TEMPERATURE EFFECT ON STORED TOMATOES (*LYCOPERSICUM ESCULENTUM* L.) QUALITY PARAMETERS

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OBJECTIVE

To evaluate temperature (2, 5, 10, 15, 20 ^{o}C) effects on tomato quality attributes, such as colour (CIELab parameters, hue (^{o}h)), firmness (maximum force, N), weight loss (%), titratable acidity (g citric acid.100 g^{-1}) and total phenolics content (mGAE.100 g^{-1}) during storage, and determine the optimal storage conditions.

INTRODUCTION

Tomatoes are a relevant fruit in Mediterranean diet with potential benefits to human health and well-being, due to their richness in antioxidants compounds, namely carotenoids (especially lycopene), phenolic composition and vitamin C [1]. Ripening is a complex process of fruit development, which can be described as a result of biochemical and physiological changes leading to a ripe stage that culminates in dramatic changes in texture, colour and flavour [2]. To slow fruits and vegetables respiratory metabolism, biochemical changes, microbial development and hence extending their shelf life, storage at low-temperatures are applied. However, limited information is available about overall implications of different storage conditions on tomato quality.

MATERIAL & METHODS

Materials: Tomatoes at mature-green stage

Storage: 2^{o}, 5^{o}, 10^{o}, 15^{o} and 20 ^{o}C at 80-90% RH during 39 days

Methods:

- Colour CIELab (Minolta CR-300, a* and $^{o}h = tg\left(\frac{a^*}{b^*}\right)$, 16 replicates)
- Firmness (TA-HDi Texture Analyser, maximum force (N), 16 replicates)
- Weight loss (%, Eq. 1, 3 replicates)
- Titratable acidity ([3], g citric acid per 100g of tomato, Eq. 2, 6 replicates)
- Total phenolics content ([4], mGAE.100g^{-1}, 6 replicates)

Eq.

$$\text{Weight loss} = \frac{(\text{initial weight} - \text{final weight})}{\text{initial weight}} \times 100 \quad (1)$$

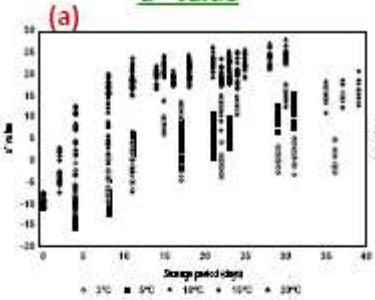
$$\text{Titratable acidity (g citric acid 100 g}^{-1}) = \left(\frac{\text{ml NaOH}}{\text{g sample}} \times 100\right) \times 0.067 \quad (2)$$

Data Analysis:

Data were subjected to analyses of variance (Main effects - ANOVA) using a Statistic v.7.0 Software [5] to determine the effect of temperature and storage time on tomatoes quality. Significant differences between samples were detected using Scheffé test (significant at $p < 0.05$).

RESULTS AND DISCUSSION

a* value



Hue value

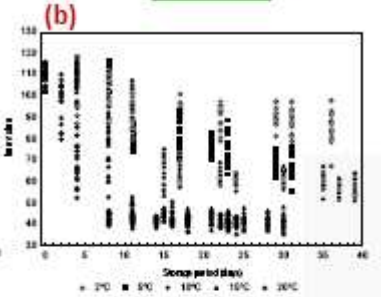
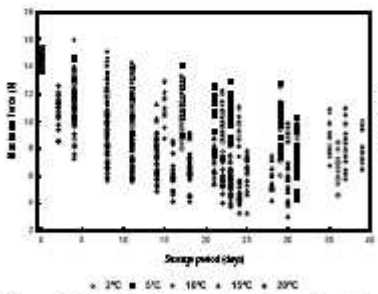


Figure 1 – Tomatoes a* (a) and ^{o}h (b) colour parameters as a function of temperature and storage time.

During storage, a* value increased (≈ 10, 20, 26, 34 and 30 units) and ^{o}h decreased (≈ 25, 45, 53, 70 and 70 units) significantly ($p<0.05$), respectively at 2^{o}, 5^{o}, 10^{o}, 15^{o} and 20 ^{o}C. This behaviour was expected because of tomatoes red colour development. However, a delay of red colour was observed on tomatoes stored at low temperatures (2^{o}, 5^{o} and 10 ^{o}C).

Texture



Weight loss

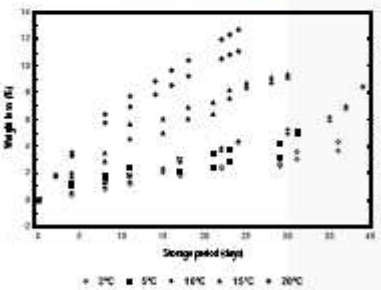
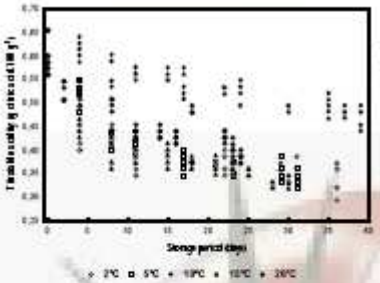


Figure 2 – Tomatoes firmness (maximum force, N) as a function of temperature and storage time.

Figure 3 – Tomatoes weight loss (%) as a function of temperature and storage time.

Firmness decreased significantly ($p<0.05$) during storage at all temperatures, but the highest decrease was verified at 20^{o}C (reduction of 70%). On the contrary, the lowest decrease was observed at 5^{o} and 10 ^{o}C (reduction of 27% and 36%, respectively).
In terms of weight loss, an increase during storage at all temperature was observed, being more distinct at higher temperatures (≈12% at 20^{o}C).

Titratable acidity



Total phenolics content

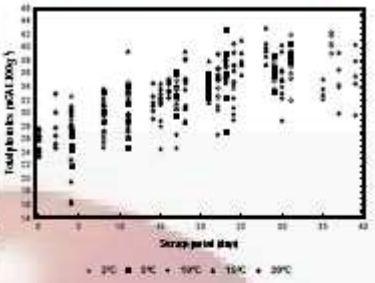


Figure 4 – Tomatoes titratable acidity (g citric acid.100 g^{-1}) as a function of temperature and storage time.

Figure 5 – Tomatoes total phenolics content (mGAE.100 g^{-1}) as a function of temperature and storage time.

A decrease in titratable acidity of stored tomatoes was denoted (≈ 0.25, 0.25, 0.12, 0.26 and 0.20 g citric acid.100 g^{-1} for 2, 5, 10, 15 and 20 ^{o}C, respectively). Decrease of tomatoes titratable acidity occurs because citric acid was used as substrate for respiration [6].
Total phenolics content increased with temperature and storage time about 62%, 52%, 40%, 60% and 50% at 2, 5, 10, 15 and 20 ^{o}C, respectively (Figure 5). This increase can be associated with the augment of enzymatic activity, especially phenylalanine ammonia-lyase (PAL), which plays an important role in phenolic compounds synthesis [7].

CONCLUSION

Temperature and storage time affects tomatoes quality in terms of physical-chemical properties, as well its shelf-life and, accordingly, the best storage temperature for quality maintenance and delaying fruit senescence is between 5 ^{o}C to 10 ^{o}C.

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