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Quantitative estimation of total phenols and flavonoids content in *Thuja orientalis*

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Abstract

From last few decades there is an advanced use of herbal medicines all over the universe and now there is potential need to study natural drugs on scientific basis to develop their individual monographs. *Thuja orientalis* commonly known as arbor vitae or white cedar or morpankhi belonging to family Cupressaceae is well known medicinal plant. Thuja is used for treatment of bronchial asthma, enuresis, cystitis, psoriasis, uterine carcinomas, amenorrhea, rheumatism, skin infections, bacterial dysentery, arthritic pains and premature blandness. The present studies were designed to estimate total phenols and flavonoids content in *Thuja orientalis* aerial parts because there are lack of literature investigation regarding this plant. The hydroalcoholic extracts of *Thuja orientalis* aerial parts collected from different regions were prepared separately as per standard procedure. Further, the hydroalcoholic extracts were screened for presence of bioactive phytoconstituents using general chemical tests. The estimation of total phenols and flavonoids content were carried out using standard procedures named Folin Ciocalteu's assay and aluminium chloride assay respectively. The total phenols content of Tamil Nadu, Rajasthan and Himachal Pradesh varieties *Thuja orientalis* aerial parts were found to be 9.12, 8.91 and 8.45% w/w respectively, whereas the total flavonoids content of Tamil Nadu, Rajasthan and Himachal Pradesh varieties *Thuja orientalis* aerial parts were found to be 4.21, 3.56 and 3.20% w/w respectively. So, it can be concluded that, Tamil Nadu variety of *Thuja orientalis* aerial parts contained higher content of total phenols and flavonoids than Rajasthan and Himachal Pradesh.

Keywords: Aluminium chloride assay, flavonoid, Folin Ciocalteu's assay, phenol

Introduction

Plant based drugs have been used worldwide in traditional medicines for treatment of various disease. World plant biodiversity is the largest source of herbal medicine and still about 60-80% world population rely on plant based medicines which are being used since the ancient ages as traditional health care system. India is the largest producer of medicinal herbs and appropriately called the Botanical garden of the world. It is now clear that the medicinal value of these plants lies in the bioactive phytochemical constituents that produce definite physiological effects on human body. These natural compounds formed the base of modern drugs as we use today [1]. The genus Thuja of exotic origin belongs to the Cupressaceae family and covers five species, including *Thuja orientalis*, commonly known as the tree of life. It is endemic in the eastern part of North America and is grown in Northern Europe, Brazil, China, Korea, Japan and India as an ornamental shrub. It is a genus of coniferous plant called 'Morpankhi' in Hindi. Thuja is used for treatment of bronchial asthma, enuresis, cystitis, psoriasis, uterine carcinomas, amenorrhea, rheumatism, skin infections, bacterial dysentery, arthritic pains and premature blandness. Different parts of plant are exhibited extensively biological activities like hair growth-promoting, anti-viral, anti-allergic, anti-epileptic, anti-inflammatory, anti-bacterial, anti-oxidant, and anti-fungal activities. Apart of these effects, it can be used as nematicidal, insecticidal and molluscicidal activity against various pests. Biochemical studies reveal that fresh plant contains essential oil, reducing sugar, water-soluble polysaccharides, water-soluble minerals, free acid, tannic acids, flavonoids, saponins, glycosides and alkaloids. The essential oil of the fresh leaves (related to the monoterpene fraction) composed of 65% thujone, 8% isothujone, 8% fenchone, 5% sabinene and 2% pinene as the main monoterpene. Other monoterpenes, namely carvotanacetone, origanol, origanene, myrcene and camphene have also been described. *Thuja orientalis* leaves contain roxanthin, The heartwood contains aroma- dendrin, taxifolin, widdrene, cedrol, thujopsadiene, dehydro- α -curcumenone, β -isobiotol and curcumenone [2, 3].

The detailed available literature about the plant material reveals that estimation of total phenols and flavonoids in plant material has not been performed on the plant. Thus, it was designed to estimate total phenols and flavonoids content in *Thuja orientalis* aerial parts.

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Materials and Methods

Collection of plant materials

The dried aerial parts of *Thuja orientalis* were collected from wild regions of different states such as Himachal Pradesh, Rajasthan and Tamil Nadu. The identity of collected dried aerial parts of *Thuja orientalis* were also confirmed from National Institute of Science Communication and Information Resources (NISCAIR), New Delhi by Dr. Sunita Garg, Emeritus Scientist, CSIR-NISCAIR with reference no. – NISCAIR/RHMD/Consult/ 2018/3203, dated 27/04/2018).

Chemicals, reagents and solvents

The various chemicals, reagents and solvents of analytical grade, used in present research work were procured from authentic sources such as E Merck, Delhi, India and S.D. Fine Chemicals, Mumbai, India.

Preparation of various extracts

The hydroalcoholic extracts of *Thuja orientalis* aerial parts collected from different regions were prepared separately as per standard procedure described in literature [4]. Further, the hydroalcoholic extracts were screened for presence of bioactive phytoconstituents using general chemical tests [5].

Estimation of total phenols and flavonoids content

The various hydroalcoholic extracts of aerial parts of plant obtained from different regions was subjected to estimation of total phenols and flavonoids content using standard procedures named Folin Ciocalteu's assay and aluminium chloride assay respectively [6]. The absorbance in the experimental protocol was measured using UV/VIS

spectrophotometer (Schimadzu, Japan). The results obtained from the experimental protocol were presented in the form of mean \pm standard deviation (S.D). The readings were taking in triplicate.

Results and Discussion

The percentage yields of hydroalcoholic extracts of *Thuja orientalis* aerial parts obtained from wild areas of different states Tamil Nadu, Rajasthan and Himachal Pradesh were found to be 18.25, 18.00 and 18.15% w/w. The results of preliminary phytochemical profiling of various hydroalcoholic extracts of *Thuja orientalis* aerial parts showed presence of phenolic and flavonoids as major classes of phytoconstituents.

The results of determination of total phenols and flavonoids content of hydroalcoholic extract of *Thuja orientalis* aerial parts obtained from wild areas of different states Tamil Nadu, Rajasthan and Himachal Pradesh are presented in table 1, fig. 1 and fig. 2. The total phenols content was quantitatively determined on the basis of standard curve between different concentrations of gallic acid against absorbance (linearity: 20 to 120 $\mu\text{g/ml}$; $r^2 = 0.9977$; fig. 1). Similarly, the total flavonoids content was quantitatively determined on the basis of standard curve between different concentrations of quercetin against absorbance (linearity: 40 to 140 $\mu\text{g/ml}$; $r^2 = 0.9977$; fig. 2) respectively. Amongst hydroalcoholic extracts of *Thuja orientalis* aerial parts, Tamil Nadu variety contained higher content of total phenols and flavonoids followed by Rajasthan variety and Himachal Pradesh variety.

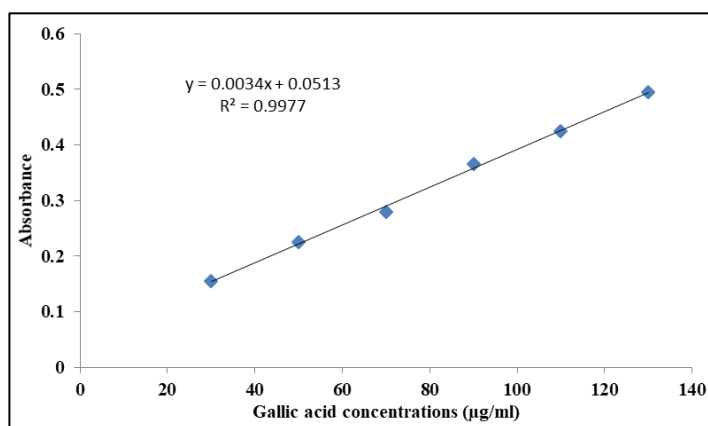


Fig 1: Standard curve between different concentrations of gallic acid against absorbance

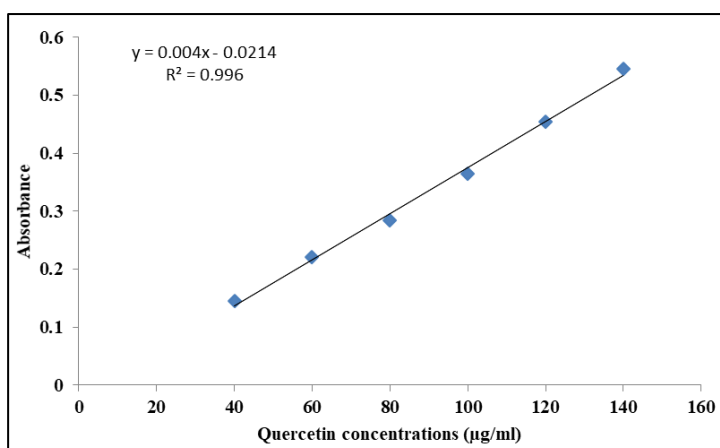


Fig 2: Standard curve between different concentrations of quercetin against absorbance

Table 1: Total phenols and flavonoids content in *Thuja orientalis* aerial parts

Test sample	Total phenols content*	Total flavonoids content*
Tamil Nadu	9.12 ± 0.85	4.21 ± 0.36
Rajasthan	8.91 ± 0.27	3.56 ± 0.85
Himachal Pradesh	8.45 ± 0.63	3.20 ± 0.49

*The data is expressed in (% w/w); Meanⁿ ± S.D.

Phenolic constituents acts as potential characteristic agent for cancer prevention and generally dispersed in plant drugs [7, 8]. Flavonoids and other phenolic mixes display different pharmacological exercises, e.g., calming, antiatherosclerotic, antitumor, antiviral, antifungal, antimicrobial, cell reinforcement, hepatoprotective, antiulcer, antidiabetic and cardioprotective [9]. Free radicals show critical job in pathogenesis of diabetes and diabetes related inconveniences [10]. A broad research work has been completed on polyphenols which display promising antidiabetic properties [11].

Conclusion

Finally, it can be concluded that, Tamil Nadu variety of *Thuja orientalis* aerial parts contained higher content of total phenols and flavonoids than Rajasthan and Himachal Pradesh. Further, it can be concluded that most of the pharmacological activities of the plant may be due to the presence of these flavonoids and phenolic compounds.

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