

A review on usefulness and biological activities of Country Mallow

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Abstract

Country mallow (*Abutilon indicum*) is a perennial herb belonging to the family Malvaceae. It has been cultivated throughout the world and used from thousands of years for essential oil application and for medicinal uses. Mostly country mallow contain mucilaginous substances and asparagines, saponins, flavonoids, and alkaloids. The extent of each of these chemical constituents varies depending upon the type of species or cultivars as well as cultivation condition such as soil, weather and other horticulture practices. Country mallow is an essential component of several industrial applications that range from food to cosmetics to pharmaceutical products. More uses of country mallow by-products are continuously added. Further research on maximizing yield per hectare and optimum preservation and oil extraction method are needed, particularly in the developing world where country mallow leaf and flower harvesting and post-harvest processing methods are much traditional.

Key words: *Abutilon indicum*, saponin, terpenes, anti-inflammatory

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1. Botany

1.1. Introduction

Country mallow (*Abutilon indicum* L.) is a perennial herb belonging to the family (Malvaceae). It has been used for thousands of years traditionally due to pharmacological and medicinal activities. The genus *Abutilon* contains approximately 150 species including herbs (perennial or annual), shrubs and small trees distributed widely in tropical and sub-tropical regions [1]. Among them *Abutilon eremitopetalum*, *Abutilon theophrashti*, *Abutilon megapotamicum*, *Abutilon grandiflorum*, *Abutilon muticum*, *Abutilon pannosum*, and *Abutilon indicum* are more prominent species. *Abutilon Indicum* L. is a woody, erect, shrub found in tropical countries. Most familiar names of this plant in different languages are: Country mallow (English), Kanghi (Hindi), Badela (Bengali), Mudra (Marathi), Rsyaprokta/Kankatika (Sanskrit), Tutturubenda (Telgu), Pepdipidika (Oriya), Tutti (Tamil), Peeli booti (Urdu) [2].

1.2. History

Abutilon Indicum L. was introduced to American countries probably in 18th or early 19th century, while, it is sometimes considered native to these areas. According to some reports, it is native to certain islands and introduced to West Indies in early 18th century.

1.3. Demography/Location

Abutilon indicum L. is found in sub-Himalayan and other hilly areas at an altitude of 1500 meters [3]. It can

grow in dry and poor soil and require hot conditions. It generally grows along roadsides and wastelands.

1.4. Botany, Morphology, Ecology

Abutilon indicum L. is a perennial herb having height of 3 meters. Roots: cylindrical, smooth, 1.2 to 1.5cm wide, salty taste, yellow in color. Stem is yellow and 0.3-0.9cm wide. Leaves: evergreen, cordate, stipulate. Flowers: yellow, bisexual, pedicillate. Petiole: yellowish brown, 1.7 to 7cm long, cylindrical with stellate hairs. Lamina: dull green, crenate, dentate, acuminate, minutely stellate. Fruits: capsule, densely pubescent, with conspicuous beaks spreading horizontally. Seeds: 3 to 5mm long, minute, dark brown or black furrowed, tubercled, glabrous, reniform [4]. This weed can grow in poor and dry soils and requires warm conditions. It usually grows on roadsides or waste places after rainy season.

2. Chemistry

Abutilon indicum L. mainly comprises of alkaloids, carbohydrates, amino acids, proteins, flavonoids, gums, phenolic constituents, tannins, glycosides, mucilages, saponins, and terpenoids. Roots contain non-drying oil which mainly consists of fatty acids (linoleic, stearic, lauric, capric, myristic, oleic, lauric, stearic, caprylic, palmitic acid, and other fatty acids having 17-Carbons chain length). Phytochemical screening of leaves of *Abutilon indicum* L. showed the presence of saponin, flavonoids, steroids, and carbohydrates. Methanolic extract of leaf showed the presence of caffeic acid, eudesmic acid, and ferulic acid.

Seven flavonoids including quercetin and its glycosides were reported from flowers of *A. indicum* L. Its flowering tops contain approximately 0.15 % essential oil. GCMS analysis is generally used to characterize essential oils [5-11]. Major components of essential oil include: terpenes, α -pinene (0.1%), caryophyllene (11.6%), α -cineole (1%), caryophyllene oxide (2%), farnesol (2.8%), borneol (0.6%), geraniol acetate (2%), and eudesmol (22%) [12]. Figure 1 shows structures of some important compounds of *Abutilon indicum*.

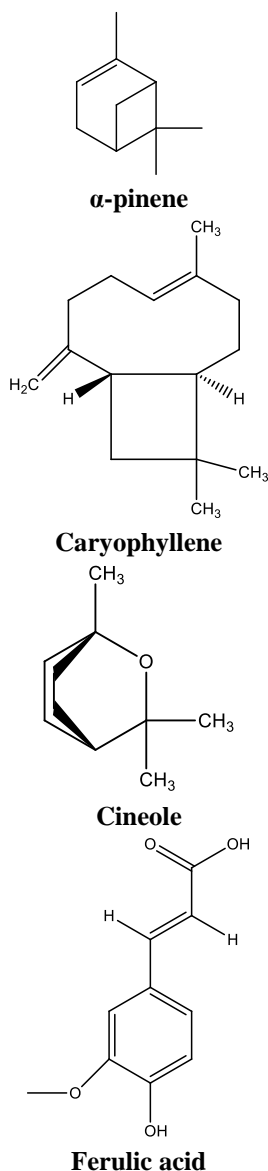


Fig.1. Structures of some important phytochemicals found in *Abutilon indicum* L.

3. General Uses

Almost all plant parts are medicinally important and are used traditionally to cure various diseases. Leaves are demulcent and are used to cure bronchitis, gonorrhoea, fever, diarrhoea, inflammation of bladder, and urethritis. Leaves are also used in toothache, eyewash, and mouthwash. Mixture of leaf juice and onion (*Allium cepa*) liquid extract is used to cure jaundice and other liver diseases [13-14]. Leaf extract can reduce thirst. Mixture of leaves juice and jaggery

is used as antidote to treat snakebite. Flower paste is used to cure ulcers and boils. Seeds are considered as aphrodisiac, laxative, and demulcent and are used to cure cystitis and gonorrhoea. They are also used to cure bronchitis, cough, tinnitus, fevers, chronic disorder, skin ulcers, puerperal disorders, diarrhoea, and diabetes [4]. Roots are considered as aphrodisiac, diuretic and pulmonary sedative and are used to cure haematuria, leprosy. Decoction of fruit mixed with ammonium chloride is used to cure hemorrhagic septicemia. Fruit is also used in the treatment of cough, piles, and gonorrhoea. Most of the *Abutilon* species are considered as fiber plants. Fibers are used to make various valuable products including drugs, jute dyes, fabrics, tissue papers, ropes cordages, rubber, shoe polishes, rugs, cigarette papers, and tyres.

4. Pharmacological uses

4.1. Anti-inflammatory activity

Anti-inflammatory potentials of leaf extracts (chloroform, aqueous, and ethanolic) of *Abutilon indicum* (L.) were investigated using HRBC membrane stabilizing method. The prevention of HRBC membrane lysis induced by hypotonicity was taken as measure of anti-inflammatory action. A biphasic effect was shown by all three extracts on membrane stabilization. Anti-inflammatory properties of *Abutilon indicum* (L.) extracts were found to be comparable to diclofenac sodium (Standard drug). However, the effect reduced with time. The extracts were supposed to show anti-inflammatory action either by stabilizing lysosomal membrane or inhibiting lysosomal enzymes [15].

4.2. Lipid lowering activities

Lipid lowering effects of leaves extracts of *Abutilon indicum* (L.) were investigated in rats using triton and diet induced hyperlipidemic assays. Significant reduction in triglycerides and serum cholesterol levels was shown by aqueous and ethanolic extracts in Triton WR 1339 administrated animals at dose level of 0.4g/kg. At the same dose levels extracts also decreased the elevated levels of triglycerides and serum cholesterol in diet induced hyperlipidemic animals. Lipid lowering activity of *Abutilon indicum* (L.) extracts is credited to phytochemicals (triterpenoids, tannins, flavonoids, saponins, and glycosides) present [15].

4.3. Analgesic activity

Pain-relieving activities of root extracts of *Abutilon indicum* (L.) were investigated. Powdered roots (900g) were subjected to solvent extraction. Petroleum ether, methanol, and ethanol were used as solvents for extraction. Analgesic activities were tested using tail flick, tail immersion, and acetic acid induced writhing models in Swiss albino rats. All extracts except methanolic extract showed remarkable analgesic activities [16].

4.4. Antioxidant and antibacterial activity

Researchers investigated the antibacterial and antioxidant activities of *A.muticum* L. and *A.indicum* L.

DPPH, FRAP, ABTS, and oleic acid peroxidation techniques were used to test total antioxidant activity. Results indicated the Presence of both slow and fast reacting compounds in both herbs seed oils. Seed oils of both herbs showed broad spectrum activities against Gram negative and Gram positive bacteria [17].

4.5. Antimicrobial activity

Fruit, leaves, and root extracts of *A.indicum* L. were tested for antimicrobial activities against various strains of microbes. No significant antimicrobial action was shown by the extracts against *Bacillus cereus*, *Pseudomonas aeruginosa*, *Candida albicans*, *Bacillus pumilus*, *Bordetella bronchiseptica*, *Streptococcus faecalis*, *Micrococcus luteus*, *Saccharomyces cerevisiae*, *Bordetella bronchiseptica*, and *staphylococcus epidermis*[18]. Results revealed the absence of antimicrobial activity in plant extracts. While, seeds showed inhibitory effect against *Absidia ramose* and *Aspergillus niger* (6.97 and 37.25), respectively [19].

4.6. Acetylcholinesterase Inhibitory activity

Abutilon indicum L. extract (methanolic) significantly inhibited acetylcholinestrace activity ($30.66 \pm 1.06\%$) at dose level of 0.1mg/ml [20].

4.7. Wound healing activity

Abutilon indicum L. extract (ethanolic) showed remarkable wound healing effect at dose level of 0.4g/kg. Wound epithelization was much earlier with ethanolic extracts, when compared to standard (Silver sulphadiazine) drug.

4.8. Antimalarial activity

β -sitosterol isolated from *Abutilon indicum* L. leaf extract (petroleum ether) showed significant antimalarial effect [21].

4.9. Anti-diarrheal activity

A study indicated significant anti-diarrheal effect of aqueous and methanol extracts of *Abutilon indicum* L. prostaglandin E2-induced diarrhea and castor oil induced diarrhea [22].

4.10. Anti-diabetic Activity

An investigation was performed to evaluate the anti-diabetic action of *Abutilon indicum* L. aqueous extracts. Significant reduction in blood glucose level of diabetic rats was observed after 30 minutes of oral administration of extract at dose level of 500 and 1000mg/kg, when compared to standard drug glibenclamide. An everted intestinal sac was used to investigate the inhibition of small intestine glucose absorption. Extracts showed significant decrease in absorption of glucose in a dose dependent manner. Maximum effect was observed at 2.5mg/ml [23].

4.11. Anti-convulsant activity

Anticonvulsant activities of leaves of *Abutilon indicum* L. were examined using MES (Maximum Electro Shock and PTZ (Pentylene tetrazole) convulsions in Wister rats. Ethanol extract decreased onset of tonic seizures at doses of 0.1 and 0.4g/kg. In (MES) induced convulsions,

aqueous and ethanol extracts exhibited potential anti-convulsant effect at dose levels of 0.1 and 0.4 g/kg. Anticonvulsant activity was credited to the presence of flavonoids and linoleic acid [24].

4.12. Anti-arthritis Activity

Abutilon indicum (L.) aqueous extract was examined for anti-arthritis activity, *in vitro*, using three parameters including protease inhibition, protein denaturation, and membrane stabilization. Extracts exhibited significant protective effect at doses of 0.1 and 0.25g/ml. Results justified plant's usefulness to cure inflammation based diseases [25].

4.13. Diuretic activity

Abutilon indicum L. seeds extract at doses of 0.2 and 0.4 g/kg was examined for diuretic effect. Furosemide was used as standard drug. Water soluble extract showed significant diuretic effect at concentration level of 0.4g/kg. Extract increased urinary excretions in a dose dependent manner, with no significant intrinsic potassium sparing effect. Results revealed significant natriuretic and diuretic activities of *Abutilon indicum* L. seeds extract.

4.14. Anti-ulcer activity

A study was performed to examine the antiulcer potential of leaves extracts of *Abutilon indicum* L. using pylorus and acetylsalicylic acid ligation, acetic acid and ethanol based ulcer models. Famotidine was used as standard drug. Extracts showed the significant ($p < 0.001$) reduction in ulcer index in experimental models in a dose dependent manner, when compared to control groups [26].

4.15. Anti-Arthritis Activity

A study was carried out to investigate the anti-arthritis effects of *Abutilon indicum* L. extracts, using Freund's adjuvant based arthritis model, *in vitro*. Male albino mice were used as model animals. Methotrexate at dose level of (0.75mg/kg as per body weight) was used as reference drug. Significant anti-arthritis effect was shown by *Abutilon indicum* L. extract at dose level of 0.4g/kg. Results were comparable to reference drug. While, extracts at dose levels 0.1 and 0.2g/kg were not significant [27].

4.16. Antifungal Activity

A new steroid (20, 23-dimethylcholesta-6, 22-dien-3 β -ol) has been reported from *A. indicum* L. stem. Isolated compound had significant inhibitory effect at dose level of 5000 ppm against growth of various fungal strains including *Aspergillus terreus*, *Aspergillus parasiticus*, *avicularia versicolor*, *Aspergillus flavus*, and *Aliivibrio fischeri* [28].

References

- [1] A. Sharma, R. Sharma, H. Singh. (2013). Phytochemical and pharmacological profile of *Abutilon indicum* L. Sweet: a review. International Journal of Pharmaceutical Sciences Review and Research. 20(1): 120-127.

- [2] S. Arora, D.P. Singh, A. Saini, A. Kumar. (2013). Pharmacognostic investigation on roots & leaves extract of *Abutilon indicum* linn.
- [3] P. Kaushik, D. Kaushik, S. Khokra, B. Chaudhary. (2009). *Abutilon indicum* (Atibala): Ethno-botany, phytochemistry and pharmacology–A review. International Journal of Pharmaceutical and Clinical Research. 1(1): 4-9.
- [4] M.K. Patel, A.P. Rajput. (2013). Therapeutic significance of *Abutilon indicum*: an overview. Am. J. Pharm. Tech. Res. 3: 20-35.
- [5] I. Ahmad, M.A. Hanif, R. Nadeem, M.S. Jamil, M.S. Zafar. (2008). Nutritive evaluation of medicinal plants being used as condiments in South Asian Region. Journal of the Chemical Society of Pakistan. 30(3): 400-405.
- [6] A.Y. Al-Maskri, M.A. Hanif, M.Y. Al-Maskari, A.S. Abraham, J.N. Al-sabahi, O. Al-Mantheri. (2011). Essential oil from *Ocimum basilicum* (Omani Basil): a desert crop. Natural product communications. 6(10): 1934578X1100601020.
- [7] Z. Arshad, M.A. Hanif, R.W.K. Qadri, M.M. Khan. (2014). Role of essential oils in plant diseases protection: a review. International Journal of Chemical and Biochemical Sciences. 6: 11-17.
- [8] M.A. Hanif, M.Y. Al-Maskari, A. Al-Maskari, A. Al-Shukaili, A.Y. Al-Maskari, J.N. Al-Sabahi. (2011). Essential oil composition, antimicrobial and antioxidant activities of unexplored Omani basil. Journal of Medicinal Plants Research. 5(5): 751-757.
- [9] M.A. Hanif, A.Y. Al-Maskri, Z.M.H. Al-Mahruqi, J.N. Al-Sabahi, A. Al-Azkawi, M.Y. Al-Maskari. (2011). Analytical evaluation of three wild growing Omani medicinal plants. Natural product communications. 6(10): 1934578X1100601010.
- [10] I. Shahzadi, R. Nadeem, M.A. Hanif, S. Mumtaz, M.I. Jilani, S. Nisar. Chemistry and biosynthesis pathways of plant oleoresins: Important drug sources.
- [11] M.A. Hanif, S. Nisar, G.S. Khan, Z. Mushtaq, M. Zubair, Essential Oils. In *Essential Oil Research*, Springer: 2019; pp 3-17.
- [12] T. Lim, *Abutilon indicum*. In *Edible Medicinal and Non Medicinal Plants*, Springer: 2014; pp 276-289.
- [13] E. Porchezian, S. Ansari. (2000). Effect of liquid extract from fresh *Abutilon indicum* leaves and *Allium cepa* bulbs on paracetamol and carbontetrachloride induced hepatotoxicity. Die Pharmazie. 55(9): 702-703.
- [14] E. Porchezian, S. Ansari. (2005). Hepatoprotective activity of *Abutilon indicum* on experimental liver damage in rats. Phytomedicine. 12(1-2): 62-64.
- [15] R. Rajurkar, R. Jain, N. Mataka, P. Aswar, S. Khadbadi. (2009). A Review on Some Important Medicinal Plants of *Abutilon* spp. Research J Pharm and Tech. 2(2): 415-16.
- [16] N. Goyal, S. Singh, S.K. Sharma. (2009). Analgesic effects of various extracts of the root of *Abutilon indicum* Linn. Journal of Pharmacy And Bioallied Sciences. 1(1): 43.
- [17] S. Khadabadi, N. Bhajipale. Research Journal of Pharmaceutical, Biological and Chemical Sciences.
- [18] V.P. Kumar, N.S. Chauhan, H. Padh, M. Rajani. (2006). Search for antibacterial and antifungal agents from selected Indian medicinal plants. Journal of ethnopharmacology. 107(2): 182-188.
- [19] D. Pandey, N. Tripathi, R. Tripathi, S. Dixit. (1983). Antifungal Activity of Some Seed Extracts with Special Reference to that of *Pimpinella diversifolia* D. International Journal of Crude Drug Research. 21(4): 177-182.
- [20] P.K. Mukherjee, V. Kumar, M. Mal, P.J. Houghton. (2007). Acetylcholinesterase inhibitors from plants. Phytomedicine. 14(4): 289-300.
- [21] A.A. Rahuman, G. Gopalakrishnan, P. Venkatesan, K. Geetha. (2008). Isolation and identification of mosquito larvicidal compound from *Abutilon indicum* (Linn.) Sweet. Parasitology research. 102(5): 981-988.
- [22] V. Chandrashekhar, A. Nagappa, T. Channesh, P. Habbu, K. Rao. (2004). Anti-diarrhoeal activity of *Abutilon indicum* L. leaf extract. Journal of natural remedies. 4(1): 12-16.
- [23] C. Krisanapun, P. Peungvicha, R. Tamsiririrkkul, Y. Wongkrajang. (2009). Aqueous extract of *Abutilon indicum* Sweet inhibits glucose absorption and stimulates insulin secretion in rodents. Nutrition research. 29(8): 579-587.
- [24] D.K. Golwala, L.D. Patel, S.K. Vaidya, S. Bothara, M. Mani, P. Patel. (2010). Anticonvulsant activity of *Abutilon indicum* leaf. International journal of pharmacy and pharmaceutical sciences. 2(1): 66-71.
- [25] D. Vallabh, V. Jadhav, V. Kadam. (2009). In-vitro anti-arthritis activity of *Abutilon indicum* (Linn.) sweet. Journal of Pharmacy Research. 2(4): 644-645.
- [26] N. Dashputre, N. Naikwade. (2011). Evaluation of anti-ulcer activity of methanolic extract of *Abutilon indicum* Linn leaves in experimental rats. Int J Pharm Sci Drug Res. 3(2): 97-100.
- [27] N.S. Bhajipale. (2012). [25] Evaluation of Anti-arthritis Activity of Methanolic Extract of *Abutilon indicum*. International Journal of ayurvedic and herbal medicine. 2(03).
- [28] S. Prabhuji, D.K. Singh, A.K. Srivastava, S. Rahul. (2010). Antifungal activity of a new steroid isolated from *Abutilon indicum* (L.) Sw. Medicinal Plants-International Journal of Phytomedicines and Related Industries. 2(3): 215-218.