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Combined spermine and spermidine postharvest treatment attenuates pomegranate cv 'sawa' fruit physiological losses and maintain fruit quality by improving biochemical and antioxidative attributes at ambient conditions

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Background and Objective

Pomegranate is an extremely valuable fruit crop. Apart from fresh fruits and juices, processed food such as wine and sweets are becoming increasingly important in international trad. Due to rising demand on the global market, this crop's potential for greater profitability has increased. It is classified as a non-climacteric fruit since it has a low respiration rate and ethylene production stops when the fruit is plucked from the tree when completely ripe. Pomegranate fruit has a short shelf life when stored at ambient temperatures, despite its non-climacteric character.

Polyamines (PAs) are organic molecules, having low molecular weight, high biological activity PAs are putrescine (PUT), cadaverine (CAD), spermidine (SPD), and spermine (SPM). Cell division, fruit development, ripening, softening, and senescence have all been linked to PAs. Application of PAs pre- and post-harvest level significantly reduced fruit softening during ripening caused changes in numerous qualitative features in a number of fruit crops.

The aim of the study was to investigate the effect of pre storage exogenous spermine and spermidine treatments on pomegranate fruit quality.

Materials and Methods

Physiologically mature fruits were harvested and transported to the MNS-University of Agriculture Multan's Postharvest Science and Technology Lab for analysis.

Fruits were washed and dipped in aqueous solution of spermine and spermidine individually and in combined form for 5min. Two to three drops of Tween 20 were used as surfactant.

After the treatment, fruits were air dried packed into cardboard boxes and placed at ambient conditions (25 ± 2ºC and 55-60% RH) for shelf life and quality assessment.

Fruit physiological attributes were quantified daily, however, fruit biochemical attributes and phytochemical was assessed at 5-day interval for 15 days of storage.

Results

No clear difference was recorded in the result of ethylene and respiration rate produced from control or treated fruits with individual or combined (SPM + SPD) of untreated (Fig. 1 A&B).

Fruits treated with combination of (Spm + Spd) showed less weight loss from day-12 to the end of shelf storage (10 %) as compared to other treatments Fig. 1 (C).

Irrespective to days at storage fruits treated with polyamines showed highest TSS, TA and TSS/TA ratio Fig. 2 (A, B & C).

Fruits treated with combination of (Spm + Spd) exhibited maximum TPC, antioxidant and vitamin-C as compared to other treatments Fig. 3 (A, B & C).

Fruits treated with polyamines either combined or alone treatments showed maximum SOD, POD and CAT activity Fig. 4 (A, B & C).

Fruits treated with combination of (Spm + Spd) showed maximum carotenoids and anthocyanin Fig. 5 (A &B).

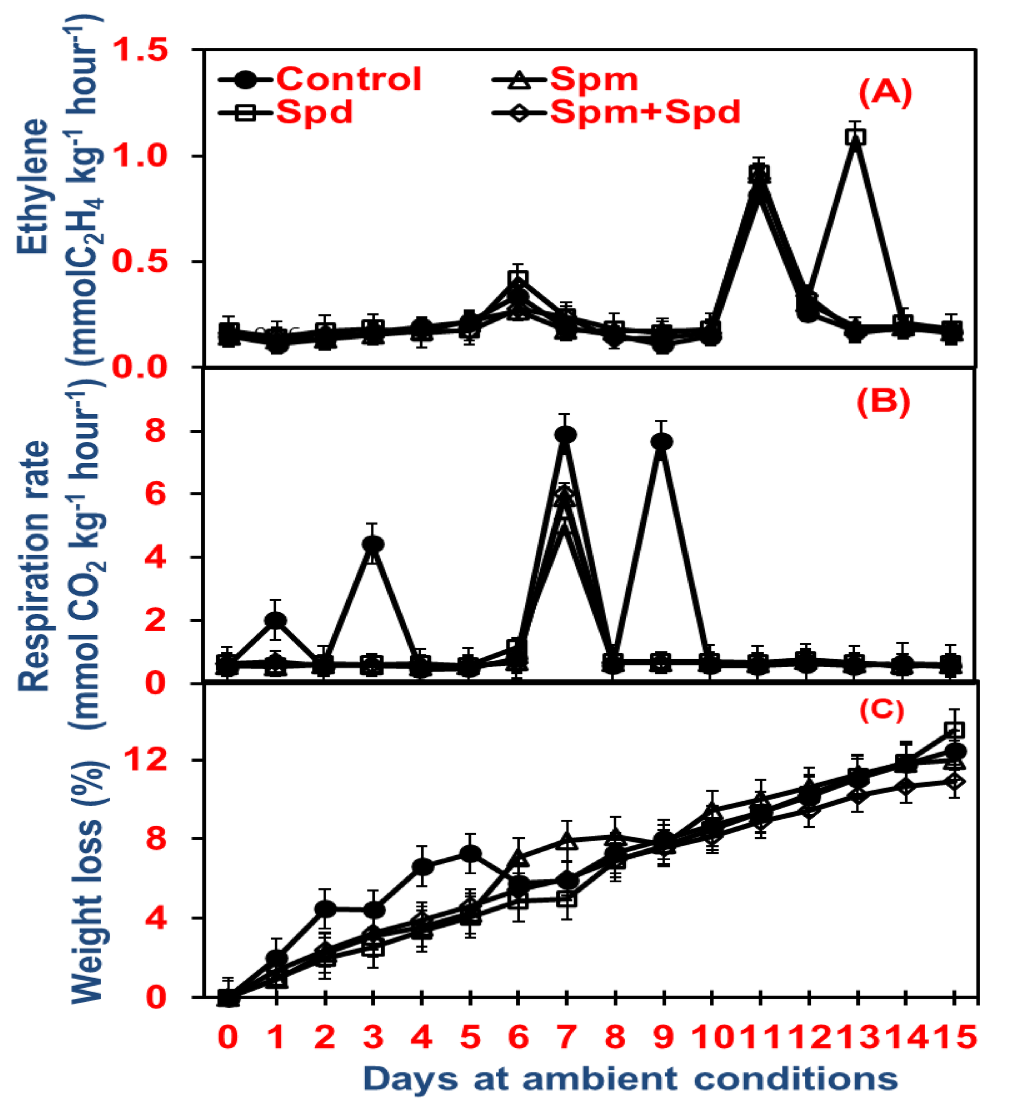

Fig.1: Effect of Postharvest polyamines (PAs) treatment and days at shelf (DAS) on Ethylene [C_2H_4: (A)], Respiration rate [CO_2: (B)] and on weight loss (C) of pomegranate cv. Sawa fruit at shelf.

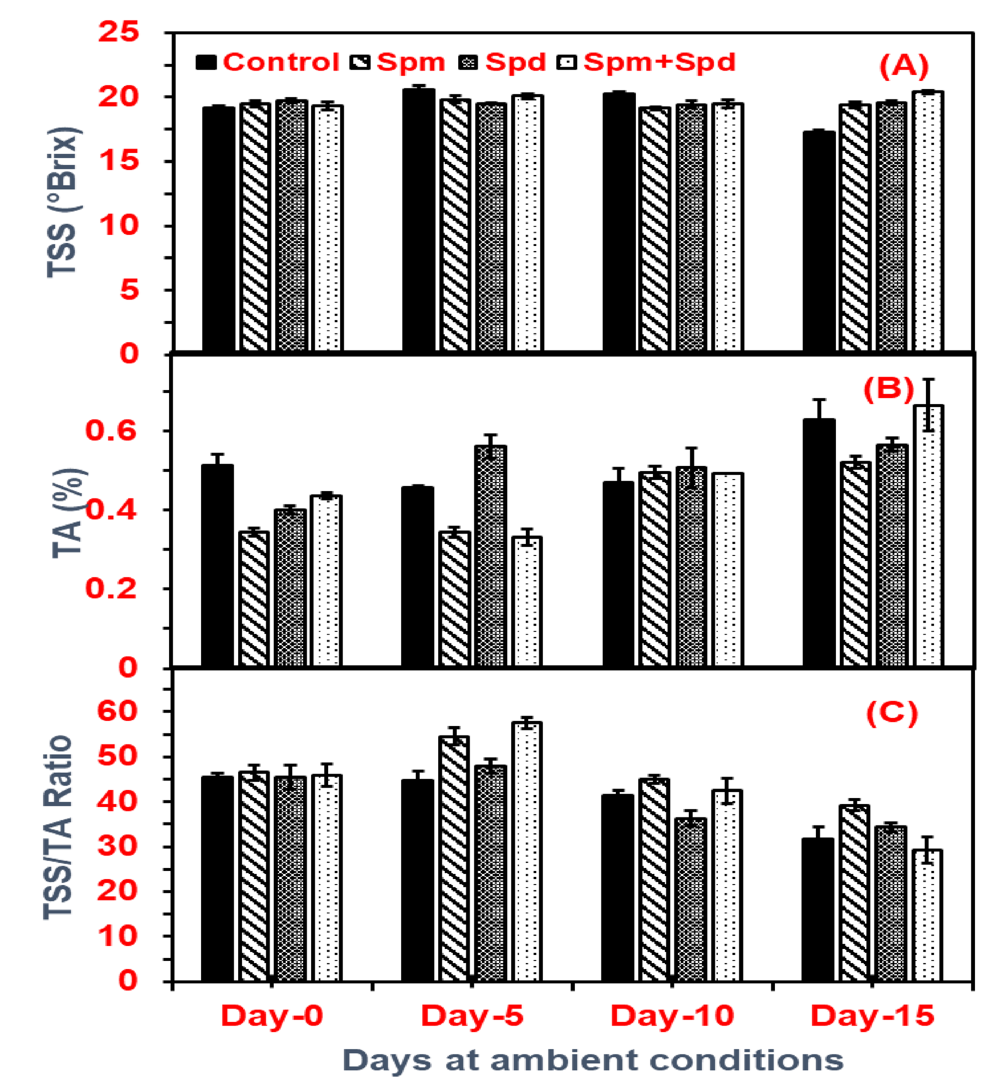

Fig.2: Effect of Postharvest polyamines (PAs) treatment and days at shelf (DAS) on total soluble solid [TSS: (A)], titratable acidity [TA: (B)] and TSS/TA ratio (C) of pomegranate cv. Sawa fruit juice at shelf.

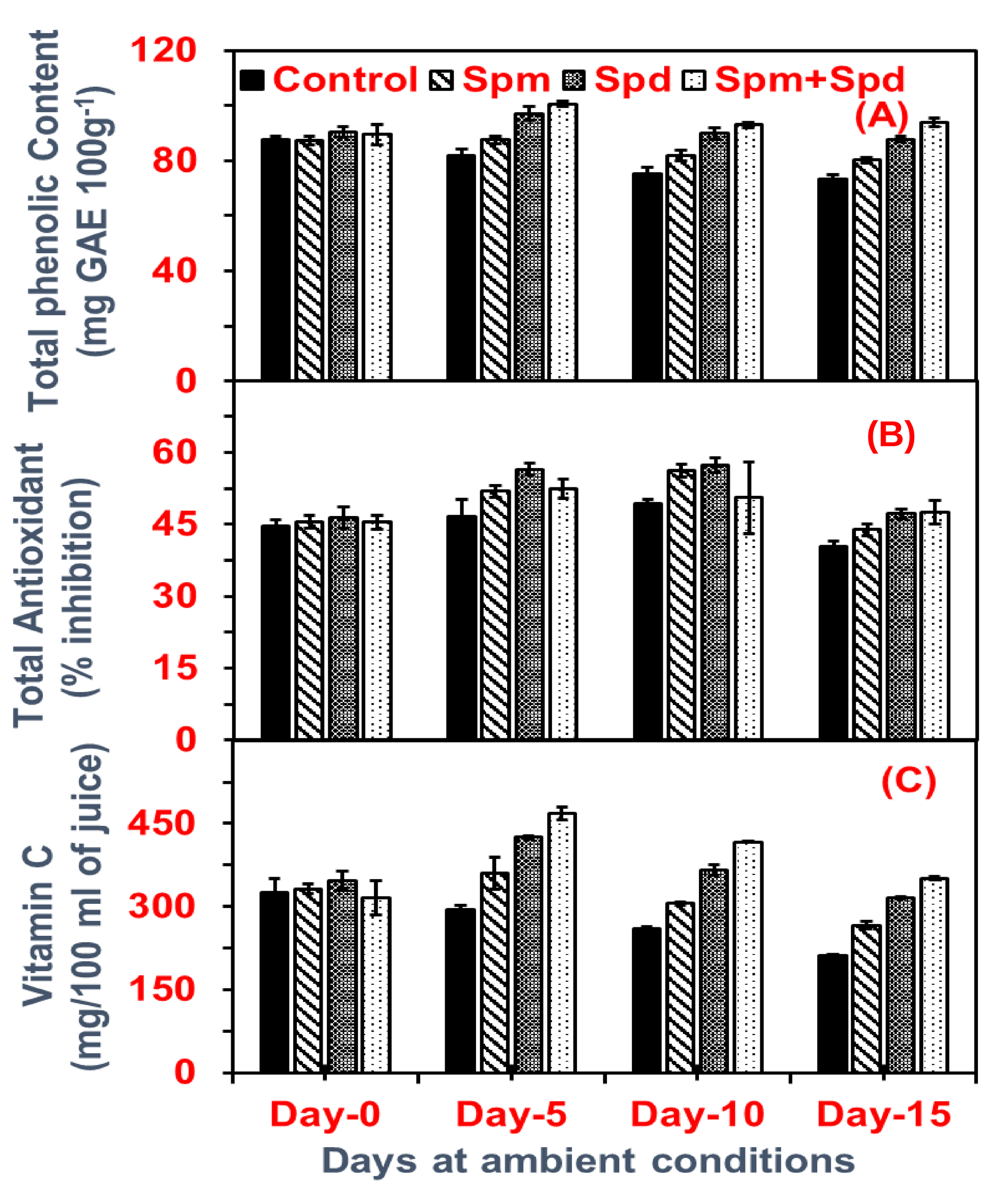

Fig. 3: Effect of Postharvest polyamines (PAs) treatment and days at shelf (DAS) on total phenolic content [TPC: (A)], total antioxidants capacity (B) and vitamin-C contents (C), of pomegranate cv. Sawa fruit juice at shelf.

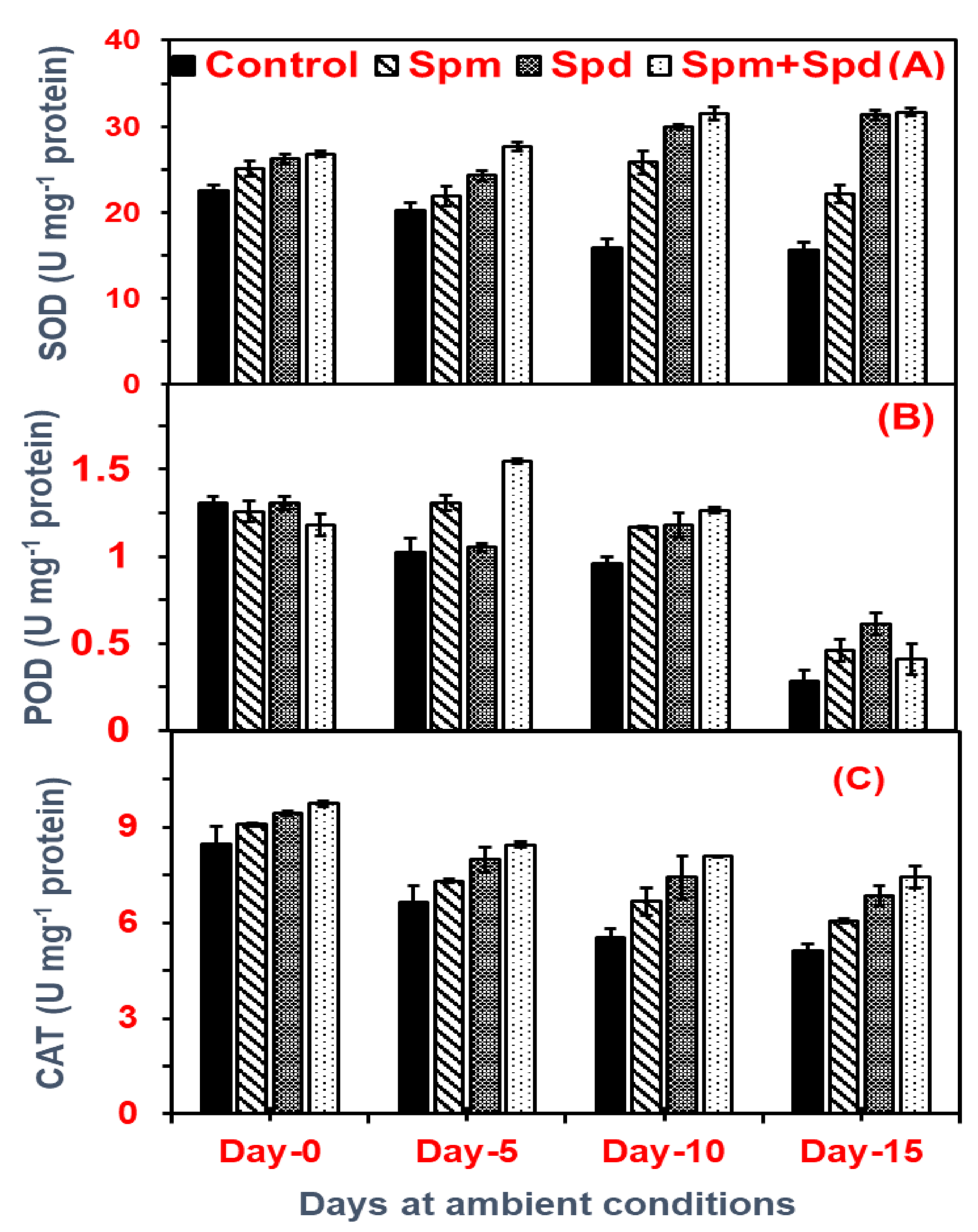

Fig. 4: Effect of Postharvest polyamines (PAs) treatment and days at shelf (DAS) on super oxide dismutase [SOD: (A)], peroxidase [POD: (B)] and catalase [CAT: (C)] of pomegranate cv. Sawa fruit juice at shelf.

Conclusion

Polyamines suppressed the overall physiological losses and improve the quality of pomegranate fruits.

The use of exogenous polyamines extended the shelf life of numerous fruits without affecting the quality of the fruit

Irrespective to shelf duration, combined SPM and SPD treatment lessened overall fruit losses and maintained fruit quality of pomegranate fruit at ambient conditions.

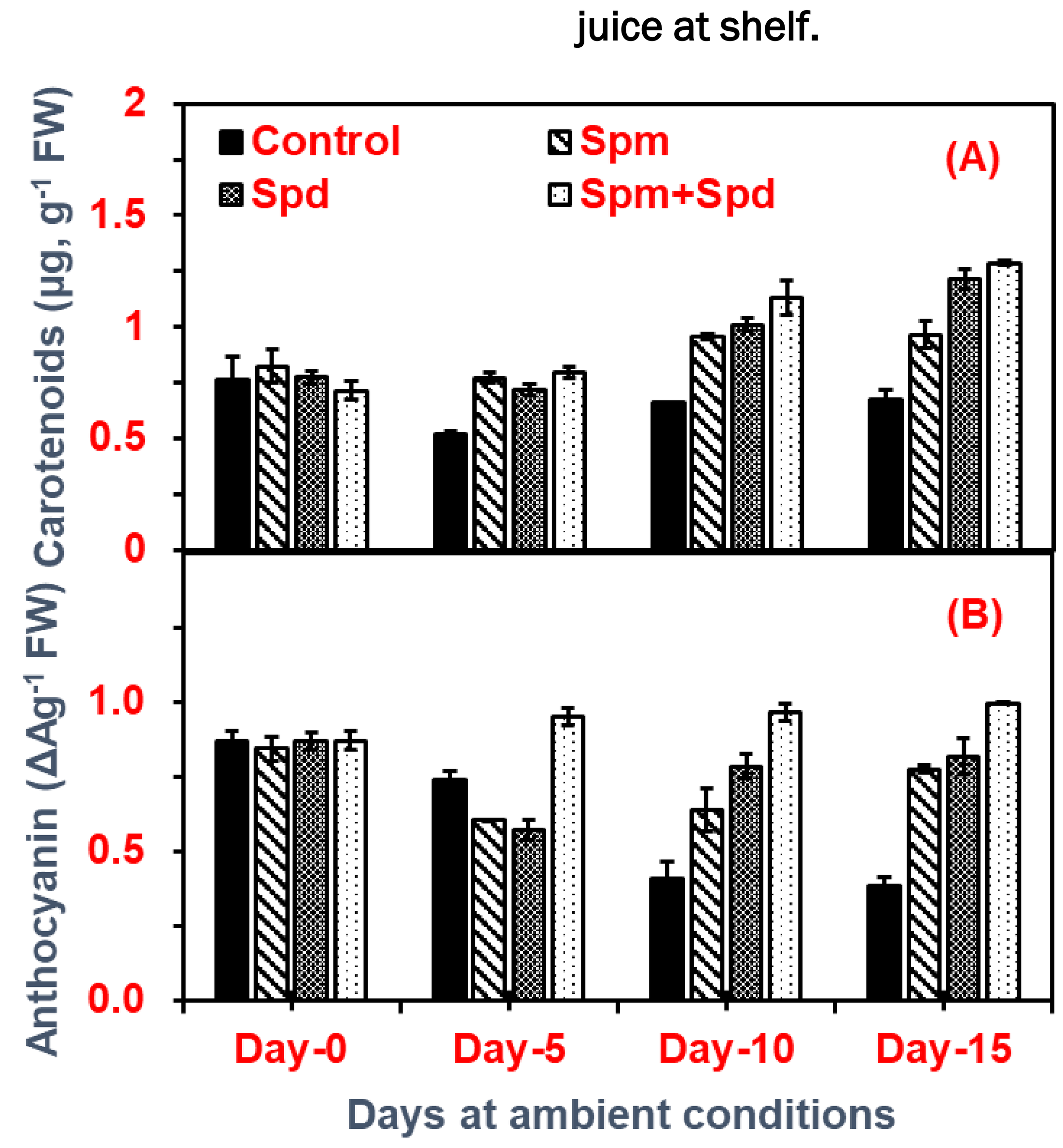

Fig. 5: Effect of Postharvest polyamines (PAs) treatment and days at shelf (DAS) on carotenoids (A) and anthocyanin (B) of pomegranate cv. Sawa fruit juice at shelf.

Acknowledgements

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