

A Gummy Pitting of Trifoliolate Orange in Italy

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ABSTRACT. In search of a bud-transmissible dwarfing factor, some Clementine trees grafted on trifoliolate orange originating from unselected sources were examined. Buds from 10-year-old trees with good size and fruit quality, without exocortis symptoms and free of tristeza, psorosis A, concave gum-blind pocket, and cristacortis were propagated on 11 rootstocks: sour orange, alemow, volkamer lemon, rough lemon, Cleopatra mandarin, Avana mandarin, *Citrus taiwanica*, *C. amblycarpa*, Troyer and Carrizo citranges, and citrumelo C.E.S. 1452. Five years later the trees grafted on citranges and citrumelo developed a variable budunion disorder, similar to that observed on trifoliolate orange. The disorder appears similar to gum pocket or gummy pitting described in Argentina, South Africa and Australia.

Index words. budunion disorder, dwarfing.

In Italy, trifoliolate orange rootstock has been used only in few orchards and/or in experimental plots, and gave poor results because of the exocortis infection in the scion (1, 5). For this reason its use as rootstock has been discontinued and the trees and/or plantations have been removed.

In 1967, during our investigations on citrus virus diseases, we found that some 8-year-old Clementine trees grafted on trifoliolate orange showed a range of sizes from normal to small. Dwarfed trees had a consistent bark scaling on the stock below the budunion, whereas others showed only mild or no symptoms, or showed the flattening of the stock and a shouldered stock overgrowth. Those trees showing no symptom of exocortis, psorosis A, concave gum-blind pocket, cristacortis or cachexia-xyloporosis, were selected as bud sources for a rootstock trial, even if the flattening was present.

Some years later a paper on gum pocket (4) caused us to examine the original mother trees, most of which had been already pulled out. Since a similar wood disorder was present in some sources it appeared interesting to follow the behaviour of the different rootstocks and those results are reported here.

SYMPTOMS ON TRIFOLIATE ORANGE STOCK

In 1967, all the Clementine trees on trifoliolate rootstock showed a variable degree and type of stock overgrowth such as smooth, benched or shouldered. Some of them appeared flattened and somewhat malformed. In 1972, when those trees were pulled out and carefully examined after removing the bark, a wood pitting was evident below the budunion. Many pits were impregnated with gum. There was a clear, indented ring in the wood at the budunion and a corresponding gum deposit on the inner bark surface. Cross sections of the trunk revealed irregular distorted growth and gum on the flattened side. In some cases, the pits produced lesions which penetrated deeply in the xylem. Bark scaling, attributable to exocortis, was sometimes associated with the above symptoms.

Other observations were made at another location, where there was a 12-year-old Clementine orchard with about a hundred trees on trifoliolate orange. All of them were smaller than trees of the same age grafted on sour orange, but a variable stock reaction was evident. Some trees showed typical exocortis scaling bark and dwarfing, whereas other trees had a shoulder-



Fig. 1. Clementine tree grafted on trifoliate orange showing a shouldered overgrowth and gummy pitting of the stock.

ed stock overgrowth, no symptoms on the outer bark, and a larger canopy. Bark patches, taken across the budunion, revealed in some cases gumming at the budunion and

wood pitting just below, on the shoulder of the stock. These trees were taller than those with scaling bark and fruiting was more abundant.

PROPAGATION ON OTHER ROOTSTOCKS

Buds from the Clementine trees grafted on trifoliolate orange and showing no scaling were propagated on the following rootstocks: sour orange, alemow, volkamer lemon, rough lemon, Cleopatra mandarin, Avana mandarin, Taiwanica, *C. amblycarpa*, Troyer and Carrizo citrange, and citrumelo C.E.S. 1452. Each stionic combination was replicated 18 times in three randomized blocks. Since 1973 all the trees were checked yearly for virus symptoms, whereas randomly selected trees were indexed for exocortis, psorosis A, concave gum-blind pocket, and cachexia-xyloporosis. Indexing was carried out on Madam Vinous sweet orange and sour orange seedlings, and on Parsons Special mandarin and Etrog (60-13 and 861S-1) citron grafted on volkamer lemon.

Test plants gave a positive reaction on Parsons Special mandarin, indicating cachexia-xyloporosis infection, and a very weak reaction on Etrog 861 S-1 citron, suggesting a very mild strain of exocortis.

Trees on alemow began to decline after 6 years, with pitting and pegging becoming worse. At the same time trees on citranges and citrumelo began to show an indentation on the cambial face of the bark and a gum ring at the budunion. With age, the citrange stocks became bigger than the scion so that at 13 years after budding, they had a circumference about 30% larger than the scion, whereas the overgrowth difference in the trees grafted on citrumelo was about 12%. The tree height and canopy volume were reduced compared to other rootstocks. All those grafted on Troyer and Carrizo citranges had a ring indentation in the wood and gumming in

the inner bark surface, whereas none of those on citrumelo did. No exocortis scaling was present.

Among other rootstocks only volkamer lemon and alemow had consistent bark gumming at the budunion with indentations varying from very light to mild.

Orlando tangelo buds topworked to a Clementine tree showed a leaf yellowing and a leaf dropping followed by die-back 1 year later. Gumming in the bark, small wood pitting and a smooth discoloured ring indentation in the wood were present 5 years later.

DISCUSSION

Symptoms on Clementine trees grafted on trifoliolate orange are similar to those described as gum pocket disease or gummy pitting of trifoliolate orange in Argentina (2), South Africa (4) and Australia (3) because of the gumming of the bark cambial face and of the ring indentations in the wood at the budunion and of the flattening and wood pitting of the stock. Therefore, this does not appear to be a general situation for Clementine but something related to an inherited or transmissible factor. Gumming in the inner bark surface and ring indentation on citranges and citrumelo could be attributed to this factor.

Since only a very mild strain of exocortis was revealed by indexing on Etrog 861 S-1 citron and no scaling was observed 13 years after the propagation of the buds on susceptible stocks it appears unlikely that the factor responsible for the disorder is exocortis. If it were due to exocortis, then a wide diffusion over the world and a relationship between exocortis strain virulence and wood pitting incidence would be expected.

The case we investigated was also carrying cachexia-xyloporosis agent whereas those studied by others (3, 4) were unaffected. Since

the symptoms are quite the same a further investigation is necessary to clarify the relationship, if any, between the two diseases.

ACKNOWLEDGMENT

Support by the "Ministero Agricoltura e Foreste" (Rome) under the Piano Agricolo Nazionale is acknowledged for this work on "Citrus dwarfing factors."

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