International Journal of Pharmaceutical Research and Applications
Volume 10, Issue 1 Jan - Feb 2025, pp: 377-385 www.ijprajournal.com ISSN: 2456-4494

A Review on Abutilon Pannosum

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Date of Submission: 10-01-2025 Date of Acceptance: 20-01-2025

ABSTRACT: Abutilon Pannosum belonging to family malvaceae. The plant is under tomentose shrub widely distributed in India, North Africa, Asia, and Australia, and bears spherical fruits with about 25 carpels, each of which covers hairy plant widely distributed from tropical Africa to Australia through Asia. It grows a height of 2 m and bears small, ovoid fruits with tasteless seeds. Abutilon is a perennial herb to shrub, rarely a small tree, that grows abundantly along road sides, in open fields, and in garden waste spots. The genus is characterised from the rest of the Malvaceae by the absence of an epicalyx, wingless mericarps, and the presence of an endoglossum. Reviewing the available literature on Abutilon pannosum revealed the presence of secondary metabolites such as Carbohydrates, Proteins, Amino Acids, Alkaloids, Phenols, Flavonoids, Phytosterols, Glycosides, Saponins and Oil, Fats and others, which are responsible for biological activities such as antibacterial, antimicrobial, antioxidant, Aphrodisiac and spermatogenesis, analgesic and anti cancer activities.

KEYWORDS: Abutilon pannosum, malvaceae, phytochemistry, biological activities.

I. INTRODUCTION

History

SCIENTIFIC CLASSIFICATION

Kingdom: Plantae
Subkingdom: Viridaeplantae (green plant)
Infrakingdom: Streptophyta (land plants)
Division: Tracheophyta (vascular plants)
Subdivision: Spermatophytina (seed plants)
Infradivision: Angiospermae (flowering plants)
Class: Magnoliopsida (Dicotyledons)
Subclass: Dilleniidae
Superorder: Rosanae
Order: Malvales
Family: Malvaceae (mallows)
Genus: Abutilon mill (Indianmallow)
Species: Abutilon pannosum

Common Names

Tamil: Thuthi Flower
Hindi: Kangahai
Urdu: Kanghi
Sanskrit: Atibalaa
Telugu: Duvvena Kayalu "duvvena benda"
Kannada name: tuththi gida[1].

Figure No: 01 Abutilon Pannosum Plant

Abutilon Pannosum is under tomentose shrub widely distributed in India, North Africa, Asia, and Australia, and bears spherical fruits with about 25 carpels, each of which covers hairy plant widely distributed from tropical Africa to Australia through Asia. It grows a height of 2 m and bears small, ovoid fruits with tasteless seeds. Its leaves have antibacterial, antioxidant, and antifungal properties.

Abutilon is a perennial herb to shrub, rarely a small tree, that grows abundantly along road sides, in open fields, and in garden waste

International Journal of Pharmaceutical Research and Applications
Volume 10, Issue 1 Jan - Feb 2025, pp: 377-385 www.ijprajournal.com ISSN: 2456-4494

spots. The genus is characterised from the rest of the Malvaceae by the absence of an epicalyx, wingless mericarps, and the presence of an endoglossum. It was distinguished from the closely related uniovulated genus Sida by the presence of more than one ovule in a locule, and the flower in Abutilon opens in the evening, whereas the flower in Sida opens in the morning[2].

Abutilon pannosum commonly known as kanghi is an important medicinal plant used in our traditional system. The seed are used as a lauative in piles and in the treatment of cough. The bark and the root were used as diuretic, anthelmlite, pulmonary sedative and in fever. It's extract is also used in relieving thirst, in treating bronchitis, diarrhea, gonorrhea and inflammation of the bladder and in reducing fever. In addition, it is used in cleaning wound and ulcer, treating vaginal infection, diabetics, hemorrhoids and can also used as an anemia (Kirtikar and Basu, 1991). Bark was used astringent, laxative, expect and demulcent (The wealth of India, 2005). The plant is very much used in siddha medicines. In fact, the root, bark, flower, leaves and seeds were used for medicinal purposes by Tamils. The leaves were used as adjunct to medicines used for pile complaints. The flowers were used to increase semen in men (Raamchandran, 2007). The plant contains mucilage, tannins asparagines, Gallic acid and sequiterpens (Khare, 2004). Various secondary metabolite synthesis by plant are biologically active for human and thus they impart medicine properties to the plant species mode of action of many such secondary metabolite is known(Kokate et al., 1998)[3].

Microscopy

Macro morphological investigation

The following plant leaf characteristics were seen and measured: laminar size, laminar form, marginal type, leaf length, leaf breadth, petiole length, leaf base angle, and leaf apex angle. For each parameter, ten readings were made, and the mean value was determined.

Micro morphological investigation

Transverse leaf sections: Three regions from each leaf (top, middle, and base) were transversely sectioned using the wax method technique , the resulting slides were dried, and they were viewed and photographed under the microscope. Transverse section photomicrographs were obtained from the slide with a camera equipped with a microscope.

Macro morphology

The leaf of Abutilon figarianum is cordate in shape, with a sharp apex and a lobate base, and measures around 6.95cm long and 6.98cm wide, with a 650 base angle and a 53.90 apex angle. The border is crenate, the petiole base is inflated, and the veins are actinodromous and laminar symmetrical .The leaf of Abutilon Pannosum is cordate in shape, with an acuminate apex and a lobate base, and measures around 8.34cm long, 7.38cm wide, and 680 base angle, 670 apex angle. 3.1The border is crenate, and the petiole base is enlarged. Abutilon figarianum, Abutilon Pannosum . Differences in radar form demonstrated the relationship between five leaf traits: leaf length, leaf width, petiole length, leaf base angle, and leaf apex angle .The radar shape revealed that the two species' leaves have a similar overall structure but differ in size.

Micro morphology

The epidermal layers are thin, with little squares or rectangular cells. Some epidermal cells are dilated and contain thick mucilage. Saikat (2016) researched A.pannosum and reported the types of trichromes as stellate, unicellular with sharp tips. The lower epidermis has a greater amount of trichomes. The mesophyll tissue is divided into adaxial palisade zone and abaxial spongy mesophyll tissue (dorsiventral leaves). The palisade mesophyll is made up of two rows of narrow, cylindrical cells. The spongy parenchyma is made up of 5 layers of loosely packed cells. In the region of the lateral vein, the lamina thickens slightly. The lateral veins' circulatory bundles are made up of phloem, xylem, and a parenchymatous bundle sheath. The midrib region is extremely visible on both the adaxial and abaxial sides. All sides of the midrib have dense trichromes. The ground tissue is made up of 4 - 5 layers of collenchyma cells from the abaxial midrib. The remaining ground tissue is made up of ground parenchymatous cells. The huge and arch-shaped vascular bundle. Xylem is made up of multiple radial rows of cells. The phloem is situated in the xylem and covers a huge area in comparison to the phloem seen in many dicotyledonous leaves. It was discovered that the architecture of the leaves in the apex, middle, and bases are comparable. The trichromes are significantly denser in the intermediate region, then in the upper and finally in the lower region. Because of the palmately venation of the leaf at the base of the leaf, two mid regions occur in Abutilon figarianum. Many

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calcium oxalate druses have developed in some parenchyma cells of the mid rib region, and these are numerous in the basal region[4].

Figure No: 02 Microscopy of Abutilon Pannosum

Medicinal importance:

1. Laxative in piles
2. Root and stem bark used as diuretic
3. Antipyretic
4. Sedative
5. Astringent
6. Laxative and for bladder inflammation
7. Pulmonary (bronchitis) disorders[5].

II. DISTRIBUTION:

Andhra Pradesh : Srikakulam district, Kadapa district, Anantapur district.
Karnataka :Ballari district, Bengaluru district,Vijayapura(Bijapur)district, Dharwad district, Hassan district, Mysuru district, Raichur district.
Maharashtra : All districts of Maharashtra.
Odisha : Kalhandi district.
Tamil Nadu : Kolli Hills (Namakkal district), Kanchipuram (Changalpattu-CGP) district, Coimbatore district, The Nilgiri district, Villipuram district, Cuddalore district, Tirunelveli district.
World Distribution : India, Sri Lanka, Pakistan, Afghanistan, Tropical Africa, Egypt[6].

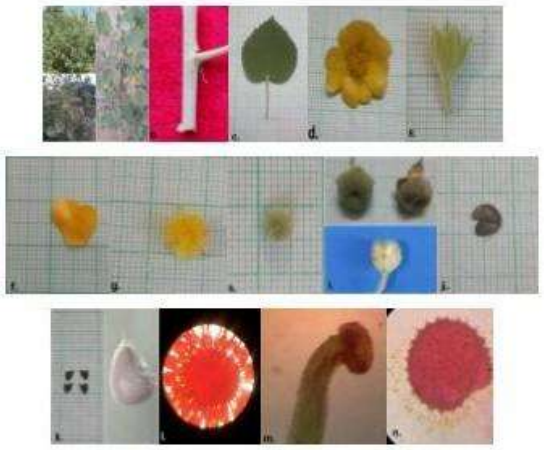

Figure 03: Abutilon Pannosum : a; Field photograph. b; Stem twig. c; Obovate Leaf.d; Flower.e; Calyx. f; Corolla. g; Androecium. h; Gynoecium. i; Schizocarpic fruit.j; Mericarp k; Seeds. l; T.S.of ovary. m; Capitate stigma. n; Pollen grain.

III. CHEMICAL CONSTITUENTS

Several phytoconstituents such as alkaloids, fatty acids, sterol lipids, and heterocyclic compounds have been found in A. pannosum leaf extracts. This species also contains flavonoids, quercetin, and kaempferol. Sterols From the genus Abutilon, nine phytosterols have been isolated: -Sitosterol , -sitosterol glucoside , stigmasterol , 20, 23 dimethylcholesta- 6, 22-dien-3-ol , cholesterol , E-24-ethylidene-23-methyl-5cholest-20-ene, pakisteroid-A, pakisteroid-B and (24R)-5α-stigmastane-3,6 dione.

Flavonoids; Flavonoids are the most common secondary metabolites of Abutilon. The genus Abutilon yielded 37 compounds . Quercetin and kaempferol, as well as their glycosides, are the most prevalent flavonols isolated from several Abutilon species. In addition, the flavones luteolin, apigenin, and chrysoeriol were isolated from A. pannosum. In addition, two flavanols, (+)-catechin and (-)-epicatechin were discovered in A. theophrasi. Three anthocyanin derivatives were isolated from the species Abutilon[7].

Table No: 01 Chemical composition of Abutilon Pannosum leaf ethanol extract[8].

Sr. no.	RT	Name of the compound	Molecular formula	Molecular weight	Peak area (%)
1	6.58	Cyclooctane,1,2-diethyl	C12H24	168	0.98
2	6.80	Cyclohexane, 1,1'-(1,2-dimethyl-1,2-ethanediyl	C16H30	222	0.33

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Volume 10, Issue 1 Jan - Feb 2025, pp: 377-385 www.ijprajournal.com ISSN: 2456-4494

3	7.26	Dodecane,4-cyclohexyl	C18H3	252	1.86
4	9.33	E-14-Hexadecenal	C16H30O	238	238
5	9.39	1-Tridecene	C13H26	182	0.46
6	10.19	n-Tridecylcyclohexane	C19H38	266	0.20
7	10.59	Cycloheptasiloxane, tetradecamethyl	C14H42O7 Si7	518	0.39
8	11.13	Phenol, 2,4-bis-(1,1-dimethylethyl), TMS	C14H22O	206	0.63
9	11.61	Cyclohexanemethanol, 4-ethenyl-α,α,4-trimethyl-3-(1-methylethenyl)-	C15H26O	222	0.26
10	11.69	Cyclohexanemethanol, 4-ethenyl-α,α,4-trimethyl-3-(1-methylethenyl)	C15H26O	222	0.32
11	11.93	Pentadecane, 1-methoxy-13-methyl	C17H36O	256	1.28
12	12.00	1-Heptadecene	C17H34	238	2.85
13	12.16	Diethyl Phthalate	C12H14O4	222	2.62
14	13.04	2-Naphthalenemethanol, decahydro-α,α,4a-trimethyl-8-methylene-	C15H26O	222	2.75
15	14.36	1-Nonadecene	C19H38	266	3.80
16	14.89	Phytolacetate	C22H42O2	338	0.52
17	14.99	2-Naphthalenemethanol,	C15H26O	222	1.13
		1,2,3,4,4a,5,6,8a-octahydro-alpha,alpha,4a,8tetramethyl			
18	15.85	Hexadecanoic acid, methyl ester	C17H34O2	270	6.96
19	16.50	1-Nonadecene	C19H38	266	4.75
20	17.59	Methyl 10-trans,12-cis-octadecadienoate	C19H34O2	294	10.85
21	17.64	9-Octadecenoic acid (Z)-, methyl ester	C19H36O2	296	19.33
22	17.86	Methylstearate	C19H38O2	298	2.60
23	17.98	l-Norvaline, N-(2-methoxyethoxycarbonyl)-, undecyl ester	C20H39NO 5	415	1.92
24	18.46	1-Tetracosanol	C24H50O	354	3.98
25	19.50	Methyl cis-11-eicosenoate	C21H40O2	324	1.88
26	19.72	Methyl 18-methylnonadecanoate	C21H42O2	326	1.51
27	20.25	1-Heptacosanol	C27H56O	396	2.56
28	21.15	1-Heptacosanol	C27H56O	396	1.88
29	21.74	Benzyldiethyl (2,6-xylyl-carbamoyl-methyl)-ammonium benzoate	C28H34N2 O3	446	7.30
30	21.91	1-Heptacosanol	C27H56O	396	1.28
31	28.36	Stigmasterol	C29H48O	412	1.82
32	29.17	Gamma-sitosterol	C29H50O	414	10.67

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IV. PHYTOCHEMICAL EVALUATION:

Phytochemical screening of the A. pannosum extract was carried out by the Following method

4.1.Test for Carbohydrates;

a) Molisch test: A small volume of dilute aqueous solution of test sample is treated with few drops of alcoholic solution of alpha naphthol. On addition of conc.sulphuric acid along the side of the test tube. A purple ring is formed at the junction below the aqueous layer indicating presence of sugar.

b) Fehlings test: add equal volume of fehlings solution A and B to a dilute solution of test sample and heat for some time. Brick red ppt of cuprous oxide is produced indicating the presence of reducing sugar.

4.2.Proteins and Amino acids

a) Ninhydrin test: Add ninhydrin reagent to the test solution and boiled for few minutes, formation of blue color it indicates presence of amino acids and proteins.

4.3.Test for phenol

a) Ferric chloride test: The fraction of extract was treated with 5% ferric chloride and observed for the formation of deep blue or black colour.

4.4.Test for alkaloids

a) Dragendroffs test: few drops of dragendroff reagent (potassium iodide and bismuth nitrate) were added to test sample. produce orange colour ppt presence of alkaloid.

b) Wagners test: few drops of wagners reagent (iodine solution) were added to test sample. Reddish brown coloured ppt indicates presence of alkaloids.

4.5.Tests for Glycosides

a) Keller-Kiliani Test. A solution of glacial acetic acid (4.0 ml) with 1 drop of 2.0% $FeCl_3$ mixture was mixed with the 10 ml aqueous plant extract and 1 ml H_2SO_4 concentrated. A brown ring formed between the layers which showed the entity of cardiac steroidal glycosides.

4.6.Test for Flavonoids:

a) Shinoda test: To a small volume of test sample solution, add very small amount of magnesium turning and then conc. Hcl. the solution turns pink, indicating the presence of flavonoids

4.7.Test for steroids

a) Salkowski's test: Extracts were dissolved in 1 or 2 mL of chloroform and 1 equal volume of concentrated sulphuric acid were added by the sides of the test tube. The upper layer turns red which reveals the presence of steroid and compounds in the extract.

b) Liebermann's Test: To a solution of extract add equal amount of acetic anhydride and then a few drops of conc. Sulphuric acid from the side of test tube. Red colour is first formed, which changes to blue and then green.

4.8.Test for Terpenoids

a) Harizon test: To 1 mL of extract 2 mL of tricholoroacetic acid (TCA) was added the formation of yellow to red precipitate shows the presence of terpenoids[9].

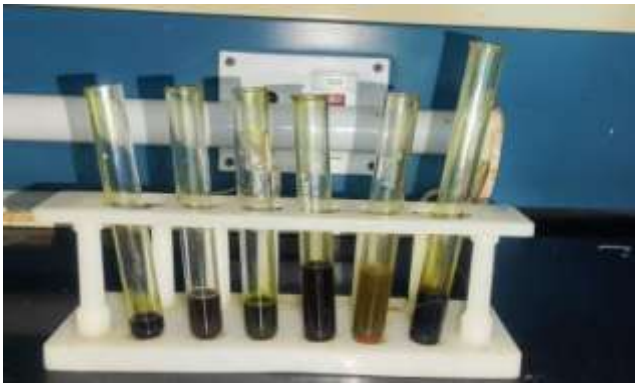

Figure No:04 Phytochemical evaluation

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Table No: 01 Phytochemical screening of Abutilon pannosum leaves extract[10].

S.No	Phytochemical Components	Test	Ethanolic Extract Of Abutilon pannosum
1	Carbohydrates	Molisch's Test	+
		Fehling's Test	+
2	Proteins And Amino Acids	Ninhydrin's Test	+
		Xanthoproteic Test	+
3	Alkaloids	Dragendrof's Test	+
		Wagner's Test	+
4	Phenols	Ferric Chloride Test	+
		Lead Acetate Test	+
5	Flavonoids	Shinoda Test	+
		Alkaline Reagent Test	+
6	Phytosterols	Salkowski Test	+
		Libermann Buchard's Test	+
7	Glycosides	Keller Kilani Test	+
		NaOH Test	+
8	Saponins	Froth Test	+
		Olive Oil Test	+
9	Gums And Mucilages	Alcohol Test	-
		Ruthenium Red Test	+
10	Oils And Fats	Spot Test	+

Preliminary phytochemical screening

The outcomes acquired from the phytochemical examination on ethanolic extract of Abutilon pannosum leaves executed the presence of Carbohydrates, Proteins And Amino Acids, Alkaloids, Phenols, Flavonoids, Phytosterols, Glycosides, Saponins and Oils And Fats.

V. PHARMACOLOGICAL ACTIVITY:

5.1.Anti-bacterial activity

Plants have been shown to be a rich source of antibacterial compounds that can be used to treat a variety of illnesses. Purified or crude antibacterial components are extracted from plants using a variety of organic solvents. The agar well diffusion method can be used to test their antibacterial or inhibitory effects on diverse microorganisms. The agar well diffusion method was used to examine the antibacterial activity of leaf extracts of Abutilon Pannosum (APL) and Grewia tenax (GTL) using four different solvents, namely Milli-Q, methanol, petroleum ether, and isopropanol. The plant extracts were synthesised using a sequential extraction approach and evaluated against 11 distinct human pathogenic microorganisms. Gram-positive organisms tested included Staphylococcus aureus, Enterococcus fecalis, Streptococcus epidermidis, Streptococcus pneumoniae, and Gram-negative organisms such as Escherichia coli, Salmonella typhi, Serratia marcescens, Klebsiella pneumoniae, Pseudomonas aeruginosa, and Proteus vulgaris.

Various solvent extracts of both plant components generated at a dosage of 1 mg/mL exhibited varying degrees of inhibitory efficacy against the pathogens tested. Both plant extracts showed very good inhibition against S. pneumoniae and S. typhi, moderate inhibition against E. fecalis, S. epidermidis, and P. aeruginosa, and no inhibition against E. coli, S. aureus, S. marcescens, K. pneumoniae, B. subtilis, and P. vulgaris. For Gram-positive and Gram-negative species, the findings were also compared to traditional antibiotics[11].

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5.2.Anti-microbial activity:

The purpose of this study was to investigate the phytochemical components and in vitro antibacterial activity of leaf extracts of Abutilonn pannosum (Forst.f.) Schlecht, also known as "ragged mallow," which grows abundantly in the Al-Baha region of Saudi Arabia. The plant leaves were gathered, air-dried, macerated, and extracted using ethanol, chloroform, and hot water. The phytochemical components and antibacterial activity against Gram-positive bacteria (Staphylococcus aureus, Bacillus cereus), Gram-negative bacteria (Escherichia coli, Pseudomonas aeruginosa), and the yeast fungus Candida albicans were investigated. The results revealed that the extracts contained saponins, coumarin, alkaloids, tannins, flavonoids, and steroids. GC/MS analysis of ethanol extract revealed 32 compounds, the most important of which were 9-Octadecenoic acid (Z)-, methyl ester, and methyl 10-trans,12-cis-octadecadienoate, while chloroform extract revealed 36 bioactive compounds, the most important of which was phytol, and aqueous extract revealed 43 bioactive compounds, the most important of which was benzyldiethyl (2,6-xylylcarbamoylmethyl) ammonium benzoate. The antibacterial activity of ethanol extract improved with concentration, from inert at 25-50mg/mL to moderately active at 100-200mg/mL and finally active at 300mg/mL. At all concentrations, chloroform extract had somewhat increased activity, ranging from moderately active to active. The chloroform extract outperformed the ethanol and water extracts against all bacteria tested. This plant can be utilised as an antibacterial agent against pathogenic germs in food and pharmaceuticals industry[12].

5.3.Antioxidant activity :

Abutilon Pannosum (AP) and Grewia tenax (GT) are important medicinal plants that are commonly utilized in the Kachchh region to treat a variety of ailments. The antioxidant activity of A. pannosum and G. tenax leaf was determined in this study. The antioxidant activity (AOA) of various solvents with different polarities, such as n-hexane, benzene, chloroform, acetone, ethyl acetate, acetonitrile, and ethanol, as well as petroleum ether, isopropanol, methanol, and water, was determined. The following findings were discovered in the current study: (i) AOA determination in various solvent leaf extracts (DSE) of AP and GT using 2, 2-diphenyl-1-picrylhydrazyl (DPPH), total antioxidant capacity (TAC) using the phosphomolybdenum technique (PM) and 2, 2'-azinobis-(3-ethylbenzothiazoline-6-sulphonate) (ABTS). Among the investigated polar solvents, acetone, ethanol, ethyl acetate, acetonitrile, and methanol have the highest free radical scavenging activity. According to the findings of this study, the different solvent extracts and methanolic fractions of AP and GT leaves have potent antioxidant activity against free radicals, prevent oxidative damage to major biomolecules, and provide significant protection against oxidative damage in the liver, lung and kidney.

In Pakistan, Abutilon Pannosum is used to treat bladder inflammation, as a diuretic, for lung problems, diabetes, and to reduce pyrexia. APM was tested for total phenolic content, total flavonoid content, and the presence of polyphenolics using HPLC. Various in vitro antioxidant tests were used to measure antioxidant activity. APM (200 mg/kg body weight and 400 mg/kg body weight) ameliorated CCl4-induced kidney and lung damage in rats by measuring antioxidant enzymes, lipid peroxidation products, cytokines (TNF-, IL-1, and IL- 2), comet assay, and histological examination. The findings of this investigation revealed that APM could protect kidney and lung damage in CCl4-intoxicated rats[13].

5.4. Aphrodisiac activities and spermatogenesis.

Abutilon pannosum (Forst.f.) Schlecht. is used for male sexual performance. In this study, we have investigated aphrodisiac potential of A. pannosum stem bark methanol extract (APM) in rat. Male rats were administered with APM (400 mg/kg) on daily basis for 5, 10 and 15 days. Time interval for mount latency, intromission latency and post-ejaculatory interval was decreased ($p < .05$) while time of ejaculatory latency, mount frequency, intromission frequency and ejaculatory frequency after 15 days were ($p < .05$) enhanced as compared to control rats. APM also increased ($p < .05$) penile erection index, copulatory rate and mount bout against control rats. Total count of spermatozoa was nonsignificantly increased whereas per cent of live spermatozoa and motile spermatozoa were increased ($p < .05$) in APM treated group after 10 and 15 days. Weight of testes, seminal vesicle, prostate and epididymis, and level of testosterone in serum increased ($p < .05$) after 10 and 15 days of APM administration to rat. Qualitative characterisation of APM indicated existence of alkaloids, terpenoids, coumarins, cardiac glycosides, phenols, flavonoids, saponins, tannins and sterols. Results of this study indicated

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aphrodisiac potential of A. pannosum in rat and may be used to enhance sexual performance in human[14].

5.6.Analgesic and anti cancer activity

This study was designed to evaluate the anti cancer and Analgesic activity of Abutilon pannosum leaves ethanolic extract in experimental animals. The ethanolic extract of Abutilon pannosum leaves was screened for anti cancer activity against MTT assay and analgesic activity against caudal immersion model. Wistar albino mice weighing between 25-30 gm were used. MTT assay was conducted to assess the anticancer effects of the plant extract of Abutilon pannosum at different concentrations on HCT-29 cell lines. The extract decreased the HCT-29, cell viability in a concentration-dependent way. The ethanolic extract of Abutilon pannosum leaves at the dose of 250 and 500 mg/kg exhibited significant analgesic activity (***P < 0.001) which was confirmed by increased tail withdrawal time of EEAPL treated animals when compared to control groups. By employing one way ANOVA, all data were found to statistical significant ($p<0.05$). Analgesic effect against thermal noxious stimuli may be elicited through opioid receptors or through modulation of several neurotransmitters involved in relevant phenomena. But the extend of + activity shown by the crude extracts significant (compared to that of the control group) and comparable to that of the standard drug Pentazocine, which justifies its activity.

With results obtained it can be concluded that Abutilon pannosum leaves possess significant analgesic activity and anticancer effect, However further studies needed to find out chemical constituent/s responsible for the effect seen in the study[15].

Traditional uses:

A. pannosum leaves are used to treat dehydration, diarrhoea, bronchitis, pile grumbles, gonorrhoea, lower fever in diabetics, haemorrhoids, and anaemia, treat vaginal infection, clean wounds and ulcers, and as an adjuvant to drugs used to treat stack complaints[16].

VI. CONCLUSION

This review provides valuable information about the various phytoconstituents and biological activities of Abutilon pannosum for the first time. It is reported that Abutilon pannosum contain different classes of chemical constituents including carbohydrates, proteins and amino acids, alkaloids, phenols, flavonoids, phytosterols, glycosides, saponins, oils and fats together with several medicinal benefits such antibacterial, anti-microbial, antioxidant, Aphrodisiac and spermatogenesis, analgesic and anti cancer activities.

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