus rootstock.

Some other Hybrids, like Citandarines (*Poncirus trifoliata* x *Citrus reticulata*) and Citradias (*Poncirus trifoliata* x *Citrus aurantium*) did not find use as rootstock, because having too many drawbacks. Because of the most inferior, bitter and sour taste of the fruits harvested from those hybrid trees the program drifted from a search of a cold hardy sweet fruit cultivar development into a valuable rootstock breeding program.

The Next Generation

Walter T. Swingle's dream did not end with this change in program and still some growers and breeders try today in endless crossing and breeding actions to find a cold hardy citrus tree. New found Citrus varieties, like the extremely hardy Citrus *ichangensis* group or some in China and northern India discovered mandarin types gave new breeding material, resulting in more challenging hybrids. The work of several researchers, like Dr. Edwin Frey in Switzerland made it possible, to discover some promising cold hardy citrus-*Poncirus* hybrids. Dr. Frey obtained often seeds from the United States Plant Board, and made research of the seedling how frost-tolerant those seedlings will be.

Some Citrange Backcrosses, so called Second-Generation Citrange (Segentrangle), seem to develop most promising in his frost challenges. The 'Sanford Curafora' Segentrangle survived - 15°C in the backyard of a member with only slight

damage, under foliar protection.. The fruit is juicy and tasty, maybe with a slight bitter aftertaste if summer temperatures had not the needed heat units. The second Segentrage, the selection 'Sanford Venasca' did not hold the cold tolerance as its sister, because survived only -5°C in a cold tolerance screening test. The taste is even more acid than 'Sanford Curafora'.

Also the US Department of Agriculture made promising results in further hybrids. The USA 119 Segentrage survived -10°C in United States cold hardiness trials, but seems to have to most promising taste. It is said to be tasty, sweet and comparable to a mediterranean sweet orange.

Also a seedling of 'Cuningham' Citrange, named Clon Livurce by Dr. Frey is promising: The plant survived -12°C in Switzerland and the fruit taste should be comparable to grapefruit: Sweet, with a slight bitter aftertaste.

All the above mentioned hybrids are very promising for a year round out-door culture, were mild winters permit. And those hybrids seem to be very valuable parents for further hybrids and many growers take the effort to develop further crosses from those hybrids to discover new hybrids, which exceed their parents in freeze-hardiness and taste.

The future

Well, with mandarines as cross-partners more promising hybrids were developed. As most promising parent the very hardy, but even acid *Citrus reticulata* 'Changsha' has been discovered. Also the Citrangequats, hybrids of the Citrange with plants from the *Fortunella* genus are promising hybrids. The 'Thomasville' Citrangequat survived freezes of -15°C with only slight damage to foliar and young shoots, reported our member Norbert Dörr. The 'Sinton' Citrangequat is not as hardy as 'Thomasville' but a promising cross-parent. Also the *Citrus ichangensis* group is promising as further cross-parent. One hybrid of *Citrus ichangensis*, the Ichandarin 'Yuzu' (Synonym *Citrus junos*) is used in cold growing regions as a rootstock for local citrus selections.

Also Dr. Litwinski discovered in Massagno in Switzerland a Sour Orange (*Citrus aurantium*), which survived all freezes in Norbert Dörrs Backyard. The cultivar clone has no name, so he named it about the discovering place: *Citrus aurantium* 'Masagno'

So further hybrids must survive several freeze trials and fruit quality must be evaluated, so some time is needed till new first results will be at hand.

Anyone who wants to plant such hybrids as a garden ornamental, should know that a slight frost protection, like that for roses is necessary. Some hybrids need additional foliar cover, so it might be best for the members to get in touch with members who have experience in growing those hybrids. Addresses can be got from the author. As further reading recommended is the book from a German citrus nursery, which has its aim in breeding cold hardy hybrids:

Citruspflanzen - Von Tropisch bis Winterhart by B. Voß

This publication has a large chapter about these hybrids and describes most above mentioned varieties closer.

Club News