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Effects of Cooking on the Chemical and Phytochemical Composition of Raw and Cooked Walnut and Melon Seeds

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Abstract

This study was aimed at determining the effects of cooking on proximate, phytochemical and selected vitamins composition of melon (*Citrullus colocynthis*) and walnut (*Tetracarpidium conophorum*) seeds. Walnut and melon seeds were obtained from theopen market and were divided into two half, one half subjected to boiling and oven dried while the other half was left untreated.Resultshowedhigher moisture and ether extractsin cooked melon (10.20 and 61.1%) and raw walnut (11.5 and 44.5%), while higher crude protein, crude fibre and ashwereinbothraw melon (30.78, 3.50, and 3.50%) and walnut (32.24, 4.09 and 5.38%). Higherphytate and flavonoid were in both cooked melon (0.72 and 24.22%) and walnut (0.81 and 21.13mg/100g) seeds. There were higher terpenoid, and alkaloid in both raw melon (37.02 and 5.23mg/100g) raw walnut (32.90 and 13.06mg/100g) seeds. A higher saponin (23.22mg/100g) was in raw melon seeds compared to cooked melon (19.22mg/100g) while cooked walnut had a higher saponin content (24.90mg/100g) compared with walnut (24.60mg/100g). Cooking method used resulted into areduction in vitamin A, C and D except for vitamin D in cooked walnut (0.53mg/kg) which was insignificantly higher than raw walnut (0.50mg/kg). Vitamin E was highest (69.40mg/kg) in raw walnut and raw melon seeds (3.07mg/kg) among the vitamin determined. The proximate composition of both seeds shows a rich source of nutrient and cooking could help to reduce anti-nutrients but more research would be required to determine their *in-ovo* dietary effects in animals.

Keywords: Vitamins, anti-nutritional factor,flavonoids, walnut, melon seeds

Introduction

Food crops and seeds are of nutritional importance as they supply nutrientsrequired for growth and development in human and animals.Despite the fear of anti-nutritional factors in some of these crops and seeds, researchhas come up with the fact that some phytochemicals present in plants have anti-nutritional or anti-nutrients with potentials in helping to reduce the risk of several deadly diseasesand are of great health benefits(Liu, 2004).Walnut(*Tetracarpidium conophorum*) seed, is of great potentials, the secondary metabolites in the seeds have shown to be biologically active (Zenk, 1991). These secondary metabolites are widely applied in nutrition and as pharmacology (Soetan, 2008). The nut is rich in fat, protein, mineralsand vitamins, though themineral content and percentageoil content of the nut varies depending on its cultivar,soil parameters and climatic conditions ofwhere it isgrown (Ogunsua and Adegbona, 1993).

Melon (*Citrullus colocynthis*), is ubiquitously grown in tropical Africa for its seed (Alkofahi *et al.,* 1996). It is reported to have hepato-protective activity (Dar *et al.,* 2012), anti-arthritic activity (Kachhawah *et al.,* 2016), good physiochemical and fatty acid profile (Oluba *et al.,* 2008).There is the need to investigate and understand the nutritional potential and safety of food before it can be considered safe for humans and animals.

Therefore, this study wasaimedatdeterminingthe proximate composition, phytochemical content and vitamins contents of walnut and melon seeds as affected by cooking.

Material and Methods

Fresh newly harvested walnut and melonseeds were purchased from Bodija market in Ibadan, in Oyo state Nigeria. The walnut was thoroughly washed and de-kernelled while melon seeds was thoroughly washed and de-hulled, before dividing both seeds into two parts. A part of both walnut and melon were cooked in boiling water at 100^{O}C for one hour, dried in oventhen groundseparatelywhile the other half weregroundwith a blender and kept for analyses.Proximate analysis of raw and cooked sampleswas carried out in triplicates using AOAC (2000). Saponin, flavonoid, terpenoid; phytate, alkaloid were determined (Okwu and Josiah, 2006), while vitamins A, C, D, and E compositions were determined as described (Okwu, 2004).

Data were subjected to descriptive statisticalanalysis of variance (SAS, 2002) while means were separated at $\alpha_{0.05}$.

Results and Discussion

The proximate and phytochemical composition of raw and cooked melon is shown in Table 1.Both raw (9.7%) and cooked melon 10.2%containedhigher moisture compared to the report of Abiodun and Adeleke (2010) formelon (*Citrullus vulgaries*) with the range of 4.2-5.2% and could be attributed to the cooking. There was decreased ash content of raw melon from 3.5 to 3.1%in cooked melon which to thermal slightly higher than 3.3 and 4.9% range reported for other melon seeds (Elinge *et al*., 2012). The crude protein of raw melon decreased when cooked from 30.8 to 27.6% which compared favourably with 24.1-29.1% reported by Odoemelam (2005) and 28.6% by Bankole *et al*. (2005). This change could beduetothermal reduction from denaturation of some nitrogenous compound during processing (Apeh *et al*., 2014). There wasincreased ether extract from 59.9-61.1% which was higher than 56.5-58.9% reported by Bankole *et al*. (2005). Higher ether extract is an indication ofhigher energy and increased fat-soluble vitamin content (Tomkins and Drackley, 2010). The concentration of saponin, terpenoid and alkaloid in melon reduced from 23.2 to 19.2mg/100g, 37.0 to 2.4mg/100g and 5.2 to 1.1mg/100g, respectively when cooked. There was a slight difference for phytate with 0.70mg/100g and 0.72mg/100g in raw melon and cooked melon, respectively. An increase was observed in flavonoid from 20.6 in raw melon to 24.2mg/100g in cooked melon. The observed flavonoid content was higher than reported (Braide *et al*., 2012) for a melon (*Citrullus lanatus*). The variation could be adduced to varietal differences and where they were grown.

Table 1: Proximate and phytochemical composition of Raw and Cooked Melon

Parameters	Raw Melon	Cooked Melon	SEM
Crude Protein (%)	30.78 $\pm$0.02^{a}	27.6$\pm$0.02^{b}	0.70
Ether extract (%)	59.88 $\pm$0.02^{b}	61.10$\pm$0.02^{a}	0.27
Crude Fibre (%)	3.50$\pm$0.02^{a}	3.10$\pm$0.01^{b}	0.09
Ash (%)	3.50 $\pm$0.01^{a}	3.10$\pm$0.01^{b}	0.09
Moisture (%)	9.68$\pm$0.02^{b}	10.20$\pm$0.01^{a}	0.12
Saponin (mg/100g)	23.22$\pm$0.02^{a}	19.22$\pm$0.02^{b}	0.89
Terpenoids(mg/100g)	37.02$\pm$0.02^{a}	2.44$\pm$0.02^{b}	7.73
Phytate(mg/100g)	0.70$\pm$0.002^{b}	0.72$\pm$0.001^{a}	0.005
Flavonoid(mg/100g)	20.59$\pm$0.01^{b}	24.23$\pm$0.03^{a}	0.81
Alkaloid(mg/100g)	5.23$\pm$0.02^{a}	1.07$\pm$0.02^{b}	0.93

Values are means of three determinations $\pm$ SD; abc: means with the same superscripts are not significantly different ($p>0.05$).

Table 2 shows the proximateand phytochemical composition of raw and cooked walnut. There was increase moisture from8.8raw to 11.5%incookedwalnut.Apeh *et al.* (2014) reported increase from 40.1 in raw to 46.5% in cooked walnut. Similarly, ether extract was increased after boiling from 26.8 to 44.6%,though lower compared to a range of 29.7-56.0% by Bradbury *et al*. (1999) and 28.3- 48.9% reported by Enujiugba and Ayodele (2003).

Table 2: Proximate and phytochemical composition of raw and cooked walnut seeds

Parameters	Raw Walnut	Cooked Walnut	SEM
Crude Protein (%)	32.24$\pm$0.01^{a}	23.78$\pm$0.02^{b}	1.89
Ether extract(%)	26.78$\pm$0.01^{b}	44.59$\pm$0.01^{a}	3.98
Crude Fibre (%)	5.39$\pm$0.01^{a}	4.09$\pm$0.02^{b}	0.29
Ash (%)	5.38 $\pm$0.02^{a}	5.30$\pm$0.02^{b}	0.02
Moisture (%)	8.8$\pm$0.02^{a}	11.5+0.01^{b}	0.61
Saponin (%)	24.62$\pm$0.02b	24.9$\pm$0.01a	0.06
Terpenoids (%)	32.90$\pm$0.01a	13.94$\pm$0.02b	4.24
Phytate (%)	0.49$\pm$0.00b	0.81$\pm$0.00a	0.07
Flavonoid (%)	12.51$\pm$0.01b	21.13$\pm$0.02a	1.93
Alkaloid (%)	13.06$\pm$0.02a	1.33$\pm$0.01b	2.62

Values are means of three determinations $\pm$ SD; abc: means with the same superscripts are not significantly different from each other.

There was a reduction in crude protein when walnut was cooked from 32.2 to 23.8%. The noted reduction could be ascribed to loss due toleaching and solubility of nitrogen as reported (Raules and Nair, 1993) in cowpea. The highest level of phytochemical was terpenoids (32.9mg/100g) and lowest phytochemical was phytate (0.5mg/100g) for raw walnut.

Table3 reveals the vitamins content of raw and cooked melon and walnut. There was a significant difference in the vitamin contents among the samples of the seeds. Vitamin E was highest in all samples observed. Vitamin E (mg/kg) (69.4) was highest in raw walnut and was lowered to (58.63) when cooked. Raw melon had 3.07 which lowered to 3.06 when cooked.The two values for walnut were lower to those reported by Ojobor *et al*. (2015). The high vitamin E content in walnut shows that it is more attractive for consumption because vitamin E as well as vitamin A are antioxidant which can be usedto prevent or minimise formation of carcinogenic substances in diets (Hunt *et al*., 1980). The vitamin C in both melon and walnut seeds were reduced from 1.53 to 1.47mg/kg and 4.4 to 3.93mg/kg, respectively.

Table 3: Vitamins Content of raw and cooked melon and walnut seeds (mg/kg)

Parameters	Raw Melon	Cooked Melon	Raw Walnut	Cooked Walnut	SEM
B carotene	0.16 ± 0.01^{b}	0.13 ± 0.01^{b}	2.63 ± 0.15^{a}	2.47 ± 0.15^{a}	0.36
C	1.53 ± 0.06^{c}	1.47 ± 0.15^{c}	4.40 ± 0.10^{a}	3.93 ± 0.25^{b}	0.41
Ergocalcipherol	0.57 ± 0.06^{a}	0.23 ± 0.06^{b}	0.50 ± 0.10^{a}	0.53 ± 0.06^{a}	0.04
E	3.07 ± 0.01^{c}	3.06 ± 0.02^{c}	69.40 ± 0.10^{a}	58.63 ± 0.25^{b}	9.26

Values are means of three determinations ± SD
abc: means with the same superscripts are not significantly different (p>0.05).

Conclusion

Cooking lowered the phytochemical and vitamin compositions of walnut and melon seeds. The effect of cooking on the proximate composition was variable. Both seeds contained appreciable nutrients that could be harnessed for animal production.

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