

New findings on the putative causal agent/s of the emerging cachexia like disease threatening the citrus industry in Egypt

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Citrus industry is the major fruit crop in Egypt. In fact, it shows dramatic increasing, where the total citrus production has increased from 3200 to 5000 thousand tons between 2008 and 2016. As benefits, it contributes to the nutrition and refreshment of local consumers, to agro-industries and to foreign revenue and employment. The water scarcity in the Mediterranean basin along with the gradual climate change and water deposition deficiency are the major threats on citriculture future. Furthermore, old Citrus orchard means low productivity and replacing it with a new fleshy tree takes long period to reach the productivity phase. Finally, emerging citrus diseases are one of the most important limiting factors confronting citriculture production. Following the epidemics of citrus tristeza disease in the Mediterranean basin, where susceptible sour oranges is prevalent, different tolerant rootstocks were introduced and among those *Citrus volkameriana* rootstock has profusely outshined in the Mediterranean basin. Afterward, cachexia like disease has emerged to affect seriously *Citrus volkameriana* rootstocks in Egypt and Turkey. The diseased citrus trees are usually stunted and showing stem pitting with gum deposits on the bark, similar to the symptoms expressed by cachexia and gummy bark diseases on mandarin and on sweet orange, respectively. The disease is currently devastating cultivated citrus in the new reclaimed land Egyptian farms. This disease incidence was correlated with hot climate and transmission potency, which have drawn the attention to consider citrus viroids as a putative causal agent. The main objectives were to identify the putative causal agent/s, which is/are associated with cachexia like disease symptoms on *volkameriana* lemon rootstock in Egypt. The study was carried out on four phases: (i) Evaluation the occurrence of citrus viroids in *volkameriana* lemon. (ii) Molecular characterization and sequencing analysis of citrus viroids. (iii) Biological indexing of symptomatic/ asymptomatic *volkameriana* lemon. (iv) Evaluation the occurrence of phytoplasmas in *volkameriana* lemon. Molecular detection and characterization of several citrus viroids were performed on previously collected samples belonging to new reclaimed land in Egypt. In addition, a biological assay of infected material was also included in these investigations. Interestingly, all the assays disclosed and confirmed that HSVd and CBCVd were the most prevalent molecularly detected viroids in the symptomatic samples, and biological indexing on woody indicators confirmed the particular severity of CBCVd, indicating that cachexia like disease could be associated with this emergent viroid.

Keywords. *Citrus bark cracking viroid* (CBCVd) - *Hop stunt viroid* (HSVd) - Molecular assays - Biological indexing - Rootstock.