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Impact of soil type in the production of Andrographolide

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Abstract

An acurate, precise, cost-effective, reproducible and selective method for the determinations of andrographolide from plants has been described. The soil types were found to influence the level of andrographolides in the medicinal plant *Andrographiis paniculata* Nees. Further, soil rich in N, P, Fe and Mn were found to be more suitable for the cultivation of this medicinal herb.

Keywords : active principles, andrographolide, *Andrographis paniculata*, medicinal plants, secondary metabolites, soil types

INTRODUCTION

Bhunimba, a drug widely used in Ayurvedic and Homeopathic systems of medicine, is derived from *Andrographis paniculata* Nees. belonging to the family Acanthaceae (Chopra *et al.*, 1999). The source taxon is an erect herb with 4-angled winged dark green stem, flowers in racemes or panicles, capsule linear oblong and seeds yellowish brown (Yoganarasimhan, 2000). The plant is distributed in almost all districts in the plains of Tamilnadu, South India. This drug source yields chemically interesting compounds like andrographin, a flavone and diterpene lactones such as andrographolides. Latter compound is the main constituent and is responsible for the therapeutic potential of the plant (Handa *et al.*, 1998). These molecules show a wide spectrum of biological activity such as anticancer, antioxidant, hepatoprotective, immunomodulatory and anti diarrhoeal (Malhotra and Singh, 2002). Impact of soil types in the production of secondary metabolites (andrographolide) was analyzed in the *A. paniculata* collected from different regions of Tamil Nadu, South India, has been evaluated and presented in this paper.

MATERIALS AND METHODS

The plant *Andrographis paniculata* Nees. was collected from three districts of Tamilnadu Cuddalore, Chennai and Tiruchirappalli (Fig. 1) in the month of May. The plant species was botanically identified and authenticated with the help of RAPINAT Herbarium, St.Joseph's College, Tiruchirappalli, South India. Collected materials were shade dried, coarsely powdered and subjected to High Performance Thin Layer Chromatography for the estimation of andrographolide content.

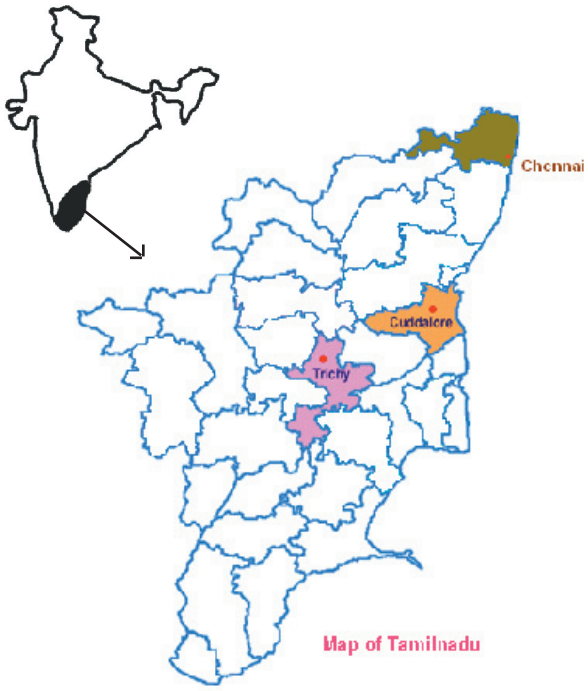

Figure 1. Location of selected Districts of Tamilnadu

Estimation of andrographolide

Four gram of plant material was soaked in 50 ml of methanol for 18 hrs, boiled for 10 minutes and filtered. The filtrate was concentrated to 10 ml in a standard flask.

The experiment was performed on silica gel 60 F254 HPTLC plates using mobile phase comprising of methanol: Chloroform (1:7). The plate was pre washed with methanol and activated in an oven at 110°C for 1 hr before use. 2 ml sample solutions were applied on the HPTLC plate as sharp bands of 20 mm width with the help of Camag Linomat IV sample applicator at a distance of 10 mm from the edge of the HPTLC plate in the samples A & B. In the sample C, 2 ml sample

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solution is placed at a distance of 15 mm from the edge of the HPTLC plate. The rate of speed for samples A, B & C are 20 mm/s. The developed TLC plate was air dried and then scanned between 200 & 400 nm using Camag TLC scanner with cat 4.06 version software. The wavelength chosen for quantification is 233 nm. The spectra for three samples are given in Fig. 2 b, c & d. The standards used were solutions containing known concentration (conc. Range 10-100 mg/ml) of andrographolide in methanol. Andrographolide identified in all the three samples and the amounts of andrographolide were determined from the Michaelis-Menten Regression equation, of calibration graph, plotted between area and concentration.

Soil Analysis

Post harvest soil samples were taken from the experimental plots from a depth of 30cm and the samples were analyzed for available nitrogen (Subbiah and Asija,1956) phosphorous (Olsen *et al*., 1954) and potassium (Stanford and English, 1949) and the results were expressed in percentages. Soil pH and EC were estimated by using pH meter and Solubridge, respectively, in 1:2 soil & water suspensions.

The primary aim of the present study was aimed to develop an analytical method for the estimation of andrographolide, a rich bioactive diterpene lactone. The method adopted in the present work is reproducible, accurate, precise, cost effective and selective in determining the suitable soil type and percentage of active principles. This could be used as a chemical marker for the identification of this traditional ayurvedic drug in dry condition, and can contribute significantly in promoting usage of genuine drugs in the traditional systems, which in turn will make the systems more efficient and acceptable even by modern allopathic doctors, scientists and other educated society. Light is also thrown on the importance of soil analysis for cultivating medicinal plants with rich bioactive contents. In the present work it is observed that a soil rich

Table 1. Characteristics of soils from the three districts studied

Place of collection	Texture	LS	EC	pH	N (%)	P (%)	K (%)	Fe (%)	Zn (%)	Mn (%)	Cu (%)
Sample A (Trichy)	SCL	M	0.27	8.57	77.0	4.5	2.8.5	3.84	0.94	2.92	0.87
Sample B (Cuddalore)	S	M	0.21	8.21	53.2	11.0	5.0	2.772	3.313	0.976	2.856
Sample C (Chennai)	SCL	-	0.51	7.77	68.6	5.5	16.0	10.140	2.271	15.756	1.573

SCL - Sandy Clay Loam; S – Sand; LS - Loamy Sand; M - Moderate

RESULTS AND DISCUSSION

The andrographolide level was higher in plants from Chennai (2.16 %) when compared to Trichy and Cuddalore (0.9819% & 0.6687%, respectively). The Chennai soil is found to be suitable for the cultivation of *Andrographis paniculata* Nees. as it is less alkaline, rich in nitrogen, potassium, iron and manganese when compared to other soils (Table 1).

in N, P, Fe, Mn is suitable for cultivating *Andrographis,* and can yield good amount of andrographolides.

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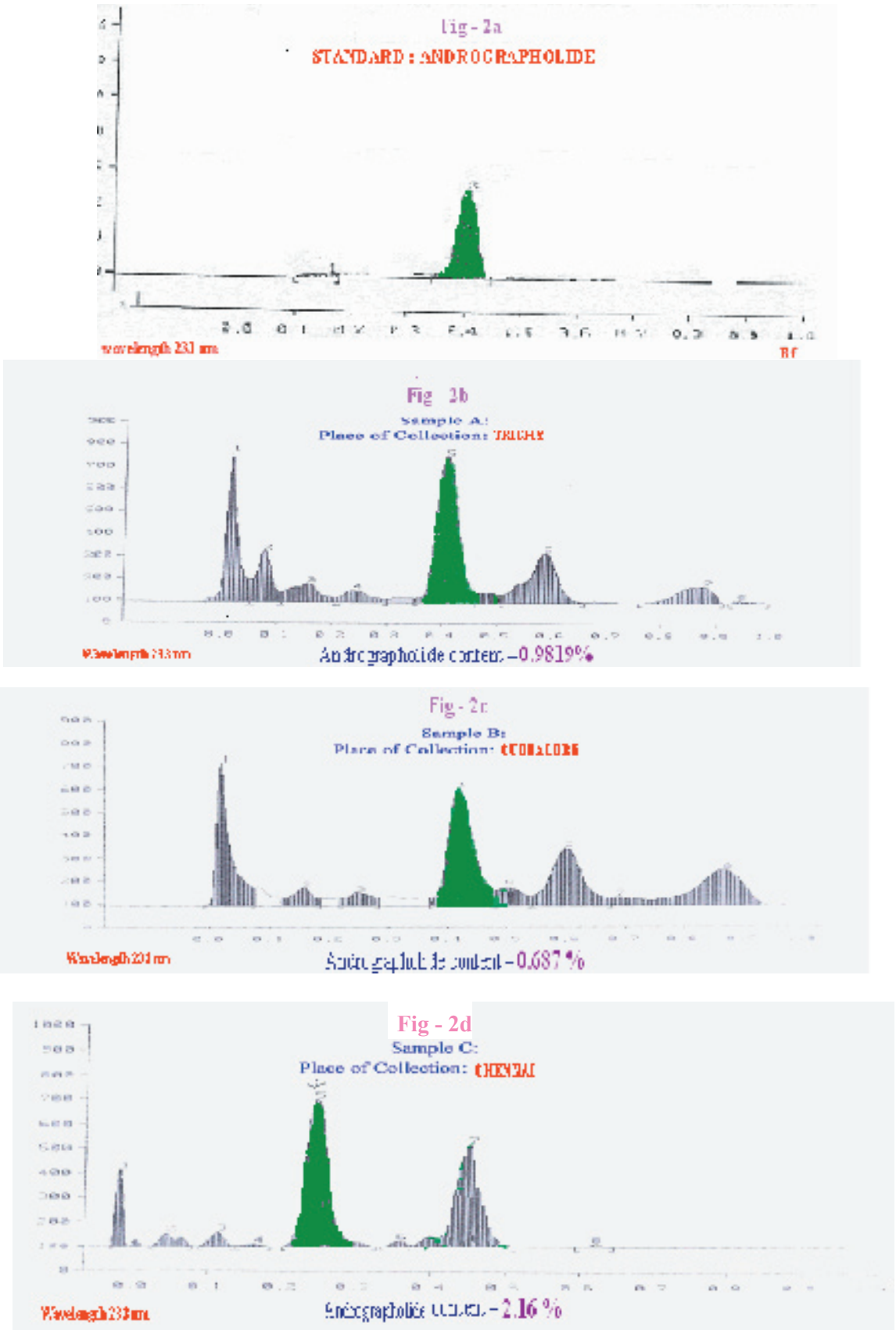

Figure 2. Chromatograms of standard andrographolide and andrographioloides in the samples collected from three different districts with different soil types

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