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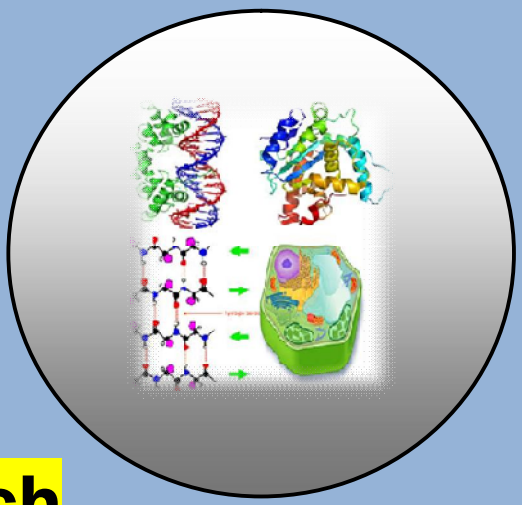
ISSN 0970-4973 Print
ISSN 2319-3077 Online/Electronic

Global Impact factor of Journal: 0.756
Scientific Journals Impact Factor: 2.597
Index Copernicus International Value
IC Value of Journal 4.21 Poland, Europe

J. Biol. Chem. Research
Volume 32 (1) 2015 Pages No. 84-88



Journal of Biological and Chemical Research

An International Journal of Life Sciences and Chemistry

Indexed, Abstracted and Cited in Various National and International Scientific Databases of the World

Published by Society for Advancement of Sciences®

J. Biol. Chem. Research. Vol. 32, No. 1: 84-88, 2015
(An International Journal of Life Sciences and Chemistry)

ISSN 0970-4973 (Print)
ISSN 2319-3077 (Online/Electronic)

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RESEARCH PAPER

Received: 23/11/2014 **Revised: 22/12/2014** **Accepted: 31/12/2014**

The Effect of Exposure to Atmosphere on the Vitamin A and Vitamin E Contents of Wheat Flour

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ABSTRACT

This study investigated the effect of exposure to atmosphere on the vitamin A and vitamin E contents of wheat flour. The wheat flour sample used for the study was analyzed for its vitamin A and E contents immediately after purchase (at time zero) and then divided into two groups: groups A and B that served as control and experimental groups respectively. The control group (group A) was wrapped in black nylon bag and stored in a cool dry place for three (3) weeks while the experimental group was exposed to the atmosphere for ten hours daily (from 8.00am to 6,00pm) for a total study period of three (3) weeks. The results of the analyses carried out on both the control and experimental groups at the end of the study period showed that the control group lost 0.50% and 1.12% of its vitamin A and vitamin E contents respectively while the exposed group lost 50.39% and 28.82% of its vitamin A and vitamin E contents respectively. The results of the study showed that exposure of wheat flour to the atmosphere caused appreciable loss of its vitamin A and E contents. So storing it adequately is very necessary to preserve its vitamin A and E contents.

Keywords: Vitamin A, Vitamin E, Wheat flour, Atmosphere and Black nylon bag.

INTRODUCTION

Wheat (*Triticum spp*) is a world wide cultivated grass from the levant (area in the Middle East). Globally, after maize, wheat is the second most produced food among the cereal crops. Wheat grain is a staple food used to make flour for leavened, flat and steamed bread, cookies, cakes, noodles and for fermentation to make beer, alcohol, vodka or biofuel. Wheat is planted to a limited extent as a forage crop for livestock and straw can be used as fodder for livestock or as a construction material for roofing thatch (Belderok *et al*, 2000).

Wheat flour is a powdery substance derived by grinding or mashing the wheat's whole grain. It is used in baking but typically added to other white flour to add nutritive value (especially fibre and protein) and good texture to the finished product. The wheat grain has an average composition of 85% endosperm, 12.5% bran and 2.5% germ, the composition is determined by the type of wheat flour, country of origin and the proportion of the outer parts removed by a particular milling process (Elias, 2006). Wheat flour contains protein, carbohydrate, B- Vitamins, calcium, folacin, iron, magnesium, vitamin E, phosphorus, potassium, zinc, minimal amount sodium and other trace elements (Nevo *et al*, 2002)

Vitamin A is one of the nutrients used in the fortification of flour. It is an essential micronutrient required in small quantities by the body for proper functioning and development (Wardlaw *et al*, 2002). Among the known vitamins, vitamin A is unique in its specialized functions in vision, cellular differentiation, growth, bone development, boosting of immune system and reproduction (Shils *et al*, 1996). Wheat flour is rich in vitamin E with the highest concentration of about 27.6 g found in the germ. It is easily oxidized by oxidizing agents (Okaka *et al*, 1992). Vitamin E is a fat-soluble antioxidant that stops the production of reactive oxygen species formed when fat undergoes oxidation (Herrera and Barbas, 2001; Packer et al, 2001).

MATERIALS AND METHODS

Procurement of sample

The wheat flour sample (Mix and Bake) that was used for the study was purchased from bakery materials market, Ogidi, Anambra State, Nigeria.

Treatment of Sample

The wheat flour sample used for the study was analyzed for its vitamin A and E contents immediately after purchase (at time zero) and then divided into two groups: groups A and B that served as control and experimental groups respectively. The control group (group A) was wrapped in black nylon bag and stored in a cool dry place for three (3) weeks while the experimental group was exposed to the atmosphere for ten hours daily (from 8.00am to 6,00pm) for a total study period of three (3) weeks.

Reagents

All reagents used were of analytical grade.

Methods

Vitamin A content Determination:

The method of Pearson (1976) was used for the vitamin A content determination.

Vitamin E content Determination:

The method of Pearson (1976) was used for the vitamin E content determination.

RESULTS

Table 1 Show the Results of the vitamin A and E contents of the wheat flour sample at the onset of the study.

Table 1. Vitamin A and Vitamin E contents of Sample at onset of study.

Parameters	Mean Value ± standard deviation
Vitamin A	6, 277.97 ± 34.71 IU
Vitamin E	55.44 ± 3.56 mg/100g.

Table 2 shows the results of the vitamin A and E contents of the wheat flour sample for the control group (group A) at 3rd week of the study.

Table 2. Vitamin A and Vitamin E contents of sample at the 3rd week of study for the control group.

Parameters	Mean Value ± standard deviation
Vitamin A	6, 215.35 ± 63.18 IU
Vitamin E	54.24 ± 2.96 mg/100g.

The results of the Vitamin A and Vitamin E contents of (group B) at the 3rd week of study are shown in Table 3

Tables 3. Vitamin A and Vitamin E contents of sample at the 3rd week of study for the exposed group.

Parameters	Mean Values± Standard Deviation
Vitamin A	2,050.4 ± 48.58 1U
Vitamin E	29.97 ± 1.69 mg/100g

Table 4 shows the percentage (%) losses of vitamin A and vitamin E contents of the sample between the onset and end of the study for both the control and exposed groups.

Table 4. Percentage (%) looses of Vitamins A and E contents of sample between the onset and end of the study for both the control and exposed groups.

Parameters	% losses for Control group	% losses for Exposed group
Vitamin A	0.5	50.39
Vitamin E	1.12	28.82

DISCUSSION

This study investigated the effect of exposure to atmosphere on the vitamin A and vitamin E content of wheat flour.

The results of the analyses carried out on both the control and experimental groups at the end of the study period showed that the control group lost 0.50% and 1.12% of its vitamin A and vitamin E contents respectively while the treated group lost 50.39% and 28.82% of its vitamin A and vitamin E contents respectively. The results of the study showed that exposure of wheat flour to the atmosphere caused appreciable loss of its vitamin A and E contents. Cort *et al* (1976) observed that vitamin A content of flour deteriorates on keeping. He observed that oxygen and light quickly degrade vitamin A in flour and thus affect the stability during storage. Vitamin A keeps body surfaces healthy so that they can act as barriers to invading micro organisms. Vitamin A stimulates and enhances many immune functions including anti-body response and activity of various white blood cells and T-helper cells (Joseph and Vitale, 1976). Vitamin A deficiency causes the death of approximately 500,000 children each year in developing countries (Underwood, 1990).

Marginal vitamin A status probably contributes to reduced survivability in response to respiratory and diarrhea diseases and increases mortality by about 3 to 4 times (Under wood, 1990) Vitamin A deficiency (VAD) is an extended public health problem, especially in Africa (Caulifield *et al*, 2004). Preschool-age children and women of reproductive age are the two population groups most at risk. Vitamin A supplementation has been shown to decrease the incidence of measles, diarrhoeal disease and all-cause mortality, as well as to improve several aspects of eye health (Fawzi *et al*, 2000).

Vitamin E on the other hand is an antioxidant. It thus protects cells and other nutrients against lipid peroxidation (Okaka *et al*, 1992). The tocotrienol forms of natural vitamin E possesses powerful hypocholesterolemic, anti-cancer and neuroprotective properties that are often not exhibited by tocopherols (Sen *et al,* 2007*)*. Oral tocotrienol protects against stroke-associated brain damage *in vivo* (Sen *et al,* 2007).

CONCLUSION

Exposure of wheat flour to atmosphere deteriorates the vitamin A and vitamin E contents of the wheat flour. Sellers and users of wheat flour should ensure that their wheat flour is stored in a cool dry place away from sunlight.

ACKNOWLEDGEMENTS

We appreciate Spring Board Laboratories Awka, Anambra State, Nigeria, for their technical assistance.

REFERENCES

Belderok, Bob, J., Hans, M., and Dingena, A. 2000 Bread making quality of wheat. *Springer*. **4**:3-7

Caulfield, L.E, Richard, S.A, Black, R.E 2004 . Undernutrition as an underlying cause of malaria morbidity and mortality in children less than five years old. *Amer. J.Trop. Med. And Hyg.*, **71**:55–6.

Cort, W.M., Borenstein, B., Harley, J.H., Osardca, M., and Scheiner, M. 1976 . *Nutrient stability of fortified cereal products. J. Fd. Tech.,* **30** 4 :52-64

Elias, D.G. 2006 Chemical composition of wheat grain. *J. Proc. of Biochem.*, **7** 1 :38.

Fawzi, W.W, Mbise, R., Spiegelman, D., Fataki, M., Hertzmark, E., Ndossi G. 2000 .Vitamin A supplements and diarrheal and respiratory tract infections among children in Dares Salaam, Tanzania. *J. Pedia.,* **137**:660–667.

Herrera and Barbas, C 2001 . "Vitamin E: action, metabolism and perspectives". *J. Physiol. and Biochem.* **57** 2 : 43–56.

Joseph J. and Vitale, S.C.D 1976 . Nutrition pathology Up John Pub., Massachuseffs. Pp. 11-15.

Okaka, J.C., Akobundu, E.N.T., and Okaka A.N.C 1992 Human Nutrition: An integrated Approach Enugu: ESUT press, p. 255.

Packer, L., Weber, S. and Rimbach, G. 2001 . "Molecular Aspects of α- Tocotrienol Antioxidant Action and Cell Signalling". *J. Nutri.*, **131** 2 : 369

Pearson, D. 1976 . Chemical Analysis of Food. 7th ed. New York; Churchill Livingstone. pp. 510-514.

Sen, C.K., Khanna, S., and Sashwati, R. 2007 .Tocotrienols in health and disease: the other half of the natural vitamin E family. *Mol. Asp. Med.*, **28** 5-6 :692-728.

Shils, M.E., Olson, J., Shikeru and Ross, A.S. 2000 . Modern nutrition in health disease. 7th ed. Lippin CoH-Williams and Wilkins, New York. Pp 27, 305.

Underwood, B.A. 1990. Vitamin A prophylaxis programs in developing countries: past experiences and future prospects. *Nutr. Rev.***48**:265-274.

Wardlaw, G.M. and Kessel, M.W. 2002. Fat-soluble Vitamins. Perspective in Nutrition. Mc Graw-Hill companies Inc., New York. Pp. 322-337.

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