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Review Article

Phytochemicals And Pharmacological Activities In Abutilon Indicum (L). Plant– A Review

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ABSTRACT

The Abutilon indicum L. is a branch of the Malvaceae Family of plants. It possesses numerous significant medicinal qualities. It is grown throughout tropical and subtropical regions of the world, including the hottest areas of India. In siddha treatment, plant parts like as root, bark, flowers, leaves, and seeds are used to cure leprosy, piles, ulcers, diabetes, and jaundice. In this plant contains flavonoids, tannin, asparagine's, hexoses, alkaloid, mucilage, n-alkane mixtures and more phytochemicals. The plant Abutilon indicumhad anti-diabetic, antibacterial, antioxidant, antiulcer, analgesic and wound healing activities of pharmacological properties occurs. The synthesis of AgNPs, CuO, NiO, Gold, and ZnO nanoparticles from extraction of Abutilon indicum L. and their properties checked in plants, animals and humans. Green synthesis of nanoparticles and their characterization was performed using UV-Vis-Spectrophotometry (Quantitative check), TEM (size and morphology), GC-MS(phytochemical analysis), FTIR (stability and functions), and XRD (crystal structure of sample). Different applications of NPs can be used various industries for production of food, cosmetics, biofertilizers, pesticides, dyes and pharmaceutical product production

INTRODUCTION

Micro propagation method is used to produce endangered species of Abutilon indicum L. in MS medium to add Auxin and Cytokine as a Growth Hormone. In tissue culture, callus induction was done, and then plant was sub cultured (Jyoti Ranjan Rout, et al, 2004). After that plant was dried and powdered. The extracted plant was used for phytochemical analysis and pharmacological activities. Current research mainly focuses on medicinal plants for the production of pharmaceutical drug compounds. Using tissue culture to produce endangered species to proliferate and their secondary metabolites for drug production in commercial way is a great way to conserve the endangered species. Using extract

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plant and nanoparticles mixture as anti-microbial, antibiotics, anti-diabetic, anti-ulcer, anti-inflammatory properties and coding agents for treating various disease and other industrial applications (Md. Reyad-ul-Ferdous, et al, 2015).

REGIONAL NAMES

Sr.no	Regional Names	
1.	Tamil	Thuthi, Tuttikkirai, Kakkati
2.	English	Indian mallow, country mallow
3.	Malayalam	Velluram
4.	Telugu	Dudi , Adavibenda
5.	Kannada	Tutti , Urki
6.	Marathi	Petari
7.	Hindi	Kanghi
8.	Bengali	Potari
9.	Assamese	Japapetari
10.	Irula	Suluku poo
11.	Gujarati	Dabli
12.	Arabian	Masthul Gola
13.	Farsi	Darakhtashaan
14.	Sanskrit	Atibala

SCIENTIFIC CLASSIFICATION:

Kingdom	Plantae
Order	Malvales
Family	Malvaceae
Genus	Abutilon
Species	Abutilon indicum
Common Name	Abutilon, Indian mallow

DISTRIBUTION:

The plant species of Abutilon indicumis distributed in Tropical & Subtropical Asia to W. Pacific has been used in traditional and folk medicine to treat a variety of ailments.

Habitat: It is a plant that is used medicinally in sub-Himalayan regions, 1200 m hills, and hotter regions of India. It belongs to Afghanistan, Andaman, Assam, Bangladesh, Cambodia, China, Himalaya, and Thailand. It was introduced into Brazil, Chagos Archipelago, Colombia, Hawaii, Iraq, Jamaica, and Rwanda (Acevedo- Rodriguez, P., et al, 2012).

BOTANICAL DESCRIPTION:

An erect shrub and hairy habit of Abutilon indicum up to 3 m in height grown. The oval-shaped, toothed, edged, and sometimes leaves measure 1.9 to 2.5 centimetres in length. The yellow flowers are accompanied by a jointed peduncle above the centre. The plant features petioles that vary in length from 3.8 to 7.5cm, petal that measures 9 mm, pedicels that are often 2.5 to 5 mm, long, axillary solitary leaves that are almost joined at the top, a middle division with elliptical and apiculate lobes, and yellow corollas that arise in the evening. The fruits are shaped like capsules, have striking beaks that spread horizontally, are extremely pubescent, and can cure coughs, piles, and gonorrhoea. Thick, robust stems that grow 1-2 meters tall, pubescent, strong, and branching. The seeds are tuberculate, reniform, 3-5 mm, black or dark brown, and stellate-hairy (Fosberg, F.R, et al, 1979).

CLASSICAL USES:

Abutilon indicum is a plant that primarily possesses anti-arthritic, anti-proliferative, anti-inflammatory, analgesic, sedative, antioxidant, anti-microbial, hepatoprotective, diuretic, Immunomodulatory, anti-estrogenic, and wound healing properties, among other medicinal qualities. Laxative, mumps, jaundice, diarrhoea, rheumatism, wound healing, ulcers, quenching thirst, piles, digestive, and a decoction for toothache and sore gums are among the uses for these qualities. Traditionally, urethrities, aphrodisiacs, anti-diabetics, and diuretics have been treated with roots and barks. Cough and piles are treated with the seeds. (Rajeshwari S, et al, 2018).

SOURCES OF PLANT MATERIALS AND EXPLANTS USED:

Abutilon indicum Linn, plants are collected from the local area or Tissue culture collection centres. Young leaves, root, shoot, flower, seed and bark were collected from one month old, disease free and healthy Abutilon indicum and used as explants for in-vitro culture (Subramanian Radhesh Krishnan, et al, 2019).

PLANT TISSUE CULTURE TECHNIQUES:

The tissue culture technique was carried out using Callus culture, Embryo culture, Seed culture, Organ culture, Anther culture, and Protoplast culture in addition to micropropagation techniques. Micropropagation is a widely used technique for producing tissues in vitro.

CHEMICAL CONSTITUTION:

MS medium contains macronutrients, micronutrients, vitamins that were stimulate the callus induction, shoot regeneration, root formation, and somatic embryogenesis and the elongation, tropism, storage, transport, and reproduction of plants all depend on growth regulators. Various concentrations and combinations of gibberellins, abscisic acid, Cytokinins (BAP and KN), or 2-4 D in conjunction with auxin (NAA or IAA) µM/L were used for multiple and callus culture induction in tissue culture technique (Chandran Sureshpandian, et al, 2021). We can also grow a plant without these hormones but it gives unhealthy plant.

Sterilization of explants, and surface is more essential for plant initiation, growth and development. Otherwise, it would be contaminated and spoil the plant growth. First step in plant tissue culture need to be cleaning, disinfection, sterilized surface and accessories washing with fungicide, 70% Ethanol, HgCL2 and antibiotics like Rifampicin + Ampicillin + Paromycin+ Pencillin G, potassium+ Penicillin G, sodium+ Gentamicin sulfate+ Cefotaxine+ cefototaxine can be used. Using genetic markers gives high stability and unique plant production (Sen Seth, et al, 2018).

PHYTOCHEMISTRY:

Abutilon indicumplants leaves, root, shoot, bark and flower has been explored more chemical constitution.

WHOLE PLANT:

The primary phytochemical components found in the entire plant are alkanol, n-alkane mixture, leucine, histidine's, hexoses, threonine, serine, glutamic acid, and aspartic acid. The entire Abutilon indicum plant, including its dried and powdered aerial parts, was extracted using petroleum ether. This contained β-sitosterol, vanillic, p-coumaric, glucose-vanilloyl glucose, p-β-D-Glucosyloxybenzoic acid, p-Hydrooxybenzoic, and caffeine. These compounds were identified using infrared, ultraviolet, and nuclear magnetic resonance (NMR) techniques, aided by chemicals that indicated the compounds present (D. P. Pandey, et al, 2011).

LEAVES:

The leaves traditionally used to treat many disease particularly diabetes mellitus. The results are revealed that phytochemicals are present in the leaves and contains flavonoids, steroids, sapogenins and carbohydrates (Lakshmayya Narasimha Rao Nelluri, et al, 2002). The phytochemicals that are present in abutilon leaves is Alkaloids, flavonoids, sterols, triter-penoids, and glycosides. NMR, IR, GC-MS and chemical methods that are allowed for identify flavonoids, terpenes, ketone, fatty acids, hydrocarbon and esters present in extract leaves sample.

FLOWERS:

The flowers possessing there exist seven distinct categories of flavonoid compounds: Apigenin (7-o-beta-glucopyranoside), luteolin (7-o-beta-glucopyranoside), chrysoeriol (7-o-beta-glucopyranoside) (Matlawska I., et al, 2002).

FRUITS:

Fruits only contains proteins, carbohydrates, phenols, steroids, flavonoids and alkaloids (Mendhekar, et al, 2018).

SEEDS:

Seeds of Abutilon indicum were separated, and the water-soluble galactomannan contained a 2:1 molar ratio of D-galactose to D-mannose. The oil plants produce malvalic acid, cis 12, 13-vernolic acid, and 9, 10-sterculic acid. Followed by TLC-

GLC studies revealed the presence of unsaturated acids and steric acids, palmitic acids as saturated acids.The following amino acids are found in seeds: proline, alanine, leucine, aspargine, histidines, valine, argininine, glycine, serine, glutamine, lysine, and methionine (Saini, A. Gahlawat, et al, 2015).

ROOT:

The oil derived from abutilon roots is non-drying and contains a variety of fatty acids, including stearic, oleic,linoleic, palmitic, capric , myristic, caprylic, andlauric, as well as unique fatty acids such as sitosterol, amyrin, and the C17 chemical skeleton that were produced from non-sustainable sources (K Ramar, et al, 2015).

PHARMACOLOGICAL ACTIVITY:

Pharmacological activities tested for vaccine, food, cosmetics and other industrial products production (MS Mohite, et al, 2012).

ANTIMICROBIAL ACTIVITY:

Antibacterial activity was performed to use the plant extract include chloroform, ethanol, methanol, petroleum ether was prepared and analyzed by using agar well diffusion and minimum inhibitory concentration was detect that against the staphylococcus sp. And E.coli. GC-MS identify their components (Lokesh Ravi, et al, 2016).

ANTIOXIDANT ACTIVITY:

The ability of antioxidant activity can be assessed using the 2,2-diphenyl-1-picrylhydrazyl scavenging assay (Singh Ranjana, et al, 2015)(P.R evansiddaya, et al, 2011).

LARVCIDAL ACTIVITY:

Here is the only possible that B-Sitoserol recognize the larvicidal compound (A Abdul Rahuman, et al, 2008).

ANTIULCER ACTIVITY:

Rantidine was given to ulcerated albino rats at a dose of 240–500 mg/kg of body weight, which decreased the activity of acidity formation (Dashputre NL, et al, 2011).

ANTI ASTHMA:

The aerial parts of plants were dried and powdered Start to cure cold sneezing, coughing, chest tightness and difficulty of breathing (Abhay Kumar Singhai, 2013).

ANALGESICACTIVITY:

Using radiant heat analgesiometer all extracts were screened for analgesic activity.The extract contains flavonoids and carbohydrates failed to show analgesic activity .Overnight fast albino rats were received the ether, benzene, alcoholic and aqueous extract orally that reduced the level of blood glucose level. Further the leaves can control of diabetes mellitus.The central analgesic activity was assessed using the tail flick and tail immersion methods, whereas the Swiss albino mice given acetic acid produced peripheral analgesic activity. The findings show that analgesic activity is observed in both animal models for all test leaf extracts, with the exception of the methanol extract. Petroleum ether exhibits the highest analgesic activity (Goyal, et al, 2009). Estrogenic and anti- estrogenic determination test in uterine by using peroxidase assay to test antifertility of rats (Johri RK, et al, 1991).

HYPOGLYCEMIC ACTIVITY:

The hypoglycemic activity in albino rats was investigated. At 400 mg/kg dose, several extracts demonstrated hypoglycemic activity; however, the aqueous extract was the most effective in lowering blood glucose levels. On the other hand, leaf extracts have been shown to have hypoglycemic and CNS depressant properties. The outcomes demonstrated that abutilon leaves have the ability to manage diabetes. For at least four hours, the extract leaves significantly reduced blood sugar levels in normal rats (Y.N. Seetharam, et al, 2002).

HYDROXYL RADICAL DETECTION ACTIVITY:

The assay of Hathwell and Gutterridge in 56 mM phosphate buffer (pH 7.4) containing 1 mM deoxyribose, 0.2 mM phenylhydrazine

hydrochloride, and other additions as necessary in a total volume of 1.6 ml has been used to measure the generation of hydroxyl radicals. The incubation period was terminated after 1 or 4 hours, and 1 ml of 2.8% TCA and 1% (w/v) thiobarbituric acid were added to the reaction mixture. The reaction mixture was then heated for 20 minutes in a boiling water bath. Concentration-dependent (10, 25, 50, and 100 µg) significant antioxidant activity against reducing power, superoxide anion scavenging, and hydroxyl radical scavenging was demonstrated by the ethanolic extract of Abutilon indicum flowers (Singh B, et al, 1998).

ANTI DIARRHOEAL ACTIVITY:

The albino rats treat with castor oil that cause diarrhea and prostaglandin induced to stop diarrhea (Koumara Velou Kailasam (2015).

REACTION AGAINST INFLAMMATORY:

Using Diclofenac as standard, 400 mg/kg of the plant extract was administered to body weight-induced rats.

ANTI-ARTHRITIC ACTIVITY:

The dosage level of 400mg/kg was given to rats and they monitored weekly (Mr. Vallabh Deshpande, et al, 2009).

ANTI- DIABETIC ACTIVITY:

The glucose level starts to get diminished in about 30 minutes to albino rats (Krisanapun C, Lee SH, et al, 2011).

IMMUNOMODULATORY:

Extract leaves were given at the rate of 200-400 mg/kg of the rats determined for haemagglutination antibody value, neutrophil value and also delayed type hypersensitivity due to the components present in plants (Dashputre NL, et al, 2010).

WOUND HEALING ACTIVITY:

Theleaves are the main components to heal wounds with the presence of petroleum ether in plant extract (Roshan S, et al, 2008). Apart from this, Lipid lowering activity and central nervous system analysis done in Abutilon indicum plant extract (Vaidya, A. B., 1997)(Giri. R. K. Kaungo, et al, 2009).

NANOPARTICLES PRODUCTION IN ABUTILON INDICUM:

To synthesizing gold , NiO, copper oxide (CuO), manganese oxide MnO, silver AgNPs, zinc oxide ZnO, Titanium oxideand so nanoparticles production by ecofriendly and they having antimicrobial, antioxidant, anti-inflammatory, anti-diabetics, antifungal, wound healing activity and photo-catalytic dye degradation potentials. Taking NPs solutions add into distilled water and plant extract. In this mixture color changed light yellowish to dark brown, indicating the formation of CuO, AgNPs, ZnO, NiO, MnO and gold solutions (J. Uthaya Chandirika, et al, 2018)(M. Prathap, et al, 2014)(Rani Mata, et al, 2015). Then, the mixture was centrifuged, dried and stored at room temperature for further uses.

CHARACTERIZATION OF NANOPARTICLES:

X-ray diffraction, Transmission Electron Microscopy (TEM), Gas phase separation and Mass Spectroscopy (GC-MS), High-Performance Liquid Chromatography (HPLC), Powder X-ray Diffract Meter (PXRD), Dynamic Light Scattering (DLS), X-ray Photoelectron Spectroscopy (XPS), Energy Dispersive X-Ray Analysis Spectroscopy (EDAX), and Fourier Transformed Infrared Spectroscopy (FTIR) are some of the techniques used to characterize these nanoparticles (Shakeel Ahmad Khan, 2020)(Faheem Ijaz, 2017)(Shakeel Ahmad Khan,2018)(Saraswathi Umavathi, et al, 2021).

WOUND HEALING PROPERTIES:

Abutilon indicum possesses a variety of beneficial properties, including anti-inflammatory and antiproliferative, anti-arthritic, analgesic, sedative, anti-diabetic, anti-diarrheal, anti-cancer, anti-convulsant, antioxidant and antimicrobial, anti-estrogenic, hepatoprotective, larvicidal, anti-

asthmatic, diuretic, immunomodulatory, and wound healing properties. Research has shown that this plant contains compounds that heal chronic wounds, such as saponins, flavanoids, glycosides, proteins, carbohydrates, and amino acids(J Uthaya Chandirika, et al, 2018).

ANTI- CANCER PROPERTIES:

Plant-derived compounds also stop the development of the cell cycle, killing MCF-7 cancer, MDA-MB-231 breast cancer, and A549 lung cancer cells (Selvam Sathiyavimal, et al, 2022).

INDUSTRIAL APPLICATIONS:

Nanoparticles having several roles and production. The primary purpose of their production was colour pigments for various industrial applications such as rubber, plastics, prints, leather, pulp, lighter car bumpers, stain-repellent clothing, more radiation resistance in sunscreen, stronger synthetic bones, lighter cell phone screens, glass packaging for drinks, self-cleaning windows, balls for different sports, and various types of dyes, paper, and textiles (Â N Sri Kumaran, 2017).

PHARMACEUTICAL INDUSTRY APPLICATIONS:

Here is the major role of silver nanoparticles production of ointment, treatment of chemotherapy, DNA delivery, brain drug delivery, treatment of leprosy, gene therapy, targeted therapy, biomarker mapping, molecular imaging, vaccine production, Toxicity control, wound healing sprays, drug delivery vehicles, gene therapy, cancer therapy, AIDS therapy, radiation, coating as antibiotics and anti-inflammatory properties. Apart from this drug discovery and drug designing was done (K Muhil Eswari, et al, 2022)(Rani Mata, et al, 2018)(Shakeel Ahmad Khan, et al, 2021).

COSMETICS APPLICATIONS:

Producing cosmetics materials like lipstick, nail polish, powder, serum, ultra violet filters, sunscreen, toothbrush, mouthwash, hair protection against UV, perfumes, anti-acne treatments, mascara with hyper branched polymer nanoparticles, hydrogel face mask and other makeup products.

FOOD INDUSTRY APPLICATIONS:

Nanoparticles is cheap and abundant availability of raw materials that can used for improve food structure, to protect aroma, flavor, improve nutritional value, improve consistency, prevent lump formation, food coating, food packaging, food processing, food long storage, to detect pathogens and toxins in food and protection from food spoiled microorganisms (Shakeel Ahmed, et al, 2016).

ENVIRONMENTAL APPLICATIONS:

The most cost effective, greener routes for synthesis of nanoparticles and their applicability in environmental to degrade the hazardous dyes, metals, endangered species protection, disease free environment from microbes, wastewater treatment, energy synthesis, environmental sensing, remediation, cleaning up oil spills, pollution observations, remediate contaminated air, water, soil and capture and remove air pollutants. Make stable, stress free, nontoxic and reliable environment (GK Prashanth, et al, 2018, Stuti Mittal, et al, 2021, Mohammad A. Chowdhury, et al, 2021).

AGRICULTURAL APPLICATION:

These particles in nanoform help prevent plant diseases, stress, and chronic wounds; they also treat chronic wounds; they are used as nano sensors for crop protection; they are used in pesticides and biofertilizers for crop improvement; they control plant pests; they improve soil; they enable precision farming; they are nanofungicides and nanoherbicides; they provide micronutrients; they have nanoinsicticidal potential; and they are used in fisheries and aqua culture (Sagar Panhwar, et al, 2021).

CONCLUSION

The plant Abutilon indicum used to produce many medicinal products through phytochemical and pharmaceutical analysis. That plant extract was mixed with nanoparticles to heal chronic wounds, diabetes, piles and leprosy etc. It has anti-oxidants, anti-inflammatory and many other properties that can be used for many industrial applications.

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