Journal of Pharmacognosy and Phytochemistry
Available online at www.phytojournal.com

E-ISSN: 2278-4136
P-ISSN: 2349-8234
JPP 2015; 3(5): 32-34
Received: 27-11-2014
Accepted: 08-12-2014

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Standardization of *Centella Asiatica* (L.) urban with market potential using thermal methods of analysis

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Abstract
Thermal analytical methods are holding the main contribution in the characterization and evaluation of medicinal plants and its qualities. The analytical systems TGA and DTA have been used for standardization of the medicinal plant *Centella Asiatica* (L.) Urban with market potential. The experiments were carried out on the genuine, collected from herb resources, and on the commercially available market samples. TGA and DTA curves were taken from the range of 35 – 600 °C and showed the decomposition pattern corresponding to the physicochemical behavior of herb.

Keywords: *Centella Asiatica,* TGA, DTA, herbal analysis.

1. Introduction

Herbs are widely used as holistic medicines for numerous diseases since time immemorial [1]. Herbal medicines are multicomponent mixtures of organic and inorganic compounds and their chemical contents may diverge for species of different locations, plants belonging to the same species, ecological condition and variation in which they grow as well. They are commercial products and need standardization. Standardization of medicinal plant material is an essential one not only for ensuring the identification but also for preventing adulteration, if any [2-4]. Thermo analytical methods could give major support to the analysis of plant material during standardization. Thermo characterization of medicinal plant materials may provide information about the content of volatile and nonvolatile compounds present in it [5-10].

Centella asiatica (L.), belonging to the family Apiaceae, commonly known as “mandukaparni” in Sanskrit, “brahmi” in Telugu and “vallarai” in Tamil, is having market potential for its rich medicinal values. *C. asiatica* has wound healing property, antioxidative property [11, 12] and used for the treatment of digestive disorders, urinary diseases, in leprosy [13-15] traditionally. In the present study, the thermal characteristics of *C. asiatica* samples were derived and analyzed.

2. Materials and methods

C. asiatica sample was collected from Western-Ghats region of Tirunelveli District, Tamilnadu and was authenticated by Dr. V. Chelladurai, Formerly Research officer (Botany), Survey of Medicinal and Aromatic Plants Unit-Siddha, CCRAS, Palayamkottai, Tirunelveli, TN, India. The sample was shade dried for obtaining a constant dry weight. Then the dried sample was powdered and noted as genuine sample (GS). The commercial sample of *C. asiatica* was procured from the local market, powdered and noted as market sample (MS). Both samples were passed through sieve of size 53 μ, stored in a closed vessel individually.

2.1 Characterization

GS and MS samples of *C. asiatica* were used for Thermo Gravimetric Analysis (TGA) and Differential Thermal Analysis (DTA) using NETZSCHSTA 409 PC/PG. The samples were heated in alumina crucibles between 35 °C and 600 °C at the heating rate of 5 °C per minute under Argon atmosphere using alumina as reference.

3. Results and discussions

The TGA and DTA curves of GS and MS of *C. asiatica* are presented in Fig. 1 and Fig. 2. Analytical results about decomposition temperatures, mass loss on TGA curves and peak height and peak temperatures on the DTA curves of both samples are shown in Table 1.

3.1 Thermogravimetry (TG)

Thermal decomposition curves of both samples (Fig.1) have three major stages. The first decomposition stage occurred in the range of 35 – 115 °C with mass loss of 7.3% for GS and 35 – 125 °C with 7.0% for MS referring to the volatile compounds, mainly desorption of water [16]. The second stage represents the degradation of micro and macro compound degradation in the range of 170 – 330 °C and 170 – 330 °C corresponding to mass losses of 38.9% and 34.7% of the samples GS and MS. The third mass loss stage correlates to the non-degradable residues mainly mineral residues with 34.52% for GS and 39.36% for MS in inert atmosphere. The total mass losses during three stages were 65.48% for GS and 60.64% for MS.

Table 1: Decomposition temperatures, Mass loss and DTA peak heights and peak temperatures of *Centella asiatica* (L.) samples.

Decomposition Stages	TGA				DTA			
	Temp (°C)		Mass Loss (%)		Peak Height (mW/mg)		Peak Temp (°C)	
	GS	MS	GS	MS	GS	MS	GS	MS
I	35-115	35-125	7.4	7.0	-0.188	-0.15	94.2	89.5
II	170-330	170-320	38.9	34.7	----	0.546	----	307.4
III	330-600	320-600	19.18	18.94	0.849	0.73,1.22	485.6	358.3,471.5

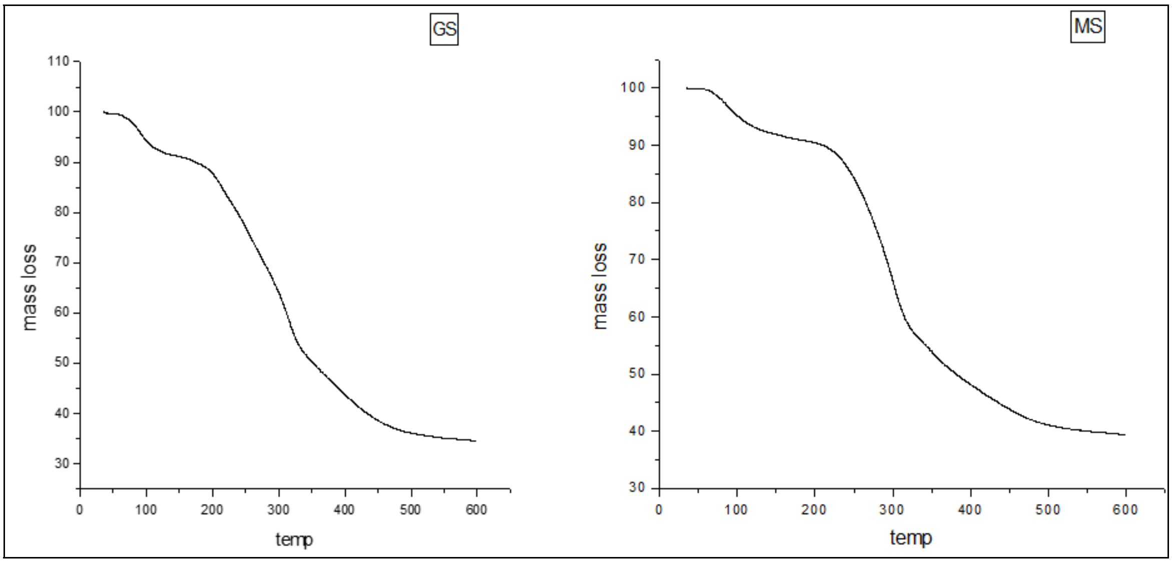

Fig 1: TGA curves of *Centella asiatica* (L.) samples

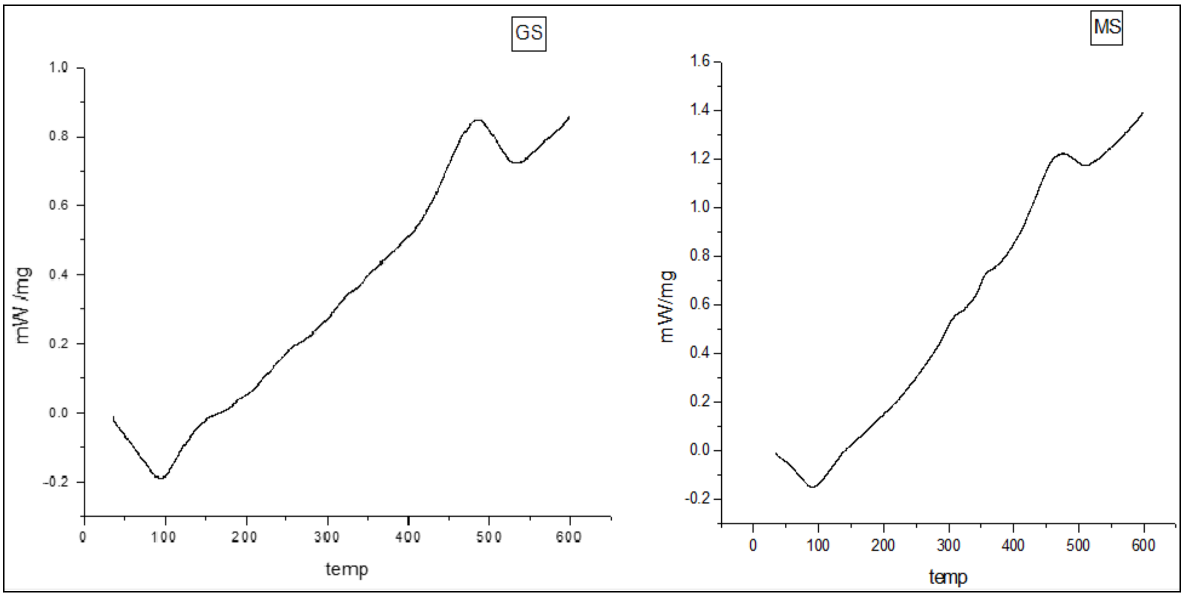

Fig 2: DTA curves of *Centella asiatica* (L.) samples

3.2 Differential Thermal Analysis (DTA)

The differences in the peak heights between the samples at the selected temperature were noted from the DTA graphic curves (Fig. 2). The endothermic peak heights were observed at -0.188 mW (94.2 °C) and -0.15 mW (89.5 °C) for GS and MS in TG first decomposition stage. By means of evaluating the temperature range of 170-330 °C, the presence of phase

transitions was observed in GS and MS samples. The exothermic peak height corresponding to the temperature ranges of TG second decomposition stage for MS was 0.546 mW (307.4 °C) and no such peak was observed in GS. One exothermic peak height of 0.849 mW at 485.6 °C for GS and two exothermic peaks of height 0.73 mW at 358.3 °C (shallow) and 1.22 mW at 471.5 °C (sharp) were obtained for MS in TG third decomposition stage.
TGA and DTA analysis indicate that the commercially available *C. asiatica* sample has notable variations in thermograms from the genuine sample.

4. Conclusion
The thermal analysis of TGA and DTA have been studied for both genuine sample and commercially available market samples of *C. asiatica*. The notable mass changes in TGA were observed in second and third decomposition stage due to phase transformation of compounds in it and also change in residual mass. Therefore, it needs much attention in the collection and storage of *C. asiatica* from its resource to market.

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