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Application of Flame Atomic Absorption Spectrometry in Food Biotechnology- Momordica Charantia Lin

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ABSTRACT

Momordica charactia lin(Bitter melon) has been the interest of many studies by researchers for a long time due to its very interesting human beneficial properties. It belongs to cucurbitacea family and momordica genus. It is used by human consumption all over the world in different forms such as a vegetable and /or medicine. The researchers have concentrated on the studies on its fruits and some times on its seeds and leaves. The present study is an extensive investigation of the quantitative elements such as Ca, Cd ,Co, Cr, Cu, Fe, Mg, Mn, Pb, Zn, K, N, and P of the fruit- skin, fruit-flesh, fruit-seed, tissue skin, leaf and root of the momordica charantia lin using flame atomic absorption spectrometry. The result shows a quite good variation of the concentration of the elements in different part of the plant.

1. INTRODUCTION

Momordica Charantia (Binomial name) often called bitter melon, bitter gourd, bitter squash, Karaila. It has also different names in different countries. It belongs to cucurbitaceae family and momordica genus.

Fig. 1. Fruit of Momordica charantia linn

The effect of orally given an amount of 200mg/100 body weight per day for 3 months of the juice of momordica charantia to the rats and no bad effect was found on any part of their bodies[1]. Fruits and leaves of momordica charantia are in use for a traditional way from a long time as a vegetable and medicine. A few nutrients are reported in different parts of momordica charantia [2].The leaves contain acidic resins, momordicine, aminobutyric acid, vitamin B , vitamin C, calcium, carotene, potassium, phosphorus and iron. The root contains silicon, calcium, phosphorus, stronsium, zinc, sodium and iron. The fruit contains peptic acid, steorites, glucosides, saponins. The seed contains stearic acid, oelic acid, linoleic, albumin, globulin, niacin, pantotheric acid, vitamin B carotene, amino butyric acid. The fruit consists of glycosides, saponins, alkaloids, resins, charantine, chorine, cryptoxalanthin, cucurbitins, cucurbitacines, cucurbitanes, cycloartenols, glacturonic acid, gentisin acid, goyaglycosides, goyasapponine but the relative amounts are not mentioned.

The fruit is known as a source of antibilous, laxative, stimulant and stomacie. It purifies blood and therefore helps in liver and spleen diseases. The leaves are also in use to prepare tea which is found very useful in case of diabetes, malaria, sores, wounds, worms and parasites. The glycoproteins extracted from seeds are in use to terminate early abortion [3].

The various constituents of crude bitter melon extract have shown anti- cancer activity and cytotoxic activity against leukemic cell [4]. Alpha and beta- momorcharins have been reported to exhibit HIV virus [5].The antibacterial activity of momordica charantia to treat the bacterial infection [6]. The bio-active compounds of momordica charantia in relation to their physiological function such as polyphenolics, antioxidant and antimutagenicity have been studied [7]. It has also been noticed that the green and the white fruit differ in many properties. The green fruit is bitter than the white fruit. The phytochemistry of momordica characteria leaves revealed the presence of flavonoids and tannis [8]. Trace elements and major minerals evaluation in mg/kg such as Fe (8.125), Zn (354.8), Mn (37.0), Cr (162.0), Cu (21.0), Cd (54.40) and Pb (48.0) were reported [9]. The study indicated that momordicilin is a potential exhibitor of glycogene synthase kinase 3 and can be used as a major anti-diabetic compound from momordica charantia [10]. Antioxidant and chemoprotective properties of momordica charantia fruit extract has been examined [11]. Ray has established that momordica charantia extract decreases breast cancer growth [12]. A review of the work on momordica charantia linn has been reported some time ago [13].

2. EXPERIMENTAL

2.1. Description of experiment

The present investigation has been taken to make a thorough study of momordica charantia and therefore the fruit containing skin, flesh, seeds and the leaves, skin from the stem and roots were collected from the same plant from an agricultural farm. All the parts were separated and properly washed with deionized water. A fine layer of fruit's skin was peeled off carefully with plastic knife and washed again with the deionized water and the flesh was also washed again with deionized water. 10.0g of each sample was kept in the separate crucibles in an oven at a temperature of 50^0C for 30 minutes. It was noticed that the seeds and leaves were dried completely. The other samples were placed in the oven again at a temperature of 100 C for 60 minutes to get dried fully. The fine power of each sample was prepared one by one by grinding using a mortar and pestle. 5.0 g of each powder sample was taken in five conical flasks to digest in aqua regia i.e. 75 ml of Conc. HCl and 25 ml of Conc. HNO3. The flasks containing samples were placed on a heater at a temperature of 50^0 C and kept observation to look for complete digestion which took 45 minutes. All digested samples were allowed to cool by normal way to the room temperature and then added some deionized water to make the total volume of each sample of 100 ml. These samples were used to record the flame atomic absorption spectra.

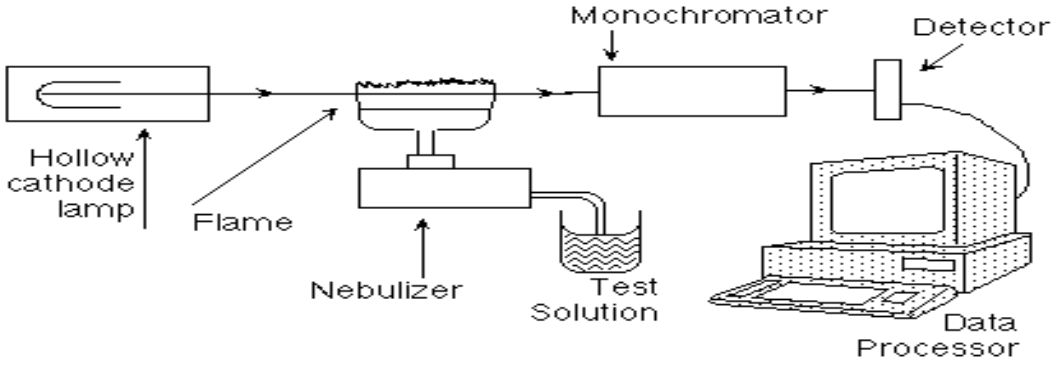

Fig.2. Experimental set up of a flame atomic absorption spectrometer to record data

One by one the sample flask (test solution) was connected to the tubing of the nebulizer to proceed to supply the sample in the flame.The other necessary settings were made and then the spectral data were recorded.

2.2

Table 1. Shows the spectral data for different parts of momordica charantia

Samples Description	Parameters									
	Ca ppm	Cd ppm	Co ppm	Cr ppm	Cu ppm	Fe ppm	Mg ppm	Mn ppm	Pb ppm	Zn ppm
Fruit-Skin	1806	nd	4.83	nd	2.01	58.08	2082	nd	nd	32.05
Fruit-Flesh	1294	nd	9.16	nd	nd	96.07	1294	nd	nd	51.13
Fruit-Seed	1728	nd	3.86	nd	6.38	65.21	3569	1.84	nd	49.09
Tissue Leaf	20089	2.96	11.46	nd	6.63	193.00	3870	36.29	3.58	58.69
Tissue Skin	9311	10.60	51.60	nd	19.99	185.00	1418	52.70	0.37	157.50
Tissue-Root	6674	6.73	26.20	nd	17.36	426.00	426	33.20	0.28	93.82

Table 2. Showing Percentage of Elements in Momordica charantia

Samples Description	Paramaters		
	K %	N %	P %
Fruit-Skin	8.70	3.40	0.50
Fruit-Flesh	5.60	1.50	0.30
Fruit-Seed	1.80	1.10	0.70

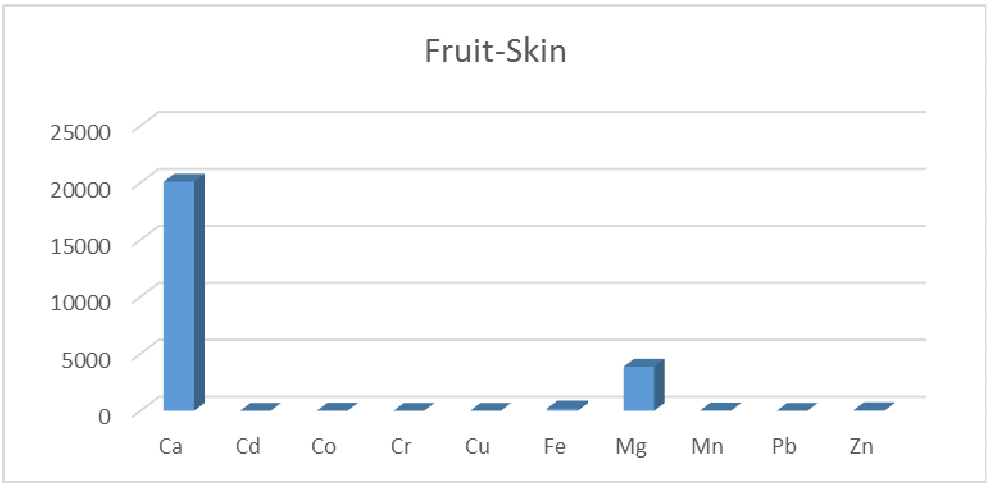

Fig.3. Showing concentration of elements in fruit skin of momordica charantia

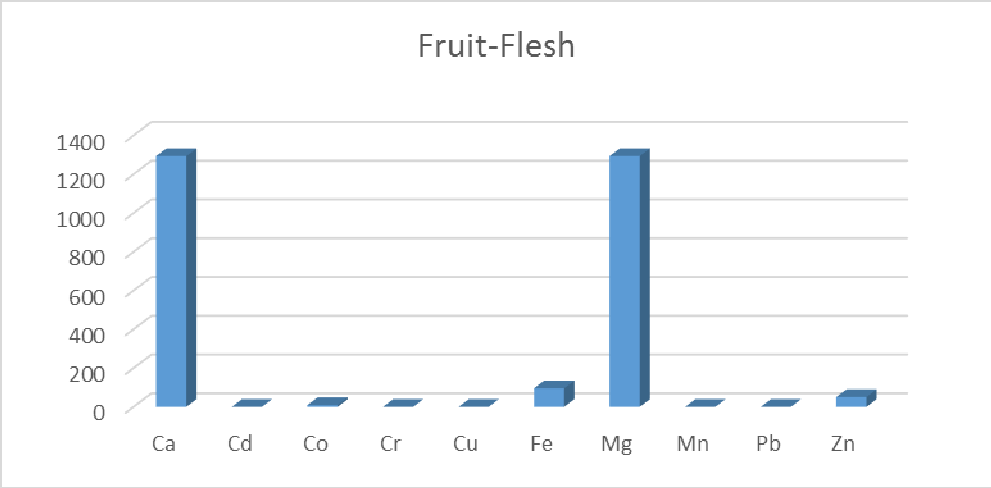

Fig.4. Showing concentration of elements in fruit flesh of momordica charantia

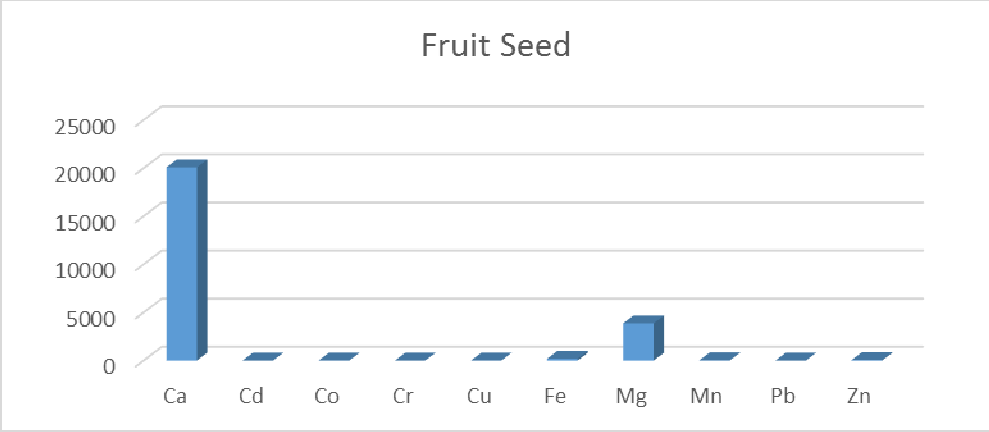

Fig.5.Showing concentration of elements in fruit seed of momordica charantia

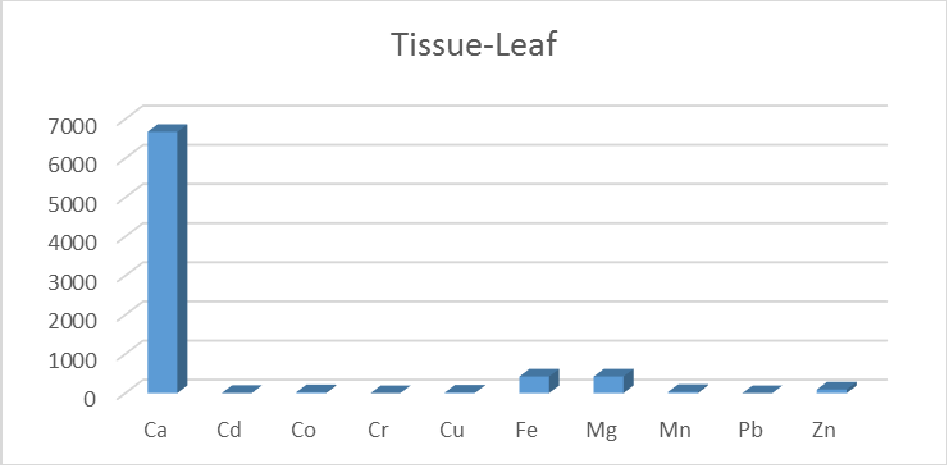

Fig.6. Showing concentration of elements in tissue leaf of momordica charantia

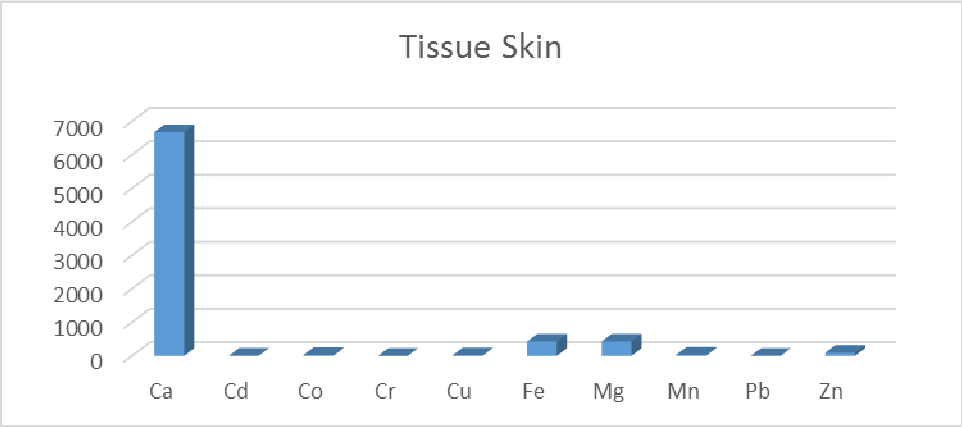

Fig.7.Showing concentration of elements in tissue skin of momordica charantia

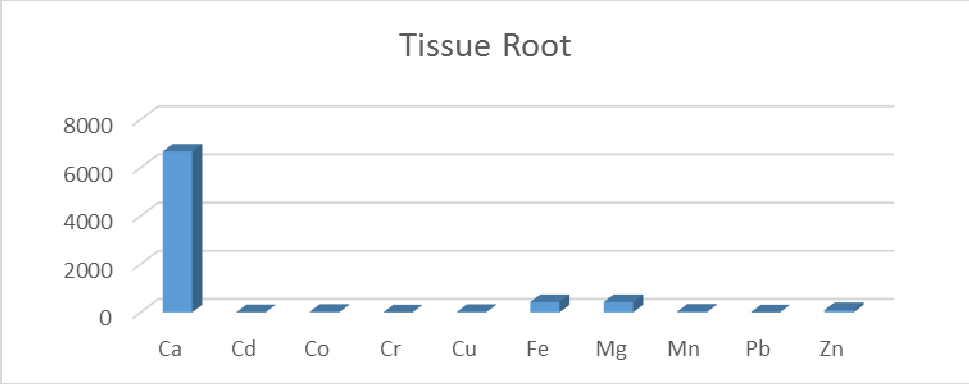

Fig.8. Showing concentration of elements in tissue root of momordica charantia

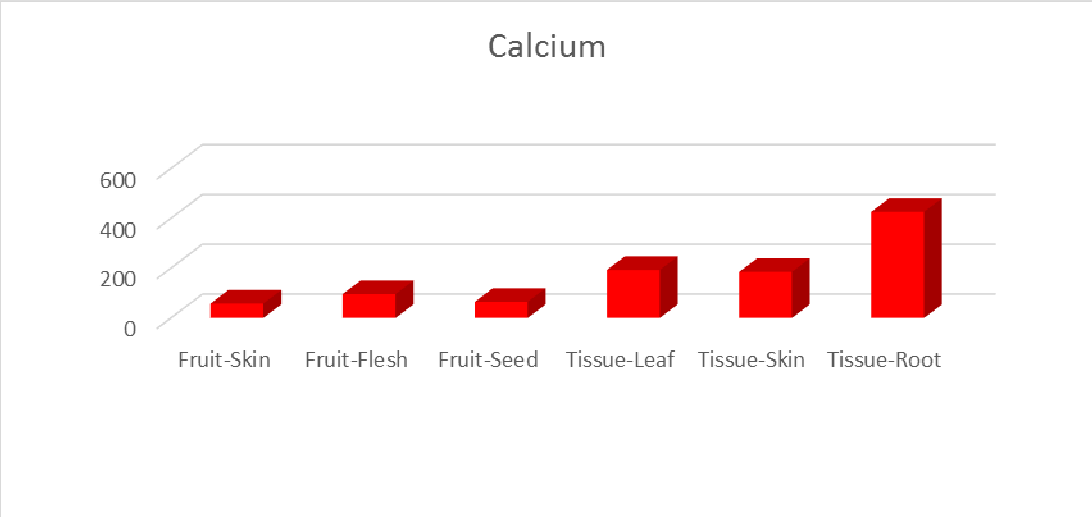

Fig.9. Showing relative concentration of Ca in different parts of momordica charantia

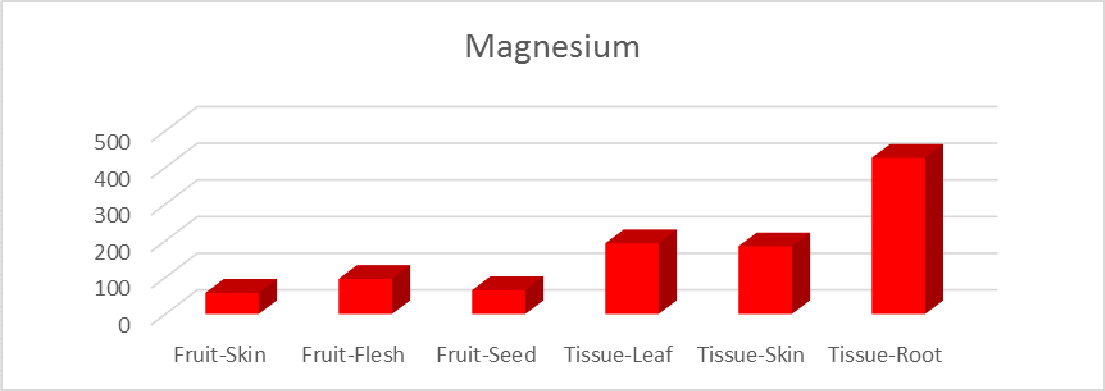

Fig.10. Showing relative concentration of Mg in different parts of momordica charantia

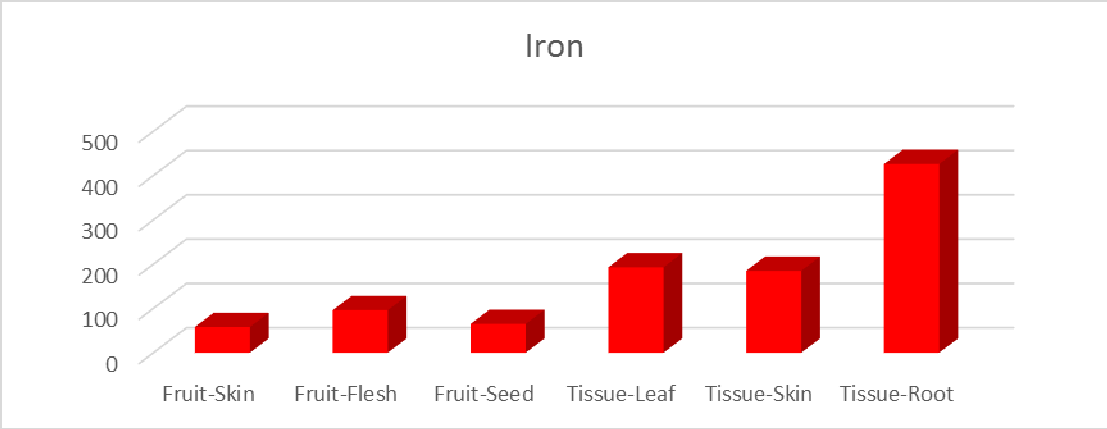

Fig.11. Showing relative concentration of Fe in different parts of momordica charantia

3. RESULTS AND DISCRIPTION

The recorded data are given in Table1 and Table2 which are self- explanatory. It is found that the calcium has the highest concentration in all parts of the fruit and the tissue. It can be considered as a good source for covering the shortage of calcium in human body to make bones strong enough. The high level of calcium is depicted in figures 4 and 9.It is also remarkable that the tissue leaf has the highest concentration and further the tissue skin and tissue root have quite high concentration of calcium. This may be the region that in many parts of the world, these parts are in use one way or the other.

The next element which is found of quite high concentration is the magnesium in most of the parts which are shown in the table1 and depicted in figures 4 and 10. The magnesium is an essential nutrient for body for healthy bones and blood vessels, muscle and energy formation. Thus the momordica charantia can be used as a natural source to meet any such shortage.

The level of concentration of iron is also sufficient in most of the parts of momordica charantia as shown in table1 and depicted in figures 4,5, 6 and 11.

The elements such as cadmium and lead which need precautions to use were also investigated and their level were found zero or near to zero and therefore the momordica charantia is safe for human consumption.

In addition to these elements potassium (K), nitrogen (N) and phosphorus (P) were also investigated and their presence were of very little which are shown in Table 2.

The concentration of some of the elements are found different from the earlier reported values in reference [9]. The reason may be the different soil structure and environmental effects.

4. CONCLUSION

From this investigation it shows that all parts of the fruit and tissues of momordica charantia are safe and useful for human consumption.

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