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Mineral Estimation of Indian Horse Chestnut (*Aesculus indica*) Seeds after Crude Saponin / Aescin Extraction

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A B S T R A C T

Aesculus indica seeds were various treated under different processing techniques to achieve maximum removal its saponin/ aescin content which is toxic if consumed seeds as raw. The mineral viz. calcium, manganese, zinc, iron and copper were estimated. The methods used were as Fresh sample (T_0), Percolator/ cold extraction (T_1), Roasted (T_2), Soxhlet (T_3), Microwave cooking whole seed (MW), Microwave cooking crush seed (MC) Pressure cooking (PW), 10 minute whole seed boiling (B_1W), 20 minute whole seed boiling (B_2W), 30 minute whole seed boiling (B_3W), 10 minute crush seed boiling (B_1C), 20 minute crush seed boiling (B_2C), 30 minute crush seed boiling (B_3C). It was found that the treatment T_3 contains more Calcium (34.80 mg/100g) comparatively. Manganese was found maximum in T_1 and T_2 treatments as 2.50 and 2.30 mg/100g respectively, which were almost similar when compared with other treatment. Zinc content in B_2W was high as 782.40 mg/100g. Iron value of MC was reported as 64.00 (mg/100 g) upper limits. And copper as 1.20 mg/100g in MW treatment.

Introduction

In various region of our country, Indian Horse Chestnut scientifically identified as *Aesculus indica* which is called as *khanor, bankhor, tatwakhar* in Himachal Pradesh, *fangar, bankhor, gugu, kanor, pankor in* Hindi, *hane, hanudun* in Kashmir, *kanur, gun, khanor* in Punjab (Parmar and Kaushal, 1982). Its general occurrence at high altitude of Himalayan forest area. The tree is tall and deciduous in nature. The fruits are shiny dark chocolate to brown in color, having smooth ovoids and each seed weighed approximately 11-21g in weight (Sood and Mishra, 2014). The seeds of the Indian horse chestnut can be used as food, feed and fodder. Bark is used for lowering temperature, ulcer suppression. It possessed medicinal as well as nutritional values. Besides, the seeds or fruit is used for neuralgia, rectal complaints, skin disease, hemorrhoids and headache (Sood *et al.*, 2015). It contains natural toxic component *i.e.* saponin/ aescin as well as flavanoids,

glycosides, tannins and phenolic compounds (Kaur *et al.,* 2011), which may lethal for human consumption if use without processing. The nuts were dehulled and crushed into detoxify by traditional techniques like steeping in water for 5 to 7 days consecutively, to detoxify its toxicity and dried in sunlight. It was grounded to made flour known as *tatwakhar* or processed flour (Mishra *et al.,* 2018a), whereas the improved different pretreatments like soaking, blanching, cooking, pressure cooking and less saponin containing flour was used for its sensory characteristics. The toxic effects include muscle contraction, weakness, need coordination, dilated pupils, vomiting, diarrhoea, depression, paralysis and coma (Thakur *et al.,* 2015). It is also given to the horses experiencing colic disorder and the oil contained 2.02 per cent in seed (Majeed *et al.,* 2010), is used to alleviate rheumatism (Zhang *et al.,* 2010). The mineral values of fresh flour of the seed were reported as calcium (8.20), phosphorus (19.00), potassium (81.00), copper (0.60), manganese (0.50), iron (8.50) and zinc (705.90) (mg/100g) by (Mishra *et al.,* 2018b). Although, only mineral content of fresh seed flour is documented not giving much emphasis on the various pretreatments done for mineral extraction. Hence, in the present study keeping in view its importance, the following investigation was done.

Materials and Methods

Firstly, fresh seed sample was used for the extraction of crude saponin/ aescin content. For extracting the same, various treatments were done to achieve maximum amount. Then this treated flour was digested as prepared for the estimation minerals.

Digestion

Took 150 ml conical flask and one gram of translucently milled sample was taken in it. Add 25 ml of diacid mixture (HNO_3:$HClO_4$ in 5:1 v/v) and kept it for overnight. The acid sample was digested on hot plate till the white or clear precipitates were not settling down at base. Then the crystals were melted by diluting with the use of double distilled water. The substances were passing through a Whatman filter paper No. 42 and made up to 25 ml volume with double distilled water. The sample was ready for the determination of copper, zinc, manganese, and iron by means of atomic absorption spectrophotometer, Model 3100, Perkin Elmer. Flame photometer, Mediflame, 127 was used for the Calcium estimation. All the values were taken as an average of triplicate readings.

Results and Discussion

Mineral composition of flour after extraction

In Table 1, the mineral content were estimated in the sample and reported as the calcium content in T_3 was found maximum with the value 34.80 mg/100 g followed by T_1 which was analyzed as 26.40 mg/100g. In T_2, it came out to be 25.4 mg/100 g. In B_3W, the value for the same content was found as 19.50 mg followed by MW (16.60 mg). In the treatments PW, B_2W and B_1C the values for calcium ranged from 13.40 to 14.30 mg/100 g.

The values were decreased in MC i.e. 12.60 mg then followed by B_3C contains 12.10 mg. On the contrary, the T_0 contains lowest (8.20 mg/100 g) amount of calcium. In T_2 and T_1 had the highest range of manganese content i.e. 2.30-2.50 mg/100 g but in MC, PW and B_1W B_2W, B_3W, B_1C, B_2C, B_3C varied the manganese content from 0.60 to 1.20 mg/100 g of flour. Statistically these are at par and different treatments showed no effect by the different method of extraction. On the other hand, T_0 and MW contain alike values (0.50 mg/100 g) in the flour. The maximum content

(782.40 mg/100 g) of zinc was found in B_2W followed by B_3W in which it was estimated as 715.50 mg/100 g. In T_0, the zinc content was analyzed as 705.90 mg /100 g whereas; B_1W and B_2C contained 680.60 and 630.40 mg/100 g respectively. In PW, the zinc content was 561.50 mg in 100 g of flour. Statistically, there was comparative difference found among the treatments. But there was drastic decline in B_3C 151.70 mg was found in the zinc content. In case of B_1C, MC and T_1; the values ranged from 4.80 5.30 mg/100 g was found. The lowest manganese content was found in T_2 i.e. 3.00 mg/100 g; whereas T_3 and MC the values were laid in the same range with T_2 (3.20 to 3.50 mg/100 g). The iron content was found highest in the treatment MC i.e. 64 mg/100 g thereafter, a significant difference was observed in T_3 (42.20 mg) and T_1 (43.00 mg/100 g) method. In T_2, the iron content was decreased to 32.20 mg whereas, the treatment B_3C contained 27.50 mg/100 g of flour; B_2W was analyzed to 23.30 mg; B_1C contained 20.20 mg followed by the B_1W where the values were established at 13.20 mg/100 g. The T_0 and B_3W contained 8.50 and 9.40 mg/100 g respectively. The lowest values were shared by the treatments PW (6.60 mg), MW (6.70 mg) and B_2C contains 7.00 mg iron per 100 g of flour. The treatment MW contained maximum copper content i.e. 1.20 mg/100 g of flour. Whereas, B_1C and B_2C values were analyzed as 0.80 and 1.00 mg/100 g, respectively. In treatments T_3, T_1, MC, PW, B_1W, B_2W, B_3W, B_3C and T_0 the copper content varied from 0.60 to 0.70 mg/100 g of flour. The copper content was found lowest in T_2 (0.50 mg/100 g) flour.

Table.1 Mineral composition of flour after extraction of crude saponin/aescin

Sl no	Treatments	Calcium (mg/100g)	Manganese (mg/100g)	Zinc (mg/100g)	Iron (mg/100g)	Copper (mg/100g)
1	**Soxhlet (T_3)**	34.80^{a}	0.60^{d}	3.20^{j}	42.20^{b}	0.60^{bc}
2	**Roasted(T_2)**	25.40^{c}	2.30^{a}	3.00^{j}	32.20^{c}	0.50^{c}
3	**Percolator/ cold extraction(T_1)**	26.40^{b}	2.50^{a}	5.30^{i}	43.00^{b}	0.60^{bc}
4	**Microwave cooking whole seed(MW)**	16.60^{e}	0.50^{e}	3.50^{j}	6.70^{i}	1.20^{a}
5	**Microwave cooking crush seed(MC)**	12.60^{i}	1.10^{bcd}	4.80^{i}	64.00^{a}	0.70^{bc}
6	**Pressure cooking(PW)**	14.30^{fg}	0.60^{d}	561.50^{f}	6.60^{i}	0.70^{bc}
7	**10 minute whole seed boiling(B_1W)**	13.70^{gh}	1.00^{bcd}	680.60^{d}	13.20^{g}	0.70^{bc}
8	**20 minute whole seed boiling(B_2W)**	13.90^{fgh}	0.90^{bcd}	782.40^{a}	23.30^{e}	0.70^{bc}
9	**30 minute whole seed boiling(B_3W)**	19.50^{d}	0.70^{cd}	715.50^{b}	9.40^{h}	0.60^{bc}
10	**10 minute crush seed boiling(B_1C)**	13.40^{h}	0.80^{bcd}	23.20^{h}	20.20^{f}	0.80^{b}
11	**20 minute crush seed boiling(B_2C)**	14.10^{fgh}	0.60^{d}	630.40^{e}	7.00^{i}	1.00^{b}
12	**30 minute crush seed boiling (B_3C)**	12.10^{j}	1.20^{bcd}	151.70^{g}	27.50^{d}	0.60^{bc}
13	**Fresh sample(T_0)**	8.20^{k}	0.50^{e}	705.90^{c}	8.50^{h}	0.60^{bc}
	CD(P≤0.05)	0.49	0.42	0.74	1.00	0.28

Each value represents mean of three replicates. In the same column, significant differences according to CRD are indicated by different letters. Same letter represent that their values are at par

Concisely, the effect of different methods of processing on minerals was found more when compared with control i.e. T_0. In T_3, the calcium content was found to be high than other treatments. Manganese content was found maximum in T_1. In B_2W, the zinc element was found high. Iron present more in MC and copper element showed highest value

in MW. The lesser values in T_0 were because of the fact that the elements might be in a complex form and they were not exist in Free State. But when heat treatment was given to the seeds, there might be availability of free ions after the breakdown of complex structure.

It can be concluded that the Indian horse chestnut seeds when treated by different processing techniques, all the minerals contents were more available than the fresh sample i.e. Calcium content was more in soxhlet extraction, same like in case of manganese and iron, exceptionally zinc content of fresh sample was found higher rather than the other treatments. The values of the copper of all treatment weren't extreme so much when compared to the fresh sample. Hence there is more availability of minerals in the pretreated flour.

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