

Radiofrequency (RF) Treatment for Shelf Life Extension of Whole Tomato Fruits: A Novel Approach to Post-Harvest Preservation

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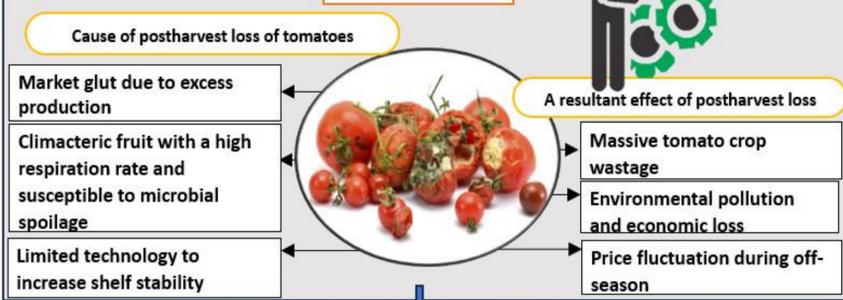
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INTRODUCTION

Tomatoes are a climacteric fruit with high perishability leading to significant loss post-harvest.

PROBLEMS



Need for robust postharvest technology to enhance the shelf life of whole tomatoes

Problem Mitigation

Radiofrequency heating treatment can be a promising non-chemical, green technology for extending the shelf life of tomatoes.

OBJECTIVE

To explore the potential of RF heating treatment at two different temperatures on whole tomatoes with/without calcium chloride pre-treatment (1%) at various storage conditions.

METHODOLOGY

Procurement of tomatoes at the pink stage from the selected farms

Fruits without defects, diseases, and uniform in size were taken for study.

Washing and air-drying

Without pre-treatment

Pre-treatment (1% CaCl₂)

Experimental Control

Radiofrequency treatment of whole tomato fruits

Air cooling to room temperature and stored at two different storage conditions (Ambient and Refrigerated conditions)

Observed for postharvest fruit quality attributes for the period of 28 days

- **Physiological parameters:** Physiological loss of weight (%), Respiration rate ($\mu\text{LCO}_2 \text{ kg}^{-1} \text{ h}^{-1}$)
- **Physical parameters:** Firmness loss (%), Tomato color index, Total color difference (ΔE)
- **Chemical parameters:** Titratable acidity (% citric acid equivalent), total soluble solids ($^\circ\text{Brix}$), pH

CONCLUSION

RF heating, particularly at 50°C for a short time, can be an effective method for preserving the quality of tomatoes during storage. The addition of calcium chloride further enhances the benefits, suggesting a synergistic effect that could be exploited in commercial post-harvest handling of tomatoes.

REFERENCES

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RESULTS AND DISCUSSIONS

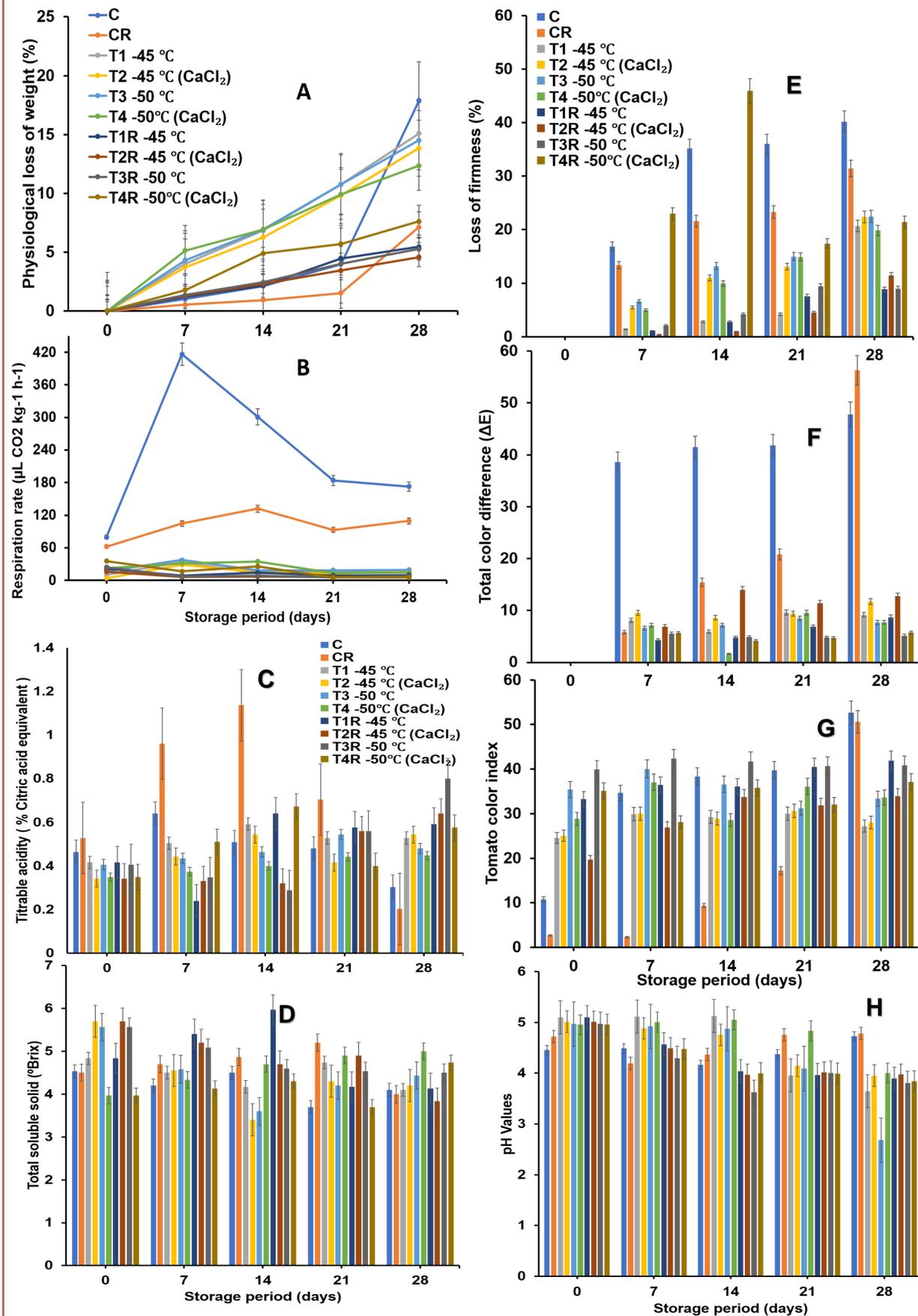


Figure 1: Effect of radiofrequency (RF) heating treatment in postharvest quality characteristics of whole tomatoes during storage under ambient and refrigerated conditions. Figure 1: Physiological parameters (A-B), Physical parameters (E-G) Chemical parameters (C, D, & H)

C: Control (ambient); CR: Control (refrigerated); T1-45°C: RF Treatment at 45°C without CaCl₂ (ambient); T2-45°C (CaCl₂): (CaCl₂) RF Treatment at 45°C with CaCl₂ (ambient); T3-50°C: RF Treatment at 50°C without CaCl₂ (ambient); T4-50°C (CaCl₂): (CaCl₂) RF Treatment at 50°C with CaCl₂ (ambient); T1R-45°C: RF Treatment at 45°C without CaCl₂ (refrigerated); T2R-45°C (CaCl₂): (CaCl₂) RF Treatment at 45°C with CaCl₂ (refrigerated); T3R-50°C: RF Treatment at 50°C without CaCl₂ (refrigerated); T4R-50°C (CaCl₂): (CaCl₂) RF Treatment at 50°C with CaCl₂ (refrigerated). Values are represented as mean \pm standard deviation (n=3)

- RF heating at both temperatures significantly affected the physiological, physical, and chemical properties of stored tomatoes.
- The treatment at 50°C with calcium chloride showed the most pronounced effect, resulting in the lowest respiration ($5.38 \mu\text{L CO}_2 \text{ kg}^{-1} \text{ h}^{-1}$) and minimized physiological loss of weight (5.26%), and loss of firmness (8.95%), higher TSS (4.73°Brix) and lower titratable acidity (0.58% citric acid equivalent) were observed in treated tomatoes, particularly under refrigerated conditions.
- Interestingly, color parameters were retained better in RF treatment at 50°C without calcium chloride at both storage conditions.

ACKNOWLEDGEMENTS