CHEMICAL STUDIES ON VIRGIN OLIVE OILS IN GAZA STRIP

2- Effect of Olive Fruits Storage on Olive Oil Quality

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ملخـــص البحـــث

يهدف هذا البحث إلى دراسة التغيرات في جودة زيت الزيتون المستخلص من ثمار خزنت في غرفة تحت ظروف تشبه ظروف مخازن معاصر الزيتون لمدة 30 يوم وذلك بتعبئتها في أكياس نايلون تجارية ، أو بنشرها على شباك في الهواء الطلق تحت أشعة الشمس لمدة 15 يوماً .

وقد تبين من النتائج أن قيمة رقم الحامض تزداد بدرجة شديدة مع ازدياد مدة التخزين سواء في الغرفة أو تحت أشعة الشمس ، وقد كان معدل الزيادة في رقم الحامض أعلى في عينات الزيت المستخلصة من ثمار خزنت في الغرفة مقارنة بتلك المستخلصة من ثمار خزنت تحت أشعة الشمس . وقد لوحظ أن قيمة رقم البيروكسيد لعينات الزيت المستخلصة من الثمار المخزنة في الغرفة قد تناقصت مع ازدياد مدة التخزين على العكس تماماً مما شوهد في عينات الزيت المستخلصة من ثمار مخزنة تحت أشعة الشمس ، وكأن هناك علاقة عكسية بين قيمة رقم الحامض ورقم البيروكسيد في عينات الزيت المستخلصة من الثمار المخزنة في الغرفة .

ومن ناحية أخرى لم تكن هناك تغيرات واضحة في قيمة رقم التصبن أو العدد اليودي كنتيجة لتخزين الثمار سواء تحت درجة حرارة الغرفة أو تحت أشعة الشمس .

ABSTRACT

The changes in quality of olive oil extracted from fruits stored by being packed in commercial nylon bags and kept at room temperature for 30 days or by being spread on commercial nets in the open air under sunlight conditions for 15 days were studied. Acid values increased extraordinarily rapidly when the olive fruits were stored for long periods at room temperature or under sunlight conditions and not processed as soon as they were picked. The increment of acid values were higher in those samples stored at room temperature than in those stored by spreading the fruits under sunlight conditions. In general , Peroxide values in olive oil samples extracted in the laboratory from fruits stored at room temperature, were decreased as the period of storage increased. However, inverse results were observed in olive oil samples extracted mechanically from fruits stored by being spread under sunlight conditions. There were almost a reversal relation between acid values and peroxide values in olive oil extracted from fruits stored in bags at room temperature. On the other hand, there were no significant changes in the iodine and saponification values as a result of olive fruits storage either at room temperature or under sunlight conditions.

Keywords: Chemical characteristics, virgin olive oil in Gaza Strip, fruits storage before processing.

INTRODUCTION

Crude olive oil extracted from fresh fruits of the olive tree (Olea europaea) has, for long, been appreciated for its delicate taste and flavor. In contrast to any other crude oil, virgin olive oil produced from olive fruits of good quality is consumed unrefined. This oil has long been widely used on a daily basis. It has been used primary for cooking and flavoring foods, though it was also found to be a good preservative, and it is still possible to purchase certain foods, such as Labaneh and cheese, that are stored in olive oil. (Kubo et al, 1995) .

The quality of olive oil, however, can be significantly affected by several factors, such as the collection procedures of the fruits (Kiritsakis and Markakis, 1984), the method of oil extraction (Nergiz and Unal, 1991), and crop load (Baron, et al, 1994) .

Production of olive oil is one of the most famous and important industries in the Gaza Strip, where high quantities of ripe olive fruits are produced yearly. Some of these fruits are preserved in brine solution and consumed as table olive while, greater quantities are used for oil production.

In recent years, olive harvesting has been accomplished by shaking the tree and gathering the falling fruits on nets. Afterwards the fruits may either be removed and pressed for oil immediately, or remain on the nets for weeks in the open air under sunlight conditions, or be packed in commercial nylon bags and stored at room temperature in oil mill stores, depending on the schedule and efficiency of the olive mill.

In appropriate storage of olive fruits before pressing results in major defects on oil quality and gives oils unacceptable sensory characteristics under the technical and health regulations established for its human consumption (Martinez Suarez, 1975).

Fungal development on stored olive fruits during improper storage conditions increased the acidity of extracted oil. The level

of acidity was variable and ranged from 8.8 to 18% (as oleic acid) in infected samples. By contrast, the acidity of oil in a healthy, fresh samples and healthily incubated fruits were 1.1% and 3.9% , respectively (Humeid and Abu - Blan, 1987).

There are few studies on the effect of olive fruits storage before processing on the oil quality, i.e. on classical parameters, such as peroxide value and acidity. The present investigation aimed to study the changes in quality of olive oil extracted from fruits stored by being packed in commercial nylon bags and kept at room temperature for 30 days or by being spread on commercial nets in the open air under sunlight conditions for 15 days.

MATERIALS AND METHODS

Olive (Olea europaea cv. Suri) fruits gathered from trees grown in Khan Younis city, Palestine, were used. Fruits were harvested on the first days of October, 1995, at the ripening stage. Harvesting was done manually. Before storage, fruits were mixed to ensure a homogenous sampling. Fruits were stored by being spread on commercial nets under sunlight conditions for 15 days. Oil was commercially produced by mechanical processes (oil - mills) after 1,4 and 15 days of spreading. Moreover, other samples were late picked from olive trees (cv. suri) grown in Gaza city, Palestine, on the second week of November, 1995.

Fruits were packed in commercial nylon bags and kept at room temperature and humidity (conditions similar to those in oil - mill stores). However, this storage system resulted in high incidence of mould that appeared on some fruits during storage period. Sampling was carried out after 1,5,9,12,16,19,23,26 and 30 days of storage. At each sampling date, extraction of the oil was carried out at the laboratory, i.e.by grinding, pressing of the pomance and separating of the oil from the vegetation water by centrifugation.

Oil samples were then subjected to chemical determinations. Peroxide value and Iodine value (Wijs method) were determined according to Offical methods of analysis A.O.A.C. (1990). Saponification value was determined as described by Stenesh (1984), while acid value was determined as indicated by Jayaraman (1985).

RESULTS AND DISCUSSION

The data in tables (1 and 2) summarize the results of the effect of olive fruits storage on the chemical characteristics of olive oil extracted manually in the laboratory or by mechanical procedures. Tables (1) and (2) reveal clearly that acid values increased with the increase of storage period in both storage conditions. It could be noticed that the increase in acid value was extraordinarly rapid when the olive fruits were stored for long periods at room temperature or under sunlight conditions and not processed quickly. The acid values of oil smples extracted at the laboratory from fruits stored in commercial nylon bags at room temperature and humidity (conditions similar to those of oil mill stores) for 5 and 16 days were 1.56 and 16.29 times greater than those of the oil samples extratced on the second day of harvest, respecively, table (1); while 4 and 15 days of spreading olive fruits under sunlight conditions resulted in 1.39 and 4.61 - fold increase in the acidity of the olive oil, respectively, compared with those processed mechanically on the second day of harvest, table (2).

Table (1) clearly shows that the rise in acid value continued gradualy with the increase of storage period. The acid values were 26.96 , 38.44 , 47.37 and 55.23 fold higher in oil samples extracted from olive fruits stored for 19,23,26 and 30 days after harvest, respectively, compared with those of the oil sample extracted on the second day of harvest .

The reason for the rapid increase in acid value of oils in the olive fruits stored for long time may be due to the enzymatic

Table (1): Chemical characteristics of virgin olive oil samples manually extracted at the laboratory from fruits stored at room temperature .

Peroxide Value meq Peroxide kg oil	Acid Value mg KOH g oil	Saponification Number mg KOH g oil	Iodine Value g I: 100g oil	Storage Period (days)
40.86	0.73	193.05	83.35	1
34.41	1.14	191.12	83.26	5
29.55	2.75	194.84	85.08	9
33.89	3.90	193.47	85.65	12
27.16	11.89	192.62	85.49	16
33.36	19.68	194.09	83.09	19
16.65	28.06	196.35	85.00	23
14.16	33.16	196.18	85.96	26
15.08	40.32	193.31	85.13	30

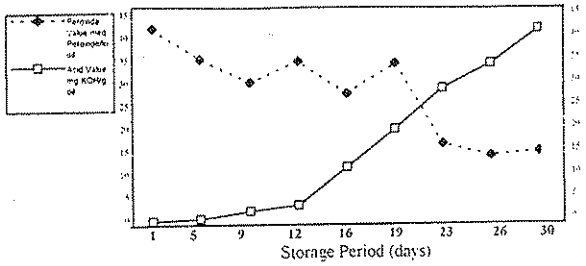

Fig (1) : Effect of olive fruits storage period at room temperature on Peroxide and Acid Values of olive oils.

Table (2): Chemical characteristics of virgin olive oil sample commercially extracted by mechanical processes from fruits stored under sunlight conditions.

Peroxide Value meq Peroxide kg oil	Acid Value mg KOH g oil	Saponification Number mg KOH g oil	Iodine Value g I: 100g oil	Storage Period (days)
23.34	4.96	193.90	83.40	1
30.42	6.79	195.24	84.49	4
41.03	22.85	195.18	83.21	15

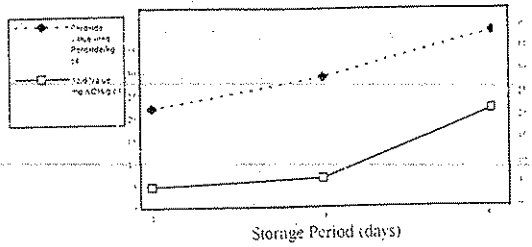

Fig (2) : Effect of olive fruits storage period under sunlight conditions on Peroxide and Acid Values of olive oils

hydrolysis of the fruit triglycerides. Both the endogenous lipases of the fruit and the lipases of microorganisms, which may grow on the fruits are likely to affect the lipolysis and increase the acidity . Bruisings sustained by the olives as a result of falling down from trees facilitate the contact of the fruit lipases with their substrate and the conditions in the commercial bags (i.e. rising temperature, humidity, and broken skin) are conductive to the growth of microorganisms (Kiritsakis and Markakis, 1984 and Humeid and Abu-Blan, 1987). In fact, white mould growth appered on the fruits during storage period.

The data in tables (1and 2) for the acid values clearly reveal that the increment of acid values were higher in those samples stored at room temperature than in those stored by spreading fruits under sunlight conditions. It was observed that spreading olive fruits on commercial nets under sunlight conditions for 15 days caused a severe loss of water and shriveling in fruits that could decrease the activity of lipases. This observation may explain the decrease in the increment of acid value in those oil samples extracted from fruits stored by spreading olive fruits under sunlight conditions compared with those stored at room temperature.

Peroxide values for the extracted oil samples in the laboratory from olive fruits picked on the second week of Novembe, 1995, and stored for one day at room temperature (table 1), were higher than those of the mechanically extracted oil samples from olive fruits harvested on the first days of October, 1995, and stored for one day under sunlight conditions (table 2). The increase could be attributed to the delay in harvesting of olive fruits or to the ambient conditions. It was reported that olive oil characteristics significantly changed with ripening, where highest values of peroxide were found in oil extracted from olive fruits that remained for long periods on trees after the optimum harvesting time (Kiritsakis and Markakis, 1984 and Barone et al, 1994).

It could be noticed from the data in tables (1) and (2) that the peroxide values of olive oil samples extracted in the laboratory from fruits stored at room temperatuer, in general decreased as the period of storage increased. However, inverse results were observed in olive oil samples extracted mechanically from fruits stored by being spread in the open air under sunlight conditions. There was almost a reversal relationship between acid and peroxide values of olive oil extracted from fruits stored in nylon bags at room temperature, fig (1), while they increased simultaneously in olive oil extracted from fruits spread on commercial nets under sunlight conditions, fig (2).

The increase of storage period under sunlight conditions was accompanied by an increase in peroxide values of olive oil commercially extracted by mechanical processes from fruits stored under sunlight conditions. The conditions of storage are suitable for oxidative rancidity, where air, light and temperature are usually important accelerating factors for autoxidation of fatty acids. (Mohammed and Amer, 1965).

The decrease in peroxide value of oil samples extracted in the laboratory from olive fruits stored at room temperature, and the increase in oil extracted commercially from fruits stored under sunlight conditions may be related to the polyphenol content of olive oil. It was mentioned by Gutfinger, 1981 and Montedoro et al , 1992, that high polyphenol content was associated with a high resistance to autoxidation of the olive oil, and they found a linear relationship between polyphenol content and the oxidation stability of the virgin olive oil during storage. The total polyphenol content of oils extracted in commercial olive oil mills was 60% lower than in oil extracted on the laboratory scale, and the stability of the industrially extracted oil was considerably lower on account of its reduced polyphonl content, (Nergiz and Unal, 1991).

As olive oil of low acidity (not higher than 1% as oleic acid) and low peroxide value commands a specially high market prices, it is important that the olive fruits should be harvested at the optimum harvesting time and pressed quickly as soon as possible after harvesting without long delay, or storing olive fruits at 5 C as recommended by Perez-camino et al, 1992.

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