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Effect of post-harvest treatments of polyamines on colour of stored peach fruits

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ABSTRACT : Peach fruit is highly perishable and climacteric in nature. It undergoes various physiological and biochemical changes during fruit ripening and these changes are continuous to occur after harvesting that leads to poor post-harvest fruit quality. An experiment was planned to study the effect of polyamines on the colour changes of peach fruit during low temperature storage. Physiologically mature, uniform and healthy fruits were harvested and treated for 5-minutes in aqueous solutions of spermidine, spermine and putrescine at three different concentrations *viz.*, 1.0, 2.0 and 3.0 mmol L^{-1}, respectively and 2.0 kg fruit from each replication of each treatment was packed in corrugated fibre board (CFB) boxes (5% perforation) with paper lining and kept at low temperature conditions (0 -1° C and 90-95% RH) for 32-days. Fruit samples were analysed after 8, 16, 24 and 32 days of storage for various physico-chemical characterstatics. Result revealed that the application of polyamines delayed the loss of green colour in peach fruits. Fruits treated with putrescine @ 3 mmol L^{-1} showed minimum "a" and "b" values, followed by putrescine @ 2 mmol L^{-1} treatment, while the maximum "a" and "b" values were recorded in untreated fruits.

KEY WORDS : Peach, Colour, Storage, Spermidine, Spermine, Putrescine

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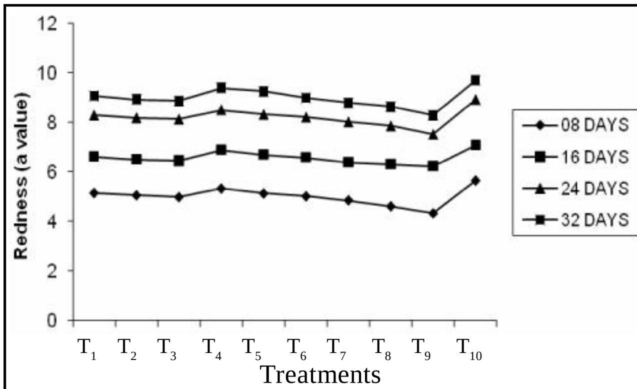
Peach [*Prunus persica* (L.) Batsch] is one of the major stone fruit grown in the temperate zones of the world, where it occupies the third position next to apple and pear. It belongs to genus *Prunus*, native to China and Persia, at one time it was called "Persian apple." It is revered as a delicious and healthy summer fruit in most temperate regions of the world. Presently, varieties like Shan-i-Punjab, Partap, Florda Prince and Earli-Grande are grown commercially in the Punjab. Shan-i-Punjab cultivar is widely planted by farmers because of better fruit quality, colour and size in comparison to other cultivars. Being a climacteric fruit it undergoes rapid ripening/senescence changes *viz.*, change in weight, colour (browning of fruits), texture, taste, acids and sugars after harvesting. Colour is an important factor which influences the marketability of fruits. Delay in ripening/senescence can be helpful to maintain the fruit colour during storage. Several growth regulators and other chemicals have been reported to delay the ripening and extend the post-harvest life of many fruits (Khadar *et al.*, 1988). Polyamines are ubiquitous in all organisms. Polyamines and ethylene has opposite effect on fruit ripening and senescence, balance between the two is important to enhance and retard the ripening process of fruits. Usually, the concentration of polyamines decreases during tissue senescence with accelerated ethylene production (Valero *et al.*, 2002). Jiang and Chen (1995) also reported that polyamines reduced or delayed browning, peroxide level and ethylene production in litchi fruits stored at 5^0 C. Pre and post-harvest application of putrescine retarded the colour development in mango fruits (Malik *et al.*, 2003). Exogenous application of polyamines, delayed the fruit senescence and physiological processes leading to the fruit ripening. A higher endogenous level of putrescine (PUT) is associated with delayed fruit ripening (Dibble *et al.*, 1988). Keeping this in view, present investigation was undertaken to study the effect of post-harvest applications of putrescine, spermidine and spermine on the colour changes of peach fruits under cold storage conditions.

The experiment was conducted in the post-harvest laboratory, Department of Fruit Science, Punjab Agricultural

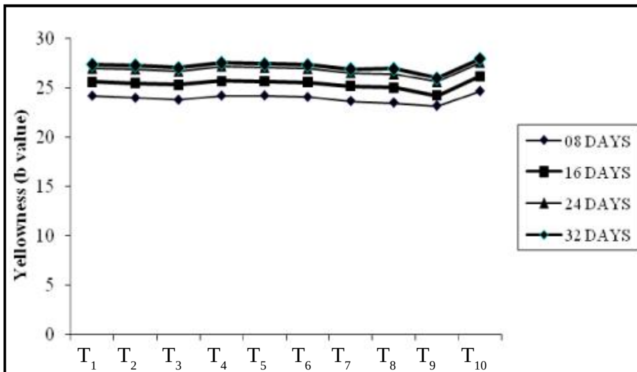
University, Ludhiana. Physiologically mature peach fruits of cv. Shan-i-Punjab were picked randomly from all the four directions of the plants with the help of secateurs in the early morning hours in the 1st week of May. The bruised and diseased fruits were sorted out and healthy fruits were washed and air dried at room temperature. Selected fruits were treated for 5-minutes in aqueous solutions of spermidine, spermine and putrescine at three different concentrations *viz.*, 1.0, 2.0 and 3.0 mmol L^{-1}. A total of ten treatments were given comprising three replications in each treatment; T_1 [Spermidine (1.0 mmol L^{-1})], T_2 [Spermidine (2.0 mmol L^{-1})], T_3 [Spermidine (3.0 mmol L^{-1})], T_4 [Spermine (1.0 mmol L^{-1})], T_5 [Spermine (2.0 mmol L^{-1})], T_6 [Spermine (3.0 mmol L^{-1})], T_7 [(Putrescine 1.0 mmol L^{-1})], T_8 [Putrescine (2.0 mmol L^{-1})], T_9 [Putrescine (3.0 mmol L^{-1})] and T_{10} [Control (Water dip)]. After drying, the fruits were packed in corrugated fibre board (CFB) boxes of two kg capacity in layers and subsequently placed in cold storage conditions (0 to 1° C and 90-95 % RH). Fruit samples were analyzed for surface colour changes on the day of harvesting and after 8, 16, 24 and 32 days of storage. The colour of fruits was measured with colour difference meter (Model: Mini Scan XE Plus, Made: Hunter Lab, USA) and expressed as "a" and "b" hunter colour values (Hunter, 1975). The data were statistically analyzed by Factorial Completely Randomized Design (CRD) as described by Singh *et al.* (1998).

The data pertaining to the effect of post-harvest treatments of polyamines on the colour changes of peach fruit are presented in Fig. 1 and 2. It shows that the application of polyamines delayed the loss of green colour in peach fruits. The colour development was improved with the advancement of storage period. All the treatments showed a continuous increase in values of "a" and "b" with the increase in storage period and attained maximum values (8.98 and 27.21, respectively) at the end of storage period. After 8 days of storage, the control fruit showed maximum "a" (5.64) and "b" (24.66) values, while the minimum values for "a" (4.33) and "b" (23.17) were observed in putrescine @ 3 mmol L^{-1} treated fruits, followed by putrescine @ 2 mmol L^{-1} and spermidine @ 3 mmol L^{-1} treated fruits. A similar trend was followed by "a" and "b" values after 16, 24 and 32 days of storage. The improvement in colour during storage might be due to the degradation of the chlorophyll pigments of the fruits and increased synthesis of carotenoids and anthocyanin pigments (Wankier *et al.*, 1970; Wang *et al.*, 1971). The results obtained in the present studies are in favour with the findings of Novita and Purwoko (2004) who reported that polyamines inhibited the change in fruit colour of papaya during storage. Valero *et al.* (1998) also reported that vacuum infiltration of lemon fruit with putrescine and calcium chloride resulted in delayed colour change. Martinez-Romero *et al.* (2002) also reported that putrescine application delayed the colour changes in apricots.



C.D. (P=0.05) level Treatment: 0.15 Storage: 0.09
Storage × Treatment: 0.27

Fig. 1 : Effect of post-harvest treatments of polyamines on redness (a value) of stored peach fruits



C.D. (P=0.05) level Treatment: 0.19 Storage: 0.12
Storage × Treatment: 0.37

Fig. 2 : Effect of post-harvest treatments of polyamines on yellowness (b value) of peach fruits under cold storage

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