

Study on ultra-structural effects caused by onion yellow dwarf virus infection in ‘Rossa di Tropea’ onion bulb by means of magnetic resonance imaging

Anna Taglienti, Maria Teresa Dell’Abate, Alessandra Ciampa, Laura Tomassoli, Giuliana Albanese, Luigi Sironi and Antonio Tiberini

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Abstract

‘Rossa di Tropea’ onion is a particular pink/red coloured onion cultivated in Calabria region (Southern Italy), representing one of the Italian most important vegetable crops granted with Protected Designation of Origin (PDO) and Protected Geographical Indication (PGI) trademarks. This local cultivar is characterised by a high nutraceutical compounds content showing anti-inflammatory, anti-cholesterol, anticancer and antioxidant properties. As all vegetable crops and *Allium* spp., ‘Rossa di Tropea’ onion is affected by several viruses. Among these, the species *Onion yellow dwarf virus* (OYDV, genus *Potyvirus*, family *Potyviridae*), represents the most limiting biotic stress, inducing severe symptoms. OYDV effect on tissues architecture in whole bulbs was investigated using magnetic resonance microimaging (MRI) technique, which allows the interior of samples to be imaged non-invasively and non-destructively and yields quantitative information on physico-chemical parameters describing water mobility (T1 and T2 relaxation times). The use of such tool allowed to determine how OYDV alters plant physiology by inducing water accumulation in bulb tissues as well as causing ultra-structural modifications of cell wall, highlighted by MRI. All these effects resulted in an increase of free water in plant tissues, and consequently relevant water losses during post-harvest storage, seriously affecting bulb quality, marketability and shelf life.