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Evaluation of Fat and Vitamin E Extracted From Some Plain, Vanilla, or Cocoa Flavored Breakfast Biscuits

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ABSTRACT

This study seeks to determine the vitamin E content in breakfast biscuits produced by three various companies, whether plain, vanilla, or cocoa-flavored. The biscuits are examined after production and after a six-month storage period to calculate losses during shelf life and to determine differences between companies and products. This research paper has used the experimental statically method and has been applied to samples of biscuits that taken from three factories on the day of production. These sample have been stored for a period of 6 months. Careful examinations have been made for each of these samples to find out the differences between the day of production and the end of the storage period. First and at the end of the storage period the moisture percentage in the three products increases. While the average of the moisture at the beginning was 3.36, it increases to 4.76 at the end-which calculates up to a 41.67% increase ($p<0.05$). Second the content of vitamin E in the three products decreases after the end of the storage period from 2.239-1.943 which is a 15% loss ($p>0.05$). Third, since vitamin E provides protection against oxidation the peroxide in the three products at the end of the storage period increases. The average in the beginning, is 0.286, then it increases to 0.842 at the end of the period-which calculates up to a 194.4% increase ($p<0.05$). Vitamin E, lipid oxidation, storage period, breakfast biscuit.

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Key Words
Vitamin E, lipid oxidation, storage period, breakfast biscuit.

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INTRODUCTION

Demand for ready-to-eat biscuits increases daily throughout the world due to their satisfying taste, ease of portability and high quality. The high demand can be also due to the world's growing urbanization and increasing employment of women[1]. Furthermore, vitamin E (tocopherols and tocotrienols) is essential to human nutrition because it is a potent antioxidant and can prevent oxidative damage to cells through inactivation of free radicals and reactive oxygen species. A daily intake of 3-15 mg of tocopherol is required on a normal diet. However, amounts over 15 mg are probably needed when large amounts of unsaturated fatty acids are included in the diet[2].

Lipid oxidation is one of the major reasons for the development of off-flavors in foods. The rate of lipid oxidation is influenced by storage conditions such as light exposure, moisture content, temperature and oxygen availability (Electron. J. Environ. Agric. Food Chem. ISSN 1579-4377). Vitamin E serves an important role as an antioxidant in cellular membranes by blocking the peroxidation of polyunsaturated fatty acid (PUFA). Consumption of foods rich in vitamin E may reduce the risk of epithelial cancers, heart disease[3].

MATERIALS AND METHODS

This research paper has used the experimental statical method and has been applied to samples of biscuits that taken from three factories on the day of production. These sample have been stored for a period of 6 months. Careful examinations have been made for each of these sample to find out the differences between the day of production and the end of the storage period.

The determination of vitamin E is measured by the Emmerie-Engel reaction[4]. The calorimetric of α-tocopherol is done by the electronic 20 calorimeters. Products are collected from three different firms and three different types of biscuits. On production days, all samples were performed in triplicate, immediately milled, packaged under N2 gas and stored in the dark at 20°C. Vitamin E content was analyzed after a six-month storage period at room temperature in a wooden cupboard and one separate bag was taken out of storage on each occasion. Data is analyzed statistically by the two tail analysis of variance and t-test.

RESULT AND DISCUSSION

The results show the average and standard deviation of moisture, vitamin E, refractive index, (FFA) (PO) iodine number, totox and p-anasidine, melting point, rancimat value, saturated F.A, Unsaturated F.A and trans-SFA. All are extracted from the biscuit's samples at the beginning and the end of the six months at room temperature in a wooden cupboard in the three factories Table 1.

Table 1: The Average of moisture %, fat %, RI, FFA, PO, iodine, p-aranasiad, melting point, Rancimat and Vitamin E for the three products of plain, vanilla-and cocoa-flavored breakfast biscuit in three firms before and after 6 mon of storage at room temperature, totox calculated as Totox = (2xPO)$\pm$p-anisid $p>0.05$ difference is not of significant importance.

Every number in this table is the average of the three samples from each factory and from each type of biscuit-with a total of nine samples.

Most determination of the total tocopherol content of foods is based upon the Emmerie-Engel reaction[4] which involves the reaction of the tocopherols in the extract with ferric chloride to yield ferrous chloride. The ferrous chloride reacts with alpha dipyridyl to yield a red complex which is measured calorimetrically.

As shown in (Table 1) the moisture percent in the three products increases after the storage period, as the average moisture at the beginning was 3.36 and which then increases to 4.76 at the end of the storage period. By calculation, there is a 41.67% increase ($p<0.05$). Also, as shown in the table, the content of vitamin E in the three products decreases after the storage period, from 2.239-1.943. By calculation, there is 0.296 mg which is about a 15% loss ($p>0.05$).

In the production of white wheat flour from whole grain wheat the vitamin E content is reduced by about 50% due to the removal of bran and germ Henderson[10]. What is more, The susceptibility of vitamin E to oxidation is another important cause of losses during storage in its function as a natural antioxidant since the oxidation of vitamin E prevents lipid oxidation, especially of polyunsaturated fatty acids[3]. Bakery products prepared with fat stabilized with various concentrations of tocopherol are appreciably more resistant to rancidity than samples[5]. Thus, as shown in (Table 1) the peroxide in the three products increases at the end of the storage period. The average of the peroxide in the beginning was 0.286 and it increases to 0.842 at the end of the storage period which calculates to a 194.4 % increase ($p<0.05$).

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 vitamin E). In this study the vitamin E content of the biscuit is decreased after the storage period[5].

Tocopherols are quite commonly used for the stabilization of fats and fatty products against oxidation. Tocopherols is a natural material derived from vegetable oil distillate additives that increases the vitamin content of finished products which can be added to biscuits to provide a natural source of vitamin E and protect the freshness of the biscuit[6].

Amount of Vitamin E in biscuits from three firms (mg^{-1}100g dry matter)

Moisture	Plain biscuit	Vanilla-flavored biscuit	Cocoa-flavored biscuit	Average	Standard deviation	p-value
Before storage	3.316	3.463	3.289	3.356	0.094	0.0494*
After storage	4.093	5.323	4.866	4.761	0.622	
Vitamin E						
Before storage	1.533	2.067	3.117	2.239	0.806	0.2742
After storage	1.5	1.897	2.433	1.943	0.468	
FFA						
Before storage	0.183	0.208	0.284	0.225	0.053	0.0509
After storage	0.208	0.226	0.324	0.253	0.062	
peroxide						
Before storage	0.29	0.191	0.377	0.286	0.093	0.0036
After storage	0.833	0.697	0.997	0.842	0.150	
Lodine						
Before storage	30.115	18.478	23.817	24.137	5.825	0.5452
After storage	31.89	20.474	27.639	26.668	5.770	
P-anisid						
Before storage	29.535	17.891	23.063	23.496	5.834	0.1182
After storage	30.232	19.087	25.646	24.988	5.602	
otox						
Before storage	30.115	18.478	23.817	24.137	5.825	0.0598
After storage	31.89	20.474	27.639	26.668	5.770	
R. index						
Before storage	429.333	380	411	406.778	24.936	0.4561
After storage	417	446	421.333	428.111	15.643	
Fat						
Before storage	13.454	15.751	20.106	16.437	3.379	
Melting point						
Before storage	24.7	23.9	23.233	23.944	0.734	
Rancimat						
Before storage	77.867	82.867	33.3	64.678	27.289	
S.F.A						
Before storage	40.111	39.724	39.473	39.769	0.321	
U.S.F.A						
Before storage	50.553	51.861	54.591	52.335	2.060	
T.U.S.F.A						
Before storage	9.336	8.415	5.936	7.896	1.758	

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 auto-oxidation[7].

If we look at Table 1 we find that the fat extracted from cocoa-flavored biscuits has the highest fat (20%) and the lowest trans fatty acid. it also has the lowest Rancimat (lowest resistance) and the highest Totox (the highest oxidation and deterioration) over the rest of the examined biscuits. We can also clearly find that the fat extracted from vanilla-flavored biscuits has the highest Rancimat value and the lowest Totox over the rest of the examined types. But trans fatty acids have a bad acid effect on the heart's health which means that it is not preferable to have a high trans fatty acid but rather a high vitamin E content instead[8].

The biscuit manufacturers use a wide range of ingredients in which the fatty oils 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 several 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 Gaziano. Tocopherols increase the vitamin content of finished products, which not only provides protection to the freshness of the biscuits but also provide a natural source of vitamin E for children[9].

Similar results have been reported by[11] who found that any fat that has the highest amount of Rancimat has the highest degree of resistance to oxidation. Similarly, there are losses of vitamin E during the six-month storage period (with an of average 23%) and increases in moisture percentages in the same products during the same storage period. As a result, a specified amount of Vitamin E is recommended to be added to offset the effects of losses during storage [1].

CONCLUSION

The result of this study shows that 15% of vitamin E is lost in storing breakfast biscuits, with a noticeable increase in moisture percentages. A specified amount of vitamin E is recommended to be added to offset the effects of losses during storage in these products.

REFERENCES

1. Ma, A.S., 2011. Evaluation of vitamin E and the change in its quality during the storage period of some cracker product. J. Food Technol., 9: 95-98.
2. Lehmann, J., H.L. Martin, E.L. Lashley, M.W. Marshall and J.T. Judd, 1986. Vitamin E in foods from high and low linoleic acid diets J. Am. Diet. Assoc., 86: 1208-1216.
3. Mazahreh, A.S., 2016. The effect of storage temperature on the content of vitamin E in Some types of biscuits and its Impact evidence on oxidative indicators. Int. J. Res. Agricult. Food. Sci., Vol. 4.

4. AOAC., 1990. Official Methods and Recommended Practices of the Americal Oil Chemists Society. 4th Edn., Firestone D. American Oil Chemists Society, Champaign IL, USA, Pages: 53.
5. Singh, R., G. Singh and G.S. Ghauhan, 2020. Nutritional evaluation of soy fortified biscuits. J. Food Sci. Technol., 37: 162-164.
6. Al-Shaw, A.F. and A.S. Mazahre, 2009. Evaluation of fat and vitamin E in some cookies diet. Pak. J. Nutr., 8: 214-217.
7. Yusu, S., G. Dagenais, J. Pogue, J. Bosch and P. Sleight, 2000. Vitamin E eupplementation and cardiovascular events in high-risk patients. N. Engl. J. Med., 342: 154-160.
8. Ford-Martin, P. and R.J. Fery, 2005. Vitamin E, gale encyclopedia of alternative medicine.
9. Mazahreh, A.S., 2020. Evaluation of fat and vitamin E in some baby biscuit. Acta. Scientific. Nutrit. Health., Vol. 4, No. 3 10.31080/ASNH02020.04.0643.
10. Henderson, C.W., 2000. Vitamin E supplements can help prevent stroke in men. High. Blood. Pressure. Blood. Week., 23: 1-12.
11. Reddy, V., A. Urooj and A. Kumar, 2005. Evaluation of antioxidant activity of some plant extracts and their application in biscuits. Food Chem., 90: 317-321.