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Research Report

Effects of Simulated In-Transit Vibration on the Vase Life and Post-Harvest Characteristics of Cut Rose Flowers

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Abstract. We examined whether exposure to vibration during transport affects the quality of cut roses. Using a laboratory vibration simulator, in-transit vibration of 7.5 or 10 Hz was applied to two cut rose cultivars ('Polar Star' and 'Revival') at three positions within a compartmented storage bin (top, middle, and bottom) for 10 or 15 min. Post-harvest characteristics of the cut flowers were measured in a test room. We observed that in both cultivars, vibration significantly reduced vase life (VL), decreased relative fresh weight (RFW), and increased flower opening rate (FOR). No significant differences were observed between vibration frequencies, positions, or durations in 'Polar Star' with respect to VL. Furthermore, we applied a simulated vibration of 10 Hz to three cut rose cultivars ('Polar Star', 'Magic Red', and 'Full House'). We observed that 'Polar Star' was more sensitive to vibration damage than the other two cultivars. Pulse treatments coupled with the exogenous application of silver thiosulfate (STS), an ethylene action inhibitor, were applied to 'Polar Star' before and after vibration. Independent of the concentration used and time of application, STS significantly decreased FOR, water uptake, water loss, and increased RFW. However, only 1 mM STS applied before vibration extended VL compared to non-vibrated control VL. Thus, vibration during transport could shorten the VL of cut rose flowers. The amount of vibration damage in cut rose flowers is cultivar dependent. Taken together, our data suggest that ethylene underlies the negative impact of vibration on post-harvest characteristics of cut rose flowers. Application of ethylene action inhibitors before transit could reduce or prevent the vibration effects on the post-harvest quality of sensitive cut rose cultivars.

***Additional key words*:** Cut flower, Mechanical damage, Silver thiosulfate, Water relations

Introduction

The vase life (VL) of cut rose flowers is affected by various factors, such as pre-harvest growing conditions, post-harvest handling, storage, and transportation (Fanourakis et al., 2013; Reid and Jiang, 2012). These factors may result in a negative water balance (van Doorn, 2012), higher respiration, and faster flower senescence (Reid and Jiang, 2012).

Long distance transport to markets imposes several negative effects on the post-harvest properties of cut flowers. The effects of altered temperature during transport of cut flowers on VL and quality have been extensively investigated in simulations (Çelikel and Reid, 2002b; Reid, 1999; Rudnicki et al., 1991), as have wet and dry transportation (Cevallos and Reid, 2001; Le Masson and Nowak, 1981; Macnish et al., 2009), and rapid vs. slow transport (Leonard et al., 2011). Respiration, bend neck, and weight loss during dry transport of cut flowers all increase as storage temperatures rise in simulated transport (Çelikel and Reid, 2004; Çelikel et al., 2010; Çelikel and Reid, 2002a; Çelikel and Reid, 2002b; Rudnicki et al., 1991). Therefore, maintaining low temperatures during commercial handling and transport is recommended. Further, hydration of cut flowers during handling and transport has long been used to restore flower turgidity, opening, and petal expansion (Evans and Reid, 1988; Mayak and Halevy, 1971; van Doorn, 2012). However, some researchers proposed dry handling of cut flowers combined with refrigeration, as this treatment reduced transport-related damage, risk of bacterial growth, occlusion of flower stems and transport and handling costs (Çelikel et al., 2010; Cevallos and Reid, 2001; Macnish et al., 2009).

The majority of fresh cut flowers sold in Iran are produced in the northern parts of the country and distributed to retailers countrywide via truck transport. Previous research