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Effect of Peeling and Cooking on Nutrients in Vegetables

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Abstract: Four vegetables brinjal, bitter gourd, colocasia and tomato were subjected for total protein, crude fiber, ash calcium, magnesium, phosphorus, potassium, ascorbic acid and folic acid contents in raw peeled raw cooked and peeled cooked forms. Losses of nutrients due to peeling and cooking were determined. The loss of protein was non-significant during peeling and was significant during cooking except in colocasia. Vegetables lost crude fiber significantly during peeling, cooking caused significant effect only in peeled form, ash reduced significantly during peeling and cooking except in tomato. Four minerals reduced significantly in both peeling and cooking especially in peeled cooking. Vitamins losses were highly significant in both peeling and cooking.

Key words: Peeling, cooking, vegetable, nutrients

Introduction

Nutritional importance of vegetables can not be neglected our daily meals. Vegetables are the major source of vitamins and minerals, but vegetable, protein is poor in quality. Vitamins and minerals are the chief regulator in metabolism in human (Robinson, 1990).

Some of the vegetables are used in raw form as salad, but most of them require cooking for the improvement of digestibility and palatability. Some other vegetables require peeling to decrease their useless fibrous (Thane and Reddy, 1997). Minerals and other nutrients are affected by both peeling (i.e. the removal of outer coarse covering) and cooking. Peeling is consider an inevitable treatment for rendering them more digestible and may result in fairly heavy loss of some nutrient, especially of vitamins. Peeling before boiling increases the loss of ascorbic acid, folic acid or other vitamins of group B (Bennion, 1980).

Methods, temperature and duration of cooking may also effect significantly on the nutritive values of vegetables. Some of the important nutrients such as ascorbic acid and folic acid which are susceptible to oxidation are readily oxidized by brisk cooking. Minerals are also affected by high temperature, in some other cases flavour may be lost by brisk cooking. Excessive cooking may also cause an adverse affect on the digestibility of the vegetables.

The present study was determined the extent of loss of nutrients that may occur in some of the important vegetable due to peeling and cooking as practiced in Pakistan.

Materials and Methods

The four vegetables with their botanical names are given below:

1. Brinjal (*Solanum melogena*)
2. Bitter gourd (*Hemordia charantia*)
3. Colocasia (*Colocasia antiquorum*)
4. Tomato (*Lycopercicum esculantum*) (Nawaz, 1997)

Four analytical procedures these vegetables were divided into four parameters:

a) Vegetables as such
b) Peeled vegetables
c) Cooked vegetables
d) Peeled and cooked vegetables

Three samples for each parameter was taken and subjected for proximate analysis, (total protein, crude fiber, ash content) according to AOAC (1984), mineral compositions, (calcium, magnesium, phosphorus and potassium) (AACC, 1983) vitamin compositions (ascorbic acid and folic acid (AOAC, 1990). Percentage loss was calculated from the data obtained for the above four parameters. Total protein was estimated by Kjeldals method. Percentage of crude fiber was determined by dissolving the sample in 1.25% H_2SO_4 and 1.25% NaOH. Residue was ignited in furnace and weight of the ash gave the percentage of crude fiber. Ash was determined by ignited the sample in furnace for 6 hours at 600 ^{o}C. The estimation of mineral was done after wet digestion. The digested extract after dilution was used for the estimation of minerals. Calcium and magnesium were estimated by titration the sample against EDTA solution a method described by Richards (1969).

Phosphorus was determined spectrophotometry after reacting the sample with ammonium molybedate solution a method described by Oser (1976). Potassium was estimated by flame photometry help of a standard graph.

Ascorbic acid was determined spectrophotometrically by indophenol-xylene extraction method reported by Robinson and Stotz (1945). Folic acid was estimated calorimetrically by a method described in methods of vitamin assay (Anonymous, 1966). The data obtained was subjected to statistical analysis and significance of the losses was determined (Steel and Torrie, 1992).

Table 1: Compositional analysis of Brinjal after peeling and cooking

Parameters	Raw unpeeled	Percentage losses due to peeling	Percentage losses due to cooking	Percentage loss due to peeled cooked
Protein	1.18gm/100g	11.016	15.25	27.97
Crude fiber	0.0gm/100g	13.33	16.00	22.22
Ash	0.58g/100g	18.96	34.48	50.00
Calcium	17.30mg/100g	8.092	14.566	25.02
Magnesium	19.0mg/100g	5.68	12.894	17.05
Phosphorus	35.50mg/100g	8.78	19.0	46.42
Potassium	221.0mg/100g	4.072	9.04	25.339
Ascorbic acid	4.8mg/100g	25.833	61.45	97.291
Folic acid	4.6μg/100g	15.21	41.30	78.47

Table 2: Compositional analysis of bitter gourd after peeling and cooking

Parameters	Raw Unpeeled	Raw Peeled	Raw Cooked	Peeled Cooked
Protein	0.7g/100g	12.85	14.28	22.85
Crude fiber	1.0g/100g	20.00	28.00	32.00
Ash	0.9g/100g	11.11	36.36	60.00
Calcium	19.0mg/100g	13.157	24.368	32.1578
Magnesium	22.05mg/100g	4.76	11.56	14.965
Phosphorus	30.25mg/100g	9.256	17.355	31.30
Potassium	270.0mg/100g	8.880	22.220	27.470
Ascorbic acid	18.25mg/100g	13.26	53.42	89.75
Folic acid	2.85μg/100g	13.13	30.52	63.15

Table 3: Compositional analysis of colocasia after peeling and cooking

Parameters	Raw Unpeeled	Raw Peeled	Raw Cooked	Peeled Cooked
Protein	0.2g/100g	10.000	14.500	16.000
Crude fiber	3.10g/100g	31.890	32.580	36.870
Ash	2.12g/100g	13.207	22.169	32.547
Calcium	33.08mg/100g	13.089	20.828	27.176
Magnesium	27.00mg/100g	11.590	18.518	31.410
Phosphorus	65.00mg/100g	2.384	6.920	15.890
Potassium	445.00mg/100g	0.449	15.500	19.320
Ascorbic acid	6.25mg/100g	8.333	49.920	68.320
Folic acid	10.80μg/100g	4.620	25.740	58.330

Table 4: Compositional analysis of Tomato after peeling and cooking

Parameters	Raw Unpeeled	Raw Peeled	Raw Cooked	Peeled Cooked
Protein	1.1g/100g	18.18	31.818	54.54
Crude fiber	0.60g/100g	18.33	33.33	40.00
Ash	0.50g/100g	20.00	32.00	40.00
Calcium	10.75mg/100g	25.395	36.279	50.883
Magnesium	11.95mg/100g	32.63	45.857	74.142
Phosphorus	30.00mg/100g	6.40	33.33	49.96
Potassium	235.0mg/100g	2.90	19.57	25.957
Ascorbic acid	22.52mg/100g	28.86	89.12	97.70
Folic acid	4.50μg/100g	17.17	68.88	100.00

Results and Discussion

Brinjal: Loss of protein in brinjal due to peeling, cooking and peeled cooking were found 11.016, 15.25 and 27.96% respectively. The loss of crude fiber due to above mentioned three parameters were found 13.33, 16.0 and 22.22 respectively. For ash content the loss were found to be 18.96, 34.48 and 50.0% respectively for three parameters. The loss of calcium, magnesium, phosphorus and potassium were observed 8.092, 14.506, 25.02 percent for calcium, 5.68, 12.894, 17.05 for magnesium, 8.78, 19.0, 46.42 percent for phosphorus and 4.072, 9.04, 25.339% for potassium respectively. The loss of ascorbic acid and folic acid for peeling was 25.833 and 15.21% for cooking 61.45 and

41.30%, for peeled cooking it was 97.291 and 78.47% respectively. These results are fully supported by Ahmad (1976); Anonymous (1972).

Bitter Gourd: The loss of protein in bitter gourd was estimated 12.85 for peeling, 14.28% for cooking and 22.85% for peeled cooking. The loss of ash for above concentration was found to be 11.11, 36.66 and 60.0% respectively. Percentage losses for the minerals in their peeled, cooked and both peeled and cooked forms were 13.157, 24.368 and 32.1578% for calcium, 4.76, 11.56 and 14.965% for magnesium, 9.256, 17.355 and 31.30% for phosphorus and 8.88, 22.22, 27.47% for potassium. The percentage losses of ascorbic acid and folic acid for above mentioned three parameters were 13.26, 53.42, 89.75 and 13.33, 30.52 and 63.15% respectively. These results are in line with these reported by Ahmad (1976).

Colocasia: The percentage loss of protein was 10% during peeling 14.50% in cooking and 16.0% during peeled cooking. Vegetable lost its 31.89% crude fiber during peeling, 32.58% during cooking and 36.87% of its crude fiber during peeled cooking. The loss of ash for peeling, cooking and peeled cooking was 13.207, 22.169 and 32.547% respectively. The losses of minerals i.e. calcium, magnesium, phosphorus and potassium were 13.089, 11.59, 2.384 and 0.449% during peeling 20.828, 18.518, 0.92 and 15.5% during cooking and 27.176, 31.41, 15.89 and 19.32% respectively during peeled cooking.

The losses for ascorbic acid and folic acid were 8.333 and 4.62% for peeling, 49.92 and 25.74% for cooking and 68.32 and 58.33% respectively during peeled cooking.

Tomato: The losses of protein, crude fiber and ash were 18.18, 18.33 and 20% during peeling, 31.818, 33.33 and 32.0% during cooking and 54.54, 40.0 and 40.0% respectively during peeled cooking. The losses of four minerals i.e. calcium, magnesium, phosphorus and potassium were 25.395, 32.63, 6.4 and 2.9% during peeling 36.279, 45.857, 33.33 and 19.57% during cooking and 50.883, 74.142, 49.96, 25.957% respectively for peeled cooking. The ascorbic acid and folic were 28.86 and 17.77% for peeling 89.12 and 68.88% for cooking and for peeled cooking. The loss was 97.7 and 100% respectively. The percent findings for content are line with the results reported Wysokinska (1967). For crude fiber and ash these results are supported by Ahmad (1976). The results for mineral losses are supported by Augustin *et al.* (1981); Astler-Dumas (1975). The results on the losses of vitamins are supported by Augustin *et al.* (1981); Astler-Dumas (1975); Klein *et al.* (1981).

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