SOME PARAMETERS AFFECTING APRICOT NECTAR QUALITIY

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(Manuscript received 31 March 1997)

Abstract

This study was performed to assess the effect of pasteurization, homogenization, dearation, head space volume and storage at ambient temperature on dissolved oxygen, ascorbic acid, degree of discoloration and organoleptic properties of glass bottled apricot nectar. The obtained data ascertained that homogenization and large volume of head spaces increased the initially dissolved oxygen content followed by a gradual decrement after one month of storage. These treatments caused also high losses of ascorbic acid during storage, besides the degree of discoloration increased and the organoleptic properties were greatly affectted. On the other hand, apricot nectar in bottles having 5% head space and which formerly dearated or homogenized followed by dearation gave the least dissolved oxygen rate and degree of discoloration. Moreover, this nectar had the highest retention of ascorbic acid as well as preferable organoleptic properties.

INTRODUCTION

Colour is an important quality factor in marketing of fruit juices especially the bottled ones. However, detrimental changes in colour, primarily caused by non-enzymatic browning lower the consumer palatability and nutritional value of these products.

The pH value, ascorbic acid, phenolic compounds and dissolved oxygen in the juice, in addition to the packing container, head space, processing conditions, temperature, storage time and marketing usually affect the rate of non-enzymatic browning (Marshall et al. (1986).

Oxygen, either in the head space of bottled juic and/or dissolved in, is known to accelerate the browning reaction and degradation of ascorbic acid content Kanner and Shapira, (1989).

Moreover, Kanner *et al.* (1982) and Marcy *et al* (1984) reported that ascorbic acid degradation, either caused by enzymatic reaction or by oxidative ones in the presence of oxygen is thought to be one of the major pathways responsible for browning. Ohta *et al.*, (1983) found that head space volume had a much greater influence on juice browning and ascorbic acid losses. While, Kanner and Shapira (1989) observed that there was a linear correlation between the amount of oxygen in head spaces and degradation rate of ascorbic acid and browning. Rouhana *et al* (1990) found that the degradation of ascorbic acid was rapid during the first days of storage but was lowered during time and consumption of oxygen where a faster degradation rate was observed at higher oxygen contents. Kacem *et al.* (1987 a,b) and Trammell *et al.* (1986) found that ascorbic acid retention was increased by deaeration and prior to packaging which may prevent initial discoloration.

The total area of apricot cultivated in Egypt is about 7212 feddans producing about 44468 tons in (1995) (Anonymous, 1996).

Apricot (Prunus armeniaca) is an important and popular fruit in Egypt. There are many varieties of apricot such as Amar, Hamawy and Fayoumy.

Concerning the chemical composition of fruits Artik (1993), Beveridge (1994) and El-Saidawy *et al.* (1997) gave variable values for the percentages of different constituents of apricot fruits.

MATERIALS AND METHODS

Materials:

Mature apricot fruits (Prunus armeniaca, variety Amar) were obtained from a private orchard at Kalubia Governorate during 1995 season. About 100 kg of fruits were washed, sorted and steam blanched for about 2 min. Fruits were mechanically extracted using the Bertuzi-juice processing line of the Food Technology Research Institute, Agric. Res. Center, Giza. The extracted pulp was diluted with water at the ratio of 1:1 (W/W) and the total soluble solids contents were raised to 18% using sucrose. 1000 ppm sodium sorbate was added to the whole nectar for preservation.

The resulting nectar was subjected to four different treatments as follows:-

1. The first was homogenized using JANKE, KVNKEL-GMBHU, COKGULTRA TURRAX homogenizer of the Food Technology Res. Institute, Giza.

2. The second was deaerated in a chaber of 10 inches vacum.

3. The third was homogenized and deaerated.

4. The last portion was left as control.

The four apricot nectar treatments were packed in white glass bottles leaving 5% 7.5, 10%, 12.5% and 15% of head spaces. Bottels were tightly closed, pasteurized at 85°C for 20 min., cooled rapidly then stored for three months at ambient temperature (about 25°C).

Analytical Methods:

Moisture, total titratable acidity (calculated as citric acid), sugars, ptotein, fat, crude fiber and ash contents were determined according to the methods described in the A.O.A.C. (1990). Total soluble solids content was determined using Carl Zeis refractometer at 25°C. Ascorbic acid content was determined using the 2,6 dichlorophenol indophenol titration method described by Pearson (1984).

Dissolved oxygen (DO) in all nectars was determined according to the method described by Askar *et al.* (1994). Degree of discoloration (Dd) of apricot nectars was determined according to Askar and treptow (1993), where total colors related to the true carotenoids were extracted in petroleum ether while those responsible for brown colors were solube in the water phase. The absorbance of petroleum ether and water extracts were measured at 450 and 380 nm respectively.

Organoleptic evaluation was performed according to the method described by Larmod (1970). A scale from 0 to 10 was used. However the score 6 was considered as the limit of acceptability.

RESULTS AND DISCUSSION

I. Chemical composition of fresh apricot fruits:

From data given in table 1, it can be observed that the total soluble solids (T.S.S) in apricot fruits were 10.9%. Also the moisture content and total titratable acidity were 85.01% and 11.32%, respectively.

As for the reducing and non reducing sugars, they were 15.35% and 38.99% respectively. From the same table, it can be noticed that apricot fruits contained protein (3.22%).

On the other hand, apricot contained ascorbic acid (93.21 mg/100 gm on dry weight basis).

Generally, the results shown in Table 1 agree with those obtained by Ibrahim (1990) and El-Saidawy *et al* (1997).

Table 1. Chemical composition of Apricot fruits.

Constituents	%
Total soluble solids (T.S.S)	10.9
Moisture Content	85.10
Total titratable acidity (as citric acid* gm/100 gm)	11.32
Reducing Sugars* (g/100 gm)	15.35
Non reducing Sugars* (g/100 gm)	38.99
Total Sugars* (g/100 gm)	54.34
Protein* (g/100gm)	3.22
Fibers* (g/100 gm)	3.62
Ascorbic acid * (mg/100)	93.21

* Calculated on dry weight basis

II. Effect of processing and technological technique on nectar qualities:

1. Dissolved Oxygen Concentration (DO):

It can be observed from Fig (1) that dissolved oxygen increased by about 25-30% in the homogenized treatments at zero time, compared to the pasteurized ones. On the other hand, deaeration of both pasteurized samples and homogenized, then pasteurized, lowered the dissolved oxygen levels by about 25-45% compared to the pasteurized treatment. After one month of storage, the same trend could be observed with slight proportional increments of dissolved oxygen in the pasteurized treatment only and homogenized with pasteurized treatments according to their head space levels. These increments could be attributed to the available oxygen content in each bottle head space being dissolved in the nectar within this month of storage in proportional amounts according to the volume of air in every head space.

From the same table, it could be noticed that insignificant increments of dissolved oxygen in deaerated with pasteurized and homogenized, deaerated and pasteurized, either at zero time, or after on month of storage at ambient temperature.

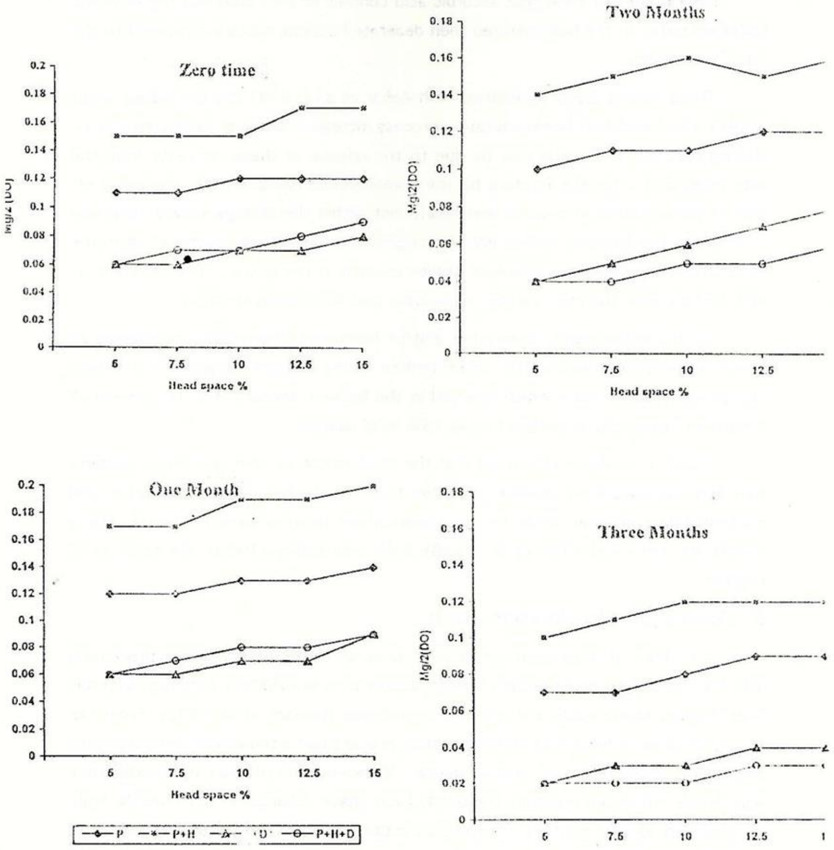

Fig. 1. Effect of some technological techniques on dissolved oxygen (Do) of bottled nectar during storage at ambient temperature (as mg/L).

However, dissolved oxygen levels were gradually decreased in all treatments up to the end of storage period. This may be due to oxidation reaction, being also in agreement with the findings of Labib (1992) and Askar *et al.* (1994).

2. Ascorbic acid content (Aa):

Data in Fig. (2) show that ascorbic acid content at zero time was higher in the homogenized or in the homogenized then deaerated apricot nectars compared to the other treatments.

These results are in agreement with Askar *et al.* (1994) and El-Saidawy *et al.* (1997) who found that homogenization process increased some of Juice contents including ascorbic acid which may be due to the release of these contents from the pulp fragments after the fracture by the homogenizer. However, this improving effect of homogenization process was nearly lost within the storage period especially in the large head space bottles. Both homogenization and large volume of air in the head spaces increased the sissolved oxygen content in the nectar. These two important factors were the main causes of ascorbic acid loss during storage.

On the other hand, deaeration and/or homogenization either separately or combined increased the ascorbic acid retention during storage compared to the pasteurization process alone which resulted in the highest amount of losses among all treatments especially in bottles having 15% head spaces.

Finally, it could be concluded that the combination of homogenization, deaeration and pasteurization process gave the best results for retaining ascorbic acid content during storage. While the only pasteurized samples were the worst. These results are agree with Chan *et al.* (1986); Bolin and Huxsoll (1989) and Askar *et al.* (1994).

3. Degree of Discoloration (Dd):

A number of deteriorative reactions occurred in the nectar during processing and storage due to many factors. These factors include oxidizing enzymes, ascorbic acid, sugars, amino acids and phenolic compounds (Labuza *et al.* 1992). From Fig. (3), it could be noticed that homogenization process had a pronounced effect on the degree of discoloration of apricot nectar. Moreover, this degree of discoloration was deeply influenced markedly the bottle head space volumes. In other words, higher dissolved oxygen contents in apricot nectars at zero time up to one month of storage were counteracted with deeper oxidative reactions which mostley led to discoloration. These deteriorations of apricot nectar color were more pronounced through the prolonged storage especially at the end of the third month.

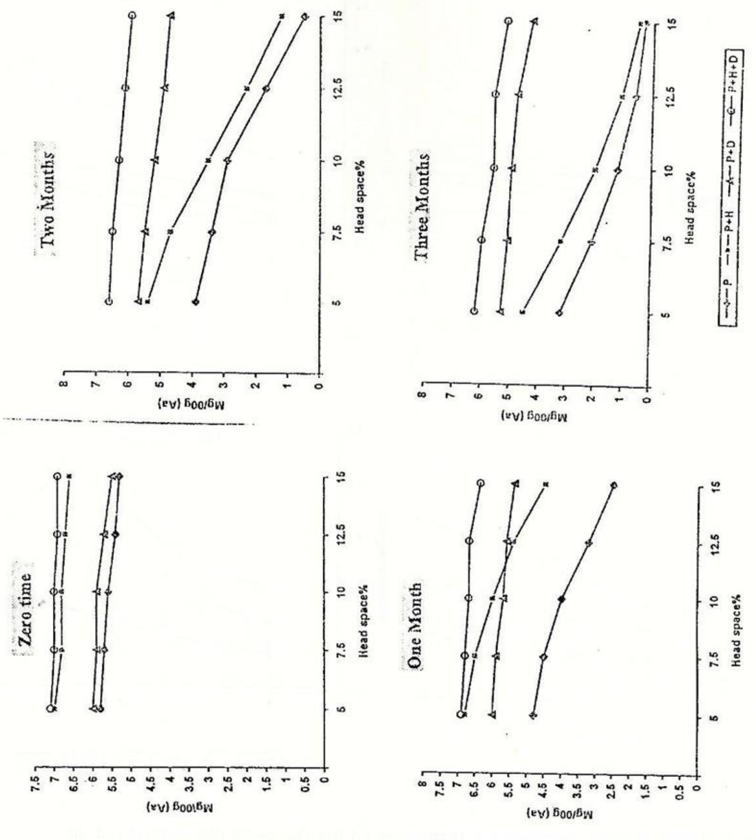

Fig.2: Effect of some technological techniques on ascorbic acid (Aa) of bottled nectar during storage at ambient temperature (as mg/L)

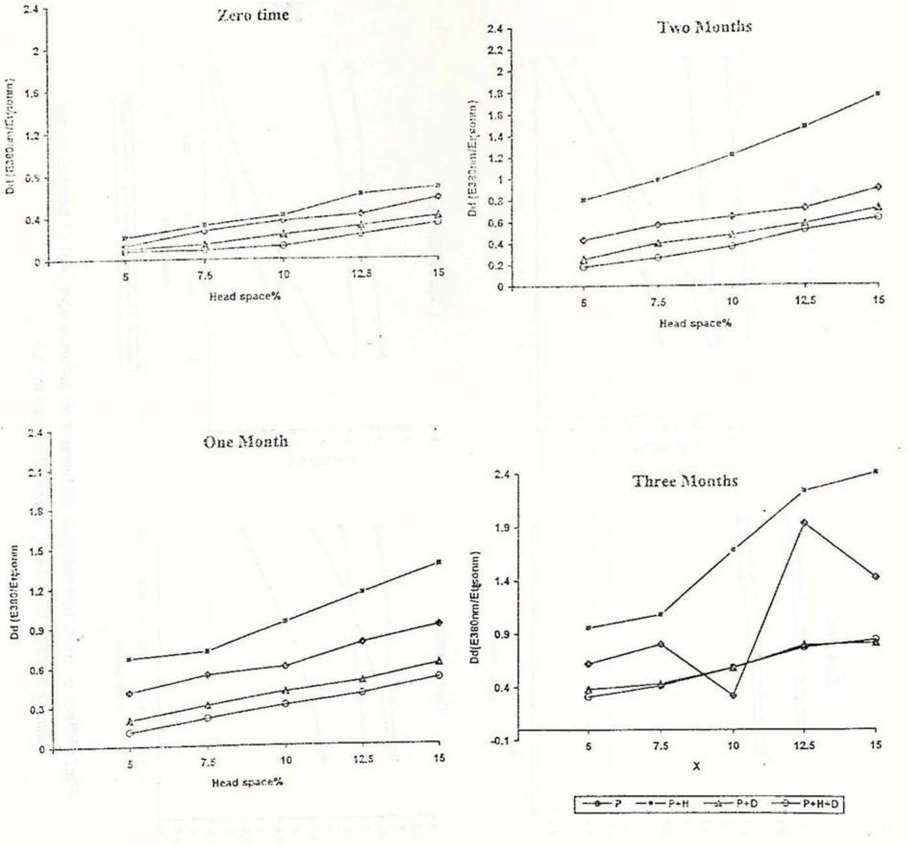

Fig.3: Effect of some technological techniques on the degree of discolosation of degree of des coloration.

Dissolved oxygen contents contents gradually declined from the begining of the second month. These decrements may be due to exhaustion of oxygen in oxidative and browning reactions.

it could be observed that deaeration process prevented initial deterioration, while the process of deaeration combined with homogenization had the medium effect.

On the other hand, pasteurzation and homogenization either separately or combined had the least protective effect. From tables (2, 3 and 4), it could be seen that undesirable change of apricot nectar color were more pronounced with the prolonged storage especially at the end of the third month, while the dissolved oxyen contents were gradually declined from the begining of second month. These decrements of dissolved oxygen may be due to oxidative reaction which causes browning color and some of these reactions lowered ascorbic acid level.

All results are inagreements with Jagtiani (1988), Abd-ElSalam (1991) and Askar *et al.* (1994).

4. Organoleptic Properties:

Colour, odor and taste of various apricot nectars were evaluated at zero time and after 3 months of storage. The obtained data are shown in Tables (5) and (6). It is clear that the containers having large head space volumes had insignificant effect on the organoleptic qualities at zero time while their scores declined after 3 months of storage. It could be also noticed that homogenization and deaeration process improved the color, odor and taste of apricot nectar at zero time while all the properties decreased in all treatments. But this decrement was highly observed in the color of homogenized treatments. The homogenized then deaerated apricot nectar bottler with 5% head space was the least changed in all three properties. These results are in agreement with Trammell *et al.* (1986); Jagtiani *et al.* (1988) and Labib (1992).

Finally, it could be recommended that homogenization separately or combined with deaeration with 5% head space in the glass package retained the high quality factors of apricot nectar. This apricot nectar had a delicious and distinctive flavor with attractive color, having approximattely its original chemical compositior.

Table 2. Organoleptic evaluation of apricot nectar at zero time as affected by different technological techniques

Treatment	Color					Odour					Taste				
Head Space %	5	7.5	10	12.5	15	5	7.5	10	12.5	15	5	7.5	10	12.5	15
P	8.15	8.10	8.12	8.15	8.10	8.10	8.07	8.0	8.05	8.0	8.30	8.35	8.22	8.20	8.27
P + H	9.05	9.10	9.0	8.98	9.07	8.93	8.71	8.80	8.91	8.70	9.45	9.42	9.50	9.40	9.38
P + D	8.82	8.75	8.90	8.80	8.75	8.21	8.29	8.07	8.10	8.15	8.15	8.21	8.10	8.18	8.16
P + H + D	9.15	9.20	9.12	9.11	9.15	8.56	8.44	8.51	8.45	8.58	9.35	9.30	9.22	9.30	9.27

Treatments :*
P : Pasteurization
P + H : Pasteurization and homogenization
P + D : Pasteurization and deaeration
P + H + D : Pasteurization, homogenization and deaeration.

Table 3. Organoleptic evaluation of apricot nectar after three months of storage at ambient temperature as affected by different technological techniques.

Treatment	Color					Odour					Taste				
Head Space %	5	7.5	10	12.5	15	5	7.5	10	12.5	15	5	7.5	10	12.5	15
P	7.65	6.63	6.01	5.85	5.57	7.25	6.03	5.99	5.50	5.05	7.50	7.11	6.63	5.90	5.7
P + H	7.38	6.25	6.01	5.60	5.49	7.55	7.33	6.86	6.33	5.95	8.36	8.02	7.53	7.13	6.96
P + D	8.15	7.96	7.60	7.35	7.11	7.60	7.20	6.99	6.30	5.91	8.30	8.15	7.61	7.35	7.17
P + H + D	8.20	8.00	7.70	7.60	7.30	7.63	7.20	7.01	6.90	6.58	8.52	8.25	8.00	7.10	7.32

*Treatments * : See Table 2*

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بعض المعايير الأساسية المؤثرة على جودة نكتار المشمش

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أجريت هذه الدراسة لمعرفة تأثير البسترة أو البسترة مع التجنيس أو مع إزالة الهواء وكذلك معرفة تأثير نسبة الفراغ القمى والتخزين على درجة حرارة الجو العادى على الأكسجين الذائب وحمض الأسكوربيك ودرجة تغير اللون والصفات الحسية لنكتار المشمش المعبأ فى زجاجات.

وقد وجد أن البسترة مع التجنيس وكذلك النسب العالية للفراغ القمى أدت إلى زيادة أولية فى الأكسجين الذائب يتبعها تناقص تدريجى بعد الشهر الأول من التخزين. وقد سببت هذه المعاملات فقداً كبيراً فى حمض الأسكوربيك خلال التخزين مع زيادة فى درجة تغير اللون وتدهور الصفات الحسية. كما دلت النتائج على أن ٥٪ فراغ قمى فى زجاجات نكتار المشمش التى تم بسترتها مع إزالة الهواء أو تجنيسها ثم إزالة هواءها وبسترتها أعطت أقل كمية من الأكسين الذاءب وأقل تغير فى اللون وإحتفظت بأعلى قدر من حمض الأسكوربيك والصفات الحسية.