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Research Paper

Effect of Soaking, Boiling and Pressure Cooking on Thiamine, Riboflavin, Niacinand Potassium Content in Green Gram Whole

Healthcare

KEYWORDS :

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ABSTRACT

India is a largest producer and consumer of the pulses in the world and accounts for 33 percent of the global area. (Singh et al., 2003). The major pulses which find an important place in our dietaries are red gram dhal, bengal gram dhal, black gram dhal, green gram dhal and masoor dhal. Some are used as whole grams. Some of the pulses like cow pea, rajmah and dry peas also belong to the leguminous family (Manay, S. and Shadakharaswamy, Pulses are good sources of fiber and water soluble vitamins like thiamine, riboflavin and niacin. Pulses are also rich in minerals like potassium, magnesium, manganese, copper, zinc, chromium which are easily destroyed by heat when subjected to cooking. Pulses also contain toxic substance like phytate, trypsin etc and hence it becomes essential to cook the pulses for easy digestion (Lutz, 1997). The aim of the present study was to estimate levels of thiamine, riboflavin, niacin and potassium in the selected Pulses (Whole Green gram and cow pea) before and after processing techniques like soaking, boiling and pressure cooking. Thiamine and riboflavin estimation was done by fluorimetric analysis, Niacin by colorimetric method and potassium was done by flame photometry. Soaking pulses for three hours in water resulted in loss of thiamine, riboflavin but soaking did not affect the niacin and potassium content. Boiling resulted in greater reduction of vitamins and minerals when compared to pressure cooking. Potassium losses was seen only when the pulses were boiled. Therefore it can be summarized that a combination of cooking methods will prove to be more advantageous in improving the retention of vitamins than mere inclusion of a single method into cooking

Introduction

India is a largest producer and consumer of the pulses in the world and accounts for 33 percent of the global area. Pulses are considered as a rich source of dietary protein for a majority of people in the world and the production of pulses accounts to 22 percent in India (Singh et al., 2003). The major pulses which find an important place in our dietaries are red gram dhal, bengal gram dhal, black gram dhal, green gram dhal and masoor dhal. Some are used as whole grams. Some of the pulses like cow pea, rajmah and dry peas also belong to the leguminous family (Manay, S. and Shadakharaswamy, 2006). Pulses are good sources of fiber and water soluble vitamins like thiamine, riboflavin and niacin. Pulses are also rich in minerals like potassium, magnesium, manganese, copper, zinc, chromium which are easily destroyed by heat when subjected to cooking. Pulses also contain toxic substance like phytate, trypsin etc and hence it becomes essential to cook the pulses for easy digestion (Lutz, 1997).

Duodu et al., 1999 had proved that cooking reduces the water soluble vitamins. Vitamin B1 or thiamine is most commonly referred to as an important member of the B group. It was the first vitamin to be discovered and is widely distributed throughout the plant and animal kingdoms. The most important function of thiamine is its role as a co-enzyme (Many, S. and Shadakharaswamy, 2005).

Riboflavin was the first component to be isolated in a pure state from milk, eggs and liver (Kuzhinar and coworkers, 2002). Rich sources of riboflavin are liver (3-4 mg/100 g), milk powder (1.6-1.7 mg/100 g), legumes and dhal (0.21-0.32 mg/100 g). Good sources of riboflavin are milk (0.21-0.32 mg/100 g), eggs (0.29-0.35 mg/100 g) and whole cereals (0.10-0.16 mg/100 g) (Swaminathan, 2004).

Niacin is a water soluble vitamin and was first isolated in boiled yeast extract by Goldberg and coworkers (1922-28). Nicotinic acid is essential for the normal functioning of the skin, intestinal tract and nervous system. Important sources of niacin are legumes (2-3 mg/100 g), whole cereals (3-5 mg/100 g), meat (6-7 mg/100 g), peanut (19-20 mg/100 g) and dried yeast (25-35 mg/100 g) (Swaminathan, 2004).

The minerals present in pulses are calcium, phosphorus, magnesium, sodium, potassium and iron. Eighty percent of the phosphorus present is bound to phytate and is biologically unavailable. Soaking of pulses in water before preparation decreases some of the bound phytate, thus increasing the amount of available minerals (Marilla, 2007).

Potassium is a mineral involved in electrical and cellular body function. In the body, potassium is classified as an electrolyte (Maria, A. 2001). Potassium is essential for proper functioning of cells, tissues, organs and performs the following functions in the body.

- It assists in the regulation of acid base balance.
- It assists in protein synthesis from amino acids and in carbohydrate metabolism.
- It is necessary for normal body growth.

(Gec, M.W., 2004).

Rich sources of potassium are soya bean, lentils, legumes, cowpea and green gram and vegetables such as spinach, beans, beets, brussels crop, potatoes, sweet potatoes, pumpkins and tomatoes, (Gopalan et al., 2003). Louis and Dolan in 1970 concluded that heat treatment like cooking resulted in substantial loss of potassium in vegetables. Cooking is the method of transfer of heat to the substance or the process of subjecting food to the action of heat. The main objective of cooking is to improve the food quality, digestibility and to destroy the micro-organisms. Most of the spores of the micro-organisms were resistant to the heat treatment and the process of irradiation (Frakas et al., 2003). Different cooking methods include boiling, steaming, frying, pressure cooking and microwave cooking. Cross 1982 concluded that cooking amounted to greater losses of water soluble vitamins.

The nutrient content of pulses depends on the fertility of the soil. So the nutrient content of pulses differ from place to place (Vanparys et al., 1998). Due to depleted soil our food supply is nutritionally inadequate and important nutrients are removed by food processing. These nutritionally depleted foods when cooked loose the valuable enzyme and vitamins (Shills, 1999). Vitamins and minerals perform many vital functions in the body. So there is a need to determine the method of cooking that minimizes the loss of nutrients.

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Pulses are generally cooked by two methods, the traditional method which includes boiling, steaming and the modern method which includes pressure cooking and microwave cooking. Food processing has the potential to alter the nutrient quality of pulses. People should be aware of the possibility of losses in nutritional quality of foods which may result from improper cooking at home and responsible for losses of vitamins and minerals (Severi et al., 1997). Most of the housewives in India, have a poor nutrition knowledge about the loss of nutrients during cooking, vitamin deficiency disorder and requirements of pulses in the daily diet (Khetarpaul, 1996). The effect of currently adopted household cooking techniques such as soaking and boiling on thiamine, riboflavin, niacin content of some selected food items commonly consumed in Nigeria was investigated. Data revealed that boiling for 60 minutes resulted in substantial loss of vitamins B1 and B2 (Mac, I. et al., 1995). Edijala J.K., 1990 reported that cooking cowpea and rice revealed a greater loss in thiamine and riboflavin content.

Pulses are generally cooked by boiling and pressure cooking. Food processing has the potential to alter the potassium content of the pulses. The effect of leaching of potassium on white potatoes (Theodore, T. 1969) and other tuberous vegetables have shown to lose a significant amount of potassium through leaching (Burrorwes.D. J., 2005).Knowledge on the methods of cooking to retain vitamins and minerals are of great importance. Hence the present study aims to evaluate the effect of soaking, boiling and pressure cooking on pulses with reference to the retention of vitamins and minerals.

Green gram (Phaseolus aureus Roxb) is grown throughout south – east Asia, central Africa, the warmer parts of china and the U.S. In India it ranks third in the production, next to bengal gram dhal and red gram dhal. Green gram grows successfully under most adverse arid and semi – arid condition where other crops fail (Menon K.K, 2002).

The aim of the present study was to estimate levels of thiamine, riboflavin, niacin and potassium in the Whole Green gram before and after processing techniques like soaking and boiling and pressure cooking.

Methodology
The research design for the study was pre-test post-test experimental design. The samples were selected by means of purposive sampling technique. Random sampling was employed in the selection of the retail outlet shops for collecting the pulses samples. 100 grams of Whole green gram were taken for each processing method.

Soaking procedure
100 grams of green gram were taken s in a kadai and soaked for six hours. It was then ground and analyzed for nutrients (Thiamin, riboflavin, Niacin and potassium).

Boiling procedure
100 grams of green gram taken in a kadai for boiling. 150 milliliter of water was added to the vessel and the temperature was brought to the boiling point. Green gram were allowed to boil for twenty minutes with closed lid at 100° Celsius. The temperature was maintained till it was done. The sample was then analyzed for nutrients (Thiamin, riboflavin, Niacin and potassium).

Pressure cooking
100 grams of green gram was taken separately in a kadai in a separator and 150 milliliter of water was added to it. The separator was placed in the pressure cooker. Green gram was cooked under fifteen lbs pressure for ten minutes. The pressure was allowed to come down to the atmospheric pressure level and the sample was analyzed for nutrients (Thiamin, riboflavin, Niacin and potassium).

Tools used for the study
Estimation of thiamine and riboflavin was done by fluorimetric analysis, process, Niacin by colorimetric method and potassium was done by flame photometry.

Statistical analysis
The data obtained were analyzed statistically using arithmetic mean, standard deviation and T.test

Results and Discussion
Pulses are included in the diet for the valuable nutrients like protein, vitamins and minerals. But most of the vitamins are lost during the process of cooking (Shasnaz, 2003). The aim of the present study was to determine the effect of soaking, boiling and pressure cooking on thiamine, riboflavin, niacin and potassium content of whole green gram

Effect of processing Green gram whole and cow pea on the mean value of Thiamin, Riboflavin, Niacin and Potassium

	Green Gram (Raw)	Green Gram (Soaked)	Green Gram (Boiled)	Green Gram (Pressure Cooked)
Thiamin (mg/g)	0.436 ± 0.001	0.409 ± 0.001	0.391 ± 0.003	0.381 ± 0.001
Riboflavin (mg/g)	0.266 ± 0.004	0.260 ± 0.001	0.223 ± 0.007	0.248 ± 0.001
Niacin (mg/g)	2.02 ± 0.075	1.97 ± 0.117	1.803 ± 0.006	1.792 ± 0.028
Potassium (mg/g)	873.48 ± 1.856	871.32 ± 1.061	577.08 ± 0.051	854.48 ± 3.584

All the data are mean and standard replications of 3 replicates.
Significance 1% ($p<0.1$) and 5 %($p<0.5$)

The present study was compared with the findings of Rehman (2000). They demonstrated that there was a reduction in the nutrient levels as a result of varying degrees of soaking and cooking. On comparing the raw whole green gram with soaked whole green gram, the mean value for thiamine reduced from 0.436 ± 0.001 to 0.409 ± 0.001 which was significant at 1 percent level (t value = 34.785). On comparing the raw whole green gram with boiled whole green gram, the mean value of thiamine reduced from 0.436 ± 0.001 to 0.391 ± 0.003 with t value of 24.653 which was significant at 1 percent level. On comparing the raw whole green gram with pressure cooked whole green gram, the mean value for thiamine reduced from 0.436 ± 0.001 to 0.381 ± 0.001 which was significant at 1 percent level (t value = 67.813). The above results clearly indicates that thiamine content of raw whole green gram reduced significantly after soaking, boiling and pressure cooking

On comparing the raw whole green gram with soaked whole green gram, the mean value for riboflavin reduced from 0.266 ± 0.004 to 0.260 ± 0.001 which was significant at 1 percent level (t value = 11.557). On comparing the raw whole green gram with boiled whole green gram, the mean value of riboflavin reduced from 0.266 ± 0.004 to 0.223 ± 0.007 with t value of 12.004 which was significant at 1 percent level. On comparing the raw whole green gram with pressure cooked whole green gram, the mean value for riboflavin reduced from 0.266 ± 0.004 to 0.248 ± 0.001 which was significant at 1 percent level (t value = 47.28). The present study was correlated with the findings of Margaret. A (1993). The study proved that there will be reduction in heat labile nutrients like thiamine, niacin and riboflavin after heating. The above results clearly indicates that riboflavin content of raw whole green gram reduced significantly after soaking, boiling and pressure cooking.

The Niacin content of whole green gram dhal reduced after soaking. (from 02 ± 0.075 to1.97 ± 0.117) which was not statistically significant at 5% level (t value = 0.117). On comparing

the raw whole green gram with boiled whole green gram, the mean value of niacin reduced from 2.02 ± 0.075 to 1.803 ± 0.006 with t value of 5.747 which was significant at 1 percent level. On comparing the raw whole green gram with pressure cooked whole green gram, the mean value for niacin reduced from 2.02 ± 0.075 to 1.792 ± 0.028 which was significant at 1 percent level (t value = 5.668).The above results clearly indicates that niacin content of raw whole green gram reduced significantly after, boiling and pressure cooking but there was no significant difference between raw and soaked, soaked and pressure cooked, boiled and pressure cooked whole green gram.

The present study was correlated with the findings of Remer. J et al, (2006) where it was found that soaking for various length of time does not appear to be possible to achieve sufficient lowering of potassium. The study result clearly indicated that potassium content of raw whole green gram (873.48 ± 1.856) reduced significantly (1%) after, boiling (577.08 ± 0.051, t value = 319.344) and pressure cooking (854.48 ± 3.584, t = 9.145) but soaking(871.32 ± 1.061, t = 0.21) did not significantly affect the potassium content of whole green gram.

Conclusion

Pulses are good sources of vitamins. Cooking of pulses produces improvement in the flavour, texture and appearance and this makes the food more palatable and easily digestible. But most of the essential vitamins especially water soluble vitamins are lost due to heat and oxidation (Thomas, 1998).

The thiamine and riboflavin content of raw whole green gram reduced significantly after soaking, boiling and pressure cooking. The Niacin content of raw green gram reduced significantly after boiling and pressure cooking. The potassium content of raw green gram reduced after boiling

Therefore it can be summarized that a combination of cooking methods will prove to be more advantageous in improving the retention of vitamins than mere inclusion of a single method into cooking

REFERENCE

Burrorwes. D. J. et al., (2006), Removal Of Potassium From TRV, Journal of renal nutrition, 16(4): 304-311. | Duodu, (1999), Importance of Thiamine to Human Health, A review article, Food Chemistry, 24(3):16. | Cross. A.G. and Fung, Y.C. (1982), The Effect Of Cooking On Nutritive Value Of Pulses, 23(2): 60-67. | Edijala. J.K. (1990), Effect of Processing on Thiamin, Riboflavin and Protein Content of Cowpeas, Journal of food technology, 10:435-400. | Farkas. J.J. et al., (2003), Studies On Irradiation Of Pre-Packaged Prepared Vegetables And Improvement Of Microbiological Safety Of Some Sous Vide Meals By Gamma Radiation, International Atomic Energy, Agency Technical documents 1337:27-44. | Gec. M. W. (2004), Potassium in Diet, Medical encyclopedia, Tufs University, Boston, The National Arcade. | Goplan. C., Rama Sasthri, B.V., Balasubiramanian, S.C. (2002). Nutritive Value of Indian Foods. ICMR, Hyderabed. | Kuzhinar et al., (2002), Riboflavin Deficiency,AJCN,48(9):1571-1577. | Khetarpaul. N., Grover and Boore, P. (1996), A Study On The Extent Of Nutritional Knowledge Of Housewives, Annuals of Agricultural Book Research, 1(1/2): 217-223. | Louis. C.J and Dolor (1970), Removal of potassium from white potatoes from white potatoes, Journal of American dietetic association, 57(1): 42-43. | Lutz. and Przytulski, (1997), Nutrition And Diet Therapy, 2nd ed. Philodelphia: F.A. Davis Company pp 106-110. | Mac Inegite (1995), Effect Of Boiling, Soaking And Wet Milling Processes On Thiamin, Riboflavin And Niacin Content Of Some Nigerian Foods, Indian Journal of Nutrition and Dietetics, 32 (40) : 40-50. | Manay. S.N and Shadakharaswamy, (2001), Foods, Facts And Principles, 2nd ed., New Delhi : New Age International Pub, pp:1-4 | Margaret. A, (1993), Journal of Consences Studies and Home Economics, Effect Of Cooking On Water Soluble Vitamins, 7(1):67 -76. | Maria and Adams, (2004), Potassium Content of Different Foods, American Journal of nutrition 58(8):88. | Marilla, L. barreto, (2007), Value of Vegetarian Food, Bombay Hospital journal, 49(3): 41. | Menon. K. (2002), Legumes In Human Nutrition, Nutrition,NIN,23(2):21-32. | Rehman. Z. U. (2000), Effect of Processing on available Carbohydrate Content and Starch Digestibility of Kidney Beans, Food Chemistry, 73(3):351 – 355. | Remer J. (2006), Effect of processing on availability of nutrients, journal of food chemistry, 58(4):46 -67. | Severi Bedogni, et al, (1997), Effect Of Cooking And Storage Methods On The Microbial Content Of Food, European Journal of cancer prevention, 6(1): 521-524. | Shils. M.E. (2005), Modern Nutrition Health and Disease, 9th ed, Newyork: Lippin Cott William Pub. P: 1783, 381 – 408. | Shanaz alvi, (2003), Effect of peeling and cooking on nutritive value of vegetables, Pakisthan journal of nutrients, 2(3):181-191. | Singh. S.R. et al., (2003), An Overview Of Pluses Production Scenario In North Eastern Hill Region, National Symposium On The Pluses For Crop Diversification and Natural Resources Management, Kanpur,pp 285. | Swaminathan, (2004), Advanced Text Book On Food And Nutrition, Volume 2. 2nd Ed., Bangalore, Buppco Pub, pp:230- 369. | Theodore. T. (1969), Extraction of Potassium from Foods, 22(2), pg.490. | Thomas, S. (2000), Importance of Nutients to Human body, Food Research Institute, Japan, 7:66. | Vanparys, L. (1997), Effect Of Fertilizers And Cultivars Choice In Stored Foods, proeftuinnieuws. 8(17):37-38.