Application of commercial disinfectants to improve chestnut fruit sanitation

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Introduction and Objectives

Fresh European chestnut (*Castanea sativa* Mill.) has intermediate perishability characteristics between fresh and dried fruits. Weight loss, infestation by insects or live larvae, decay, and fungal development are some of the problems observed after harvesting and storage. These problems lead to significant economic losses for chestnut producers.

The conservation methods currently used by the chestnut industry (conventional hydrothermal treatment, 50 °C/45 min, to eliminate insect larvae and eggs) are not enough to minimize the problems observed during storage. Thus, this work aimed to test an alternative/complementary way of post-harvest treatment of fresh chestnuts, using an appropriate disinfectant based on sodium hypochlorite, available on the market and used in the food industry.

Material and Methods

- Fresh chestnuts (*Castanea sativa* Mill.) were provided by a local enterprise in the North of Portugal (Agromontenegro, Carrazeda de Montenegro). After transportation to the laboratory, the chestnuts from the same lot were subjected to two post-harvest treatments, in a 7 L:3 kg ratio (solution:chestnut):
  - ✓ (**TA**) Immersion in a hot water bath at 50ºC/45 min (conventional hydrothermal treatment);
  - ✓ (**TB**) Immersion in a cold water bath with sodium hypochlorite (100 mg/L of active chlorine) for 10 min;
- After treatment, the chestnuts were stored in an industrial refrigeration chamber at 0 -2 ºC (Fig. 1).
- The population of mesophilic aerobic microorganisms (ISO 4833:2, 2013) and fungi (molds and yeasts) (ISO 21527-1:2008) was quantified after 0 (T0), 30 (T30), 60 (T60), 90 (T90) and 120 (T120) days of storage. Samples were taken in triplicate.

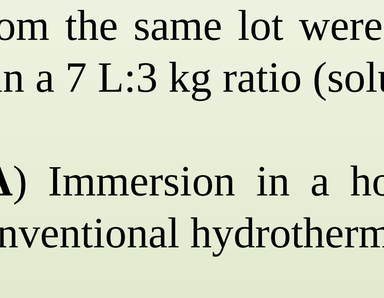
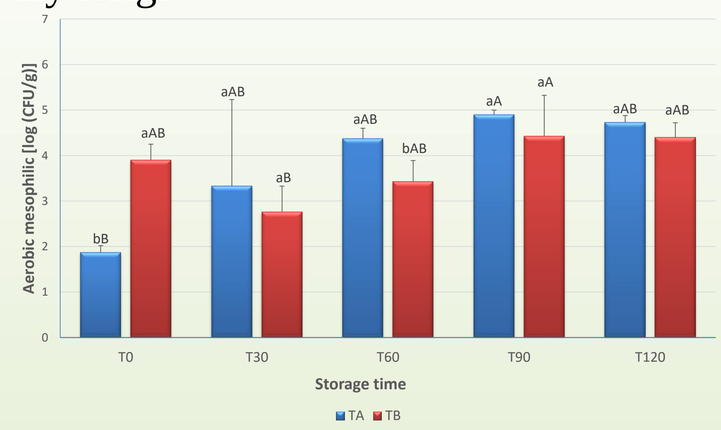


Figure 1. One of the perforated boxes containing trays with treated chestnuts, for industrial chamber storage.

Results and Discussion

During storage, the microbial load of aerobic mesophiles ranged from 1.9±0.15 to 4.9±0.10 log CFU/g in the hot water treatment (TA), and from 2.8±0.60 to 4.4±0.89 log CFU/g in the treatment with cold water and sodium hypochlorite (TB) (Fig. 2i). Regarding the fungal load, it ranged from 1.4±0.00 to 5.8±0.89 log CFU/g and from 3.1±0.00 to 4.4±0.85 log CFU/g in treatments A and B, respectively (Fig. 2ii). It should be noted that the conventional treatment was more effective in reducing the microbial load immediately after the applied treatments. However, treatment with hypochlorite prevented the growth of microorganisms for up to 60 days (Fig. 3). Thus, although cold sodium hypochlorite solution does not sanitize as well as hot water, in the long term it becomes useful to reduce microbial growth, especially fungi.

(*i*)



(*ii*)

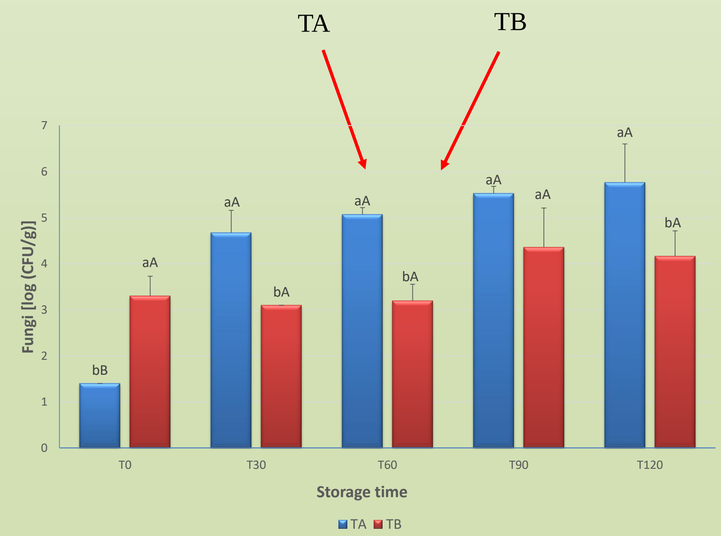


Figure 2. Mean counts (log cfu/g ± standard deviation) of aerobic mesophilic microorganisms (*i*), yeasts and molds (*ii*), analyzed in chestnuts throughout storage. Lowercase letters indicate the statistical difference between treatment for the same sampling time; Different capital letters indicate statistical differences over storage time per treatment ($p<0.05$).

Figure 3. Visual appearance of chestnuts after 60 days of storage.

Conclusions

The results showed that the disinfectant sodium hypochlorite significantly reduced the microbial load of fungi up to 60 days of chestnut storage in a refrigerated chamber. Thus, treatment in a cold water bath with sodium hypochlorite can be an alternative or a complement to conventional treatment, aiming to increase the shelf life of fresh chestnuts; however, more studies are needed.

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