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Phytochemical and Pharmacological Profile of *Abutlion Indicum* – A Review

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A B S T R A C T
An Indian shrub *Abutilon indicum*, belongs to the family of Malvaceae traditionally known as tuturabenda or duvena kayalu. Multiple parts of the plant such as roots, leaves, flowers, seeds as well as whole plant is helpful in treating several ailments. It contains constituents such as alkaloids, flavonoids, tannins, mucilage, β-sitosterol, asparagines, hexoses, n-alkane mixtures, alkanol, gallic acid and sesquiterpenes. The plant is found to possess Antioxidant acivity, Nephroprotective activity, Diuretic activity, Anti-urolithiatic activity, Anti-diarrhoeal, Respiratory activity, Cardioprotective activity, Hepatoprotective activity, Anti-inflammatory activity, Antihypoglycemic activity, Antiulcer and gastroprotective activity, anticonvulsant activity, Antiarthric activity, Antipyretci activity, Wound healing activity, Antivenomic activity, Aprodisiac activity, Cytotoxic activity, Antifungal activity, Antibacterial activity, Antiviral activity, Antimalarial activity, Larvicidal activity, Immunodulatory activity. The present aim of this review is provide to detailed information on phytochemical and pharmacological profile of *Abutilon indicum.*

Keywords: Abutilon indicum, Phytochemical, Pharmacological activity.

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C O N T E N T S

1. Introduction

Abutilon indicum is a small shrub which belong to the family of malvaceae that comprises of about 150 annual and /or perennial herbs. It is occurs in the sub-tropic and tropic regions of Asia (India), America, Africa, Australia and is invasive to tropical islands[1]. *Abutilon indicum*, the Indian Abutlion , Indian mallow is a hairy under-shrub with golden yellow flowers and is found in the hottest parts of India. In Sanskrit it is called as "Atibala" which is described for its potential medicinal and therapeutical uses in the Indian traditional system of medicines[2]. The whole plant as or different parts of the plants such as leaves, flowers, seeds, roots, and bark is used in the treatment of various disorders. The leaves contains steroids, sapogenins, carbohydrates, flavonoids and is used as demulcent, laxative, diuretic, aphrodisiac, sedative. The flowers contain flavonoids compounds and is used by the populations of tribals in the south parts of India as to increase the semen volume in human beings. Seeds contain water soluble

galactomannans and they are used as laxatives, expectorants, demulcants. Roots have non-drying oils consisting of various fatty acids and are used as diuretics. Stem bark is used as diuretic and astringent. The mucilage extracted from leaves had diuretic and demulcent properties. Roots and seeds are also used in the form of decoctions to treat fever and cough and roots itself acts as nervine tonic to cure paralysis and effective in strangury. The decoction of roots and leaves is used to treat dental problems. It is reported that application of leaf paste on the area of scorpion bite relives pain where as the powdered form of dried leaves when mixed with wheat flour is used to treat uteus displacement in some of the tribes of Orissa in India[3,4]. It is found to possess Antioxidant acivity, Nephroprotective activity, Diuretic activity, Anti-urolithiatic activity, Anti-diarrhoeal, Respiratory activity, Cardioprotective activity, Hepatoprotective activity, Anti-inflammatory activity, Antihypoglycemic activity, Antiulcer and gastroprotective activity, anticonvulsant activity, Antiarthric activity, Antipyretci activity, Wound healing activity, Antivenomic activity, Aprodisiac activity, Cytotoxic activity, Antifungal activity, Antibacterial activity, Antiviral activity, Antimalarial activity, Larvicidal activity, Immunodulatoryactivity[5, 6, 7, 8,] . *Abutilon indicums* has been used in folklore medicines in India as well.

2. Plant Profile

Fig: 1 *Abutilon indicum*

Distribution

Abutilon indicum (linn.) sweet belongs to malvaceae family and is commonly called as country mallow, kanghi, atibala. This is perennial shrub up to 3 m inn height. The plant is found in India, America, Srilanka and tropical regions. In sub-Himalayan tracts it is found as weed up to 1200 m of hill as wellas the hotter parts of India[8].

Botanical description

The leaves are ovate, acuminate, toothed, rarely subtrilobate and 1.9cm long. The flowers are yellow in colour, penduncle jointed above the middle. (The petioles 3.8-7.5 cm long,stipules 9 mm long, pepdicles often 2.5-5 mm long, axillary solitary, jointed very near the top, calyx 12.8 mm long divided into middle,lobes ovate, apiculateand corolla 2.5 cm diameter, yellow, opening in the evening).The fruits are are capsule, densly pubescent, with conspicuous and horizantlly spreading beaks. The stems are stout, branched, 1-2 m tall, pubescent. The seeds are 3-5 mm, reniform, tubercled or minutely stellate- hairy, black or dark brown[9-12].

Synonyms(s): sida indica L.,

Scientific classification

Kingdom	:	Plantae
Order	:	Malvales
Family	:	Malvaceae
Genus	:	Abutilon
Species	:	*Abutilon indicum*

Uses

- All parts of *Abutilon indicum* are used in the treatment of various disorders.
- The root infusion is prescribed as cooling medium in fever and is useful as strangury, haematuria, leprosy. It is also considered as demulcent, diuretics, urethritis, in chest infusion[2,4].
- The leaves decoction is used in the treatment of toothache, tender gums and internal inflammation of bladder[2,4].
- The bark is found to possess diuretic, astringent, febrifuge, antihelmintic, alexeteric[4].
- Seeds are used in the treatment of piles, gonorrhoea, laxative, expectorant and in chronic cystitis[4].

Photochemistry

Leaves

The leaves of the plant are found to posess steroids, sapogenins, carbohydrates and flavoniods. The methanolic extract of leaveas of plant isolation is reported to contain eudesmic acid, ferulic acid and caffeic acid by using 1H-NMR, 13C-NMR, mass spectroscopy and chemical methods. Ethanolic leaf extract plant contains flavonoidss, terpenes, amino acids, aldehydes, hydrocarbon, ketones, fatt acids and esters and are found by using mass spectroscopy (GC-MS) and gas chromatography[1,3,8,13].

Fruits

Fruits are found to posess flavonoids and alkaloids[3].

Seeds

Seeds are found to posess water soluble galactomannans consisting of galactose and mannose in the ratio of 2:3. The seed oils consists of saturated acids like cis 12,13-epoxyoleic (verrnolic) acid, 9,10- methylene actadec-9-enoic(sterculic) acid, 8,9-methylene-heptadec-8-enoic (malvalic) acid. TLC-GLC studies of seeds oil revealed the presences of high amount of unsaturated acids[14-17].

Roots

Roots consists of non-drying oils that are found to posess several fatty acid like linoleic acid, oleic acid, steric acid, palmitic acid, lauric acid, myistic acid, caprylic acid, capric acid, sitosteroland amyrin from unsaponifiable matter and unusual fatty acid having C17 carbon skeleton[3].

Aerial parts

The aerial parts of plant are found to posess n-alkane mixture, alkanol fraction, β-sitosterol, fumaric acid, p-coumaric acid, vanillic acid, caffeic acid, p-hydroxybenzoic acid, gluco-vanilloyl glucose, fructose, aspartic acid, histidine, threnonine, serine and leucine. The mucilage part consists of galactose and galacturonic acid. Shoots of flowers consists of saponins, flavonoids and alkaloids1[9].

Whole plant

The whole plant is found to posess mucilaginous substances and asparagines. The main class of compounds includes

saponins, flavonoids, alkaloids, hexoses, n-alkane mixtures, alkanols. B-sitosterol, vanillic acid, p-coumaric acid, caffeic acid, fumaric acid, abutilon A, p hydrobenzoic, galacturonic acid, caffeic acid are some of the important compounds reported. It consists of essential oils likes α-pinene, caryophyllene, caryophyene oxide, endesmol, farnesol, borenol, geraniol, geranyl acetate, elemene and α-cineole1[8,19].

3. Pharmacological Profile

Antioxidant activity

Antioxidant activity of alcoholic extract of *Abutilon indicum* (whole plant) is investigated by using reducing power assay and DPPH free radical scavenging methods (87.7% inhibition at a concentration of 500µg/ml). The methanolic extract of *Abutilon indicum* is investigated using FRAP, DPPH and nitric oxide (inhibiton activity of 28.74%) and superoxide radical scavenging (inhibition acivity of 49%) methodsand and it showed 62% of inhibition at a concentration of 250µg/ml. The ethonolic extract of *Abutilon indicum* (whole plant) showed invivo antioxidant activity using CCl4 induced toxicity in rats by 500mg/kg.the n-hexane, chloroform, ethylacetate and butanol fractions are investigated for antioxidant by using ABTS, FTAP, DPPH and linoleic acid peroxidation methods. Leaves of *Abutilon indicum* was found to posses strong antioxidant acivity with total protein content of 12.5 plus or minus 3.6 mg/g and is investigatedfor its antioxidant activity by using FRAP assay. Flowers of *Abutilon indicum* showed significant antioxidant acivity at concentration of 100µg and it is more potent than standard drug in superoxide and hydroxyl radical scavenging activity but less potent in reducing power activity. Seed oil of A. indicum showed strong antioxidant acivity when assyed with ABTS, FRAP, DAPH and lenolic acid peroxidation. The antioxidant activity of Abutilon indicum is due to its higher phenolic content[20-24].

Nephroprotective activity

The ethanolic extract of *Abutilon indicum* plant showed to have protective effect against cisplatin-induced nephrotoxicity and acetaminophen-induced nephrotoxicity in rats. Oral administration of dose of 20mh/kf and 400mg/kg of extract for 7 days before cisplatin injection showed decreased cisplatin-induced nephrotoxicity in rats. Histopathological studies on rat kidne confirmed the decreased cisplatin-induced renal damage. In case of acetaminophen-induced nephrtoxicity oral administration of dose of 400mg/kg shows greater protective effect than that the dose of 200mg/kg of extract. Serum creatine levels, alkalins phosphate levels and uric acids levels have undergone significant reduction. Histopathalogical examination of kidney confirmed the nephroprotective effect of the extract and improment in the renal cellur damage[25-27].

Diuretic activity

Abutilon indicum Linn (seeds) extract is evaluated for its diuretic activities in rats that are carried out by administration of normal saline along with the active constituents for the treatment. Increased levels of volume of urine, electrolytes like Na+ and K+ content in urine are the parameters used for the evaluation of diuretic activity. When an extract of 200mg/kg and 400mg/kg of *Abutilon indicum* is administered it results in increased dieresis (increased sodium level and not potassium levels). The aquous extract of abutilon indicum (seeds) showed both diuretic and natreuretic activities. When a dose of 200mg/kg and 400mg/kg of plant extract is administered orally it shows a significant increase in dieresis and increase in sodium elimination but it doesnot effect the potassium levels when compared with furosimide at a dose of 20mg/kg. When an aqueous and ethanolic extract of Abutilon indicum (leaves) at dose of 200mg/kg and 400mg/kg are administered to rats orally it results in a siginificant increase in excreation of electrolytes like Na+, Ka+ and Cl- in urine and urinary volume. As aqueous extract (400mg/kg) of A.indicum shows same effect as that of furosemide(25mh/kg) it was support in folklore use in the treatment of diuretic effects[25-27].

Anti-urolithiatic activity

Urolithiatic activity of *Abutilon indicum* plant extract (400mg/kg and 800mg/kg) was evaluated by calcium oxalate calculi induction using CPD and gentamicin (40mg/kg) which showed a significant decrease in excreation of calcium oxalate urinay stones and lose of kidney weight[28].

Anti-diarrhoeal activity

The various extracts of *Abutilon indicum* like petroleum ether extract, methanolic extract and aqueous extracts are investigated diarrhoea induced by castor oil and prostaglandin E-2 in rats. The methanolic extract and aqueous extract exhibits significant anti-diarrhoeal activity as they are foun to inhibit the frequency of defecation, faeceal drooping as compaired to that of lopiramide whereas petroleum ether didnot show any significant activity. These extracts that showed antidiarrhoeal activity are mainly due to the mechanism of by inhibiting intestinal peristalsis, gastrointestinal motility and prostaglandin E-2 induced enteropooling[29].

Respiratory activity

The dried power of *Abutilon indicum* (aerial plant parts) when administered orally at a dose of 1.0g with water three time daily for 4 weeks it has not shown any significant changes but when it is administered with antdiarrhoeal drugs they showed a significant decrease in the bronchial symptoms like wheezing, cough and chest tightness.thhe methanolic extract of *Abutilon indicum* is evaluated for branchial asthama treatment by using histamine and acetylcholine induced branchospasma in guniea pig and egg albumin induced rat peritonieaal mast cell degranulation. The extract showed as significant mast cell stabilizing effect and anti inflammatory activity when estimated using carragenan induced rat paw odema and doesn't exhibit any significant branchodilating activity aganist histamine and acetylcholinecholine induced branchospasm[30,31].

Cardioprotective activity

The ethanolic extract of *Abutilon indicum* (roots) was investigated for its protective action aganist isoproterenol induced myocardial infarction is done in male wristar rats. The ethanolic extract of *Abutilon indicum* when administered orally at a dose of 100mg/kg was proved to be

safe and is effective in preventing cardiovascular dysfunction in rats is possibily due to the antioxidant acivity but when it is administered at a dose of 500mg/kg it showed to induce myocardial injury on its own and is failed to exhibit protective action aganist myocardial injury induced by isoproterenol[32].

Hepatoprotective activity

The aqueous extract of *Abutilon indicum* (leaves) shown a dose dependent hepatoprotectivity in rats against CCl4 induced hepatotoxicity and paracetamol induced hepatotoxicity. When the extract is pretreated at doses like 100mg/kg and 200 mg/kg, it showed a reduced the depleating levels of GSH and as wellas elevating levels of SGOT, SGPT,ALKp and bilirubin. The methanolic (80%) extract of *Abutilon indicum* (aerial parts) had showed to have potent hepatoprotective activity in rabbits against CCl4 induced hepatotoxicity and paracetamol induced hepatotoxicity. It is found to have significant decrease in serum enzymes (SGPT, SGOT, ALKP and bilirubin) when campared with silymarin. The ethanolic extract of *Abutilon indicum* (leaves) when administered orally at a dose of 100mg/kg and 200mg/kg shown hepatoprotective acivity and the levels of hepatic antioxidant emzymes (SOD, CAT, GPx, GR, GST) returned to normal.this mechanism of hepatoprotection is due to the synergistic effect of the isolated flavonoids. The ethanol (70%) extract of A.indicum (flowers) showed as strong protective action against CCl4 induced liver damage and significant reduction in elevated levels of SGPT, SGOT, ALP, ACP and direct bilirubin at a dose of 500mg/kg. this is may be due to the flavonoid content in the extract[33-35].

Anti-inflammatory and analgesic activitys

The ethanolic extract of *Abutilon indicum* (whole plant) is evaluated for its anti-inflammatory by using carrageenan-induced paw odema methodin wistar rats. When different doses of 250, 500, 750 mg/kg are adminited it showed a significant reduction in oedema volume (37%, 49%, 65.65%) in compartion to ibufropen (76.34% at 10mg/kg) after treatment for 3 hours. Quercetin which is isolated for the ethanolic extact of *Abutilon indicum* (whole plant) has shown dose dependent anti-infalmmatory acitivity when investigated by using carrageenan induced paw oedema in rats. The ethanolic extract of *Abutilon indicum* (whole plant) was found to display analgesic effects (due to the presences of eugenol) when evaluated in tail flick method and formalin induced paw licking method in wistar albino rats. The ethanolic leaves of *Abutilon indicum* extract is repoted possess high anti-inflammatory activity by using lipoxygenase inhibition assay. The methanolic extract of *Abutilon indicum* showed to have significant effect in early stage of inflammation and it has oedema inhibition after 1st and 3rd hours when treated with a dose of 100 (47.36% and 42.62%) and 200mg (50.25% and 66.12%) compared with indomethacin (15.338% and 40.79% at dosee of 10mg/kg) against carrageenan induced paw oedema in wistar rats. This effect is especially due to the presences of phenolic compounds (falavonoids) that has potent anti-inflammatory acivity. When petroleum ether, chloroform, methanol and aqueous extract of *Abutilon indicum* (whole plant) were administrated orally at dose of 400 mg/kg those showed significant anti-inflammatory activities by using respective models. The ethanol, aqueous and petroleum extracts of *Abutilon indicum* (roots) reported analgesic activity in tail flick method and acetic acid induced writhing test in swiss albino mice[36-39].

Antihyperglycemic activity

The aqueous extract of *Abutilon indicum* (whole plant) is found to possess anti-diabetic activity and is evaluated for anti-diabetic activity induced by streptozocin in rat. When a dose of 0.5g/kg and 1.0 g/kg is administered orally is found to effective in moderately diabetic rats than severely diabetic induced rats this is due to significant reduction in plasma glucose levels in 30 minuts after administration. 0.5 g/kg shows faster reduction of glucose levels in moderately induced diabeties where as 1.0g/kg of dose showed a significant reduction in severely induced diabetic rats in comparision with that of glibenclamide. The extract is also administered at a dose of 250mg/kg or 500mg/kg orally for 14 days while significantly lowering the extract[40,41].

Antiulcer and gastro protective activity

Antiulcer activity of ethanolic extract of *Abutilon indicum* is investigated by using aspirin and prylorus ligation induced ulceration methods in the rats. When a dose of 100mg/kg and 200mg/kg (p.o) is administered orally twice daily for five days it showed a significant reduction in the PH level, formation of lesions and acid secreation compared with rantidine (50mg/kg). The ethanolic extract of *Abutilon indicum* is showed to be effect against aspirin, pylorus ligation and alcohol induced ulcer models in rats. The ethanolic extract shows more gastroprotective activity (50.22% gastro protection) when compared with that of aqueous extract (gastro protection). The two extract exhibit a significant inhibition of gastric lesions and reduced gastric volume and total acidity level. When a dose of 250mg/kg and 500mg/kg of hydro-alcoholic extract of *Abutilon indicum* is administered orally it showed a significant dose-dependent antiulcer affects against ethanol and pyloric ligation induced gastric ulcers in rats (omeprazole as standard drug).a dose of 250mg/kg and 500mg/kg of methanolic extract of *Abutilon indicum* showed a significant antiulcer properties in pylorus ligated and ethanolic induced ulceration in albino rats. This activity is manily due to the presence of flavonoids (qurecetin), alkaloids and tannins[42-45].

Anticonvulsant activity

Anticovulsant activity of ethanolic extract of *Abutilon indicum* was investigated by pentylene tetrazole induced convulsions in rats. When a dose of 100mg/kg and 400mg/kg is administered orally it shows a significant anticonvulsant effect. It exhibit an increase in the latency, onset of clonic convulsions and decreases the onset of tonic seizures in case of pentylene tetrazole induced convulsions. Both of the extracts exhibits a highly anticonvulsant activity in case of maximal electro shock induced convulsions[46].

Anti-arthritic activity

In-vitro studies of anti-arthritic acivitiy are investigated in male albino rats by using different extracts of *Abutilon indicum* (whole plant). Freunnds adjuvant induced arthritis model is used for the evaluation of anti-arthritic acitivity. Methorexate(0.75mg/kg body weight) act as standard drug.

The methanolic extract(400mg/kg) of *Abutilon indicum* showed t anti-arthritic effect and showed reduction in paw volume($p<0.001$) on 7^{th} and 14^{th} days repectivitly in comparision with the standard drug methorexate[47].

Wound healing activity

The ethanolic extract of *Abutilon indicum* is evaluated for tis wound healing activity by using exision wound model in the albino rats. It exhibited a significant wound contracting and increase in wound closure rate than that of the standard drug nitrofurazone[48].

Antivenomic activity

The methanolic and hexane extracts of *Abutilon indicum* are investigated for its *invitro* anti-venom acivity by using Echis carinatus. These extracts both methanolic and hexane are able to inhibit acetylcholine esterase, phospholipase, hyluronidase and phosphomonoesterase toxic emzymes but methanolic extract shows greater effect than that of the n-hexane extract. The inhibition of phosphomoesterase and phosphodiesterase varies from that of maximum inhibition of 100% to that of minimum inhibition of phosphomonoesterase of 14% with the concentration at 250µg/ml[49].

Aphrodisiac acivity

When a dose of 100mg/kg, 200mg/kg and 400mg/kg of aqueous extract of *Abutilon indicum* were administered orally it resulted in significant aphrodisiac effect. A dose of 200mg/kg and 400mg/kg of extract is administered it showed a significant increase in the frequency of penile erection episodes with the penile erection index of 229 and 332, when compaired with that of erection index of sildenafil. All the other extracts also exhibited an increase in the level of sperum count as well as the number licking behaviour of females aiding the mating performance in the males[50].

Immunodulatory activity

The ethanolic and aqueous extract of *Abutilon indicum* (leaves) are used for the screening of immunomodulatory acivity on specific and non specific immunity. It is done by using hemaggulutination antibody titer (HA), delayed typr hypersensitivity (DTH), neutrophil adhesion test and carbon clearance test. Oral administration of ethanolic extract at adose of 200mg/kg/day and aqueous extract of dose 400mg/kd/day increased the production of circulating antibodies titre and potentiated the DTH reaction. It showed the significant increase in the percentage of neutrophil adhesion fibers and phagocytic activity. This effect may be due the prescence of flavanoids contents in the extract[51].

4. Conclusion

The present review provides valuable information regarding the the various aspects of plant profile, phytochemical screening and pharmacological characteristic of the plant *Abutilon indicum*. It is reported that the plant contains a different classes of chemical compounds like flavnoids, alkaloids, fatty acids, steroids, triterpenes, coumarines. This plants is shown have proven of containing various pharmacological effects like antioxidant activity, nephroprotectivity, antidiuretic activity, antiurolitheatic activity, antidiarrhoeal acivity, anti-hepatoprotectivie acivity, respiratory protective activity, cardio protective activity, wound healing activity, antivenomic activity, immunomodulatory activity. According to the present review the plant *Abutilon indicum* is considered to be a good point of intrest in futher studies to explore the various pharmacological aspects as well as the development and exploration of new drug from natural sources.

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