Review Paper

Phytopharmacology Studies of Ulmaceae

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Abstract

In spite of recent advance in analytical techniques of modern medicine, in India and even western countries the traditional medicine is still the major form of treating diseases of majority of people. The number of people using one form or another of complementary of alternative medicine is rapidly increasing worldwide. The family Ulmaceae included in core eudicots. Species form this family economically used as timber, making ropes and traditional medicine. Bioactive compounds of Ulmaceae are moderately strong accumulators of polyphenolic compounds, derivatives of caffeic acid, catechins, pro-anthocyanidins, flavonols and condensed tannins seem to occur more or less ubiquiteous in leaves, fruits, barks and woods. The present review discussed about the phytopharmacology studies of family Ulmaceae.

Keywords: Extracts, Pharmacology, Phytochemistry, Traditional system of medicine, Ulmaceae

Introduction

Phytopharmacology studies discuss about the phytochemical investigations and ethno-botanical reports on folk use of medicinal plants. Phytopharmacology studies also talk about the structure elucidation studies of bio-active compounds, identification of bioactivity in plant extracts, identification of targets and pharmacological mechanisms of natural products, development of standardization method for bioactive plant extracts and natural products. The Ulmaceae family (elm family) consists of 15 genera and 200 species are distributed over tropical and temperate regions of the northern hemisphere (Parrott, 2001; Jaya Srivastava *et al*., 2013). It is a small angiospermic family, included in the order Rosales in the APG IV (2016) classification.

The family Ulmaceae consists of evergreen or deciduous woody trees and shrubs. The leaves are simple, stipulate, margin serrated, leaf base oblique, reticulate venation and the secondary veins terminating at teeth. The flowers are small, actinomorphic, unisexual or

bisexual. Tepals 5 -9 are basally united. Stamens are with numerous anther, free, bithecous, dorsifixed and versatile. Pollination is by wind. Gynoecium consists of 2 -3 capels, syncarpous, ovary superior, 2–3-loculed, placentation apical with 1 pendulous ovule per locule and style 2 -3. The fruit is dry indehiscent, often a flattened samara.

Many species of this family used for various medicinal purposes. The leaves and the bark of *Trema orientalis* are used to treat cough, sore throats, asthma, bronchitis, gonorrheas, yellow fever, toothache, and as an antidote to general poisoning (Yanes, 2007). *Holoptelea integrifoila* commonly called as Indian Elm and are used in India by the tribal people for its medicinal properties. The mucilaginous bark is boiled, and the juice squeezed out and applied to rheumatic swellings (Nadkarni, 1976). It is also used traditionally for the treatment of inflammation, gastritis, dyspepsia, colic, intestinal worms, vomiting, wound healing, leprosy, diabetes, hemorrhoids, dysmenorrhea and rheumatism (Warrier *et al*., 1995). *Celtis durandii* is a medicinal plant used in the treatment of various illnesses such as: migraine, epilepsy, painful menstruation, cardiovascular disorders, especially arterial hypertension, and renal disorders (Fidele *et al*., 2009). *Celtis australis* exhibited significant analgesic and anti- inflammatory activities (Ruchi and Deepak, 2012). *Ulmus* is useful in the treatment of obesity, edema, bronchitis (Nasir and Ali, 1985; Baquar, 1995) and also possess ovipositor deterrent activity and protease inhibitory activity (Shastri, 1950; Sing *et al*., 1992).

Many plants of this family have economic value. Few plants in this family are medicinally evaluated for Pharmacognostic and Phytochemical analysis. The present review discussed on overview and critical assessment of published data concerning pharmacology studies of family Ulmaceae.

Phytopharmacology studies

Total phenolic content, flavonoid concentration and antioxidant activity are reported in leaves and bark extracts of *Celtis australis* (Hammash *et al*., 2016). Antioxidant properties of the methanol extracts are reported in the leaves and stems of *Celtis africana* (Adedapo *et al*., 2009). Methanolic and aqueous extracts of *T. orientalis* leaves have anti-convulsant activity against pentylenetetrazole-induced seizures and maximum electroshock-induced seizures in mice (Panchal *et al*., 2010). The leaf extract has also been shown to have anti-arthritic effects in acute and chronic models in mice (Barbera *et al*., 1992). The plant has been reported to possess anti-

inflammatory (Kalpana and Upadhyay, 2010), antidiabetic (Sharma *et al*., 2010), antitumour (Lakshmi *et al*., 2010), antidarrheal (Shrinivas *et al*., 2009), antioxidant (Saraswathy *et al*., 2008), antimicrobial (Paarakh and Nadella, 2011), anthelmintic (Durga and Paarakh, 2010; Kumar *et al*., 2010) activities.

Holoptelea integrifolia bark and leaves are reported to be anti-inflamatory, carminative, anthelmintic, depurative and urinary astringent (Kinjal Shah *et al*., 2015). Anti-diabetic and hypolipidemic effect of ethanolic extract has reported in *T. orientalis* (L.) Blume STZ - Nicotinamide induced type 2 diabetes in male Albino wistar rats. Over-production (excessive hepatic glycogenolysis and gluconeogenesis) and decreased utilization of glucose by the tissues are the fundamental basis of hyperglycemia in diabetes mellitus. The extract did not produce any significant effects on normal animals, which further confirms the safety and antidiabetogenic action of the extract (Jiji *et al*., 2016). In the traditional system of medicine, bark and leaves of *H. integrifoila* are used as bitter, astringent, acrid, thermogenic, anti-inflammatory, digestive, carminative, laxative, anthelmintic, depurative, repulsive, urinary astringent and in rheumatism (Kirtikar and Basu, 2000; Prajapati *et al*., 2003).

The pharmacological interest coupled with traditional uses (antidiarrhoeal, antiseptic, analgesic etc.) prompted us to test for anti-inflammatory, antinociceptive and diuretic activities of *T. orientalis* Linn. The crude methanolic leaves extract of *T. orientalis* was investigated for its possible anti-inflammatory activities using carrageenin induced rat paw edema model and cotton pellet implantation method in mice. Then the extract analyzed for its antinociceptive activities by acetic acid induced writhing model in mice. The extract possessed significant anti-inflammatory activity in both models at the doses of 200 and 400 mg/kg body weight of mice. Moreover, the extract showed significantly reduced the number of acetic acid-induced abdominal constriction in mice of 200 and 400 mg/kg body weight. The extract also showed positive diuretic activity in albino mice (Sarder Nasir Uddin, 2008).

Hepatoprotective activity of *Sophora interrupta* and *Holoptelea integrefolia* against carbontetrachloride induced hepatotoxicity in rats (Hemamalini and Sathya, 2013). The whole bark of *H. integrifolia* was subjected for extraction and fractionation, in which the partitioned EtOAC fraction (20 gm) was undergone for isolation and detection followed by chromatographic procedures. Betulin is isolated from the bark of *H. integrifolia* (Maryam, 2013). The diagnostic

macro and microscopic anatomical features, chemomicroscopic, characteristic fluorescent colours and the numerical standards could be useful in quality control and to supplement a monograph for *Trema orientalis* (Ugwoke *et al*., 2017).

Analgesic activity of various extracts is reported in *Holoptelea integrifolia* (Roxb.) Planch leaves (Rizwani *et al*., 2012). Comparative pharmacological evaluation of adaptogenic activity was studied in *H. integrifolia* and *Withania somnifera (*Puri *et al*., 2012). Antitumor activity of ethanolic extract was experimented in leaves of *Holoptelea integrifolia* on Dalton's ascitic lymphoma in Swiss albino mice (Lakshmi *et al*., 2010). Evaluation of anthelmintic activity of stem bark was studied in *H. integrifolia* Planch (Durga and Paarakh, 2010). Anti inflammatory evaluation of ethanolic extract of the leaves was reported in *H. Integrifolia*, Planch (Kalpana and Upadhyay, 2010).

Holoptelea integrifolia, various extracts, like methanolic, aqueous, petroleum ether, and ethanolic extract of leaves and bark of the plant used as antiviral, antioxidant, antimicrobial, abortifacient, and in cancer. Traditionally the leaves and bark used as bitter, astringent, anthelmintic, inflammation. Studies on anti- inflammatory effect of aqueous extract of leaves of *Holoptelea integrifolia*, in rats (Sharma *et al*., 2009). Paste of stem bark of *H. integrifolia* is applied externally to treat inflammation of lymph gland and common fever, scabies and ring worm, whereas paste of bark and leaf is applied externally for treatment of leucoderma (Kaur *et al*., 2010).

Holoptelea integrifolia (Roxb.) Planch (Ulmaceae) commonly had known as Indian Elm, Kanju. It is a large deciduous tree, commonly found throughout the greater part of India. In the traditional system of medicine, bark and leaves are used as bitter, astringent, acrid, thermogenic, anti-inflammatory, digestive, carminative, laxative, anthelmintic, depurative, repulsive, urinary astringent and in rheumatism (Nadella Durga and Padmaa Paarakh, 2011).

The fatty acid methyl esters from the dichloromethane fraction of the methanol stem bark extract of *T. orientalis* is responsible for the antimalarial activity of the plant. *T. orientalis* showed potential antimalarial activity by its therapeutic clearance and enhanced haematological indices against *P. bergei* parasites. The extracts have considerably low or no toxicities in experimental mice. This finding supports the traditional use of this plant for the treatment of malaria (Oludele Olanlokun *et al*., 2017).

Holoptelea integrifolia contains active principle such as Beta amyrin, Beta sitosterols, octacosanol, holopettelin-A, holopetelin-B, hederagenin, hexacosanol, Beta-D-glucose,fridelin, epifriedelin, 2-amino napthaqiunone, 1,4-napthalenedione are considered as responsible for various activities. Various extract, like methanolic, aqueous, petroleum ether, and ethanolic extract of leaves and bark of plant used as antiviral,antioxidant, antimicrobial, abortifacient, and in cancer. Traditionally leaves and bark used as bitter,astringent, anthelmintic, inflammation (Sandhar *et al*., 2011).

Antibacterial activity of *Trema orientalis* was reported by Chowdhury and Islam (2004). Anti-sickle erythrocytes haemolysis properties and inhibitory effect of anthocyanins extracts of *T. orientalis* on the aggregation of human deoxyhaemoglobin S *in vitro* was studied by Mpiana *et al*., (2011). Flavonoids were isolated from *Celtis australis* (Cannabaceae) (Spitaler *et al*., 2009). Fatty acid composition and antimicrobial activity of *Celtis australis* L. fruits were experimented by Badoni *et al*., (2010). Chemical investigation of *H. integrifolia* Planch. and *Cassia fistula* Linn. was studied by Biswas *et al*. (1986).

A Triterpenoid antioxidant agents found in *Holoptelea intigrifolia* (Roxb.) Planch (Ahmed *et al*., 2013). Anti-inflammatory effect of aqueous extract of leaves of *H. integrifolia* in rats was reported by Sharma *et al*. (2009). Inhibition of β-lactamase by 1, 4- napthalenedione from *H. integrifolia* was observed by Vinod *et al*. (2009). Antibacterial evaluation and preliminary phytochemical analysis of the leaf extract of *H. integrifolia* was studied by Ahmad *et al*. (2012). Anti-inflammatory evaluation of ethanolic extract of leaves of *H. integrifolia* was reported by Kalpana and Upadhyay (2010). Phytochemical screening and evaluation of anti-inflammatory activity of leaf extract of *H. integrifolia* (Sharma *et al*., 2011). Evalution of anthelmitic activity of *H. integrifolia* (Roxb.) Planch (Nadella and Paarakh**,** 2010). Comparative Study of anthelmintic activity of aqueous and ethanolic extract of bark of *H. integrifolia* (Kaur *et al*., 2010). Anticancer efficacy of *H. integrifolia*, Planch, against 7, 12- dimethyl benz(A) anthracene induced breast carcinoma in experimental (Soujanya *et al*., 2011). Absence of hypolipidemic effect of *H. integrifolia* leaf extract in tyloxapol-induced hyperlipidemic rats (Baroda *et al*., 2012). Anti-diabetic screening leaves extract of *H. integrifolia* (Sharma *et al*., 2010).

A positive antioxidant and α-amylase inhibitory activities was reported in *T. orientalis* bark. Positive bioactivity demonstrated by extracts could be due to the synergistic effect of the active compounds, with emphasis on the phenolic compounds (phenols, flavonoids and tannins). The higher total phenolics content was also exhibited in the methanol extract than aqueous extract. In addition, traditional preparation (decoction) is revealed to be non-toxic and methanol extract exhibited weak toxicity against brine shrimp assay. Pharmacological evidence on the antidiabetic potential of *T. orientalis* bark and its traditional use as a diabetes treatment (Dana Joanne Von *et al*., 2016).

Conclusion

Herbal drugs have gained popularity because they are less toxic and possess better therapeutic properties. Though the process of drug discovery is slow and time-consuming, recent advances in the plant-based biomanufacturing system, the production and commercialization of herbal drugs and plant-made biologics have gained impetus. Phytopharmacology have provided scope for the development of plant-made new drugs, which is the need of the hour. Plant-based drugs hold great potential in providing an efficient system to develop new medicines for fighting the detrimental effects caused by infectious microbes.

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