

HEAT TREATMENT EVALUATION ON QUALITY AND SAFETY OF WHOLE TOMATO (*LYCOPERSICON ESCULENTUM* L.) FRUITS



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Introduction

Tomatoes (*Lycopersicon esculentum* L.) are a climacteric fruit, and during ripening several important changes occur on physical-chemical quality. Treatments, such as heat treatment (HT), have been investigated for controlling postharvest fruits and vegetables quality. HT inhibits biochemical pathways involved in ripening, like chilling injury and external skin damage during storage.

OBJECTIVE: Studies were conducted to find the effects of HT (temperature range 40-50°C; different times) on quality and safety attributes of mature-green tomatoes, namely, colour (CIELab parameters), texture [Maximum force – MF, (%)], total phenolics content [TPC, (%)], peroxidase activity [POD, (%)], microbial count and moulds & yeasts (Log_{10} CFU.g⁻¹).

Material

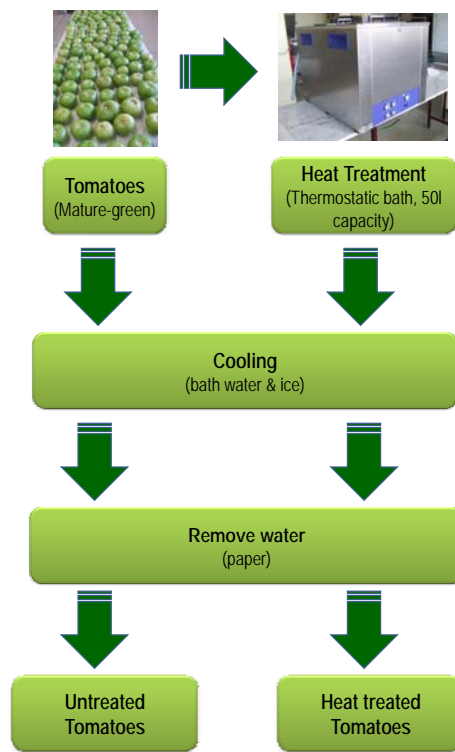


Table 1 - Heat treatment conditions .

T (°C)	40	45	50
0	0	0	0
5	5	5	2
15	10	5	5
30	20	7	7
45	30	10	10
60	40	15	15

Methods

- ✓ **Colour**
 - Minolta CR-300
 - CIELab parameters
 - 16 replicates
- ✓ **Texture**
 - TA-HDI Texture Analyser
 - Maximum force (MF, %)
 - 6 replicates
- ✓ **Total phenolics content**
 - Singleton & Rossi, 1965
 - % TPC
 - 6 replicates
- ✓ **POD activity**
 - Yahia *et al.* (2007)
 - % Activity
 - 6 replicates
- ✓ **Microbial count & moulds and yeasts**
 - NP 4405 /2002 & NP 3277 /1987
 - Log_{10} (CFU.g⁻¹)
 - 3 replicates

Data analysis

Data were subjected to analyses of variance (one way ANOVA) using a Statistic v.7.0 Software (StatSoft, Inc., 2004) to determine the effect of heat treatment on tomatoes quality. Significant differences between samples were detected using Scheffé test (significant at $p < 0.05$).

Conclusions

The more effective HT in terms of total elimination of microbial count and moulds and yeasts, without negatively effect on tomatoes quality attributes appears to be at 50°C. However, more studies are required to conclude about the efficiency of HT on tomatoes quality and safety during shelf life period.

Results & Discussion

Colour & Texture evaluation

Fig. 1 and 2 show the effect of heat treatment on tomatoes a* colour parameter and maximum force, respectively.

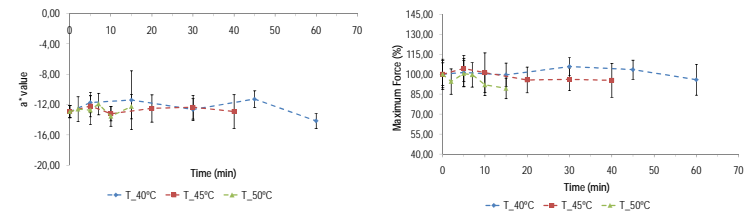


Fig 1 -- Effect of HT on tomatoes a* colour parameters. Bars represent mean \pm standard deviation.

Fig 2 -- Effect of HT on tomatoes maximum force (%). Bars represent mean \pm standard deviation.

The a* colour value of untreated tomatoes was -12.94 ± 0.80 . Only at 60 min of treatment, a significantly decrease ($p < 0.05$) was observed.

Untreated tomatoes maximum force was $16.23 \pm 1.63\text{N}$ (100%). Firmness of HT tomatoes at 40°C and 45°C was not significantly ($p > 0.05$) affect. However, at 50°C/10 min and 50°C/15 min, a decrease of 8% and 10%, respectively, can be observed.

TP content & POD activity

Fig. 3 and 4 show the effect of heat treatment on tomatoes TP content (%) and POD activity (%), respectively.

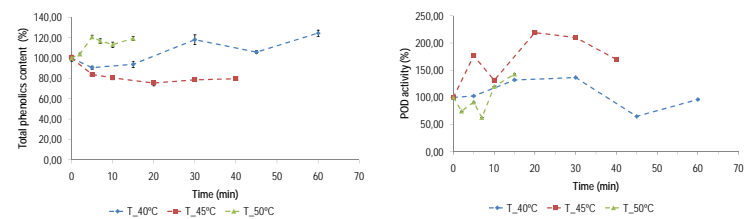


Fig 3 - Effect of HT on tomatoes total phenolics content (%). Bars represent mean \pm standard deviation.

Fig 4 - Effect of HT on tomatoes POD activity (%). Bars represent mean \pm standard deviation.

Untreated tomatoes TP content was 29.49 ± 2.05 mGAE.100g⁻¹ (100%). The application of higher temperatures and longer times of treatment appear to increase the tomatoes TP content.

Untreated tomatoes POD activity was 2.33 ± 0.13 Abs.min.ml⁻¹(100%). An opposite behavior was observed in POD activity related with TP content. For example, at 50°C a reduction on POD activity and an increase of TP content, was observed.

Microbial count & moulds & yeasts

The effect of heat treatment on microbial count and moulds & yeasts are presented in Fig. 5 and 6, respectively.

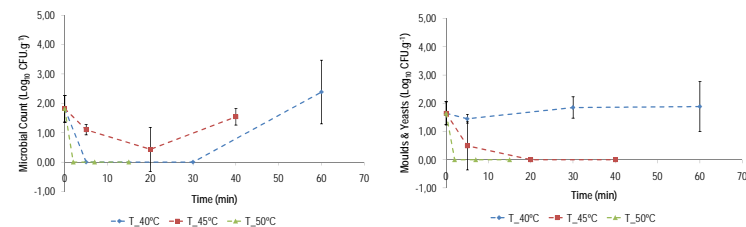


Fig 5 - Effect of HT on tomatoes microbial count (Log_{10} CFU.g⁻¹). Bars represent mean \pm standard deviation.

Fig 6 - Effect of HT on tomatoes moulds & yeasts (Log_{10} CFU.g⁻¹). Bars represent mean \pm standard deviation.

Untreated tomatoes microbial count and moulds & yeasts were 1.82 ± 0.45 & 1.65 ± 0.41 Log_{10} CFU.g⁻¹, respectively. In all the evaluated treatments conditions, with exception of 40°C/60min, a decrease of microbial load was observed. Tomatoes treated at 45°C and 50°C revealed a reduction in terms of moulds and yeasts load during treatment, being more effective at higher temperature and time. After 2 min at 50°C a total elimination was denoted in terms of moulds and yeasts.

References:

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