Research Paper

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Nutritional Potentiality and Elemental Analysis of Leaves Extract of Selected Medicinal Plants

Life Science

KEYWORDS : Therapeutic efficacy, medicinal plants, proximate composition, Atomic Absorption Spectrometric method.

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ABSTRACT

Indian literatures mention the use of plants in the treatment of various human ailments. Though ample literature on therapeutic application of medicinal plants was available but data on the proximate composition of medicinal plants is very scarce. The study was undertaken to investigate the compositions of some common medicinal plants. The plant leaves are widely used in pharmaceutical preparation because of therapeutic efficacy against various diseases. The leaves were analyzed for ash content, moisture, crude fat, crude fibre, crude carbohydrate, and crude protein. The essential elements such as Fe, Cu, Cr, Mg and Ni have been analyzed using Atomic Absorption Spectrometric method from the leaf extract of selected medicinal plants in variable range.

Introduction:

Plants have great importance due to their nutritive value and continue to be a major source of medicines as they have been found throughout human history [Balick and Cox, 1996]. About 30-40% of today's conventional drugs used in the medicinal and curative properties of various plants are employed in herbal supplements, botanicals, nutraceuticals and drugs [Shulz *et al*., 2001].

Medicinal plants are natural resources, yielding valuable herbal products, which are often used in the treatment of various ailments. In traditional methods, the medicinal plants being used, very often are in powder or paste forms of the crude herbs, which contain both the organic and inorganic constituents. Any attempt to incorporate these specific parts of herbal plants as intakes of food components will be requiring a thorough analysis of energy and nutrient values, along with the specific knowledge of their metabolic actions and active biological components [Prasad *et al.,* 2010].

Proximate and nutrient analysis of leaves plays a crucial role in assessing their nutritional significance [Pandey *et al*., 2006]. For this purpose, leaves of selected medicinal plants species were analyzed to evaluate their nutritional value and mineral contents.

Materials and Methods:

1. Sample collection and preparation:

The medicinal plants (fifteen) were collected from Covenent Center of Development (CCD), MPC-Medicinal plant conservation, RLHT-Revitalization of Local Health Tradition, Sadana, Sevaiyur, Thiruchuli at Virudhunagar district, Tamilnadu. Plant material (leaf) of fifteen medicinal plants were identified and authenticated by comparing it with that of herbarium species by GRAM MOOLIGAI (Village herbs) CO.LIMITED and the plants were preserved in the form of herbarium. The dried leaves were powdered in blender and were stored in airtight containers.

The fifteen medicinal plants collected from the centre were:

Abrus precatorius, Adhatoda vasica, Aegle marmelos, Aloe vera, Andrographics paniculata, Calotropis gigantean, Centella asiatica, Coleus aromaticus, Costus igneus, Eclipta alba, Phyllanthus amarus, Sesbania aegyptica, Solanum trilobatum, Terminalia chebula, Wrightia tinctoria.

2.Proximate analysis:

Ash Content:

Five gram of each leaf sample was weighed in a silica crucible and heated in muffle furnace for about 5-6 hours at 500^{0}C. It was heated again in the furnace for half an hour, cooled and weighed. This was repeated consequently till the weight became constant (ash become white or grayish white). The weight of ash was measured.

Moisture Content:

Two gram of each sample was taken in a flat-bottomed dish and kept overnight in an air oven at 100-110^{0}C and weighed. The loss in weight was regarded as a measure of moisture content.

Crude fat Content:

Two gram of dry of each sample was extracted with petroleum ether at 60-80^{0}C in a Soxhlet apparatus for about 6-8 hours. After boiling with petrol, the residual petrol was filtered using Whatman no: 40 filter paper and the filtrate were evaporated in a preweighed beaker. Increase in weight of the beaker was measured as the weight of crude fat.

Crude fibre Content:

Two gram of moisture and fat-free material of each sample was treated with 200ml of 1.25% H_2SO_4. After filtration and washing, the residue was treated with 1.25% NaOH. It was filtered, washed with hot water and then 1%HNO3 and again with hot water. The washed residue was dried in an oven at 130^{0}C to constant weight and cooled in a dessicator. The residue was scraped into a pre-weighed porcelain crucible, weighed, ashed at 550^{0}C for two hours, cooled in a dessicator and reweighed.

Crude protein Content:

The crude protein was determined using micro Kjeldahl method. The total protein was calculated multiplying the evaluated nitrogen by 6.25 (AOAC, 1990).

Carbohydrate Content:

Percentage of available carbohydrate was calculated using the formula: 100-(percentage of ash + percentage of fat + percentage of protein + percentage of crude fibre) (AOAC, 1990).

3. Nutritive value (energy) analysis:

Nutritive value of each plant sample was determined by multiplying the values obtained for protein, fat and available carbohydrate by (4:9:4) respectively and adding up the values.

4.Mineral content of screened medicinal leaf extracts:

0.5gm of the leaf powder of *Terminalia chebula* and *Wrightia tinctoria* were weighed separately and put in a separate 100ml conical flasks and 30ml nitric acid (HNO_3) were added. Each flask was placed on magnetic stirrer heater in fume hood for four hours at 25^{0}C$^\circ$ and the colour solutions were changed to milky solutions which were cooled for 10 minutes and then 15ml concentrated perchloric acid ($HClO_4$) was added and the solutions

were heated until colorless solutions were obtained. The colorless solutions were filtered to remove the impurities for trace elements analysis by Atomic Absorption Spectroscopy (AAS).

5. Statistical analysis:

The proximate analysis was carried out in triplicate for all experiments. The results were expressed as mean ± Standard deviation $p<0.05$.

Results and Discussion:

The proximate analysis of nutritive content of fifteen medicinal leaf extracts was depicted (Table: 1). The *Terminalia chebula* leaf extract, showed about 3.90% ash, 51.66% moisture content, 3.60% crude fat, 1.24% protein,80.58% carbohydrate,6.90% crude fibre and 360.90 Kcal/100g nutritive value. The *Wrightia tinctoria* leaf extract, showed about 2.62% ash, 38.66% moisture content, 1.93% crude fat, 0.56% protein, 60.42% carbohydrate, 5.60% crude fibre and 297.66Kcal/100g nutritive value (Figure: 1). These two medicinal leaf extracts showed high nutritive contents than others. After screening *Terminalia chebula and Wrightia tinctoria* leaf extracts were chosen for future study. The investigation for various trace elements like copper, chromium, cobalt, magnesium, iron and nickel were done in these two plants. *Terminalia chebula* leaf extract contained copper (0.832ppm), chromium (0.2480ppm), cobalt (0.2883ppm), magnesium (0.8183ppm), iron (5.6597ppm) and nickel (0.1114ppm) which was measured by Atomic absorption spectroscopy (AAS). *Terminalia chebula* leaf extracts showed more flame actual concentration than Wrightia *tinctoria* leaf extract (Table: 2, 3 and Figure: 2). A one way analysis of variance comparing the nutritions in the selected leaf extract of fifteen medicinal plants, revealed the differences in nutritive values (%), were statistically significant at $P<0.05$. Based on the results, the *Terminalia chebula* leaf extracts were taken as efficient medicinal plant material than other 14 medicinal plant material (leaf) extracts. The study showed that the leaves of *Terminalia chebula* and *Wrightia tinctoria* were rich in protein, available carbohydrate, crude fibre and minerals. Hence the results suggested that consumption of these leaves in sufficient amount could be used for nutritional purpose of human being and adequate protection might be obtained against diseases arising from malnutrition. The results on mineral content were in accordance with the findings of Gopalan *et al*., 2004, Sundriyal and Sundriyal, 2004. The reason for the difference was due to their geological habitat and therefore different parts of the plant were used for medicinal purposes The concentration of micro- and macro elements was different in different parts of plant body (Singh *et al*., 2010). Trace elements played both restorative and protective role in skirmishing diseases. There was an immense scope to develop the preventive medicinal aspects of various trace elements (Hameed *et al*., 2008).

The experiments were done in triplicates and expressed as mean ±Standard deviation, Statistical significance at $p< 0.05$.

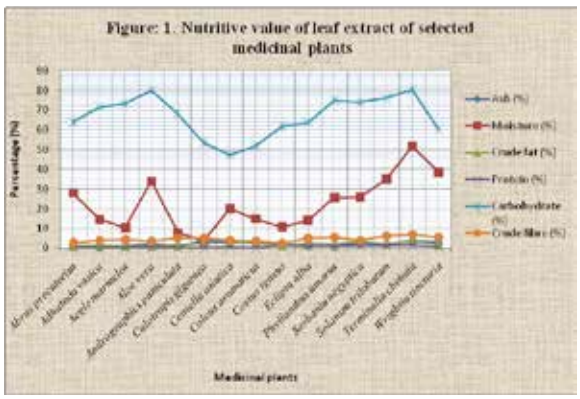

Table: 2. Elemental assay of leaf extract of *Terminalia chebula* by Atomic Absorption Spectroscopy (AAS):

S.No	Samples	Elements identified	Flame Actual Concentration in ppm	
			Flame Absorption	Flame Concentration
1.	Terminalia chebula	Copper	0.0225	0.832
		Chromium	0.0036	0.2480
		Cobalt	0.0169	0.2883
		Magnesium	2.1383	0.8183
		Iron	0.4593	5.6597
		Nickel	0.0045	0.1114

S.No	Samples	Elements	Flame Actual Concentration in ppm	
			Flame Absorption	Flame Concentration
1.	Wrightia tinctoria	Copper	0.0219	0.813
		Chromium	0.0026	0.237
		Cobalt	0.0166	0.234
		Magnesium	1.1372	0.732
		Iron	0.4588	5.297
		Nickel	0.0034	0.157

Table: 3. Elemental assay of leaf extract of *Wrightia tinctoria* by Atomic Absorption Spectroscopy (AAS):

Table: 1. Nutritional parameters of leaf extract of selected medicinal plants:

S.NO	Medicinal plants	Ash (%)	Moisture (%)	Crude fat (%)	Protein (%)	Carbohydrate (%)	Crude fibre (%)	Nutritive value (KCal/100g)
1	*Abrus precatorius*	0.62±0.03	28.0±1.0	1.1±0.10	0.75±0.02	63.96±0.15	2.76±0.15	248.23±0.21
2	*Adhatoda vasica*	0.17±0	14.66±0.57	1.56±0.05	0.30±0.02	71.51±0.01	4.10±0.10	218.58±0.20
3	*Aegle marmelos*	0.91±0.02	10.33±1.15	1.16±0.15	0.39±0.02	73.28±0.01	4.33±0.15	287.26±0.02
4	*Aloe vera*	2.56±0.15	34±2.0	1.13±0.01	0.70±0.02	80.24±0.01	3.66±0.15	242.92±0.04
5	*Andrographics paniculata*	1.02±0.01	8.0±1.0	1.75±0.07	0.27±0.01	68.27±0.01	5.10±0.10	223.93±0.20
6	*Calotropis gigantea*	3.58±0.03	3.66±0.57	2.53±0.05	0.30±0	53.77±0.02	5.13±0.20	204.64±0.03
7	*Centella asiatica*	2.73±0.03	20.0±1.0	2.40±0.17	0.60±0.02	47.25±0.03	4.00±0.20	193.74±0.03
8	*Coleus aromaticus*	2.37±0.03	15.0±0	2.60±0.10	0.30±0.02	51.76±0.02	3.73±0.05	163.74±0.03
9	*Costus igneus*	1.36±0.02	10.66±1.52	1.60±0.1	1.30±0.02	61.93±0.20	2.60±0.17	146.47±0.03
10	*Eclipta alba*	1.14±0.01	14.0±1.0	2.40±0.10	0.95±0.01	63.90±0.01	4.93±0.20	240.61±0.97
11	*Phyllanthus amarus*	0.86±0.02	25.66±0.57	2.20±0.10	0.97±0.06	75.14±0.02	5.33±0.05	252.39±1.70
12	*Sesbania aegyptica*	2.46±0.05	26±1.0	3.40±0.20	1.04±0.01	74.28±0.01	4.10±0.10	257.71±0.67
13	*Solanum trilobatum*	1.82±0.04	35±1.0	2.30±0.10	1.16±0.01	76.30±0.55	6.13±0.05	273.55±1.03
14	*Terminalia chebula*	3.90±0.01	51.66±1.52	3.60±0.26	1.24±0	80.58±0.02	6.90±0.20	360.90±1.90
15	*Wrightia tinctoria*	2.62±0.01	38.66±0.57	1.93±0.15	0.56±0.05	60.42±0.50	5.60±0.02	297.66±1.10

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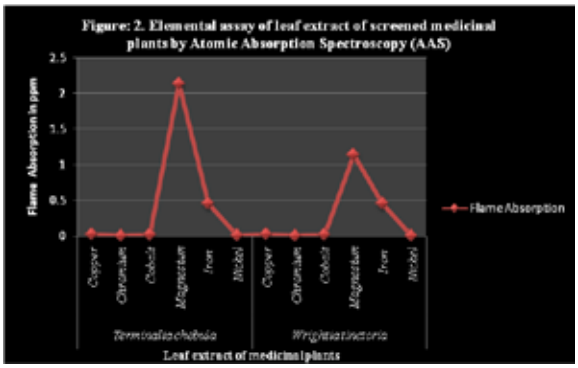

Conclusion:

Conservation and use of medicinal plants has taken considerable amount of attention

in recent years. The indigenous and marginal communities for curing various diseases from time immemorial have used it globally. Most of the plant species are also used as food supplement along with its oral decoctions. However, little have been done so far to verify the uses in this regard. The present research is an effort in doing so. Our current study on nutritional evaluation of *Terminalia chebula* and *Wrightia tinctoria* had revealed that these plants are good source of nutrients (moisture, ash, proteins, fats, carbohydrates, fiber and minerals) and can be used as substrates deficit in either of these nutrients.

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