Abstract

Low temperature injury (LTI) of roses (*Rosa hybrida* L.) is difficult to assess by visual observation. Relative chlorophyll fluorescence (CF; F_v/F_m) is a non-invasive technique that provides an index of stress effects on photosystem II (PS II) activity. This instrumental technique allows determination of the photosynthetic efficiency of plant tissues containing chloroplasts, such as rose leaves. In the present study, pre- and post-storage measurements of F_v/F_m were carried out to assess LTI in 'First Red' and 'Akito' roses harvested year round. Relationships between the pre-harvest environment conditions of temperature, relative humidity and photon flux density (PFD), F_v/F_m, and, vase life duration after storage are reported. After harvest, roses were stored at 1, 5 and 10 °C for 10 days. Non-stored roses were the control treatment. F_v/F_m ratios were reduced following storage, suggesting LTI of roses. However, reductions in F_v/F_m were not closely correlated with reduced vase life duration and were seasonally dependent. Only during winter experiments was F_v/F_m of roses stored at 1 °C significantly ($P \leq 0.001$) lower compared to F_v/F_m of non-stored control roses and roses stored at 5 and 10 °C. Thus, the fall of F_v/F_m was due to an interaction of growing season and storage at 1 °C. Vase lives of roses grown during winter were significantly ($P \leq 0.001$) shorter compared to roses grown during summer. Length of vase life was intermediate for roses grown during autumn and spring. Because of the lack of correlation between F_v/F_m and post-storage vase life it is concluded that the CF parameter F_v/F_m is not a practical index for assessing LTI in cold-stored roses. Higher PFD and temperature in summer were positively and significantly correlated with maintenance of post-storage F_v/F_m ratios and longer vase life. It is suggested that shorter vase lives and lower post-storage F_v/F_m values after storage at 1 °C are consequences of reduced photosynthesis and smaller carbohydrate pools in winter-harvested roses.