ORIGINAL ARTICLES

Vitamin C Retention in canned orange Juice, Imitation orange Juice and orange beverage

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ABSTRACT

TWO cans of three brands of canned orange juice and one brand of orange beverage were reconstituted, one using an electric blender and the other by stirring. One can of imitation orange juice was reconstituted by stirring only. The beverages were analyzed immediately after reconstituting after 3 days, and after 7 days of storage in a refrigerator at 0 + 1 c (30-34f). Method of preparation did not have asignificant effect on vitamin c (ascorbic acid plus dehydro-ascorbic acid) levels. Both time and product affected vitamin c levels. The mean value for imitation and orange beverage were higher in vitamin c (52 mg/100ml) as compared with the canned orange juices (42 mg/100ml). All kinds of juice samples studied were slightly differ retention of vitamin c retaining 92 percent or more after 3 days and 88 percent or more after 7 days.

Key words: Reduced ascorbic acid (RAA)- dehydro-ascorbic acid (DHAA)- diketo-gluconic acid (DKGA).

Introduction

The susceptibility of ascorbic to aerobic oxidation and possible loss of vitamin activity prompted a study to determine vitamin c content of canned orange juice prepared using an electric blender which is different from that prepared by stirring, and to ascertain the stability of vitamin c in canned orange stored in a refrigerator for up to one week.

Both reduced ascorbic acid (RAA) and reversibly oxidized ascorbic acid, dehydro-ascorbic acid (DHAA), have vitamin c activity (Beston, G.H. and G.A. Henderson, 2004) loss of vitamin c activity occurs upon hydrolysis of DHAA to diketogluconic acid (DKGA), which does not have vitamin activity.

Materials And Methods

Experimental work:

Materials:

Canned orange juice (three brands of orange juice, an imitation orange juice and an orange beverage) were purchased from local markets at makka almokrma two 6-ounce cans (same lot number) of each orange juice and orange beverage were purchased for each replication.
Procedure:

One was mixed in electric mixer and the other by stirring. One 12-ounce can of imitation orange juice was purchased for each replication. The juices were transferred to jug for refrigeratore storage. Although the imitation orange juice reconstituted to more than jug, only 24 fluid ounces were stored in order to keep the amount of headspace in all bottles equal.

Five ml of each juice was removed for analysis immediately after preparation, after both 3 days and after 7 days of storage in refrigerator at 0+1 °C.

The beverages were mildly shaken by inverting each bottle 10 times. Four replications were done.

Statistical analysis of variance for all interactions was carried out according to (6), LSD at 0.05 level of significant was calculated.

Analytical method:

Five ml of juice were diluted to 100 ml with 5 percent metaphosphoric acid (pH 5), thoroughly mixed, and filtered through whatman NO. 4 filter paper three aliquots of this filtrate were then used to differentially analyse for RAA, DHAA, and DKGA according to (association of vitamin chemists, 1996, pp 328-332) A Bausch and Lomb electronic 20 (Bausch & Lomb, Rochester, NEW YORK) was used to read percent absorbance of samples and standard against the blank at 520 nm.

Table 1: Ascorbic acid content and retention (mg/100ml) of different kinds of orange juices stored at 0+1 °C for 3 and 7 days.

<table>
<thead>
<tr>
<th>KIND OF ORANGE JUICE</th>
<th>STORAGE TIME (DAYS)</th>
<th>BLENDER MG/100ML RAA+ TAA</th>
<th>BLENDER %RETENTION TAA</th>
<th>STIRE MG/100ML RAA-TAA</th>
<th>%RETENTION TAA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Orange juice</td>
<td>0</td>
<td>42.5-46.2</td>
<td>92.0</td>
<td>42.0-44.9</td>
<td>89</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>38.2-42.7</td>
<td>88</td>
<td>40.6-41.7</td>
<td>89</td>
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<tr>
<td></td>
<td>7</td>
<td>36.2-40.5</td>
<td>89</td>
<td>35.1-40.1</td>
<td>90</td>
</tr>
<tr>
<td>Brand B</td>
<td>0</td>
<td>43.3-45.0</td>
<td>96</td>
<td>41.6-44.8</td>
<td>92</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>38.7-43.0</td>
<td>89</td>
<td>37.0-41.1</td>
<td>92</td>
</tr>
<tr>
<td></td>
<td>7</td>
<td>34.9-39.9</td>
<td>89</td>
<td>35.3-40.2</td>
<td>90</td>
</tr>
<tr>
<td>Brand C</td>
<td>0</td>
<td>40.5-44.1</td>
<td>93</td>
<td>38.0-42.1</td>
<td>97</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>34.8-40.9</td>
<td>88</td>
<td>35.7-40.7</td>
<td>92</td>
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<tr>
<td></td>
<td>7</td>
<td>34.6-39.9</td>
<td>88</td>
<td>33.3-38.9</td>
<td>92</td>
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<td>Imitation orange juice</td>
<td>0</td>
<td>-</td>
<td>-</td>
<td>51.1-54.1</td>
<td>95</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>-</td>
<td>-</td>
<td>50.7-51.4</td>
<td>91</td>
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<tr>
<td></td>
<td>7</td>
<td>-</td>
<td>-</td>
<td>50.7-51.0</td>
<td>91</td>
</tr>
<tr>
<td>Orange beverage</td>
<td>0</td>
<td>52.1-55.2</td>
<td>93</td>
<td>50.9-55.6</td>
<td>100</td>
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<td></td>
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<td>45.7-51.5</td>
<td>92</td>
<td>46.6-55.6</td>
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<td>46.2-51.0</td>
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</tr>
</tbody>
</table>

RAA = reduced ascorbic acid, DHAA = dehydro ascorbic acid and TAA = total ascorbic acid.

Results and discussion

Ascorbic acid content and percentage retention data for the products included in this study are presented in table.

The TAA contents of the three brands of canned orange juice after reconstitution were similar. TAA levels for the four replications ranged from 49 to 61 mg TAA/100ml. Reconstituted juice with a mean of 55 mg/100ml.

The two concentrates containing synthetically derived vitamin C (imitation orange juice and orange beverage) were higher TAA than were the orange juices after reconstitution. TAA levels in four replications of these products ranged from 57 to 69 mg/100 ml with a mean of 65 mg/100 ml.

Canned orange concentrates reconstituted with an electric blender did not differ significantly at 0.05 level in total ascorbic acid (TAA) content initially or after storage from concentrates reconstituted by stirring. More specifically

Reconstituted products prepared by the two procedures were not significantly different at 0.05 level in RAA content. Thus reconstitution of frozen concentrates in an electric blender, as used in this study, does not appear to accelerate the oxidation of RAA to DHAA more than reconstitution by stirring.

All reconstituted products showed excellent stability of vitamin C during refrigerator and storage at 1 °C. after 3 days, all retained 92 percent or more initial TAA and after 7 days 88 percent or more. These values for TAA retention are in agreement with those reported by Beston and Henderson (1984) for orange beverage stored at 42 °F (5.6 °C) but they are higher than the 80 percent TAA retention (4 days storage at 42 °F) that these workers reported for orange juice. The higher retentions observed in this study can probably be explained by the lower storage temperature, as increased temperatures accelerate the rates at which RAA oxidation and DHAA...
hydrolysis occur. Consumers might expect slightly lower vitamin C retention than observed in this study if a temperature higher than 1°C is maintained in the refrigerator compartment.

This may not be the case for other food products where pH, temperature, storage time, and other factors may be more favorable for RAA oxidation and subsequent DHAA degradation.

References


