



## Increased Incidence of Citrus Viroid Diseases

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An increase in viroid related diseases has been observed over the last three years due to the use of field-cut material for tree propagation and the practice of top-working viroid-sensitive cultivars to existing viroid-infected rootstocks.

Citrus viroids can only be transmitted mechanically by grafting with infected plant material or by the use of contaminated cutting tools, but are not transmissible by seed- or insects. Viroids induce a range of symptoms which are determined by the sensitivity of the rootstock and scion. Symptoms such as tree stunting, leaf chlorosis, gumming and pitting of the phloem and twig-dieback can be induced on sensitive scions, resulting in unthrifty trees with significantly reduced productive lifespans. Cachexia disease, caused by certain variants of Hop stunt viroid, is characterized by gumming and browning of phloem tissue and specifically affects mandarins, their hybrids and kumquats (Figures 1 & 2). On sensitive rootstocks, trees infected with Citrus dwarfing viroid at a young stage may remain stunted and never yield a crop (Figure 3). Exocortis, the disease caused by Citrus exocortis viroid, affects sensitive rootstocks such as trifoliate orange and citranges, and typically induces bark scaling on the rootstock (Figure 4), often accompanied by severe stunting if trees are infected at a young age. In a recent example, navel trees on Carrizo Citrange rootstock, made from uncertified budwood sources that were infected with Hop stunt viroid, Citrus dwarfing viroid and Citrus exocortis viroid, displayed the characteristic exocortis symptoms and after 10 years growers are still struggling to get economical crop loads on these trees.

Although certain tolerant scions and rootstocks show no detrimental symptoms when infected, these infections are problematic when transmitted to more sensitive cultivars. Tolerant rootstock-scion combinations may, however, show variable levels of stunting, resulting in uneven and difficult to manage plantings (Figure 5).

Viroid diseases are best prevented by using Citrus Improvement Scheme certified propagation material supplied by the Citrus Foundation Block and by ensuring that pruning equipment is properly sanitised during pruning. Determining the disease status of older orchards prior to top working new cultivars is also strongly advised. For viroid analysis contact Chanel Steyn at CRI Nelspruit ([chanel@cri.co.za](mailto:chanel@cri.co.za)).



## Toenemende Gevalle van Sitrus Viroïed Siektes

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As gevolg van die gebruik van plantmateriaal wat in kommersiële boorde gesny word vir boomproduksie, asook vir die oorwerk van viroïed-sensitiewe kultivars op besmette onderstamme, word 'n toename in viroïed-verwante siektes gedurende die laaste drie jaar waargeneem.

Sitrus viroïde kan slegs meganies oorgedra word deur enting met besmette materiaal of deur die gebruik van gekontameneerde snygereedskap, maar kan nie d.m.v. insekte of saad versprei word nie. Viroïde veroorsaak 'n spektrum van simptome, wat bepaal word deur die sensitiwiteit van die onderstam en bostam. Simptome soos verdwering, blaarverkleuring, stamgleuf, vergomming en tak-terugsterwing kom voor op sensitiewe bostamme, wat gevolglik lei tot onproduktiewe bome met 'n verkorte lewensduur. Cachexia siekte, wat veroorsaak word deur sekere variante van *Hop stunt viroïed*, word gekenmerk deur blaar-verkleuring, stamgleuf, vergomming en verbruining van floëem weefsel, en affekteer mandaryne, hul kruisings en koemkwat (Figure 1 & 2). Jong bome wat met *Citrus dwarfing viroïed* geïnfekteer is, kan verdwerg bly en nooit 'n oes lewer nie (Figuur 3). Exocortis, 'n siekte wat deur *Citrus exocortis viroïed* veroorsaak word, affekteer sensitiewe onderstamme soos trifoliaat en sekere "citranges", en manifesteer tipiese bas-skilfering op die onderstam (Figuur 4), asook hewige verdwering as die bome teen 'n vroeë ouderdom geïnfekteer is. In 'n onlangse voorbeeld het navels op Carrizo Citrange onderstam, gemaak van 'n besmette plantmateriaal-bron wat met *Hop stunt viroïed*, *Citrus dwarfing viroïed* en *Citrus exocortis viroïed* besmet was, tipiese exocortis simptome gewys en daardie produsente sukkel steeds na 10 jaar om ekonomiese oeslading op daardie bome te dra.

Alhoewel sommige verdraagsame bostamme en onderstamme dikwels geen nadelige effekte toon nie, kan die infeksies problematies word wanneer dit na sensitiewe gashere versprei. Verdraagsame

onderstam-bostok kombinasies mag wel met wisselende grade verdwerg word, wat kan lei tot oneweredige en moeilik bestuurbare boorde (Figuur 5).

Viroïed siektes kan voorkom word deur die gebruik van Sitrus Verbeteringskema gesertifiseerde voortplantingsmateriaal wat deur die Sitrus Grondvesblok verskaf is, asook om toe te sien dat snoeitoerusting deurlopend gesteriliseer word tydens snoei. Dit is ook belangrik om die siektetoestand van ouer boorde te bepaal voor die oorwerk na nuwe kultivarre. Vir viroïed analise kontak vir Chanel Steyn by CRI Nelspruit ([chanel@cri.co.za](mailto:chanel@cri.co.za)).





## Typical viroid infection symptoms



**Figure 1.** Twig-dieback symptoms, typical of Cachexia, on mandarin.



**Figure 2.** Pitting and gumming symptoms of Cachexia on mandarin.



**Figure 3.** Stunting of a mandarin tree infected with *Citrus dwarfing viroid* on the sensitive C-35 rootstock.



**Figure 4.** Exocortis bark scaling on a trifoliolate rootstock.



**Figure 5.** Tolerant rootstock-scion combinations with variable stunting resulting in uneven plantings.