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Analysis on Nutritional values and Antioxidant properties of powdered Momordica *charantia* (bitter gourd) and Colocasia *esculenta* (cocoyam)

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Abstract

The main aim of the study was to analyze and compare the nutritional and antioxidant properties of a popular vegetable, M. *charantia* and little known tuber, C. *esculenta*. The nutritional values and antioxidant properties were estimated using AOAC methods and in-vitro assays techniques respectively. Though the nutritional values of both the dried and powdered vegetables are varying, it was found that C. *esculenta* had relatively higher amounts of calcium (21.8mg/100g), carbohydrates (87.4mg/100g) and starch (6880 mg/100g) as against M. *charantia* having calcium (22.4mg/100g), carbohydrates (85.41mg/100g) and starch (2000 mg/100g). The antioxidant capacity of C. *esculenta* was found to be little lesser than M. *charantia*. Both the vegetables are thus capable of providing the basic nutrition and have good antioxidant property, which is required for the current lifestyle.

Key words: Nutritional values, Antioxidant Properties, Bitter gourd, Cocoyam

1. Introduction

Momordica *charantia* (bitter gourd) belongs to the cucurbitaceae family and grows in the humid and subtropical regions. The fruit extracts of M. *charantia* could reduce blood glucose level patients suffering from diabetes. Besides, bitter melon has other nutritional values and has antioxidant properties. Generally tubers are rich in carbohydrates and found to be less in high value nutrients. Colocasia *esculenta* (cocoyam) belongs to the Araceae family is a commonly available tuber. Unlike bitter gourd, this vegetable is little known and can be made more popular since it is an acceptable vegetable by all age groups. The main aim of the study was to analyze and compare the nutritional and antioxidant properties of a popular vegetable, M. *charantia* and little known tuber, C. *esculenta*. The estimation of nutritional values was done by using the AOAC methods and antioxidant properties of these two vegetables were estimated through in-vitro assays.

2. Materials and methods

2.1 Sample preparation and Analytical procedure

Fresh samples of M. *charantia* and *C. esculenta* were collected from local vegetable market. These samples were washed separately and the non-edible portions were discarded. These sample materials were then peeled, cut into pieces and dried in hot air oven, then powdered, sieved by passing through 60 mesh sieve and stored in air tight container.

By following AOAC (2000) method, the nutritional values viz. moisture, ash, crude fiber, iron and calcium of samples was determined. Protein content was analyzed by Micro Kjeldahl (AACC, 2000) method. The level of

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carbohydrate was estimated by following the procedure of Raghuramulu *et al*., 1983. Fat percentage was estimated by Soxhlet – extraction (Pearson *et al*., 1985). The ascorbic acid content is quantitatively analyzed by the method suggested by Ranganna *et al*., 1997. The starch was determined by the methods adopted by MacRae .J.C., 1970 and Joslyn, M.A & Goldstein J.L., 1964 respectively.
The antioxidant properties of the samples were determined through in-vitro Antioxidant Assays. The sample preparation for antioxidant assay involved packing of samples in Soxhlet separately and extracted with methanol. The solvent extracted is concentrated by rotary vacuum evaporator and then dried in vacuum oven. Further, the samples were evaluated based on three assays namely DPPH radical scavenging activity (Blios, 1958), Metal chelating activity (Dinis *et al.* 1994) and Phosphomolybdenum assay (Prieto *et.al*., 1990).

3. Results and discussion

The nutritional values of M. *charantia* and C. *esculenta* are shown in Table 1.
Table 1: Nutritional values of M. *charantia* and C. *esculenta*

Parameters	**M. *charantia***	**C.*esculenta***
Moisture content (%)	6.14±0.03	4.36±0.31
Ash content (%)	2.76±0.11	5.81±0.08
Iron (mg/100g)	0.45±0.16	0.57±0.19
Calcium (mg/100g)	22.4±0.06	21.8±0.09
Vitamin C (mg/100g)	23±0.03	2.5±0.02
Starch (mg/100g)	2000±0.20	6880±0.21
Tannin (mg/100g)	0.81±0.03	0.47±0.08
Crude fat (%)	2.38±0.01	1.05±0.03
Crude protein (mg/100g)	27.88±0.19	7.6±0.29
Crude fibre (%)	2.31± 0.23	1.38±0.23
Carbohydrate (mg/100g)	85.41	87.4

Note: ± value expresses triplicate measurements

The results indicated that M. *charantia* had relatively a high moisture content (6.14%) than C. *esculenta* (4.36%). The ash content, the reflection of mineral status, of M. *charantia* was found to be only 2.76% compared to C. *esculenta* (5.81%). The iron content of both vegetables was found to be 0.45 mg/100g and 0.57mg/100g respectively. Calcium content in both the vegetables varied very slightly and was found to be 22.4mg/100g and 21.8mg/100g respectively. Vitamin C content which determines the antioxidant capacity of the sample was found to be 23mg/100g in M. *charantia* and only 2.5mg/100g in C. *esculenta.*
The starch content was found 2000mg/100g in M. *charantia* and 6880mg/100g in C. *esculenta*. The tannin content was found to be 0.81mg/100g in M. *charantia* and 0.47mg/100g in C. *esculenta*. Crude fat was and crude proteins were found to be 2.38% and 27.88% for M. *charantia* and 1.05% and 7.6% for C. *esculenta*. The crude fibre content was found to be 2.31% and 1.38% while carbohydrate content was found to be 85.41% and 87.4% respectively in the above two vegetables.
The in-vitro antioxidant assay results of DPPH radical scavenging activity is shown in "Figure 1" to "Figure 3".

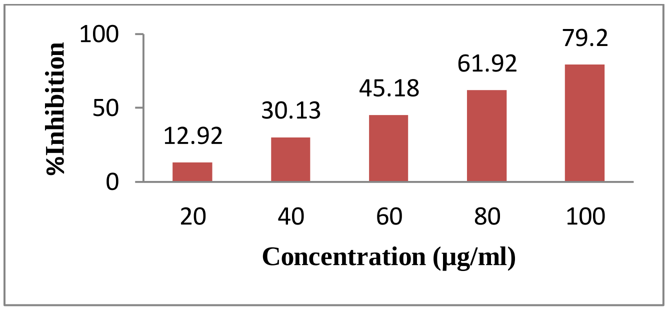

Figure 1: DPPH radical scavenging activity of various concentrations of M. *charantia*

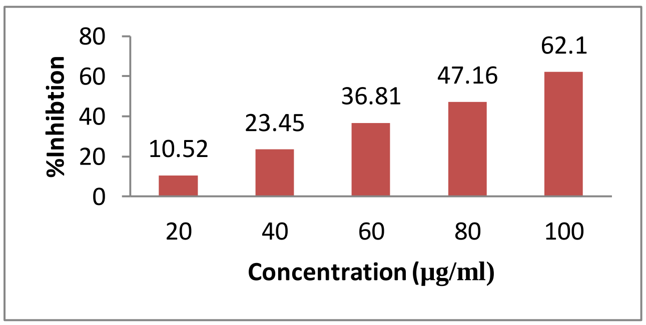

Figure 2: DPPH radical scavenging activity of various concentrations of C. *esculenta*

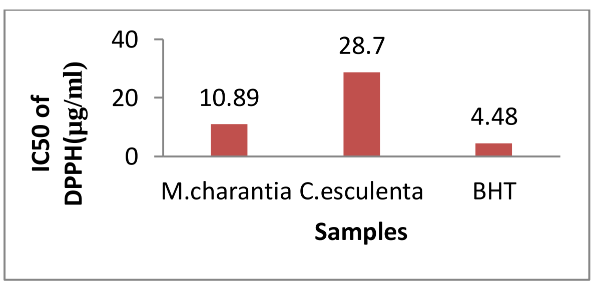

Figure 3: IC50 values of M.*charantia* and C.*esculenta*

The free radical scavenging activity exhibited by M. *charantia* and C. *esculenta* was then compared with the referred standard BHT which had a IC50 of DPPH (µg/ml) value of 4.48. Lower IC50 value and a higher inhibition rate indicate a higher antioxidant activity.

At a concentration of 100µg/ml, the inhibition rate of M. *charantia* was found to be 79.2 % and the IC50 of DPPH (µg/ml) was found to be 10.89µg/ml. The inhibition rate of C. *esculenta* at a concentration of 100µg/ml was found to be 62.1 % and the IC50 of DPPH value of was found to be 28.7µg/ml. Thus between these two vegetables, M. *charantia* has higher antioxidant activity.

The metal chelating activities of M. *charantia* and C. *esculenta* are shown in Table 2.

Table 2: Metal chelating activity of M.*charantia* and C.*esculenta*

	M. *charantia*	C. *esculenta*	BHT (standard)
Metal chelating capacity (%)	75.1	61.9	53

The sample extracts exhibited the ability to chelate metal ions. The M. *charantia* sample extract showed a metal chelating activity of 75.1 % and that of C. *esculenta* showed a metal chelating activity of 61.9%. The findings of the study thus established the factthat the extract could chelate irons and the values are substantial. M. *charantia* extract had the strongest phosphomolybdenum reduction of 238.77mg GAE/g of extract when compared to that of C.*esculenta* sample which had a reduction rate of 292.93mg GAE/g of extract.

4. Conclusion

From this analytical research, it could be concluded that C. *esculenta* has a higher amount of calcium (21.8mg/100g), carbohydrate (87.4mg/100g) and starch (6880mg/100g) compared to M. *charantia.* M.*charantia* had lesser IC50 (10.89µg/ml of DPPH) value when compared to C. *esculenta* (28.7 µg/ml of DPPH) while C.*esculenta* was found to have a better metal chelating property than BHT (the standard antioxidant used for the assay). Both the vegetables are thus capable of providing the basic nutrition and have good antioxidant property, which is required for the current lifestyle.

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