Title Water relations of cut roses

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Abstract

The cut rose industry comprises an important share of the agricultural products market, and strives to provide a high-quality, long-lasting product to the consumer. One of the major postharvest stresses for cut roses is water limitation which can result in premature wilt of the flower stalk. A set of experiments was carried out to localise and identify the major resistances to water flow in cut roses, followed by an evaluation of several methods aimed at eliminating those resistances. Finally, a detailed investigation of the response of cut roses to various stress factors experienced during postharvest processing was performed.

Measurements of specific hydraulic conductivity (k_s) were made to determine the impact of resistances to water flow in cut roses, and the effectiveness of various postharvest treatments. The lowest k_s (i.e. the highest resistance) was found to be located in the basal 15 cm segment of the flower stalk after four days, and corresponded to the development of bacterial infection in the open vessels. Microscopic and biochemical analyses confirmed that the occlusions were microbial in origin. Vase solutions containing various bactericides were nearly free of bacteria, but bacterial plugs were still present in the xylem, as confirmed by plate counts of homogenised stem tissue and direct observation. The most successful technique for maintaining k_s in the basal segment was the regular removal of a portion of the cut end of the flower stalk. However, the entire open vessels need to be removed to fully maintain k_s in the shoot.

Tracking xylem water potential (ψx) and stomatal conductance (gs) during postharvest processing of cut roses revealed two factors that negatively impacted water relations. First, artificial plugs mimicking bacterial or debris occlusions from pail water contamination resulted in very negative values for ψx and increased cavitation events as seen by direct observation of embolisms. Second, the combination of cold storage and dehydration during industrial processes affected stomatal functioning, and has implications for water loss in cut roses. In cut roses, ψ x and g s were generally well correlated, meaning that severe xylem tensions result in stomatal closure under most conditions.