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EFFECT OF BLANCHING AND FROZEN STORAGE ON SOME SELECTED MINERALS AND VITAMIN C CONTENT FOR FOUR LEAFY VEGETABLES WIDELY CONSUMED IN ILARO COMMUNITY, OGUN STATE, NIGERIA

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Abstract

Leafy vegetables lose their eating quality very rapidly after harvesting. They are highly perishable food items and require pre-treatment processing such as blanching and freezing to preserve them. In this present work, some selected minerals and vitamin C contents of four leafy vegetables widely consumed in Ilaro community, Ogun state, Nigeria were subjected to blanching and frozen storage. The results indicated a reduction in all the minerals and vitamins evaluated. The potassium ranged from 0.12 – 54.2mg/100 while Calcium varied from 0.06 – 44.5mg/100 for all the samples. Magnesium contents of 0.11 and 24.48mg/100g, and Sodium contents of 2.44mg and 28.43mg/100 were obtained for the samples. Zinc varied from 0.02 – 8.53mg/100g while Iron ranged from 12.6 – 21.06mg/100g. The vitamin C content for all the samples ranged from 5.77 – 70.00mg/100g. However, there was gradual reduction in the levels of these nutrients as storage time increases.

Keywords: Minerals, Vitamins, Blanching, frozen storage, Vegetables.

INTRODUCTION

Fruits and vegetables offer the most rapid and lowest cost method of providing adequate supplies of vitamins, minerals and fibres to the people, who live in the tropics. Vegetables are understood to mean the leafy outgrowth of plants used as foods and include those plants and parts of plants used in making soups or served as integral parts of the main source of meal (1). They play an important part in maintaining general good health, owing to presence of minerals and vitamins, principally vitamin C (Ascorbic acid). The presence of indigestible cellulose as roughage helps to keep the large bowel functioning regularly in the elimination of unwanted matters from the body (2). The cellulose incites peristaltic movement and indirectly helps digestion and prevents constipation (3).

Green vegetables lose their eating quality very rapidly after harvesting: Sugar content declines; and the amount of cellulose increases (1). If allowed to stand long after harvesting or gathering, they become wilted and tough through loss of moisture. The flavour is also impaired due to enzyme action and to conversion of sugar to starch. At this stage, vitamin C contents of the leaves begin to decrease as the structure of the living cells become disorganized (1). Vegetables loose some of their nutrients during storage. Research has shown that blanching of vegetables resulted in leaching of water soluble nutrients, primarily vitamins. These nutrients are lost by the action of heat in the presence of air (4). The action of oxidizing enzymes causes loss of nutrients and again, vitamin C is easily rapidly destroyed by oxidases in the presence of oxygen in water used for blanching (5).

The minerals in vegetables comprises of phosphorus, sodium, iron, calcium and potassium and these minerals can be affected by chemical or physical treatments; some may be oxidized to higher valence by exposure to oxygen. Blanching and freezing are pre-treatments given to fruits and vegetables during preparation for further processing. Blanching time and temperature depends on the final processing to be employed as well as the nature of material (5). Freezing preserves vegetables by reducing the temperature so that micro organisms are kept in suspended animation (6).

Therefore, the objectives of this present work is to know the effects of these pre-treatment operations on some minerals and vitamin C contents of some leafy vegetables widely consumed in Ilaro community, Ogun state, Nigeria and to relate them to their food values.

MATERIALS AND METHODS

Collection of Materials: Four freshly harvested leafy vegetables viz: Tree Spinach, Egg plant, African spinach and black night-shade (*Cnidoscolus chayamansa*, *Solanum nodiflorum*, *Amaranthus hybridus* and *Solanum nigrum*) were obtained from a local farm in Ilaro community, Ogun state, Nigeria. They were collected early in the morning in clean polythene bags and taken to the Laboratories of Food Technology, Federal Polytechnic Ilaro for pre-treatment processing and analysis.

Preparation of Samples: The fresh leafy vegetable samples were destalked, sorted, sliced and washed with clean portable water to remove unwanted matters (4). Blanching was carried out by immersing the cleaned leafy vegetable in hot water maintained at 85^{o}C for 2 minutes after which they were cooled in cool water, allowed to drain and neatly packed in nylon bags (4). The blanched vegetables were transferred to freezer maintained at -18^{o}C for frozen storage (2). Samples were taken for analysis at intervals of 8 days.

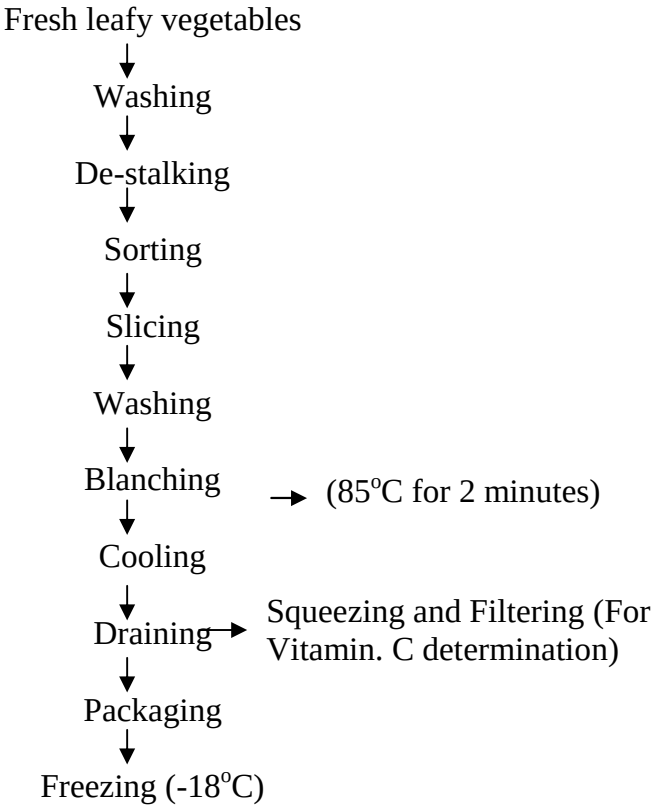

Fig 1: Flow chart for the preparation of fresh vegetable samples.

METHODS

The minerals analysis of blanched and frozen leafy vegetables were carried out using standard methods, as described by Pearson, 1976 (7). The process involved dry-ashing samples at 550^{O}C to constant weight and dissolving the ash in volumetric flask with distilled water, and then de-ionized water with a few drops of concentrated hydrochloric acid. Sodium and Potassium were determined on Jenway Digital Flame photometer (PF P7) model. Other minerals were determined by Atomic Absorption Spectrophotometer (Perkin-Elmax model 403, Norwalk, CT, USA). All determinations were done in triplicates.

Vitamin C determination; (8).

Vitamin C (Ascorbic acid) contents of the samples were determined using methods described by Barakat et al., 1973 (9). This was carried out by incarceration the sample with a stabilizing agent (5% metaphosphoric) and titrating the decanted/ filtered extract with 2, 6-dichlorophenol-indophenol. The vitamin C content was calculated as:

mg ascorbic acid per 100g sample

$$= \frac{VxTx100}{W}$$

Where:
V = ml of dye used for titration of a liquor sample
T = Ascorbic acid equivalent of dye solution expressed as mg ml of dye
W = Gram of sample in a liquor titrated.

RESULTS

Figures 2, 3, 4 and 5 presents the results of effect of blanching and frozen storage on selected mineral composition of four leafy vegetables widely consumed in Ilaro community of Ogun state, Nigeria (mg/100g). The result of vitamin C content (mg/100g) is as shown in figure 6.

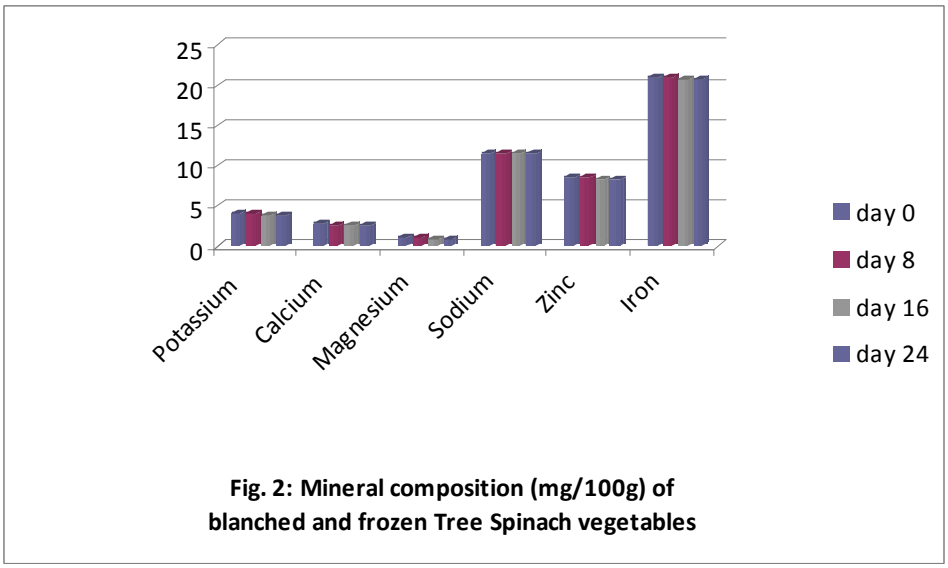

Fig. 2: Mineral composition (mg/100g) of blanched and frozen Tree Spinach vegetables

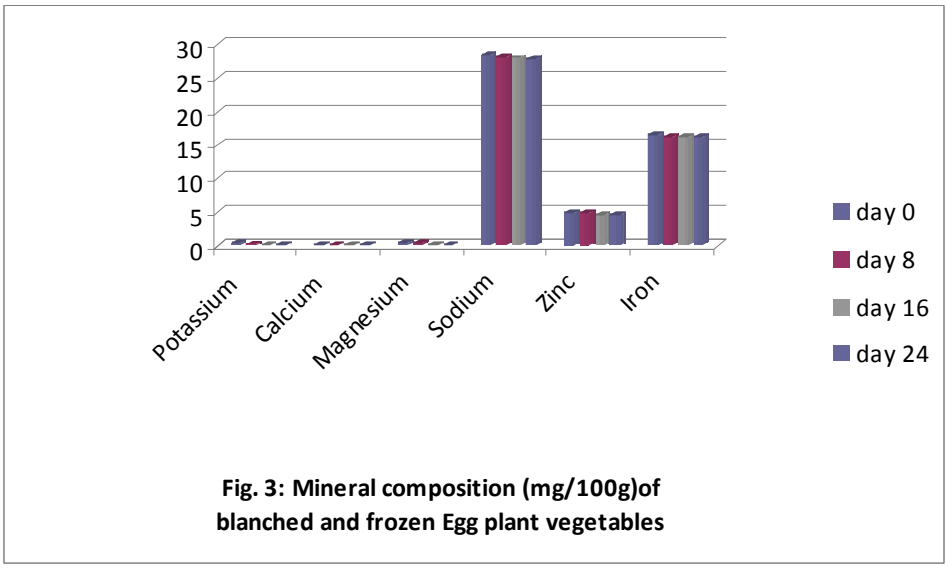

Fig. 3: Mineral composition (mg/100g)of blanched and frozen Egg plant vegetables

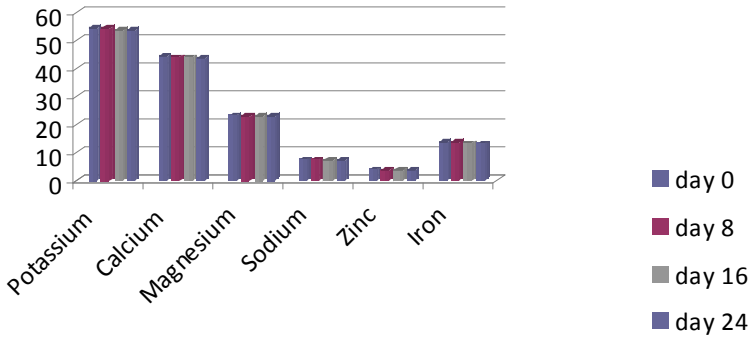

Fig. 4: Mineral composition (mg/100g) of blanched and frozen of African spinach vegetables

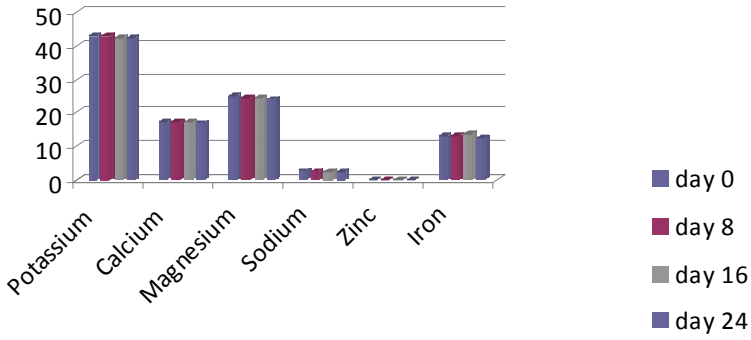

Fig. 5: Mineral composition (mg/100) of blanched and frozen of Blacknightshadevegetables

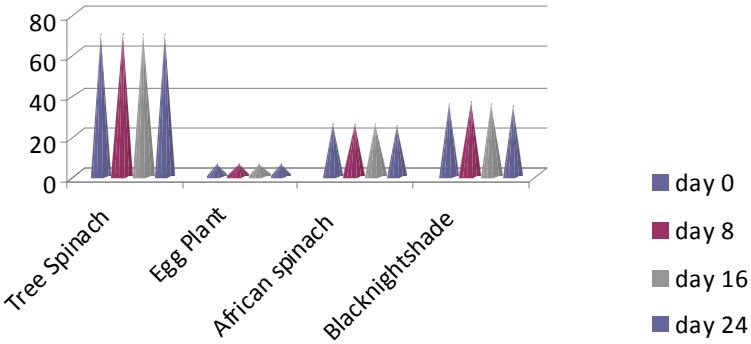

Fig. 6: Vitamin C contents (mg/100g) of blanched and frozen vegetables

DISCUSSION

Heating is one of the most important methods developed to extend the shelf life of foods and increasing the availability of nutrients to consumers (10). Blanching, as a preservative methods for vegetables often leads to loses of nutrients, mostly vitamins and minerals because of the leaching of these important nutrients. Data obtained for all the minerals evaluated viz: Potassium, Calcium, Magnessium, Sodium, Zinc and iron showed a gradual decrease in quantities from day 0 to day 24 during the storage period. Potassium, for all the samples under consideration, ranged from 0.12 – 54.20mg/100g. The recommended daily allowance set by the 1989 RDA is 20.00mg (10). So, there is need for more consumption of these vegetables to support the primary electrolyte and major cation inside the cell since low blood Potassium is a life threatening problem (11). The Calcium contents for all the samples ranged between 0.06 and 44.15mg/100g. Calcium represents about 40% of all the minerals present in the body as reported in the literature (11). The amount obtained from this work varied greatly hence other sources of Calcium should be made available to the body system. Calcium is also a major factor sustaining strong bones and plays a part in muscle contraction and relaxation, blood clotting, synaptic transmission and absorption of vitamin B12 (12).

Potassium and magnesium are known to decrease blood pressure (12).

Magnesium occurs abundantly in chloroplasts as a constituent of chlorophyll molecule (10). The amount obtained in this work varied from 0.11 to 24.80mg/100g. Its low concentrations in most of the vegetables could be attributed to the age of plants and cultural practices are reported in the literature (10). The recommended daily Allowance (RDA) is 400mg/day for men 19-30 years old and 310mg/day for women 19-30 years old (13).

The sodium content ranged from 2.44-28.4mg/100g. However, as reported in the literature (10), sodium intake of less than 2g/day increases calcium loss in urine and high intakes contributes to hypertension in some people. The low level of zinc (0.02 – 8.53mg/100g) is grossly inadequate and can contribute to high morbidity (10).

Green leafy vegetables also contain iron needed in haemoglobin formation (14) and hence recommended for anaemic convalescence. The values ranged between 12.6mg/100 and 21.06mg/100 respectively for all the samples. Various minerals are also co-enzymes in certain biochemical reactions in the body which underscores the importance of leafy vegetables in metabolic reactions (12).

Figure 6 gives the vitamin C contents of the blanched and frozen vegetables. All the leafy vegetables under study contained ascorbic acids in varied concentrations. The vitamin C contents in Tree spinach are 70.00mg/100g, 69.82mg/100g, 69.72mg/100g and 69.64mg/100g on days 0, 8, 16, and 24 respectively.

Vitamin C in egg plants are 6.00mg/100g, 5.92mg/100g, 5.85mg/100g and 5.77mg/100g for the duration of days during storage. The vitamin C contents in African Spinach ranged from 24.42 – 25.40mg/100g while Black-nightshade varied from 34.25 – 35.18mg/100g. Ascorbic acid (vitamin C) is an antioxidant which helps to protect the body against cancer and other degenerative diseases such as arthritis and type II diabetes mellitus (12). It also strengthens the immune system. However, as reported in the literature, Blanching prior to freezing or drying to inactivated enzymes which could contribute to undesirable changes in colour, flavour or nutritive value during storage also cause significant loss of vitamin C (10). The reported losses of ascorbic acid during blanching or cooking are enormous and may vary between 40 and 70% in some cooked vegetable when processed at 100^{O}C for 15minutes (15).

CONCLUSION

Vegetables are known to provide nutrients such as vitamins, minerals, fibres etc to the people and mostly abundant during the raining season but become scarce during the dry season. Blanching and frozen storage offers better means of preserving these vegetables so that it becomes available almost all the year round, with little loss of these nutrients during processing.

REFERENCES

1. Ihekoronye, A.I and Ngoddy, P.O. (1985). Integrated Food Science and Technology for the Tropics. Macmillan Press, London, UK pp: 293- 311.
2. Fayemi, P.O (1999): Nigerian vegetables. Heinemann Educational Books. (Nig). Pp 1-4.
3. Lintas, C. (1982): Nutritional Aspects of Fruits and Vegetable Composition Optiion. Mediteraennes 19:79-87.
4. Fellows, P.(1990): Food Processing Technology. Principle and Practice. West Sussex, England. 1st edn, Ellis Horwood Ltd, pp 31-35, 197-208.
5. Brian, A.F and Allan, G.C. (1995): Food Science and Nutrition. 6th edition, Edward Arnold Publisher. Pp261.
6. Dessrosier, D (1972): The Technology of Food Preservation. 4th edition, AVI Publishing Company Inc. pp50-52.
7. Pearson, D.H (1976): Chemical Analysis of Foods. Church-hill, London, pp 335-336.
8. AOAC (1990): Official Methods of Analysis. 5th ed. Pp342-1230. Arlinton, V.A: Association of Official Analytical Chemists.
9. Barakat, M.Z, Shehab, S.K, Darwish, N and Zahermy, E.I (1993). Ascorbic Acid from plants. Anal.Biochem. 53:225-245.
10. Mepba, H.D, Eboh, L and Banigo, D.E.B (2007). Effect of Processing Treatments on the Nutritive Composition and Consumer Acceptance of some Nigerian Edible leafy Vegetables. Afri.J. Food Agric. Nutr. Dev. 7 (1): 1-18.
11. Wardlaw, G.M and Kessel, M.W (2002). Minerals: Dietary needs, absorption, transport and excretion In: Perspective in Nutrition. (5th Edn), Mc Graw-Hill companies Inc. pp418-464.
12. Mensah, J.K, Okoli, R.I, Ohaju-Obodo, J.O and Eifediyi. (2008). Phytochemical, Nutritional and medical properties of some leafy vegetables consumed by Edo people of Nigeria. African Journal of Biotechnology, Vol. 7&14) pp2304-2309.
13. FNB. (1997): Food and Nutrition Board, Institute of Medicine: Dietary Reference intakes for calcium, phosphorus, magnesium, vitamin D and fluoride. Washington DC, National Academy Press.
14. Latunde-Dada, G.O (1990). Effects of processing on Iron levels and availability from Nigerian vegetables. J. Sci., Food Agric. 53:355-361.
15. Bassir, O and Umoh, I.R (1976): Nutrients changes in some Nigeria traditional foods during cooking. I. Vitamin changes. West African Journal of Biology and Applied Chemistry, pp 9-13.