

THE EFFECT OF COOKING TIME ON THE VITAMIN C, DIETARY FIBER AND MINERAL COMPOSITIONS OF SOME LOCAL VEGETABLES.

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INTRODUCTION.

In Nigeria and other tropical African countries where the daily diets are dominated by starchy staple food, vegetable are the most essential and cheapest source of vitamins, protein, dietary fiber and minerals. The consumption of varieties of herbs and vegetables by man is believe to have contributed significantly to his nutritional status and healthy living through prevention of diseases because plants have long serve as therapeutic agents (Akinsoyinu & Tower,1989). Fluted Pumpkin (FP), (*Telfaira occidentalis*) commonly called Ogwu, Bitter Leaf (BL) (*Vernonia amygdalina*) Water Leaf (WL) (*Talinum fruticosum*) and Spinach (SP), (*Spinacia oleracea*) are some of the common vegetables found in the diet of Nigerians and linked as therapeutic agents in the management of various ailment like diabetes mellitus, lowering of high blood pressure, colorectal cancer and constipation (Sandra, 1995). Several methods of processing the vegetables are being use without considering the effect on the vitamin C, dietary fiber and minerals components. This study is designed to determine the effect of cooking time on the Vitamin C, dietary fiber & mineral constituents of *T. occidentalis* (FP), *V. amygdalina* (BL), *T. fruticosum* (WL) & *S. oleracea* (SP).

Sample Collection: The *T. occidentalis*, *V. amygdalina*, *T. fruticosum* & *S. oleracea* used in this study were obtained from Tudun Wada market in Zaria, Kaduna State, Nigeria. The sample were transported to the laboratory in a polyethylene bag.

Sample Treatment: The vegetable samples were individually washed manually with distilled water. Each sample was divided into six portions and treated differently: raw (T1), boiled for 5 minutes (T2), boiled for 15 minutes (T3), boiled for 20 minutes (T4), boiled for 25 minutes (T5), boiled for 30 minutes (T6). The boiling was done in a beaker on a hot plate set at 100 °C. Each sample was pounded separately using mortar and pestle and 100g of the homogenous sample extracted with 250 cm³ of ethanol for 48 hours in a separating funnel. These were then used for all the analyses

Determination of vitamin C: The recommended method of association of analytical chemists (AOAC, 1984) was used for the determination of vitamin C content in the samples.

Determination of crude fiber: This was done using the modified method of FAO (2003).

Determination of mineral and heavy metal contents: Zinc, Iron, Cadmium and Chromium contents were analyzed using automated atomic absorption spectrophotometer. The concentration was expressed as part per million (ppm).

Table 1 above shows the effect of cooking time on the vitamin C content of vegetables. The results indicate that *spinacea oleracea*

had the highest content of vitamin C while Water leaf had the least concentration in raw vegetables. All the green leafy vegetables showed a general decrease in their vitamin C content with increased duration of cooking. Fluted pumpkin had the highest content of dietary fiber while Water leaf had the least content. There was an observable decrease in these values in all the vegetables when the cooking time was increased from 5 minutes to 30 minutes respectively. All the vegetables contain reasonable contents of iron and zinc. There was also an observable decrease in the concentration of the heavy metals chromium and cadmium with increased cooking duration.

TABLE 1. CONCENTRATION OF VITAMIN C IN RAW AND COOKED VEGETABLES (mg/100g).

Time (min)	BL	SP	FP	WL
T1	8.66	15.34	9.94	8.00
T2	6.00	5.94	6.00	4.00
T3	5.50	5.74	4.72	3.76
T4	1.86	3.86	3.87	2.00
T5	1.66	3.74	3.40	1.86
T6	1.14	2.06	3.26	1.13

Results are mean of three replicate.

TABLE2. COMPOSITION OF CRUDE FIBER IN RAW AND COOKED VEGETABLES (g/100g).

Time (min)	BL	SP	FP	WL
T1	4.82	6.28	12.2	2.44
T2	4.80	6.22	10.8	2.42
T3	4.60	5.16	10.6	2.40
T4	4.36	5.10	9.16	1.08
T5	3.66	4.88	9.02	0.86
T6	3.61	4.56	9.00	0.64

Results are mean of three replicate.

TABLE 3. THE LEVEL OF IRON (Fe) IN RAW AND COOKED VEGETABLES (ppm)

Time (min)	BL	SP	FP	WL
T1	12.9	8.22	7.38	3.09
T2	12.6	8.17	6.52	3.78
T3	12.1	8.13	6.40	2.16
T4	11.82	7.21	2.67	2.08
T5	10.6	3.49	2.43	2.03
T6	8.64	3.23	1.58	2.01

Results are mean of three replicate.

TABLE 4. THE LEVEL OF ZINC (Zn) IN RAW AND COOKED VEGETABLES (ppm)

Time (min)	BL	SP	FP	WL
T1	0.97	2.53	0.89	1.32
T2	0.96	2.51	0.87	1.30
T3	0.92	2.50	0.85	1.29
T4	0.90	2.35	0.78	1.24
T5	0.87	2.20	0.76	1.22
T6	0.85	2.15	0.73	1.20

Results are mean of three replicate

TABLE 5. THE LEVEL OF CADMIUM (Cd) IN RAW AND COOKED VEGETABLES (ppm)

Time (min)	BL	SP	FP	WL
T1	2.32	2.62	1.86	1.18
T2	2.22	2.51	1.84	1.15
T3	2.13	2.32	1.83	1.13
T4	2.11	2.21	1.78	1.10
T5	2.10	2.03	1.72	1.11
T6	2.01	1.92	1.62	1.10

Results are mean of three replicate

TABLE 6. THE LEVEL OF CHROMIUM (Cr) IN RAW AND COOKED VEGETABLES (ppm)

Time (min)	BL	SP	FP	WL
T1	1.75	1.86	1.26	1.19
T2	1.74	1.86	1.25	1.18
T3	1.74	1.84	1.25	1.17
T4	1.67	1.82	1.22	1.14
T5	1.62	1.82	1.19	1.12
T6	1.57	1.77	1.16	1.11

Results are mean of three replicate.

The result from this study indicate that all the vegetable samples are rich in vitamin C, but the duration of cooking beyond 15 minutes reduces the vitamin C content in all of them (Table 1). Hassan & Hassan, (2008) also observed high content of vitamin C in local fruits and vegetables but Achinewu (1983) reported that fresh *Spinacia oleracea* is the richest in vitamin C compared to other vegetables.

The result from crude fiber analysis (Table 2) indicates that all the vegetables used for this study are a good source of crude fiber but cooking beyond 15 minutes reduces the content. The results obtained for the fresh and cooked vegetables are in agreement with that determined by Auta *et al.*, (2011). The results from the present study showed that fresh *Telfaira occidentalis* had the highest content of crude fiber. It has been reported that fiber reduces the transient time of food in the intestine this is why it is locally recommended for the management of blood sugar, high blood pressure, constipation and colorectal cancer (Akorada, 1990).

Results from this work also revealed that all the vegetables analysed are good sources of dietary iron with *V. amygdalna* containing the highest concentration (Table 3), agreeing with Bosni *et al.*, (1995). Iron is a major component of hemoglobin, the oxygen carrier of the red blood cell. Cooking the vegetables beyond 15 minutes decreases the iron content. The high iron content in *V. amygdalna* could be the reason why the juice extract is mixed with milk and drank to increase the blood level of seriously ill patients.

The results of the levels of zinc, cadmium & chromium on the studied vegetables (Tables 4, 5 & 6) showed that increase in cooking time did not significantly affect the content of the minerals. The highest content of zinc, cadmium & chromium observed in *S. oleracea* is in agreement with Jacques & Carol (2006). The high amount of cadmium and chromium contained in spinach could be due to the site of cultivation of the vegetable.

It is concluded that cooking of *T. occidentalis*, *V. amygdalna*, *S. oleracea* and *T. fruticosum* various duration up to 30 minutes leads to a reduction on the Vitamin C, crude fiber and mineral composition of these vegetables. Greater lost was observed when the vegetables was boiled for 20, 25 & 30 minutes, therefore in order to maintain a good nutritional value, vegetables should not be subjected to cooking beyond 15 minutes.

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