

# Chemical and technological studies on some vegetable and fruit juices

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**SUMMARY AND CONCLUSION** Juice and drink production is considered as being one of the largest food industries in Egypt. Although, there is a high increase in cantaloupe's production in Egypt especially in the new reclaimed areas and also the increase of the quantities, there is no production of juice or concentrations from it. Moreover, the grapefruit has not been used to prepare juice, concentrations and drinks. This is due to the problems of the bitterness that is existed during the technological treatments. So this study will carry out the production of new concentrations from Egyptian juices which have high quality. The aim of this investigation could be summarized as follows:

- 1-Study of the physical, chemical and flavor compounds of fresh cantaloupe and grapefruit juices.
- 2-Evaluation the effects of pasteurization on physical and chemical characteristics of cantaloupe and grapefruit juices.
- 3-Study of the effect of concentration methods (vacuum, reverse osmosis and freeze concentration) on the physical, chemical and flavor compounds after concentration process.
- 4-A trial to prepare the natural drinks from cantaloupe and grapefruit juices.

From the obtained results the following conclusion could be reached:

**I- The Cantaloupe Juice :**

**A- Physical, chemical characteristics and flavor compounds of fresh cantaloupe juice.**

- 1-The results showed that the fresh cantaloupe contained 91.49 % moisture, 8.5 % total soluble solids, 0.35% total acidity, 4.92 % reducing sugars, 2.76 % non-reducing sugars, 7.68 % total sugars, 17mg/100g free amino nitrogen, 0.231% ash, 37 mg/100g ascorbic acid and 7.08 % pulp content. (Fresh basis). The browning index and color measurements  $L^*$ ,  $a^*$  and  $b^*$  were 0.050, 29.87, - 9.21 and 21.44, respectively. Also the fresh cantaloupe contained 4.46 mg/100g chlorophyll (A), 8.92 mg/100g chlorophyll (B), 13.38 mg/100g total chlorophyll, 0.76 mg/100g total carotenoids, 14 mg/100g calcium, 9.87 mg/100g magnesium, 16 mg/100g phosphorus, 12.65 mg/100g sodium, 227 mg/100g potassium and 0.40 mg/100g iron (fresh basis).
- 2-The results indicated that, the dominant amino acids of fresh cantaloupe juice were aspartic acid, glutamic acid, alanine, leucine and arginine were 13.05, 24.48, 7.63, 6.33 and 5.75 g/100g protein, respectively.
- 3-The thirty four volatile compounds were identified in the fresh cantaloupe juice. The predominant compounds were 2-methyl —1-butyl acetate followed by ethyl propyl acetate, di-propyl disulfide, ethyl butanol and ethyl acetate were 26.29, 5.90, 5.94, 5.72 and 5.42 %, respectively.

**B-Effect of pasteurization on the physical and chemical characteristics of cantaloupe juice.**

from the obtained data it could be concluded that, the pasteurization of cantaloupe juice caused loss in ascorbic acid and total acidity by 4.13 and 5.83 %. The reducing sugars were increased slightly were by 0.98, while the non-reducing sugars were decreased by 1.95 %. In addition the free amino nitrogen and browning index were increased slightly from 202.45 to 219.01 mg/100g (dry basis) and 0.050 to 0.069, while the chlorophyll "B" and total chlorophyll were decreased slightly by 1.56 and 1.12%. The total soluble solids, pH, total sugars, ash,  $L^*$  value,  $b^*$  value and minerals content were not affected by pasteurization.

**C-Evaluation of different concentration methods on the physical and chemical characteristics juice.**

- 1-Effect of the concentration by vacuum concentration method on the physical and chemical characteristics of cantaloupe juice. The total soluble solids reached to 65 % (fresh basis) after 135 min. by vacuum concentration. The vacuum concentration leads to a decreased in total acidity, ascorbic acid, non-reducing sugars, total sugars, protein, free amino nitrogen,  $L^*$  value,  $b^*$  value, total chlorophyll

and total carotenoids. While the reducing sugars, browning index and  $a^*$  value were increased. The minerals and ash content were not affected by vacuum concentration method.

**2-Effect of the concentration by reverse osmosis method on the physical and chemical characteristics of cantaloupe juice.**

1-The total soluble solids reached to 21 % (fresh basis) after 45 min. by reverse osmosis method. The reverse osmosis method leads to a slight decrease in total acidity, reducing sugars, free amino nitrogen, ash content, ascorbic acid and potassium in the reconstituted juice. While the non-reducing sugars and browning index were increased slightly. The total sugars, protein, color, total chlorophyll, total carotenoids, calcium, magnesium and iron were not affected by reverse osmosis method.

**3-Effect of the concentration by freeze concentration method on the physical and chemical characteristics of cantaloupe juice.**

The total soluble solids reached to 43 % (fresh basis) after three stages from concentration. The freeze concentration method leads to a decrease in total acidity, ascorbic acid and free amino nitrogen. Also, the reducing sugars, non-reducing sugars, total sugars, protein ash,  $L^*$  value,  $b^*$  value, total chlorophyll and total carotenoids were decreased slightly. While the pH value, browning index and  $a^*$  value were increased slightly in the reconstituted juice.

**4-The results indicated that the reconstituted juice by reverse, osmosis, method had a lower changes in the physical and chemical characteristics than other concentration methods at 21 — 27 % T.S.S.**

**5-The results indicated that the reconstituted juice by reverse osmosis-freeze concentration method had a lower changes in the physical and chemical characteristics than other concentration methods at 40 — 45 % T.S.S.**

**6-The results indicated that the reconstituted juice by reverse osmosis — vacuum concentration method had a lower changes in the physical and chemical characteristics than other concentration methods at 60 — 65 % T.S.S.**

**7-The results indicated that the amino acids content of the reconstituted juice were decreased by using (R.O.C.), (F.C.), (R.O-F.C.), (R.O-V.C.), (V.C.) and (V.C.S.P.) methods by 3.81 , 7.31, 5.40, 25.59, 51.99 and 48.49 % , respectively.**

**8-The results indicated that the volatile compounds which were identified in the fresh and reconstituted cantaloupe juice after concentration by R.O.C. and F.C. methods were thirty four volatile compounds, the predominate compounds were 2-methyl-1-butyl acetate, ethyl propyl acetate, di-propyl disulfide, ethyl butanol and ethyl acetate. While the volatile compounds which were identified in the reconstituted juice by V.O method were twenty-five volatile compounds.**

**D- Preparation of natural drinks from cantaloupe juice :**

**1-The results indicated that the best composition of the cantaloupe drinks of the economic state and acceptability for consumer was 15 T.S.S. and 40 % natural juice by adding sodium metabisulphite.**

**2-The results indicated that there was no significant difference ( $P>0.05$ ) in the color taste, flavor, appearance and over all acceptability between drinks which content 40,45 and 50% natural juice during storage after 60 days at room temperature. While, the drinks which content 45 and 50 % natural juice were better than drinks which content 40 % natural juice after 90 days.**

**3-The results during storage for 90 days indicated that, the total acidity, reducing sugars, browning index and  $a^*$  value were increased slightly. While the non-reducing sugars, free amino nitrogen, ascorbic acid,  $L^*$  value and  $b^*$  value were decreased slightly during storage for 90 days.**

**II- The Grapefruit Juice :**

**A- Physical, chemical and flavor compounds of fresh grapefruit juice :**

**1-The results showed that the fresh grapefruit juice contained 90.23 % moisture, 9.5 % total soluble solids, 1.51% total acidity, 4.84 % reducing sugars, 2.33 % non-reducing sugars, 7.17 % total sugars, 24.05 mg/100g free amino nitrogen , 0.269% ash, 33.89 mg/100g ascorbic acid 527.52 p.p.m. naringin and 0.94 % pulp content. The browning index and color measurements  $L^*$ ,  $a^*$ , and  $b^*$  were 0.098, 37.25, - 2.66 and 7.67, respectively. Also, the fresh grapefruit juice contained 20.01 mg/100g calcium, 11.07 mg/100g magnesium, 18.20 mg/100g phosphours, 3.80mg/100g sodium, 176.50 mg/100g potassium and 0.35 mg/100g iron (fresh basis).**

**2-The results indicated that, the dominant amino acid of fresh grapefruit juice were aspartic acid, glutamic acid, proline and arginine were 29.72, 9.51, 11.73 and 9.87 g/100g protein.**

**3- The twenty five volatile components were identified in the fresh grapefruit juice. The predominant component was D-Limonene (68.51 %) followed by  $\alpha$ -terpineol (3.61 %), f3-caryophyllene (2.49 %) and linalool (1.54 %).**

**B-Effect of the bitterness**

removal on the physical and chemical characteristics of fresh grapefruit juice. The bitterness removal caused a decrease in total acidity and naringin content by 16.03 and 44.73 %, respectively. Also the total sugars, free amino nitrogen, browning index and ascorbic acid were decreased slightly. The protein content, ash, total soluble solids and minerals content had no significant changes by the bitterness removal by using florisol 5 % at 45°C for 15 min.

**C-Effect of the bitterness removal on the acceptability evaluation of grapefruit juice :** The results indicated that, the taste and over all acceptability of grapefruit juice were improved after treatment by florisol. While there was no significant change in flavor of grapefruit after treatment.

**D-Effect of pasteurization on the physical and chemical characteristics of grapefruit juice:** The pasteurization of grapefruit juice caused a slight decrease in total acidity, non-reducing sugars and ascorbic acid by 2.54, 4.22 and 4.61 %, respectively. While a slight increase in reducing sugars, free amino nitrogen, naringin content, browning index, L\* value and a\* value. The total soluble solids, pH, total... Stinv, 2, 271/ f 62012CL11012

**E- Evaluation of different concentration methods on the physical and chemical characteristics of grapefruit juice :**

**1-Effect of the concentration by vacuum concentration method.** The total soluble solids reached to 65 % (fresh basis) after 125 min. by vacuum concentration. The vacuum concentration method leads to a decrease in total acidity, ascorbic acid, non-reducing sugars, total sugars, protein, free amino nitrogen, L\* value and b\* value. While the reducing sugars, browning index, naringin content and a\* value were increased. The minerals and ash content were not affected by vacuum concentration method.

**2-Effect of the concentration by reverse osmosis method .** The total soluble solids reached to 25.5 % (fresh basis) after 60 min. by reverse osmosis method. The reverse osmosis method leads to a slight decrease in total acidity, reducing sugars, free amino nitrogen, ash, ascorbic acid, naringin, L value, phosphorus, potassium. While the non-reducing sugars and browning index were increased slightly. The total sugars, protein, at value, b\* value, calcium, magnesium and iron were not affected by reverse osmosis concentration method.

**3-Effect of the concentration by freeze concentration method.** The total soluble solids reached to 42.5 % after three stages from concentration. The freeze concentration method leads to a decrease in total acidity, ascorbic acid and free amino nitrogen. Also the reducing sugars, non-reducing sugars, total sugars, protein, ash, naringin content, L value, b\* value and minerals content were decreased slightly. While the pH value, browning index and a\* value were increased slightly.

**4-The results indicated that the reconstituted juice by reverse osmosis method had a lower changes in the physical and chemical characteristics than other concentration methods at 24- 26 % T.S.S.**

**5-The results indicated that the reconstituted juice by reverse osmosis-freeze concentration method had a lower changes in the physical and chemical characteristics than other concentration methods at 40 — 45 % T.S.S.**

**6-The results indicated that the reconstituted juice by reverse osmosis-vacuum concentration method had a lower changes in the physical and chemical characteristics than other concentration methods at 60 — 65 % T.S.S.**

**7-The results indicated that the amino acids content of the reconstituted juice were decreased by using (R.O.C.), (F.C.), (R.O.F.C.), (R.O.V.C.), (V.C) and (V.C.S.P.) methods by 3.59, 7.97, 5.42, 28.63, 51.07 and 48.60 % , respectively.**

**8-The results indicated that the volatile compounds which were identified in the fresh and reconstituted juice after concentration by (R.O.C.) and (F.C.) methods were twenty five volatile compounds. The predominant component was D-limonene (68.51 %). While the volatile compound which were identified in the reconstituted juice by (V.C.) method were eighteen volatile compounds.**

**c\_Curnmcaay Conofulion 199F- Preparation of natural drinks from grapefruit juice.**

**1-The results indicated that the best composition of the grapefruit drink of the economic state and acceptability for consumer was 13% T.S.S. and 35 % natural juice by adding sodium metabisulphite.**

**2-The results indicated that there was no significant differences ( $P>0.05$ ) in color, taste, flavor, appearance and over all acceptability in the samples which content 35 % natural juice during storage for 90 days. While there was significant difference ( $P<0.05$ ) in taste and over all acceptability in the samples of drink which content 40 % natural juice after 90 days from storage.**

**3-The results during storage for days indicated that, the reducing sugars, naringin content, browning index and a\* value were increased slightly. While the non-reducing sugars, free amino nitrogen, ascorbic acid, L\* value and b\* value decreased slightly during storage for 90 days.**

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