INTERNATIONAL RESEARCH JOURNAL OF PHARMACY
www.irjponline.com
ISSN 2230 – 8407

Review Article

ETHNOBOTANY, PHYTOCHEMISTRY AND PHARMACOLOGY OF *MELOCHIA CORCHORIFOLIA* L.

T. Pullaiah*
Department of Botany, Sri Krishnadevaraya University, Anantapur, A.P. India
*Corresponding Author Email: pullaiah.thammineni@gmail.com

Article Received on: 10/06/14 Revised on: 30/06/14 Approved for publication: 05/07/14

DOI: 10.7897/2230-8407.0507109

ABSTRACT
Plant profile, vernacular names, folk medicinal uses, ethno botany, phytochemistry and pharmacology of an important medicinal plant *Melochia corchorifolia* L. belonging to the family Sterculiaceae are reviewed in this paper. Triterpenes, flavonol glycosides, alkaloids melochinine, franganine and melochironine have been reported from the plant. Plant extract showed hepatoprotective, antioxidant, antibacterial and anthelmintic activities.
Keywords: *Melochia corchorifolia,* phytochemistry, hepatoprotective, antioxidant, antibacterial, anthelmintic

INTRODUCTION

Plant Profile: *Melochia corchorifolia* L., Sp. Pl. 675. 1753
Erect branching herbs or under shrubs, up to 70 cm high, thinly stellate-hairy. Leaves variable in shape, ovate, ovate-lanceolate, oblong-ovate or sub orbicular, rarely obscurely 3-lobed, 1-5.5 × 0.5-3 cm, glabrous above, thinly stellate-hairy below; base obtuse or truncate, margin serrate, apex acute; petiole up to 3.5 cm long. Flowers pale to deep pink in terminal peduncled, capitate cymes, surrounded by 4-5 bracteoles; calyx ciliate, hairy outside, lanceolate; petals white or pink, obovate to spathulate; staminal cup somewhat spindle-shaped, ovary 5-loculed, hairy; capsules sub-globose, hispid; seeds angular, black.

Vernacular names

Chocolate-weed, redweed (English). Indonesia: orang-aring (general), jaring (Sundanese), gendiran (Javanese). Malaysia: lemak ketam, lemak kepiting, bayam rusa (Peninsular). Philippines: bankalanan (Iloko), kalingan (Panay Bisaya). Thailand: khaang paak put (Chiang Mai), sa aeng bai mon (Chai Nat), seng lek (Ang Thong). Vietnam: tr[uws]ng cua, v[ai]i gi[aas]y. India: Tikiokra (Bengali), Bilpat (Hindi), Ceruvuran (Malayalam), Chyeron, Dasoderotan (Oriya), Pinnak, Kuppundu (Tamil), Ganuga pindikura (Telugu).

Origin and geographic distribution

Melochia consists of approximately 55 species and is largely confined to the tropics, although some species reach subtropical regions. The greatest diversity in species is found in Central and South America. Only 2 or 3 species are native to South-East Asia. *Melochia corchorifolia* is a weed throughout the tropics and subtropics, including South-East Asia. It originates from the Old World tropics and has been introduced in the Americas.

Growth and development

Melochia corchorifolia is reported to flower and fruit all year round. The flowers are probably pollinated by small insects.

Other botanical information

Melochia corchorifolia is extremely variable morphologically and numerous varieties have been distinguished. Roots of *Melochia tomentosa* L. have been used in Curaçao to relieve throat inflammation. However, the root extract was reported to be tumorigenic. *Melochia umbellata* (Houtt.) Stapf is a small tree indigenous from India to New Guinea for which no medicinal uses have been recorded.

Ecology

Melochia corchorifolia is a common weed in many regions in sunny or slightly shaded, usually humid localities, at watersides and in fields, waste places and open forest, up to 700 m altitude in Java. Although it is adapted to xerophytic conditions, *Melochia corchorifolia* has retained its ability to grow in mesophytic and hydrophytic habitats. In the Philippines, it is reported as one of the dominant weeds in upland rice, together with *Echinochloa colona* (L.) Link. In Thailand and Indonesia it is also a weed in lowland rice, moreover it is also recorded as such in soya bean.

Propagation and planting

Scarification of seed improves germination considerably. Scarified seed germinates best at a temperature of 35-40°C. Seed buried to a depth of 1-5 cm gave a germination rate of 80-90 % after 7 days; when planted at the soil surface or deeper than 8 cm the seed did not germinate.

Folk uses and Ethnobotany

The leaves of *Melochia corchorifolia* are eaten as a pot herb in West Africa. The cooked leaves provide a popular slimy side-dish in Malawi. Similar use of these leaves is reported from Indo-China and India[1]. Leaves are used for unspecified stomach disorders in Coastal East Africa. In Benin the seed is used to treat stomach ache. An aqueous solution of leaves has insecticidal properties. Pulses stored in gunny bags treated with the solution have shown a reduction in the number of eggs laid and in damage done by the storage pest *Callosobruchus maculatus*[2]. In Malaysia the leaves are used for poulticing sores and swellings of the abdomen, and the sap is applied as an antidote to wounds caused by arrows poisoned with *Antiaris toxicaria* Lesch. Leaves and roots are used for poulticing in cases of smallpox. A decoction of the leaves and roots is used internally to treat dysentery, and a decoction of the leaves to stop vomiting. A leaf decoction is

prescribed in a compound mixture against urinary disorders. A decoction of the plant is applied in folk medicine in India as a cure for abdominal swelling, dysentery[3] and water snake bites[4]. In Papua New Guinea, the leaves of an unidentified *Melochia* species are applied to the forehead to treat headache and the fruit is eaten. The leaves of *Melochia corchorifolia* are sometimes eaten in Indo-China and India. The plant yields a beautifully silvery-white, fine and strong fiber, but in too small quantity to be important. *Melochia corchorifolia* is used as fodder for cattle. Leaves are sometimes used as vegetable. Fruit powder is used for ear problems, anthelmintic, dysentery, abdominal swellings and snake bites[5]. The sap is applied to heal wounds poisoned by *Antiaris.* The plant is also used to relieve gastralgia and headache[6]. The stem bark yields a valuable fiber. Stem and leaves decoction with oil are useful for preventing bad consequences from snake bites; leaves occasionally edible[7]. In Jharkhand leaves of *Melochia corchorifolia* are consumed as sag[8]. Leaf and root are anti dysenteric. Leaf is applied as poultice for swellings of abdomen and sores. Leaf and stem boiled in oil is used to prevent bad consequences from bites of water snakes[8]. Santhal tribes of Jharkhand consume leaves as vegetable[9]. Tribals of Uttar Pradesh, India use the decoction of leaves to treat dysentery[10].

Phtochemistry

A phytochemical study of leaves of *Melochia corchorifolia* has shown the presence of triterpenes: friedelin, friedelinol and β-amyrin; flavonpol glycosides: hibifolin, trifolin and melochorin; aliphatic compounds; flavonoids: vitexin and robunin; β-D-sitosterol and its stereate β-D-glucoside and alkaloids[11]. A phytochemical investigation of extracts from the dried, powdered aerial parts of *Melochia corchorifolia* revealed the presence the aliphatic compounds ethylstearate, tetratriacontanol, nonacosylnon-4-enoate, 24-ethyl-2-methyltritetracont-1-ene-3,23-diol and 27-methyloctacosane-1,3-diol and the flavonoids vitexin and robunin. Furthermore several alkaloids have also been reported in similarly prepared extracts: franganine, frangufoline adouetine-y' and melofoline (cyclopeptide alkaloids), melochicorine (a pseudo-oxindole alkaloid) and 6-methoxy-3-propenyl-2-pyridine carboxylic acid (a pyridine alkaloid). The latter compound may be of significance, since related pyridine derivatives (e.g. pyridoxine, 4'-methoxypyridoxine, nicotinic acid) are physiologically active. The flavonol glycosides hibifolin, triflin and melocorin have been isolated from the leaves. The main alkaloid in *Melochia pyramidata* L., American in origin but naturalized in many tropical and subtropical regions including South-East Asia, is (-)-(R)-melochinine. This compound has been shown to produce paralysis, bradypnea, bradycardia and hypotension in laboratory animals, and ingestion of plant material by cattle may cause paralysis. The mechanism of action of this alkaloid can be described as in general non-specific. It may be partly explained by an unspecific interaction with membranes, partially responsible for a calcium-antagonistic effect. Unlike its structural analogue piercidin A, a well-known inhibitor of the mitochondrial respiratory chain, melochinine does not show insecticidal activity. Adouetine and a new cyclopeptide alkaloid, melofoline, have been isolated from *M. corchofolia*[12]. A cyclopeptide alkaloid, franganine, and a new pseudooxindole alkaloid, melochironine, have been isolated from *M. corchorifolia*[13]. A pyridine alkaloid, 6-methoxy-3-propenyl-2-pyridine carboxylic acid, may be important as related pyridine derivatives are physiologically active[14,15]. The proximate analysis of the dried powdered leaves of *M. corchorifolia* showed the following composition (dry weight content %). High crude protein content (23.31 %), crude lipid value (13.3 %), low available carbohydrate value (30.03 %), high dietary fiber content (23.33 %) and high ash content (10.00 %). The fresh leaves have high moisture content (620.16 % wet weight) with low energy value (275.66 kcal/100 g). Macro and microelements play a vital role in human nutrition as they are dietary essential. Mineral analysis of *Melochia corchorifolia* showed the leaves contain a high level of potassium (7.25 mg/100 g DW), followed by calcium (750.37 mg/100 g DW) and then phosphorus (101.89 mg/100 g DW). Sodium content (94.00 mg/100 g DW) is the lowest among the macro elements determined. Other mineral composition in mg/100 g DW are: Cu (33.50), Fe (19.91), Mn (9.68) and Zn (6.73)[16].

Pharmacology

Hepatoprotective and Antioxidant Activity

Rao *et al.* [17] and Rao[18] evaluated hepatoprotective and antioxidant capacity of *Melochia corchorifolia* aerial part extracts. Antioxidant activity was evaluated by using three free radicals (Superoxide, Hydroxyl and DPPH) and hepatoprotective activity was assessed against CCl_4 induced liver intoxication in rats. The extracts produced concentration dependent percentage protection in decrease of serum enzymes and percentage inhibition on free radicals. Among all extracts methanol extract showed better activity with percentage protection of SGOT (78.98 %), SGPT (79.65 %), ALP (82.48 %) and total bilirubin (80.0 %) levels against CCl_4 liver intoxication and also methanolic extract showed better activity with IC_{50} values on superoxide, hydroxyl and DPPH radicals were 127 µg, 240 µg and 179 µg. From the results obtained during the study it could be concluded that *M. corchorifolia* aerial part extracts have antioxidant and hepatoprotective components. Further study is necessary for isolation and characterization of bioactive molecules which are responsible for hepatoprotective and antioxidant activity[17].

Antioxidant Activity

Palaksha[19] investigated the free radical scavenging activity of *Melochia corchorifolia* plant extract by determining DPPH, Nitric oxide, Hydroxyl and Hydrogen peroxide scavenging activity. Petroleum ether, chloroform and ethanol extract of plant parts exhibited strong free radical scavenging activity in all the tested methods and showed maximum scavenging of DPPH, Nitric oxide, hydroxyl and hydrogen peroxide at 100 µg/ml concentration. The phytochemical screening constitutes flavonoids and tannins and the antioxidant activities may be due to the presence of these phenolic compounds.

Antibacterial activity

Rao *et al.*[20] and Rao[18] evaluated the antibacterial activity of different extracts of *Melochia corchorifolia* on eight bacterial strains by using cup plate method. All tested extracts at different concentrations have shown significant antibacterial activity along with standard drug. Extracts showed good zones of inhibition against gram^{-ve} organisms than gram^{+ve} organisms. The methanol extract showed better activity against tested bacterial strains compared to other extracts. Methanol extracts showed maximum zones of inhibition (19 mm, 18 mm and 18 mm) on *Pseudomonas aeruginosa,*

Bacillus megaterium and *Klebsiella pneumoniae* at a concentration of 400 µg/cup. Ethanol (70 %) and Ethyl acetate extracts showed moderate zones of inhibition on tested bacterial strains. Ethanol extract showed maximum zone of inhibition (18 mm) on *Pseudomonas aeruginosa* at a concentration of 400 µg/cup. Ethyl acetate extract showed maximum zone of inhibition (15 mm) on *Klebsiella pneumoniae*. Hexane extract showed highest zone of inhibition (12 mm) against *Staphylococcus aureus* and *Klebsiella pneumoniae* at a concentration of 400 µg/cup. Palaksha *et al.*[21] evaluated *in vitro* antibacterial activity of *Melochia corchorifolia* extracts employing a standard agar cup plate method. Petroleum ether, chloroform and methanol extracts (50 mg/ml and 100 mg/ml) were tested against gram negative (*Klebsiella pneumonieae, Pseudomonas aeruginosa* and *Escherichia coli*) and Gram positive (*Bacillus subtilis* and *Staphylococcus aureus*). Both gram positive and gram negative bacteria were sensitive to the extract.

Anthelmintic activity

Palaksha *et al.*[21] evaluated anthelmintic activity of *Melochia corchorifolia* plant extracts using *Pheritima posthuma* (Indian earthworm). All the extracts were found to possess vermifuge and vermicidal activity with 100 mg/ml concentration and the results were compared with standard drug Albendazole. Aqueous and ethanol extracts from the stems of *Melochia carchorifolia* were investigated by Palaksha *et al.*[22] for their anthelmintic activity against *Pheritima posthuma.* Three concentrations (20, 40, 60 mg/ml) of each extracts were studied in activity, which involved the determination of time of paralysis and time of death of the worms. Both the extracts exhibited highly significant anthelmintic activity at highest concentration of 60 mg/ml. Piperazine citrate was included as standard reference and normal saline as control. The anthelmintic activity of aqueous and ethanol extracts of *Melochia corchorifolia* has therefore been demonstrated for the first time.

Prospects

Although some research has been done on the phytochemistry, very little is known about the pharmacological properties and activity of *Melochia corchorifolia* and its compounds. The fact that tumorigenic and toxic activity has been reported from some other *Melochia* spp. should lead to caution in using *Melochia corchorifolia* in phytotherapy as so little is known about its biological activity.

CONCLUSION

Various bioactivity studies of *Melochia corchorifolia* L. plant derivatives are at the preliminary level requiring further studies to determine the mechanism of action. This review provides an overview on various aspects that need to be carried out in developing suitable clinical therapeutics out of plant *Melochia corchorifolia* L.

REFERENCES

1. Grubben GJH. Vegetables. PROTA Foundation, Wageningen, The Netherlands; 2004.
2. Raja N, Babu A, Dorn S, Ignacimuthu S. Potential plants for protecting stored pulses from *Callosobruchus maculatus* (Coleoptera: Bruchidae) infestation. Biological Agriculture and Horticulture 2001; 19(1): 19-27. http://dx.doi.org/10.1080/01448765.2001.9754906
3. Wealth of India. Raw Materials. Vol. 7, N-Pe. Publication and Information Directorate, CSIR, New Delhi; 1966.
4. Chopra RN, Nayar SL, Chopra IC. Glossary of Indian medicinal plants. CSIR, New Delhi; 1956.
5. Ajaib M, Khan Z, Khan N, Wahab M. Ethno botanical studies on useful shrubs of district Kotli, Azad Jammu and Kashmir, Pakistan. Pak J Bot 2010; 42(3): 1407-1415.
6. Herbal Medicine Research Centre, Institute for Medical Research, Kuala lumpur. Compedium of medicinal plants used in Malaysia; 2002.
7. Naskar K. Plant wealth of the Lower Ganga Delta: An Eco taxonomic approach. Daya Publishing House, New Delhi; 1993.
8. Sharma HP, Kumar RA. Health security in ethnic communities through nutraceutical leafy vegetables. J Environ Res Dev 2013; 7(4): 1423-1429.
9. Sinha R, Lakra V. Edible weeds of tribals of Jharkhand, Orissa and West Bengal. Indian J Trad Knowledge 2007; 6(1): 217-222.
10. Shukla AN, Srivastava S, Rawat AKS. A survey of traditional medicinal plants of Uttar Pradesh (India) – used in treatment of infectious diseases. Nature and Science 2013; 11(9): 24-36.
11. Bosch CH. *Melochia corchorifolia* L. Record from protabase; 2004.
12. Bhakuni RS, Shukla YN, Thakur RS. Cyclopeptide alkaloids from *Melochia corchorifolia*. Phytochemistry 1987; 26(1): 324-325. http://dx.doi.org/10.1016/S0031-9422(00)81541-1
13. Bhakuni RS, Shukla YN, Thakur RS. Melochicorine, a pseudooxindole alkaloid from *Melochia corchorifolia*. Phytochemistry 1991; 30(9): 3159-3160. http://dx.doi.org/10.1016/S0031-9422(00)98281-5
14. Bhakuni RS, Shukla YN, Thakur RS. 6-methoxy-3-propenyl-2-pyridine carboxylic acid: a new pyridine alkaloid from *Melochia corchorifolia*. Chemistry and Industry 1986; 13: 464.
15. Bhakuni RS, Shukla YN, Thakur RS. Chemical constituents of *Melochia corchorifolia* Linn. Indian Journal of Chemistry 1987; 26(12): 1161-1164.
16. Umar KJ, Hassan LG, Dangoggo SM, Inuwa M, Almustapha MN. Nutritional content of *Melochia corchorifolia* Linn. leaves. Int J Biol Chem 2007; 1(4): 250-255. http://dx.doi.org/10.3923/ijbc.2007.250.255
17. Rao BG, Rao YV, Rao TM. Hepatoprotective and antioxidant capacity of *Melochia corchorifolia* extracts. Asian Pacific J Trop Med 2013; 6(7): 537-543. http://dx.doi.org/10.1016/S1995-7645(13)60092-9
18. Rao TM. Biological and preliminary phytochemical evaluation of three folklore medicinal plants, *Melochia corchorifolia* L., *Chrozophora rottleri* (Geiseler) A. Juss. ex Spreng. and *Spilanthes acmella* L. Ph.D. thesis, Andhra University, Visakhapatnam; 2013.
19. Palaksha MN, Ravishankar K, Girija Sastry V. Preliminary phytochemical screening and *in vitro* free radical scavenging activity of *Melochia corchorifolia* plant extracts. International Journal of Research in Pharmacy and Chemistry 2013b; 3(2): 378-383.
20. Rao BG, Rao YV, Rao TM. Antibacterial activity of different extracts of *Melochia corchorifolia* and *Spilanthes acmella* aerial parts. J Pharmacy Res 2012; 5(6): 3022-3024.
21. Palaksha MN, Ravishankar K, Girija Sastry V. Evaluation of *in vitro* antibacterial and anthelmintic activities of *Melochia corchorifolia* plant extracts. Int J Biol Pharmaceu Res 2013a; 4(8): 577-581.
22. Palaksha MN, Satish S, Shalavadi MH, Biradar BS. Investigation of *in vitro* anthelmintic activity of *Melochia corchorifolia* stem extract against *Pheritima posthima*. Int J Pharmaceu Chem Sci 2012; 1(2): 764-768.

Cite this article as:

T. Pullaiah. Ethnobotany, phytochemistry and pharmacology of *Melochia corchorifolia* L. Int. Res. J. Pharm. 2014; 5(7):543-545 http://dx.doi.org/10.7897/2230-8407.0507109

Source of support: Nil, Conflict of interest: None Declared