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Evaluation of Vitamin E and the Change in its Quality During the Storage Period of Some Cracker Product

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Abstract: The production of cracker was considered as an important food industry because cracker have a high nutrition value especially when supplemented with various substances that are rich in fats, vitamin E and proteins. Cracker are made from flour with the addition of other ingredients such as salt, fat, sugar and flavoring agents. This study was carried out on cracker products from three different factories. Vitamin E does not only protect the oil against oxidation and increases shelf-life but it also allows food manufacturers to include more nutritive beneficial fatty acids in their products. The vitamin E, refractive index, melting point, rancimat value, Free Fatty Acid (FFA), Peroxide value (PO), iodine number and P-anasidine of the cracker sample were evaluated by analysis at the beginning as well as the end of storage period. At the beginning and at the end the results were respectively as the following: the content of vitamin E which was (1.37, 1.14) in mg/100 g dry matter in the products from three different firms. Moisture percentages were (3.73, 6.37), FFA (0.57, 0.59), PO (0.20, 8.11), iodine number (58.95, 66.24), refractive index (1.46, 1.47), P-anasidine (9.07, 11.37), fat (%) was (2.78). Totox (9.78, 27.60) were evaluated by calculation. It may be concluded that 23% of vitamin E were lost during the storage period.

Key words: Vitamin E, lipid oxidation, storage period, natural antioxidants, cracker, Jordan

INTRODUCTION

In general, there is an increase in demand for ready to eat processed foods with better, shelf life, satisfying taste, easy of portability and with high nutritional quality. And that's because of the urbanization growth as well as the increase in the employment of women (Al-Shawabkeh and Mazahreh, 2009). From these products, the cracker are the most important that can satisfy these requirements. Because these products do not need cold temperatures for preservation, they are popular for camping trips, hunting and fishing expeditions and other activities where refrigeration may not be available. In addition, they are convenient products to have on hand in your cupboard (Singh *et al*., 2000). Vitamin E is a powerful antioxidant in the bodies and also in food. Recently, natural plants have received much attention as sources of biological active sub-stances including antioxidants.

In the recent years, Natural antioxidants have gained considerable interest for their role in preventing the auto oxidation of fats, oils and fat containing food products (Reddy *et al*., 2004). At the same time, vitamin E (tocopherols and tocotrienols) is essential for human nutrition. Because vitamin E is also a potent antioxidant, it has the ability to prevent oxidative damage to cells through inactivation of free radicals and reactive oxygen species (Ford-Martin and Frey, 2005). Clinically, vitamin E deficiency in premature infants may manifest itself as edema and hemolytic anemia thus red blood cells lacking this vitamin are vulnerable to hemolysis by hydrogen peroxide (Yusuf *et al*., 2000). A daily intake of 3-15 mg of tocopherol is required on a normal diet. While >15 mg are probably required when large amounts of unsaturated fatty acid are included in the diet (Lehmann *et al*., 1986).

Lipid oxidation is important to food manufacturers especially when they increase unsaturated lipids in their products to improve the nutrition value. Processed foods containing fats and oils are oxidized slowly during storage. Various oxidation products cause rancidity and deterioration of the sensory properties of the food products. Auto oxidation of fats and oils in processed foods maybe prevented by the use of oxidation inhibitors or antioxidants (Reddy *et al*., 2004).

MATERIALS AND METHODS

Determination of vitamin E by Emmerie-Engel reaction (AOAC, 1990). Most determination of the total tocopherol content of foods are based upon the Emmerie-Engel reaction which involves the reaction of the tocopherols in the extract with ferric chloride to yield ferrous chloride. The ferrous chloride reacts with α-ha dipyridyl to yield a red complex which is measured calorimetrically. In this study, vitamin E was evaluated according to Emmerie-Engel reaction.

Calorimetric of α-tocopherol done by spectronic 20 calorimeter. Products were collected from three different factories at the production days all samples were performed in triplicate, immediately milled and under N_2 gas packaged and stored in the dark -20°C, the vitamin E content was analyzed after 6 months of storage at room temperature in wood cupboard, one separate bag was taken out of storage on each occasion. Data were analyzed statistically by one way analysis of variance and t-test.

RESULTS AND DISCUSSION

The results showed the average of the vitamin E, moisture, refractive index, melting point, rancimat value, Free Fatty Acid (FFA), Peroxide value (PO), iodine number, totox and P-anasidine of the fat extracted from the cracker sample at the beginning and the end in three factory (Table 1). Figure 1 shows clearly that vitamin E were lost during the storage period and (Fig. 2-6)

Table 1: The vitamin E, moisture, refractive index, melting point, rancimat value, Free Fatty Acid (FFA), Peroxide value (PO), iodine number and P-anasidine of the cracker sample were evaluated at the beginning and the end in three factories, totox were calculated totox = (2x PO)+p-anisid

	Factories				
Factors	A	B	C	Average	SD
Moisture					
Before	3.96[b]	4.50[b]	2.72[b]	3.7266667	0.912651814
After	6.99[a]	6.84[a]	5.29[a]	6.3733333	0.941187194
Vitamin E					
Before	1.30[a]	1.40[a]	1.42[a]	1.3733333	0.064291005
After	1.12[b]	1.03[b]	1.26[b]	1.1366667	0.115902258
R. index					
Before	1.46[a]	1.46[a]	1.47[a]	1.4633333	0.005773503
After	1.47[a]	1.47[a]	1.47[a]	1.47	0
FFA					
Before	0.72[a]	0.80[b]	0.19[b]	0.57	0.331511689
After	0.42[b]	1.04[a]	0.30[a]	0.5866667	0.39715656
Peroxide					
Before	0.14[b]	0.18[b]	0.27[b]	0.1966667	0.066583281
After	6.48[a]	8.26[a]	9.58[a]	8.1066667	1.555677773
Iodine					
Before	53.41[b]	58.04[b]	65.39[b]	58.946667	6.041244353
After	66.57[a]	63.41[a]	68.74[a]	66.24	2.680279836
Totox					
Before	13.53[b]	6.85[b]	8.97[b]	9.7833333	3.413463539
After	26.10[a]	26.07[a]	30.62[a]	27.596667	2.618326438
P-anisid					
Before	12.25[b]	6.50[b]	8.47[b]	9.0733333	2.922093998
After	13.10[a]	9.55[a]	11.45[a]	11.366667	1.77646653

Means with the same letter within the same column are not significantly different

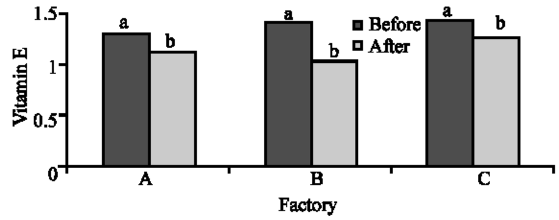

Fig. 1: Vitamin E

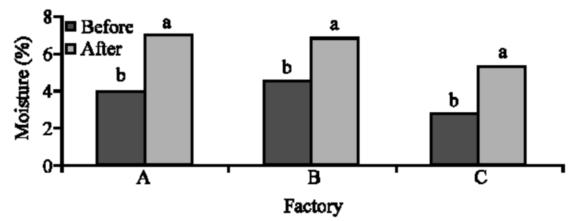

Fig. 2: Moisture

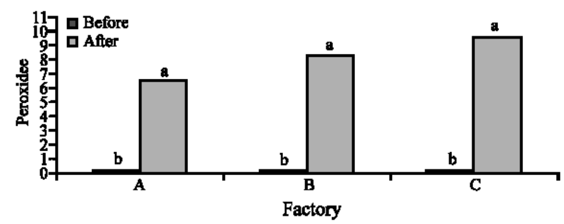

Fig. 3: Peroxide

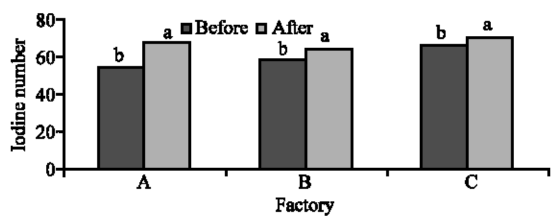

Fig. 4: Iodine number

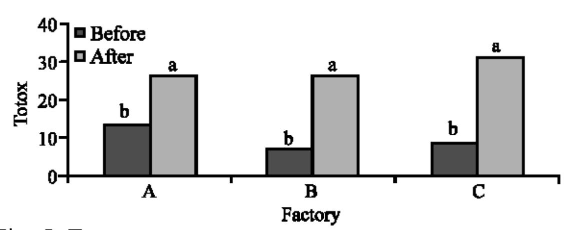

Fig. 5: Totox

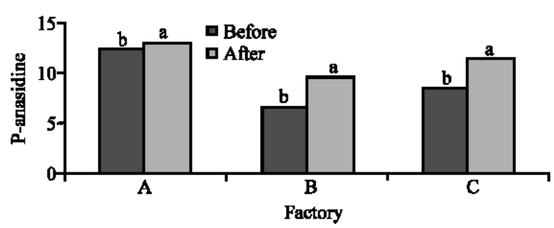

Fig. 6: P-anisidine

Table 2: Effect of factory source, regardless of storage

Factories	Moisture	Vitamin E	Lipid	Ref. index	Melting point	Ranc	FFA	Peroxide	Iodine	Totox	P-anisidine
A	5.47	1.21	1.61	1.47	7.34	9.71	0.35	3.31	59.99	19.30	12.68
B	5.67	1.22	2.80	1.47	8.95	19.19	0.92	4.22	60.73	16.46	8.03
C	4.00	1.34	3.95	1.47	12.9	12.70	0.25	4.93	67.06	19.79	9.96

Table 3: Effect of storage, regardless of factory

Conditions	Moisture	Vitamin E	Ref. index	FFA	Peroxide	Iodine	Totox	P-anisidine
Before	3.72^{b}	1.37^{a}	1.47^{a}	0.42^{b}	0.20^{b}	58.95^{b}	9.45^{b}	9.08^{b}
After	6.73^{a}	1.14^{b}	1.47^{a}	0.59^{a}	8.11^{a}	66.24^{a}	27.59^{a}	11.37^{a}

Means with the same letter within the same column are not significantly different

shows increasing in the level of moisture, FFA, PO, iodine number and P-anasidine of the cracker sample during the storage period. Table 2 shows effect of factory source, regardless of storage. The test ransimat being to measure the degree of resistance of oils and fat to oxidation if we look at the Table 2, we find that the fat extracted from the cracker factory B has the highest resistance to corruption of fat the rest of the factories if we look to actually peroxide number we find that the oils extracted from cracker of factory B have the least amount of peroxide number this mean that factory B oil have the least deterioration. That means, any fat that has the highest amount of alransimat have the highest degree of resistance to oxidation. Table 3 shows effect of storage, regardless of factory As shown in Table 3, the content of vitamin E in the 3 factories at the end of storage period was decreased, the average of vitamin E at the beginning was 1.37 and it decreased to 1.14 at the end of the storage period by calculation there was 23% loss. We find a significant. Relationship between the decrease of vitamin E content and with the increase of moisture (%) in cracker ($p>0.05$).

As shown in Table 3, the moisture percent in the 3 factories at the end of storage period was increased, the average of the moisture at the beginning was 3.72 and it increased to 6.73 in the end of the storage period by calculation there was 80.91% increase.

As is clear in Table 3, the peroxide number did not increase in all products >10 milequivalent oxygen kg^{-1}, this is consistent with the specifications and standards for product cracker. The oxidation of fat-containing food is a serious problem in the food industry. Besides resulting in the development of off-flavors, oxidation of lipids causes other undesirable effects such as discoloration and nutritional losses especially losses of E vitamin. The cracker manufacturer uses a wide range of ingredients of which the oils fats offer the highest potential risk of rancidity in the autoxidation of fats, unsaturated fatty acids are oxidized to hydro peroxides which on subsequent decomposition yield a number of saturated and unsaturated aldehydes and ketones.

The oxidation of vitamin E prevents lipid oxidation, especially of polyunsaturated fatty acids. Tocopherols are quite commonly used for the stabilization of fats and fatty products against oxidation. A natural tocopherols, a material derived from vegetable oil distillate additives increases the vitamin content of finished products which may be an added incentive to cracker provide a natural source of vitamin E and protect freshness of the snack diet.

CONCLUSION

The result of this study showed that loss of vitamin E during the storage of cracker for 6 months in average 23% and with increase of moisture percentage in products during storage period. Specified amount of vitamin E is recommended to be added to offset the effects off losses during storage, vitamin E not only protect the oil against oxidation and increase shelf-life but also allow food manufacturers to include more nutritionally beneficial fatty acids in their products because vitamin E is powerful antioxidant in the bodies and in the foods specially in fat and fatty foods.

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