Research Note

EFFECT OF BLANCHING ON NIACIN CONCENTRATION IN CANNED RED KIDNEY BEANS[1]

Niacin is one of the most important vitamins in human and animal nutrition. Biochemically, it is used in the synthesis of a great number of enzymatic systems. Every living tissue must have a certain amount of niacin for a proper metabolism[2] Its behavior during food processing has been thoroughly studied during the last few years. Khattab[3] studied its changes during cheese processing. Chaturvedi[4] examined the behavior of the vitamin in pea processed by three different methods. A similar study was made on fish by Duda,[5] who also tested the effect of boiling on the niacin concentration of vegetables.[6]. Colakoglu and Detles[7] examined the effect of presoaking and container material on the vitamin content of beans.

Nutritional data usually does not take into account the losses in bioavailability that might occur during food processing.[8] Although the main purpose of food processing is to inhibit those factors that might reduce the shelf-life of food, this has to be accomplished with the least possible loss of nutrients. Air exposure, light, pH, water content, natural biological enzymes of the food, their combined effects, and heat are some of the factors involved in food processing that might contribute to the loss of nutrients in foods.[9]

Niacin is stable in its dry form and in solution It is unaffected by light or pH and is relatively undisturbed by strong oxidizing agents. It is thermally stable to 236° C. However, during processing and cooking in foodstuffs a maximum loss of 75% has been reported.[10]

The solubility of niacin is the cause of its excessive loss during processing. The vitamin leaches into the water used during the soaking, blanching, and thermal processing operations. Nordstrom and Sistrunk did not find any differences in the hydration ratios

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[2]Association of Vitamin Chemists, Inc. 1951. Niacin, Ch. 8 "Methods of Vitamin Assay" 2nd ed. pp 177-203 Interscience Publishers, Inc., New York, NY.

[3]Khattab, A. A. and N. Zaki. 1986. The changes in niacin, biotin, B_{12}, and folic acid during the preparation of Kareish and Domiati cheeses. *Egypt. J. Dairy Sci.* 14 (2): 165-172.

[4]Chaturvedi, A. and P. Geervani, 1986. Biovailability of niacin from processed groundnuts. *J. Nut. Sci. & Vit.* 32 (3): 327-334.

[5]Duda, G., M. Maruszewska, M., C. Kuylesza, H. Gertig, and Z. Szajkowski. 1987. Losses of B-vitamins in selected fish species during cooking. *Bromatologia i Chemia Toksykologiczna* 20 (2): 89-95.

[6]Duda, G. and H. Gertig, 1983. Effect of boiling of certain vegetables and cereals in the niacin equivalent value. *Zywienie Czlowieka i Metabolizm* 10 (4): 283-89.

[7]Colakoglu, M. and S. Oetles, 1986. Influence of different cooking methods on niacin content of beans (*Phaseolus vulgaris*). *Mitteilungen aus dem Gebiete der Lebensmitteluntersuchung und Hygiene* 77 (4): 605-08.

[8]Ekanayake, A. and P. E. Nelson, 1990. Effect of thermal processing on lima bean vitamin B-6 availability. *J. Food Sci.* 55 (1): 154-57.

[9]Institute of Food Technologists, 1986. Effects of food processing on nutritive values. *Food Tech.* 40 (12): 109-16.

[10]Harris, R. S. 1971. General discusson on the stabilty of nutrients, Ch 1., Nutritional Evaluation of Food Processing. 3rd Ed. pp 3-5.

and shear press readings of processed beans soaked for 0 to 1 hr and 16 to 18 h.[11] They showed that higher drained weights were obtained when beans were soaked for 2 h than when the beans were soaked overnight. It can be concluded that the shorter the soaking period the higher the niacin retention.

Another factor that affects nutrient retention is the blanching operation, which can be accomplished by hot water or by steam. With either of these methods, nutrients are lost because of thermal degradation; however, with steam, more nutrients are retained. Guerrant et al. examined the effect of blanching time on the content of certain nutrients of peas and lima beans (21). He found that 32% of the niacin was lost when the peas and lima beans were blanched at 200° F for 2 minutes. After 4 and 6 minutes blanching, 32 and 37% of what was left was lost, respectively.

Ekanayake and Nelson[8] found that during thermal processing most of the nutrients are retained, specially the vitamin B6. Because of greater thermal stability, niacin should have a better retention than vitamin B_6 during thermal processing.[12]

The effect of the blanching treatment upon retention of niacin in canned red kidney beans was studied. Dry red kidney beans where hydrated for 2 hours 28 minutes. The hydration ratio was 1.75. The beans were blanched at 190° F for 4, 5, and 6 minutes. A filled weight of 8.5 ounces of blanched beans was placed in each enameled can. A salt tablet containing 1.6% EDTA sodium was added to each of the cans. The canned beans were sealed and heat processed at 250° F for 19 minutes.

Two samples of raw beans and five samples per blanching time were analyzed in duplicate for niacin content according to the AOAC colorimetric method[13]. The UV/VIS Spectrofotometer used was a Beckman DB-G.[14]

Results show that blanching time is an important variant in nutrient retention (table 1) as shown below:

Blanching time (min	Niacin conc. (mg/100g)
0	2.54
4	1.18
5	0.55
6	0.23

The first process studied, which had a 4-minute blanching, had a 54% niacin concentration loss. The 5- and 6-minute blanching processes had 78% and 91% niacin loss, respectively. Thus for a one minute increase in the blanching time, a rough estimate of 18% nutrient loss is added to that of whole canning process. If the beans are hydrated for 2 hr and blanched 4 minutes, at least half of the initial niacin concentration can be retained in processed beans. These small changes in bean canning can also reduce costs in energy and time.

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[11]Nordstrom, C. L. and W. A. Sistrunk, 1977. Effect of type of bean, soak time, canning media and storage time on quality attributes and nutritional value of canned dry beans. *J. Food Sci.* 42 (3): 795-98.

[12]Lund, D. 1971. Heat Processing, Ch 12. Nutritional Evaluation of Food Processing. 3rd ed. pp 336-37.

[13]A.O.A.C., 1984. Official Methods of Analysis of the Association of Official Analytical Chemists. 14th ed. Association of Official Analytical Chemists, Inc., Arlington, Virginia.

[14]Trade names in this publication are used only to provide specific information. Mention of a trade name does not constitute a warranty of equipment or materials by the Agricultural Experiment Station of the University of Puerto Rico, nor is this a mention or statement of preference over other equipment or materials.