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Wood Pitting—Gum Pocket—Gummy Pitting of Trifoliolate Orange: Considerations About Their Etiology

N. Duran-Vila, L. Botella, and C. Vernière

ABSTRACT. The terms “gum pocket”, “wood pitting” and “gummy pitting” have been used to describe a characteristic disorder of trifoliolate orange. Affected trees show gum pockets, which develop only in the bark and wood of the trifoliolate orange rootstock, but the etiology remains unclear. Viroid-infected Clementine trees grafted on trifoliolate orange were monitored for the presence of symptoms that were identified in all the viroid-infected treatments as well as in some uninoculated controls. These observations suggest that these symptoms may be of physiological or stress origin and that viroid infection may act simply by enhancing its development.

The terms “wood pitting”, “gum pocket”, and “gummy pitting” have been used to describe a characteristic disorder of trifoliolate orange. Wood pitting was the name given in Argentina to a cachexia-like disorder characterized by “the presence of wood indentations with gum deposits accumulating both in the xylem and the bark at the site of the pit” in trees grafted on trifoliolate orange rootstock (5). These symptoms were usually found associated with the “bud-union crease” and “laminated shelling” disorders of unknown origin, and were shown to be unrelated to cachexia (6). Gum pocket was described in South Africa as “a new disease characterized by gum pockets and malformation of the trunks in trifoliolate orange rootstocks under sweet orange scions” (14). The disease was mainly found in commercial orchards of Palmer Navel and Olinda Valencia located in the Transvaal region with 70-80% incidence and the symptoms were defined as similar to those of wood pitting found in Argentina. Gummy pitting was described as “development of gum-impregnated pits in the surface of the wood of the stock, associated with gumming in xylem and phloem”, and initially appeared associated with bud-transmissible dwarfing factors assays conducted on trees grafted on trifoliolate orange

(7). Similar symptoms have also been observed in Italy (3), Turkey (1) and Chile (Besoin, pers. comm.).

The symptoms of wood pitting, gum pocket, and gummy pitting of trifoliolate orange, are similar to those of cachexia in Orlando tangelo (4), xyloporosis of Palestine sweet lime (13), gummy bark of sweet orange (10), and Kasala disease of grapefruit (2), but the etiology of these disorders has only been demonstrated for cachexia and xyloporosis which are caused by the same viroid agent (11, 12). The observation that gum pocket described in South Africa was found on trees that had been graft-inoculated with a common source of a mild protecting isolate of *Citrus tristeza virus* (CTV) was considered as an indirect evidence indicating that the causal agent of gum pocket was graft transmissible agent probably present in the original source as CTV (14). Similarly, since the gummy pitting disorder described in Australia was consistently seen in field trials conducted to evaluate the potential of graft-transmissible dwarfing factors, this was considered as an additional evidence for its graft-transmissibility. Since dwarfing factors are now known to be associated with the infection of specific viroids or viroid combinations (8), a viroid etiology was taken into consideration (9). This working hypothesis was consistent with earlier observations indi-

TABLE 1
GUM DEPOSITS OBSERVED ON VIROID-INOCULATED CLEMENTINE TREES GRAFTED ON TRIFOLIATE ORANGE

Viroid	Gum deposits ^a		Rootstock/scion ^b
	Clementine	Trifoliolate orange	
CEVd	0/12	2/12	1.50
CVd-I	0/5	5/10	1.43
CVd-II (non cachexia)	0/5	1/5	1.34
CVd-II (cachexia)	11/11	0/11	1.41
CVd-III	0/24	11/24	1.57
CVd-IV	0/6	1/6	1.34
Uninoculated	0/5	1/5	1.34

^aNumber of trees showing gum deposits over total number of trees.

^bRootstock perimeter/scion perimeter.

cating that the severity of the symptoms varied with locality, scion variety, and dwarfing strain (7).

The first transmission assays were conducted with a gum pocket source from South Africa and the results showed evidences indicating an association of the disease with a viroid-like RNA with the electrophoretic mobility of CVd-III (9), but since the viroid-like RNA has not fully characterized the Koch's postulates cannot be considered as satisfactorily fulfilled. In a separate trial

on the use of viroids as dwarfing agents, gum pocket symptoms were found in trifoliolate orange rootstock of trees inoculated with an uncharacterized viroid source containing a viroid with the electrophoretic mobility of CVd-III (15).

Field trials were established to determine the effect of different citrus viroids on Clementine trees grafted on trifoliolate orange (16). Ten years after inoculation, the trees were monitored to evaluate the presence of gum deposits and malforma-



Fig. 1. Symptoms observed in the trifoliolate orange rootstock.

tions in the bud union region. Gum deposits in the Clementine scion were observed in all the plants inoculated with cachexia sources of CVd-II (Table 1). Trees showing gum deposits in the trifoliolate orange rootstock were, however, identified in all the viroid-infected treatments and uninoculated controls (Table 1). Symptoms were more frequently observed (50% and 46%) on trees infected with CVd-I and CVd-III respectively, than in the other treatments. The symptoms appeared to be associated with trees showing a prominent shouldered stock overgrowth. No symptoms were observed on seedlings of

trifoliolate orange trial infected with the same viroid sources which were conducted in a different location.

The symptoms observed (Fig. 1) in these field trials consist of pits and indentations with gum deposits similar to those described as terms wood pitting, gum pocket, and gummy pitting. These observations suggest that the symptoms observed in this particular field trial are not caused by viroids but that viroid infection may act simply by enhancing its development. A physiological or stress origin of the symptoms must be entertained until further research provides conclusive results.

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