Journal of Ethnopharmacology 146 (2013) 645–658

Contents lists available at SciVerse ScienceDirect

Journal of Ethnopharmacology

journal homepage: www.elsevier.com/locate/jep

Review

Nyctanthes arbor-tristis Linn—A critical ethnopharmacological review

Jyoti Agrawal, Anirban Pal *

In vivo testing facility, Molecular Bio-prospection Department, Central Institute of Medicinal and Aromatic Plants, Council of Scientific and Industrial Research, Lucknow 226015, India

ARTICLE INFO

Article history:
Received 7 September 2012
Received in revised form
19 January 2013
Accepted 21 January 2013
Available online 30 January 2013

Keywords:
Nyctanthes arbor-tristis (Oleaceae)
Chemical constituents
Pharmacological actions
Bio-prospection
Ethnopharmacology
Clinical studies

ABSTRACT

Ethnopharmacological relevance: Nyctanthes arbor-tristis (Oleaceae) is a mythological plant; has high medicinal values in Ayurveda. The popular medicinal use of this plant are anti-helminthic and anti-pyretic besides its use as a laxative, in rheumatism, skin ailments and as a sedative. Vitally, the natives plant it in their home gardens to pass on its medicinal usage to oncoming generations.

Aim of the review: The present review encompasses an ethnopharmacological evaluation focusing on information on the chemical constituents, pharmacological actions and toxicology in order to reveal the therapeutic potential and gaps requiring research involvement.

Materials and methods: The present review is based on searches in Scifinder®, Pubmed (National Library of Medicine) and books published on the subject during the period 1933 to 2012.

Results: Nyctanthes arbor-tristis is most important in local and traditional medicines especially in India for treating intermittent fevers, arthritis and obstinate sciatica. Crude extracts and isolated compounds from the plant were shown to be pharmacologically active against inflammation, malaria, viral infection, leishmanisis and as an immunostimulant. The major class of biologically active compounds are the iridoid glucosides incl., Arbortristoside A, B and C from the seeds active as anticancer, anti-leishmania, anti-inflammatory, anti-allergic, immunomodulatory and antiviral. Other molecules; calceolarioside A, 4-hydroxyhexahydro-benzofuran-7one and β-sitosterol from leaves have been reported to be active as anti-leishmanial, anticancer and anti-inflammatory, respectively. The crude extracts have been found to be safe with an LD_{50} of 16 gm/kg, while the LD_{50} of arbortristoside-A isolated from the seeds was found to be 0.5 g/kg.

Conclusion: Mostly *in-vitro* or in some cases *in-vivo* models provide some evidence especially in the treatment of inflammatory conditions like arthritis, fevers related to malaria and protozoan diseases especially leishmaniasis. The only clinical study found, is for treating malaria, but with crude extract only. Further, more detailed safety data pertaining to the acute and sub-acute toxicity, cardio and immunotoxicity also needs to be generated for crude extracts or pure compounds.

Contents

* Corresponding author. Tel.: +91 522 2718 644; fax: +91 522 2342 666.
E-mail addresses: a.pal@cimap.res.in, drapaul@gmail.com (A. Pal).
URL: http://www.cimap.res.in (A. Pal).

0378-8741/$ - see front matter
http://dx.doi.org/10.1016/j.jep.2013.01.024

1. Introduction

1.1. The Indian traditional system of medicine

The use of plants as medicine is as old as human civilization. The earliest record of use of medicinal plants for prevention of disease and cure of ailments can be traced in "Rigveda" perhaps the oldest repository of human knowledge having been written between 4500 and 1600 BC. In the "Atherveda", which is a later production, the use of plants as drug is more varied and it is the "Ayurveda" which is considered as "Upveda" that the definite properties of drugs and their uses have been given in more details. Figs. 1 and 2.

Traditional systems of medicines such as Unani and Ayurveda have provided us with the novel concepts and modalities in the healthcare arena. Right from the ancient times, the importance of traditional medicine in the treatment of various ailments are well documented. Such use of medicinal plants is still a tradition followed by the ethnic community dwelling in the undulating planes and at the foothills of major forests of the globe. *Nyctanthes arbor-tristis* L. (Oleaceae) belongs to such a group of medicinal plant. Tables 1–3.

1.2. Nyctanthes arbor-tristis L.: Taxonomy and synonyms

Nyctanthes arbor-tristis L. (Oleaceae), are shrubs or small trees with soft white hairs, young branches sharply quadrangular. Leaves are opposite, ovate, apex acute or acuminate, rough with short stiff hairs, margin is entire or with few large distinct teeth, base is rounded or slightly cuneate, with the main nerves conspicuous beneath. Inflorescence is axillary, solitary or in terminal short trichotomous cymes. The flowers have a pleasant fragrance, with a five- to eight-lobed white corolla with an orange–red center, produced in clusters of two to seven together, with individual flowers opening at dusk and finishing at dawn. Fruits are in capsule, orbicular, compressed. Seeds are orbicular and flattened.

Synonyms of *Nyctanthes*

Homotypic synonyms:
Parilium arbor-tristis (L.) Gaertn., Fruct. Sem. Pl. 1: 234 (1788).
Heterotypic synonyms:
Scabrita scabra L., Syst. Nat. ed. 12, 2: 115 (1767).
Scabrita triflora L., Mant. Pl. 1: 37 (1767).
Nyctanthes tristis Salisb., Prodr. Stirp. Chap. Allerton: 11 (1796).
Nyctanthes dentata Blume, Mus. Bot. 1: 282 (1851).
Bruschia macrocarpa Bertol., Mem. Reale Accad. Sci. Ist. Bologna 8: 238 (1857).

1.3. Traditional usage

Nyctanthes arbor-tristis L. is a plant that is predominantly native to southern Asia and according to reports from Germplasm Resources Information Network, Flora of Pakistan and Agro Forestry Tree Database, the geographical distribution of the plant extends from northern Pakistan and Southern Nepal through northern India and southeast to Thailand. It is a shrub or a small tree growing up to 10 m, with flaky grey bark. *Nyctanthes arbor-tristis* L. is said to have a wide range of medicinal benefits to mankind. The flowers of *Nyctanthes arbor-tristis* are used in India, Indonesia (Java) and Malaysia to provoke menstruation while the bitter leaves are used as cholagogue, laxative, diaphoretic and diuretic (Agroforestry tree database). The leaves of the plant are opposite, simple, 6–12 cm long and 2–6.5 cm broad. The leaf juice is used to expel roundworms and threadworms in children (Chauhan, 1999). The leaf juice is also used to treat loss of appetite, piles, liver disorders, biliary disorders, chronic fever, malarial fever, obstinate sciatica, rheumatism, and as a diaphoretic (Banerjee et al., 2007). Fresh leaf juice has been suggested to be safe purgative for infants when given with honey mixed with common salt. In the form of infusion in doses of two ounces it is useful in fever and rheumatism as diaphoretic and diuretic (Nadkarni, 1982). The seed powder is used for scalp scurvy, in alopecia and as anthelmintic (Chatterjee et al., 2007; Nair et al., 2005). The bark is used for the treatment of bronchitis and snakebite (Chatterjee et al., 2007). In central India, the tribal people use various parts of *Nyctanthes arbor-tristis* to relieve cough, hiccup, dysentery, snakebite and sores (Banerjee et al., 1992; Jain et al., 2005). The inflorescence is used to treat scabies and other skin diseases (Jain et al., 2005). The plant has been used in Nepal as an anthelmintic (Bhattarai, 1992). Besides the activities mentioned above, *Nyctanthes arbor-tristis* is also known in Indian traditional medicine to possess immunotoxic, antiallergic, antihistaminic, purgative, antibacterial and ulcerogenic activities (Annonymous, 1997). Other uses are as an expectorant and for bilious fevers (Nair et al., 2005). The hot infusion of flowers is used by some elderly Sri Lankan Buddhist monks as a sedative (Ratnasooriya et al., 2005). In Myanmar, a decoction of 300–500 ml or dried herb in a dose of 3–6 g is orally taken for diabetes. Also, crushed fresh leaves are externally used for ulcers and sore to reduce inflammation. (Annon.). The Jayantia tribes (India) habiting regions close to Myanmar use the leaf juice orally as an anthelmintic and the flower along with honey as an antispasmodic. (Jaiswal, 2010). Traditionally, the flowers of the plant are known to be effective as stomachic, carminative, astringent, anti-bilious, expectorant, hair tonic and are used in the treatment of piles and various skin diseases. The bark is used to treat bronchitis and snake bite (Aggarwal et al., 2011).

1.4. Scope of the review

The traditional usage of the plant has been in an assortment of ailments with the scientific studies gyrating this information. The need for a critical review of the gaps in scientific studies in terms of phytochemical profile, pharmacological or toxicity studies