

Research Article

A PRELIMINARY INVESTIGATION OF THE SHODHANA (DETOXIFICATION) OF ROOTS OF PLUMBAGO INDICA L. IN AYURVEDA

Padumadasa C*, Abeysekera A M, Meedin S D K

Department of Chemistry, Faculty of Applied Sciences, University of Sri Jayewardenepura, Gangodawila, Nugegoda 10250, Sri Lanka.

ABSTRACT

Plumbago indica L. (Plumbaginaceae) is a medicinal herb, credited with a number of therapeutic properties. It is widely used in Sri Lankan traditional medicine and in Ayurveda. In Sri Lanka, Ayurveda formulations which incorporate the roots of *P. indica* L. are prepared using commercially available air dried material after subjecting it to a detoxification with limewater prepared from commercially available milk of lime. The detoxification process is referred to as "Shodhana". According to the Ayurveda, this process is done to remove toxicity associated with the roots and, it can be surmised that it is done to remove toxicity associated with plumbagin, the predominant toxic naphthoquinone in *P. indica* L.. *Shodhana* of roots results in a deep maroon coloured extract arising from the calcium salt of plumbagin. Here, we report a qualitative and quantitative study of the *Shodhana* of roots of *P. indica* L. using Ultra Violet-Visible spectrophotometric and chromatographic methods to give a scientific basis for this process. A method for the quantitative extraction of plumbagin from root samples was optimized. A calibration curve for plumbagin in hexane was developed using the absorption values at 258 nm. The plumbagin content of 8.7 ± 0.1 mg/g in a fresh root sample was lowered by 19.4% to 7.0 ± 0.1 mg/g upon subjecting to *Shodhana*. It was found that a commercial dried root sample of *P. indica* L. root contained a much lower level (0.55 ± 0.05 mg/g) of plumbagin. To better understand the changes in the level of plumbagin in roots of *P. indica* L. during drying, a study was carried out by drying the root samples for five weeks subjecting them to analysis periodically by TLC and Ultra Violet-Visible spectrophotometric methods. The amount of plumbagin (8.6 ± 0.1 mg/g) present in fresh untreated roots at the beginning of the study was reduced by 62.7% to 3.2 ± 0.1 mg/g after one week. There was no measurable change in the plumbagin level thereafter up to week 5. The amount of plumbagin in dried roots can be further reduced by *Shodhana*. The total reduction of plumbagin by drying and *Shodhana* was 87.7%. Our results show that *Shodhana* of the fresh undried roots does not reduce the plumbagin content substantially, and that air drying followed by *Shodhana* is the most effective method to reduce the plumbagin content to a non-toxic level, supporting the currently used processing method.

KEYWORDS: *Plumbago indica* L., Plumbagin, *Shodhana*, Limewater.

INTRODUCTION

Plumbago indica L. (Plumbaginaceae) syn. *P. rosea* L. is a medicinal herb (Figure 1), credited with a number of therapeutic properties. It is widely used in Sri Lankan traditional medicine and Ayurveda^[1]. Popularly it is called "Rathnitul" in Sinhala. The chemical profile of roots is marked by the presence of naphthoquinones, flavonoids, tannins, alkaloids, and terpenoids^[2]. Naphthoquinones are the major secondary metabolites in the roots of which plumbagin (2-methyl-5-hydroxy-1,4-naphthoquinone), a volatile compound is predominant^[3]. In Sri Lanka, Ayurveda formulations which incorporate the roots of *P. indica* L. are prepared using commercially available air dried material after subjecting it to a detoxification with limewater^[4]. The detoxification process is referred to as "Shodhana". According to the Ayurveda pharmacopoeia, this process is done to remove toxicity associated with the roots and based on anecdotal evidence, it can be surmised that it is done to remove

toxicity associated with plumbagin. Previous investigations indicate that plumbagin at high doses causes skin irritations and is toxic to normal cells^[5]. Here, we report a qualitative and quantitative study of the *Shodhana* of the roots of *P. indica* L. by using Ultra Violet-Visible (UV-VIS) spectrophotometric and chromatographic methods to give a scientific basis for this process.

MATERIALS AND METHODS

Plant material, roots of *Plumbago indica* L. were collected from six months old plants grown in the Botanical Garden of the Bandaranaike Memorial Ayurveda Research Institute (BMARI), Nawinna, Sri Lanka. A voucher specimen was deposited in the herbarium of the Botany division of the BMARI (reference number 638 e). Roots were washed, wiped and cut in to small pieces to prepare fresh homogenized