



Phenotypic and molecular characterization of a tomato (*Solanum lycopersicum* L.) F₂ population segregation for improving shelf life

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ABSTRACT. Breeding for better quality fruits is a major focus for tomatoes, which are continuously subjected to post-harvest losses. Several methods have been used to improve the fruit shelf life of tomatoes, including the use of ripening gene mutants of *Solanum lycopersicum*. We developed extended shelf-life tomato hybrids with better quality fruits using ripening mutants. Nine tomato crosses were developed using 3 fruit ripening gene mutants of *S. lycopersicum* [alcobaca (*alc*), non-ripening, and ripening inhibitor] and 3 agronomically superior Indian cultivars ('Sankranti', 'Vaibhav', and 'Pusaruby') with short shelf life. The hybrid progenies developed from *alc* x 'Vaibhav' had the highest extended shelf life (up to 40 days) compared with that of other varieties and hybrids. Further, the F₂ progenies of *alc* x 'Vaibhav' were evaluated for fruit quality traits and yield parameters. A wide range of genetic variability was observed in shelf life (5-106 days) and fruit firmness (0.55-10.65 lbs/cm²). The potential polymorphic simple sequence repeat markers underlying shelf life traits were identified in an F₂ mapping population. The marker association with fruit quality traits and yield was confirmed with single-marker analysis and composite

interval mapping. The genetic parameters analyzed in the parents and F_1 and F_2 populations indicated that the cross between the cultivar 'Vaibhav' and ripening gene mutant *alc* yielded fruit with long shelf life and good quality.

Key words: Composite interval mapping; Fruit firmness; Shelf life; Simple sequence repeats; Single marker analysis