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THE EFFECT OF STORAGE TEMPERATURE ON THE CONTENT OF VITAMIN E IN SOME TYPES OF BISCUITS AND ITS IMPACT EVIDENCE ON OXIDATIVE INDICATORS

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ABSTRACT:

This study was carried out on 3 different products from 3 different firms: Biscuits with nut, Biscuits with fiber and Digestive biscuits. Moisture, vitamin E, refractive index (R I),free fatty acid (FFA), peroxide value (PO), iodine number, melting point, and rancimat value, of the biscuit sample were evaluated by analysis at the beginning as well as the end of storage period at room and at refrigerator. At the beginning, and at the end: **1**-at room temperature in wood cupboard, **2**-at refrigerator in the three factories. The results were respectively as the following: Moisture percentages were (3.486,4.220,4.200), the content of vitamin E which was (3.976,2.791,3.281) in mg/100 g dry matter in the products from the three different firms. The refractive index (365.667,416.333,428), FFA (0.224,0.279,0.291), PO (0.550,0.482,0.414), iodine number (54.144,54.822,56.242), P-anasidine was (15.569,19.761,21.642). On the other hand, when fat, melting point, and rancimat evaluated just at the begging, the results were respectively as the following: fat percentages were (21.812), melting point was (27.1333) and rancimat was (39.567).Totox (16.155,20.487,22.241) were evaluated by calculation.) It may be concluded that 29.8% of vitamin E were lost during the storage period at room temperature while 17.48 % of vitamin E were lost during the storage period at refrigerator. These results indicate that biscuit products must be stored at refrigerator.

***Keywords**: Vitamin E; Natural antioxidants; Biscuits; Lipid oxidation; Storage temperature.*

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].

Lipid oxidation is one of the major reasons for the development of off-flavors in foods. The rate of lipidoxidation is influenced by storage conditions such as light exposure, moisture content, temperature, andoxygen availability. Natural antioxidants have gained considerable interest in recent years for their role in preventing the auto oxidation of fats, oils and fat containing food products (Reddya, Uroojandand Kumar, 2005).At the same time, Vitamin E (tocopherols and tocotrienols) is essential for human nutrition(Henderson,2000). Vitamin E stability is a function of the conditions to which vitamins are exposed to in a given food product over time such as moisture content, water activity (AW), PH, temperature, air or oxygen, light, packaging, and/or the presence of degradative enzymes. Packaging does affect the nutritive value of foods by controlling the degree to which environmental factors connected with processing, storage, and handling can interact with food components (Ott, 1988).

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 (Reddya, Uroojaand and Kumar,2004)

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MATERIALS and METHODS

Determination of vitamin E by Emmerie-Engel reaction[AOAC, 1990.] Most determination of the total tocopherol content of foods is based on 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 alp1ha dipyridy1 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 is done by spectronic 20 calorimeter. Products (digestive biscuit, biscuit with fiber, biscuit with nut) were collected from three different factories at the production days. All samples were performed in triplicate, immediately milled under N2 gas packaged and stored in the dark -20°C the vitamin E content was analyzed after 6 months of storage: 1-at room temperature in wood cupboard.2-at refrigerator, one separate bag was taken out of storage on each occasion. Data were analyzed statistically by One Way Analysis of variance and t-test.

RESULT and DISCUSSION:

The tocopherols are the most important natural antioxidants allowed to use in food to prevent or interrupt the chain reactions produced by the free radicals, neutralizing them by donation of their phenolics hydrogen. These are very unstable species which have a despaired electron that can react with any other molecules like fatty acids. Several authors studied the tocopherol stability in different food matrixes (wheat flour, rye meal, biscuits, margarine, jams). The degradation rate of the compounds with vitamin E activity depends on oxygen availability, temperature, water activity and storage time, as well as on the fat content and food composition (Bramley, Elmadfa, Kafatos,et al.2000).

The results showed the average of Themoisture,Vitamin E ,refractive index, free fatty acid (FFA), peroxide value (PO), iodine number, totox and P-anasidine,melting point, and rancimat value of the fat extracted from the biscuits sample at the beginning, and the end:1-at room temperature in wood cupboard. 2-at refrigerator, in three factory(Table 1).

Table (1):The Average of Moisture % and Fat %,RI, FFA, PO, iodine, p-aranasiad, melting point, Rancimat **and Vitamin E for the three Products in Three Firms** before and after at room and after at refrigerator, buttotox were calculated Totox = (2xPO) +p-anisid

no	Moisture	Moisture before	After at room t	Level of significance	T –test value
1		4.447	4.886	.05	2.5945
		3.752	4.215		
		2.259	3.558		
		X 3.486	**X** 4.220		
		σ 1.118	**σ**0.664		
2	Moisture	Moisture before	After at refrigerator	.05	1.2673
		4.447	5.397		
		3.752	3.394		
		2.259	3.802		
		X 3.486	**X** 4.200		
		σ 1.118	**σ**1.058		
3	Vitamin E	Before	After at room t	.05	3.4135
		4.807	3.0167		
		3.843	2.663		
		3.277	2.693		
		X 3.976	**X** 2.791		

		σ0.773	σ0.196		
5	Vitamin E	Before	After at refrigerator	.05	2.8811
		4.807	3.81		
		3.843	2.977		
		3.277	3.057		
		X 3.976	**X** 3.281		
		σ 0.773	**σ** 0.460		
6	R.index	Before	After at room t	.05	2.3778
		342	434		
		390	411		
		365	404		
		X 365.667	**X** 416.333		
		σ24.007	σ15.695		
7	R.index	Before	After at refrigerator	.05	3.1804
		342	441		
		390	422		
		365	421		
		X 365.667	**X** 428		
		σ24.007	σ11.269		
8	FFA	Before	After at room t	.05	5.2747*
		0.206	0.267		
		0.188	0.222		
		0.279	0.347		
		X 0.224	**X** 0.279		
		σ0.0482	σ0.063		
9	FFA	Before	After at refrigerator	.05	1.04922
		0.206	0.357		
		0.188	0.238		
		0.279	0.278		
		X 0.224	**X** 0.291		
		σ0.0482	σ0.061		
10	Peroxide	Before	After at room t	.05	1.1818
		0.287	0.38		
		0.867	0.463		
		0.497	0.603		
		X 0.550	**X** 0.482		
		σ0.2937	σ0.113		
11	Peroxide	Before	After at refrigerator	.05	0.8292
		0.287	0.313		
		0.867	0.403		
		0.497	0.527		

		X 0.550	**X** 0.414		
		σ 0.2937	**σ** 0.107		
12	Iodine	Before	After at room t	.05	1.709
		56.933	57.067		
		52.267	52.233		
		53.233	55.167		
		X 54.144	**X** 54.822		
		σ2.463	**σ**2.435		
13	Iodine	Before	After at refrigerator	.05	1.3204
		56.933	58.76		
		52.267	51.767		
		53.233	58.2		
		X 54.144	**X** 56.242		
		σ2.463	**σ**3.886		
14	Totox	Before	After at room t	.05	7.0836*
		26.944	30.118		
		9.908	15.16		
		11.612	16.183		
		X 16.155	**X** 20.487		
		σ9.382	**σ**8.356		
15	Totox	Before	After at refrigerator	.05	2.0897
		26.944	27.272		
		9.908	19.635		
		11.612	19.816		
		X 16.155	**X** 22.241		
		σ9.382	**σ**4.358		
16	p-aranasiad	Before	After at room t	.05	6.2264*
		26.374	29.358		
		9.72	14.942		
		10.612	14.983		
		X 15.569	**X** 19.761		
		σ9.368	**σ**8.311		
17	p-aranasiad	Before	After at refrigerator	.05	2.0754
		26.374	26.652		
		9.72	19.397		
		10.612	18.876		
		X 15.569	**X** 21.642		
		σ9.368	**σ**4.347		
18	Vitamin E	After at room t	After at refrigerator	.05	4.1215
		3.0167	3.81		

		2.663	2.977		
		2.693	3.057		
		X 2.791	**X** 3.281		
		σ 0.196	**σ** 0.460		
19	Fatbefore	**X** 21.812	**σ**2.625		
	Melting point before	**X** 27.133	**σ**2.5007		
	Rancimat before	**X** 39.567	**σ**8.278		

* (**significance**at α= 0.05)

As shown, in table number 1 the moisture percent in the 3 products, at the end of storage period was increased , the average of the moisture at the beginning was 3.486 and it increased to 4.22 at room temperature or to 4.22 at refrigerator at the end of the storage period , by calculation, there was 21.1 % increase. Free fatty acids generally showed an increasing trend for the samples kept at room temperature and at refrigerator over the period of the study.

As shown, in table number 1 the content of vitamin E, in the 3 products, at the end of the storage period was decreased. 29.8 % of vitamin E were lost during the storage period at room temperature while 17.48 % of vitamin E were lost during the storage period at refrigerator. These results similar to that found by Cortes et.al.2009 .These results indicate that biscuit products must be stored at refrigerator.

In general, high amounts of vitamin E have a protective effect on the polyunsaturated fats in biscuits. Vitamin E acts as a free radical scavenger, terminating the free radical reaction in autoxidation. This could be a reason why little change was seen overall in the lipid oxidationby products examined in this study but the content of vitamin E, in the 3 products, at the end of storage period was decreased.

CONCLUSION

The result of this study showed that loss of Vitamin E during the storage of biscuits for 6 months in average 29.8 % of vitamin E were lost during the storage period at room temperature while 17.48 % of vitamin E were lost during the storage period at refrigerator. These results indicate that biscuit products must be stored at refrigerator. 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 a powerful antioxidant in our bodies, and in our foods specially in fat and fatty foods.

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