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Influence of pasteurization treatment and storage in antioxidant activity of pomegranate juice

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Abstract. The combination of time and temperature of pasteurization treatments and storage conditions are important factors in the degradation of the organoleptic and nutritional properties and bioactive compounds of pomegranate juice. Therefore, the influence of pasteurization (high and low temperature) and storage conditions (refrigerated and room temperature) on the variation of the antioxidant capacity of processed juice was evaluated. The analysis of the results indicates that cloudy juice does not suffers loss of antioxidant activity due to pasteurization. However, in the clarified juice the antioxidant activity loss due to the pasteurization treatments was between 20-25%. None of the juices studied showed loss of antioxidant capacity due to storage time.

I – Introduction

The antioxidant capacity of pomegranate juice is three times higher than those of red wine and green tea. It has been amply demonstrated that the antioxidant properties of pomegranate juice are mainly due to a group of compounds called polyphenols. The content of these compounds in pomegranate juice is limited to 0.2-1% depending on the variety. The major polyphenols described in the pomegranate are anthocyanins (as cyanidin-3-glucoside, cyanidin-3,5-diglucoside, and delphindin-3-glucoside), catechins, ellagitannins, gallic acid and ellagic acid (Gil *et al.,* 2000) even as anomers punicalagin (Seeram *et al.*, 2004). The compounds to which is attributed the high antioxidant capacity of pomegranate are the punicalagins group, followed by hydrolyzable tannins, anthocyanins and ellagic acid (Gil *et al.,* 2000). These compounds may also be affected by the pasteurization treatment and storage, reducing the quality of pomegranate juice.

II – Materials and methods

1. Juice extraction

Ten kilograms of pomegranate variety "Mollar Elche" from Elche Experimental Farm were used to obtain the juice. Juice was obtained by pressing of arils inside a nylon mesh with a laboratory pilot press (Zumonat C-40; Somatic AMD, Valencia, Spain). The resulting cloudy juice contained 10% pulp. For obtaining clarified juice, the cloudy juice was centrifuged at 4000 rpm for 10 minutes.

2. Juice pasteurization and storage

Both cloudy and clarified juices were subjected to pasteurization treatments at high and low temperature (HT and LT) for specified times in a semi-tubular pasteurizer 25 l / h (Mipaser Prototype). The juices were stored at room (25℃) and refrigeration temperature (5ºC) for 45 and 120 days, respectively.

3. Antioxidant capacity determination in Trolox equivalent (TEAC)

Antioxidant capacity of pomegranate juice was determined according to the method of Re *et al*., 1999. The radical cation was prepared by the reaction between a 7 mM solution of ABTS (2.2 '-azinobis (3-ethylbenzothiazoline-6-sulfonate, Sigma-Aldrich Corp. St. Louis, MO, USA) in water mixed with a 2.45 mM solution of potassium persulfate. The misture was incubated 24 h in dark at room temperature. Then this solution was diluted with water to reach an absorbance of 0.7 ± 0.02 at 734 nm, measured in a plate reader Spectrostar Omega (BMG LabTech GmbH, Offenburg Germany). To determine the antioxidant capacity of pomegranate juice, 200 µl of the $ABTS^{+}$ dissolution were mixed with 20 µl of juice and after 3 minutes the absorbance was measured at 734 nm, obtaining the value of the decrease in absorbance. This determination was carried out with a 1:50 dilution of juice. Trolox was used as standard and results were expressed in mmol Trolox equivalents per liter of juice.

III – Results and discussion

1. Antioxidant capacity of pomegranate juice

Figure 1 shows the changes in the antioxidant capacity of pasteurized cloudy and clarified pomegranate juices stored at 25ºC and 5ºC.

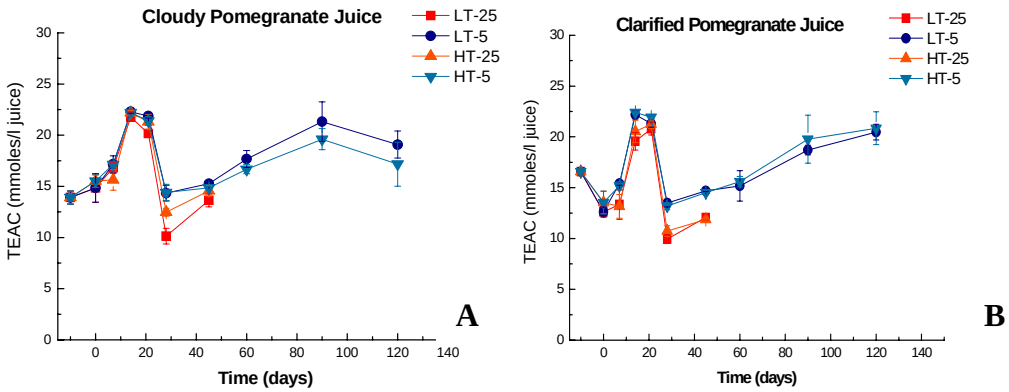

Fig. 1. Measurement of antioxidant capacity of pasteurized pomegranate juices stored at 25ºC and 5ºC. A, cloudy and B, clarified juices.

The analysis of the results indicates that in clarified juice (Fig. 1B), the loss of antioxidant capacity due to pasteurization treatment at HT and LT reached values between 20-25%. However, in cloudy juice (Fig. 1A) there was no loss in antioxidant capacity, increasing a 5% in both pasteurization treatments.

In Fig. 1, we observe how it behaves the antioxidant activity of juices due to the storage. Both

juices show an increase of the antioxidant capacity until day 14 after which it begins to decrease until day 28. This behavior is independent of pasteurization treatment and juice type. From day 28 the antioxidant capacity increases until the end of the storage period (45 days in samples stored at 25℃ and up to 120 days in samples st ored at 5℃). Hence, the juices have not a loss of antioxidant activity along the storage time, regardless of the juice type and pasteurization treatment. This may be due to the presence of polyphenol oxidation compounds with a high antioxidant activity (Gil *et al.*, 2000).

Conclusion

The treatment of pasteurization and storage temperature do not appear to influence decisively in the antioxidant capacity of pomegranate juice. Actually we are working in the identification and quantification of the major bioactive compounds occurring in the pomegranate juice (anthocyanins, phenolic acids, punicalagins, etc) to determine the relationship between changes in the profiles of these compounds and antioxidant capacity.

References

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