

VITAMIN C CONTENT: FRESH HOMEMADE VS. COMMERCIAL ORANGE JUICES

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INTRODUCTION

Citrus juices are important sources of health-promoting compounds. Orange juice, in particular, is rich in natural antioxidants, such as vitamin C. Human plasma levels of L-ascorbic acid are entirely dependent on dietary sources, such as fruits and vegetables, since we are unable to synthesize this vitamin. Moreover, evidence shows that in a great percentage of the population, plasma levels of this vitamin are suboptimal for the beneficial health effects of vitamin C. This important compound acts as an antioxidant, reducing the risk of cardiovascular diseases, arteriosclerosis and some forms of cancer. Dietary Reference Intake (DRI) for vitamin C was established by the Food and Nutrition Board of the Institute of Medicine, National Academy of Sciences. Values given for healthy males and females, >19 years, are 90 mg/day and 75 mg/day, respectively.

OBJECTIVES

- To determine total vitamin C content, L-ascorbic acid and L-dehydroascorbic acid in six samples of orange juice (one nectar, three concentrated juices, one filtered freshly squeezed juice and one unfiltered freshly squeezed juice);
- To evaluate the nutritional value of these juices as a source of vitamin C.

MATERIALS AND METHODS

- The oranges and orange juices were acquired in local supermarkets, and only the edible portion was analysed (Figure 1);
- Vitamin C content was determined by a highly precise and accurate high performance liquid chromatography method coupled with a photodiode array detector, previously validated;
- The total vitamin C content was determined by reducing dehydroascorbic acid to ascorbic acid (adding a reducing agent *tris*(2-carboxyethyl)phosphine, TCEP).

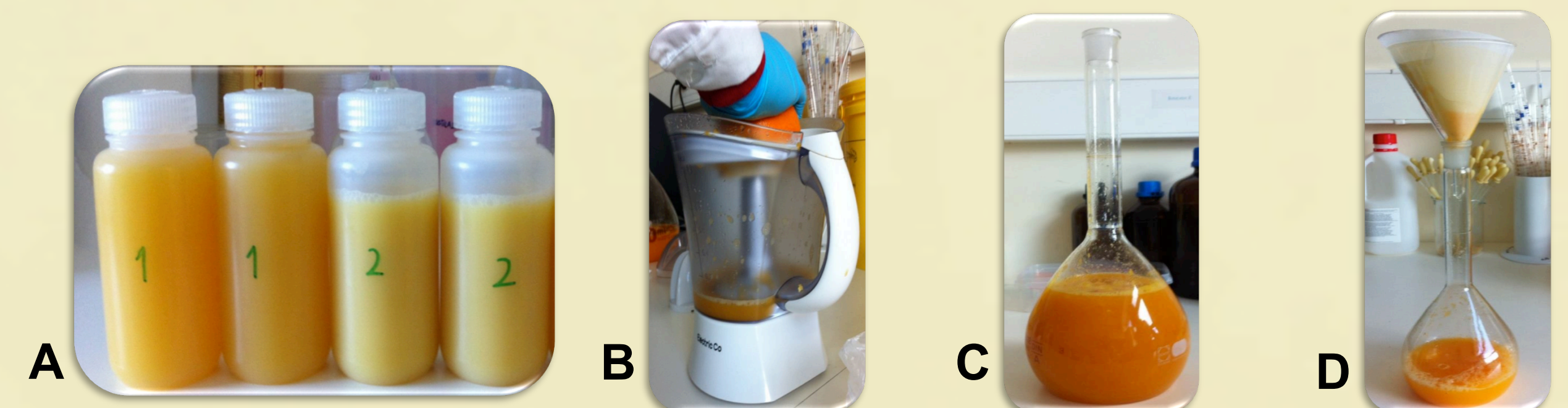
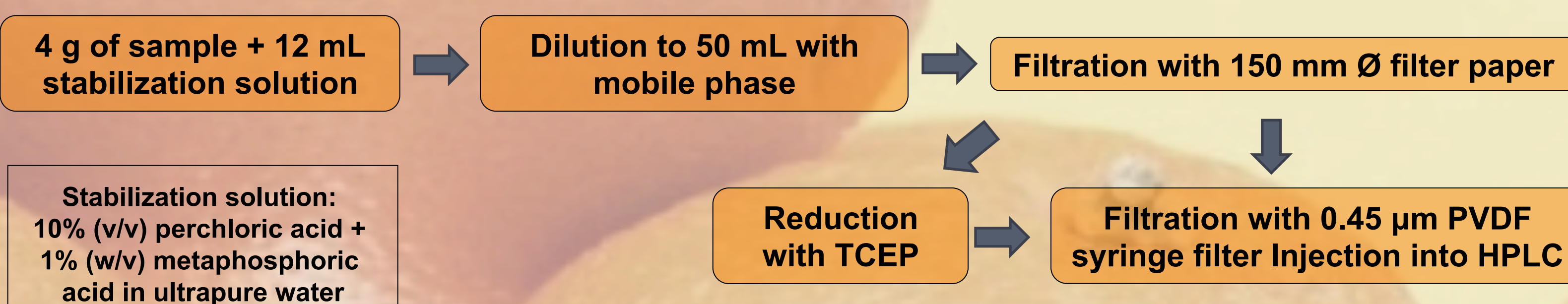


Figure 1. (A) Concentrated juices and nectar, (B) Squeezing, (C) Unfiltered freshly squeezed juice, (D) Filtered freshly squeezed juice

Sample preparation



Chromatographic conditions

Column	Synergi™Hydro-RP (150×4.6 mm I.D., 4.0 µm particle size)
Flow	0.6 mL/min
Column temperature	30 °C
Auto-sampler temperature	4 °C
Mobile phase	20 mM ammonium dihydrogen phosphate, pH 3.5 (adjusted with orthophosphoric acid 85%), and containing 0.015% (w/v) of metaphosphoric acid
Injection volume	20 µL
Run time	6 min

RESULTS AND DISCUSSION

- Total vitamin C content in the analysed samples varied between 42.5 ± 0.7 and 66.4 ± 0.2 mg/100 g of edible portion, for nectar and concentrated juice, respectively (Figure 2).
- The highest ascorbic acid value and the lowest dehydroascorbic acid content (60.9 ± 0.3 and 1.3 ± 0.6 mg/100 g of edible portion, respectively) were observed in the concentrated juice.
- The freshly squeezed juices presented higher vitamin C and ascorbic acid contents than the nectar.

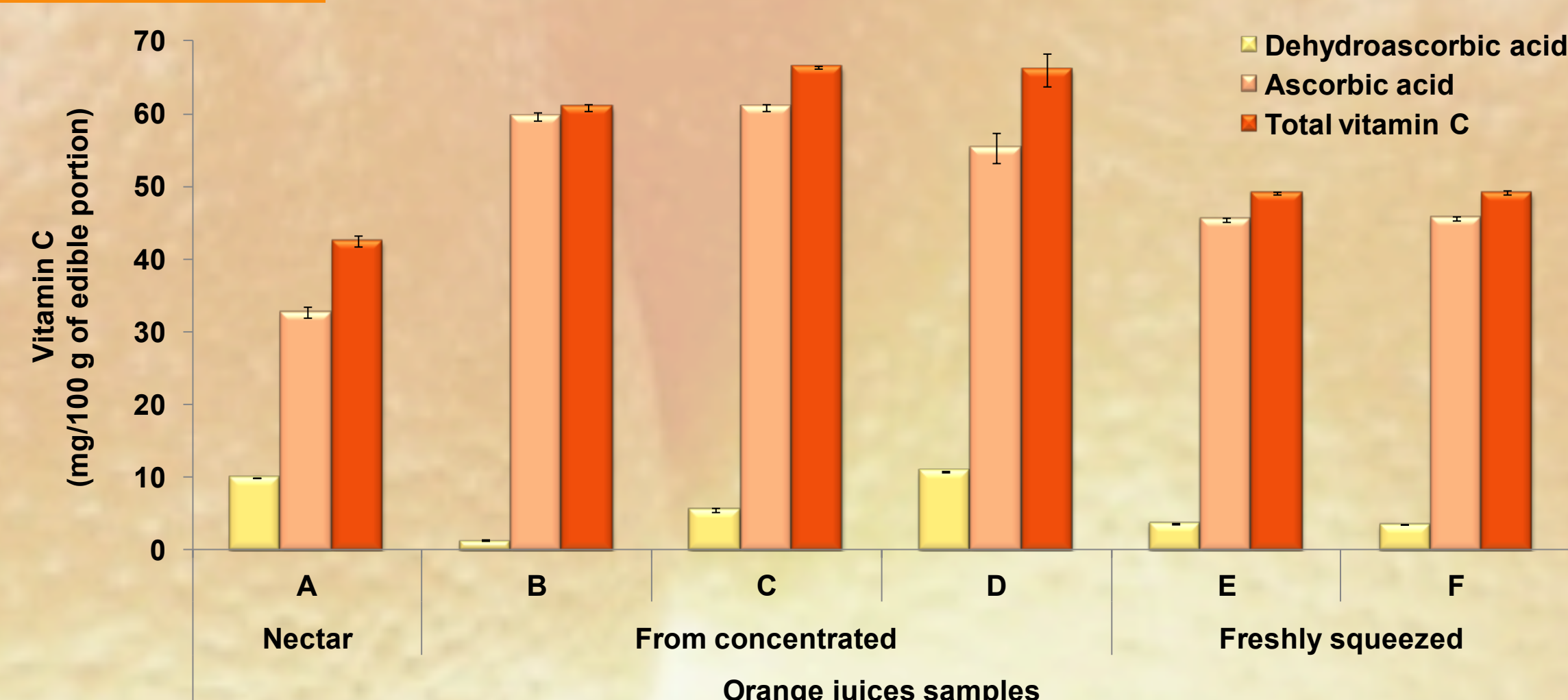


Figure 2. Total vitamin C, L-ascorbic acid and dehydroascorbic acid contents of the analysed orange juices.

- Considering an intake of 100 mL of juice, the commercial juices can supply 57% to 88 % of DRI for females and 47% to 74% of DRI for males.
- With respect to freshly squeezed orange juice, 100 mL can contribute with 65% and 54% of DRI, for females and males, respectively.

CONCLUSION

Taking into account the established DRI, orange juices can be considered a good source of vitamin C. Most of the vitamin C content in the analysed orange juices is due to the presence of L-ascorbic acid, which is the main biologically active form of this vitamin and it is an effective antioxidant. Since orange juice is an important and highly consumed source of vitamin C, and due to the wide range of different types of orange juices available in the market, it is essential to analyse total vitamin C content (L-ascorbic and L-dehydroascorbic acids).

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