

A REVIEW ON *GOSSYPIMUM HERBACEUM*(LINN)

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ABSTRACT: *Gossypium herbaceum* belongs to family Malvaceae, commonly known by name of cotton plant, levant cotton. It is widely distributed throughout tropics and sub-tropics. Which was used by ancient people in folk medicine for curing bronchial asthma and utilized for preparing medicines for curing skin diseases and infections. Flowers of plant used as galactagogue and can be utilized for manufacturing herbal medicines for boosting lactation and enhancing breast milk production in new mothers. Leaves of plant used as first-aid remedy in treatment of cuts, bruises and wounds for stopping bleeding. The phytochemical study of this plant reveals the presence of alkaloids, carbohydrates, flavonoids, glycosides, saponins, steroids, tannins, terpenoids. The pharmacological study of this plant explains about anti-bacterial, anti-convulsant, anti-depressant, anti-diabetic, anti-fertility, anti-helminthic, anti-oxidant, anti-poisonous, anti-spermatogenic, anti-tumor, anti-ulcer, anti-viral activities. It is used as abortifacient, contraceptive and diuretic agent. This review is effort to highlight its phytochemical and pharmacological studies.

Keywords: *Gossypium herbaceum*, Levant cotton, Folk medicine, Phytochemistry, Pharmacological activity

INTRODUCTION:

The genus *Gossypium* of family Malvaceae, consist of about 50 species distributed in arid to semiarid regions of the tropics and subtropics. The source of this genus is about 5-10 million years ago ¹. The 4 domesticated cottons of the world (*Gossypium arboreum* and *Gossypium herbaceum* are the Old World diploids and *Gossypium barbadense* and *Gossypium hirsutum* are the New World tetraploids) have been cultivated separately in various parts of the world ². *Gossypium herbaceum* is an Old World cotton plant introduced in the indigenous systems of medicine. This plant has been used in the preparation of medicines and food. Cotton seed is rich source of vitamin E and used as pain reliever, anti-oxidant, laxative. Root bark of this plant used as aphrodisiac and root bark decoction is used for amenorrhea ³. In Unani medicine leaves of *Gossypium herbaceum* useful in *ishal atfal* (childhood diarrhea) and seeds useful in *qillatul laban* (inadequate lactation) ⁴

Vernacular names: The plant is known by different vernacular names in the different places by the local people (Table 1). It is commonly called cotton plant, levant cotton, karpas ³.

TABLE 1: NAMES USED WORLDWIDE OF *G. HERBACEUM* ARE AS FOLLOWS ³

S.no	Language	Vernacular names
1	English	Cotton plant
2	Gujarati	Kapas vina
3	Hindi	Kapas
4	Kannada	Hatti
5	Malayalam	Panji
6	Punjab	Kapas
7	Tamil	Parathi
8	Telugu	Karpasimu,Pratti

Botanical description: *Gossypium herbaceum* is a bushy shrub that grows height of 2-8 feet. It has thick woody stem with soft hairy branches. Leaves are separated from centre possess 3-7 partition. The flowers are small, white, purple, red, yellow in colour with or without red blotch at the base of petals. Seeds contains two layers of cotton after removal of fuzz seeds are black in colour. Roots are white in colour from inside and yellow in colour from outside. The plant part used in the medicine are seeds, root, root bark, leaves, flowers. Flowering and fruiting of the plant is January to April ³.

FIG. 1: *GOSSYPIMUM HERBACEUM* FOUND IN TELANGANA IN ITS HABITAT

Distribution: *Gossypium herbaceum* is native to the semi- arid regions of sub Saharan Africa and Arabia. It was first cultivated in Arabia from there cultivation spread eastward to India and westward to Africa. It is spread throughout India mainly in Andhra Pradesh, Assam, Gujarat, Madhya Pradesh, Maharashtra, Mysore, Punjab, Tamil nadu, Telangana, Uttar Pradesh ⁵.

Phytochemical review: The major chemical constituents of *Gossypium herbaceum* are flavonoids, tannins, carbohydrates, saponins, steroids, terpenoids, glycosides, resins, phenols and proteins ⁶.

The leaf extract of *G. herbaceum* were screened to have Condensed tannins i.e Proanthocyanidins which can undergo hydrolysis yield Cyanidin and O-75 percent delphinidin. The tannins combination with flavan-3-ols, mainly (+)- catechin and (+)-gallocatechin which are associated with lesser concentrations of (-)-epicatechin and (-)-epigallocatechin ⁷.

The seed extract of *G. herbaceum* were screened to have glycosides, steroids, resins, carbohydrates, saponins, proteins and phenolic compounds tannins. The main chemical constituents of *G. herbaceum* seed is gossypol. It is a polyphenolic compound present to 0.4-2.0% in the kernels. The presence of two aldehydic groups and six phenolic hydroxyl groups makes gossypol chemically reactive. Gossypol can participate in oxidation, methylation, ozonolysis, Schiff base formation to produce gossypol derivatives ⁸.

Tannins, starch, saponin, calcium, mucilage, carbohydrate, phenolic compounds which are screened from root extract of *G. herbaceum* ⁹.

Carbohydrates, flavonoids, tannins, steroids, saponins, terpenoids, resins, phenols and proteins which are screened from flower extract of *G. herbaceum* ³.

TABLE 2: PHYTOCHEMICALS PRESENT IN *G.HERBACEUM*

S.no	Part	Chemical constituents	Author and year
1.	Leaves	Flavonoids, condensed tannins, terpenoids	Alois A.Bell et al, 1992 ⁷
2.	Seeds	Flavonoids	Chaturvedi A et al, 2010 ¹⁰
3.	Seeds	Glycosides, steroids, saponins, resins, carbohydrates, proteins and phenolic compounds tannins	Kumar SP et al, 2011 ⁸
4.	Roots	Tannins, starch, saponin, calcium, mucilage, Carbohydrate, phenolic compounds	Hemant G.Masram et al, 2012 ⁹
5.	Leaves	Flavonoids, tannins, alkaloids, steroids, saponins	Velmurugan C et al, 2012 ¹¹
6.	Leaves	Flavonoids, tannins, alkaloids	Velmurugan C et al, 2014 ¹²
7.	Flowers	Carbohydrates, flavonoids, tannins Steroids, terpenoids, saponins, resins, phenols and proteins	Anitha John et al, 2015 ³
8.	Roots Leaves Seeds Stem bark	Carbohydrates, glycosides, saponins, phenols, flavonoids, proteins, terpenoids and tannins	Monika Patel et al, 2017 ⁶

Pharmacological activities:

Diuretic activity: The ethyl acetate and ethanolic leaf extract of *G. herbaceum* (100mg/kg and 200mg/kg) showed a significantly increased excretion of total volume of urine as well as anions and cations as compared to the standard drug Frusemide (100mg/kg.b.w.orally). The extract showed diuretic activity because of presence of different chemical constituents like alkaloids, carbohydrates, tannins, steroids, proteins¹³.

Anti-bacterial activity: *G. herbaceum* seed extract of free and bound flavonoid fraction and callus extract of free flavonoids showed activity against *Tricoderma viride*. *G. herbaceum* and *G. hirsutum* seed extracts of free flavonoid fraction showed activity against *Tricoderma viride*, *Bacillus cerus*, *Staphylococcus epidermidis*, *Escherichia coli* and *Salmonella typhimurium*¹⁰.

Anti-ulcer activity: The ethanolic leaf extract of *G. herbaceum* (250mg/kg and 500mg/kg) showed a significantly inhibited ulcer formation in ethanol induced gastric ulcer in rats as compared to the standard drug Lansoprazole(8 mg/kg.b.w.orally). The extract shown increases healing of gastric ulcer and possess potential anti-ulcer activity because of presence of chemical constituents like flavonoids, tannins etc¹⁴.

Anti-oxidant activity: The hydro-alcoholic leaf extract of *G. herbaceum* (70:30) showed decreases the free radical to correlative with hydrazine when it reacts with hydrogen donors in anti-oxidant principle. This study provide complete description of the anti-oxidant activity, with respect to its phenolic content⁸.

Wound healing activity: The methanolic leaf extract of *G. herbaceum* (200mg/kg) showed a significant decrease in period of epithelization and wound concentration against excision and incision wound induced rats. And a significant increase in the breaking strength was observed in the incision wound induced rats. The extract showed wound healing activity because of presence of different chemical constituents like flavonoids, tannins etc¹¹.

Anti-epileptic activity: The aqueous leaf extract of *G. herbaceum* (10, 30, 100 mg/kg) showed significant dose dependent anti-epileptic effect, potent than Phenobarbitone and Diazepam because of enhanced GABA ergic neuro-trasmission¹⁵.

The chloroform leaf extract of *G. herbaceum* (10, 30, 100 mg/kg) showed significant dose dependent anti-epileptic activity potent than Phenobarbitone and Diazepam¹⁶.

Anti-diabetic activity: The ethanol and ethyl ether leaf extracts of *G. herbaceum* (200mg/kg) showed a significant reduced blood glucose level in alloxan induced diabetic rats. The extracts lowered the Triglycerides, Low density lipoprotein, Very low density lipoprotein, Total cholesterol levels and increase the High density lipoprotein level. The extracts showed anti-diabetic activity because of presence of chemical constituents like flavonoids, tannins and alkaloids¹².

The aqueous and ethanolic seed extracts of *G. herbaceum* (200mg/kg and 300mg/kg) showed a significantly reduced normoglycemia, triglyceride, serum cholesterol and urea levels in a dose dependent order in normal rabbits. The extracts showed anti-diabetic and hypolipidemic activities because of presence of chemical constituents like flavonoids and phenolic compounds¹⁷.

The ethanol and ethyl ether leaf extracts of *G. herbaceum* (200mg/kg) showed a significant reduced blood glucose level in dexamethasone induced diabetic rats. The extracts lowered the Triglycerides, Low density lipoprotein, Very low density lipoprotein, Total cholesterol levels and enhance the High density lipoprotein level. The extracts showed anti-hyperglycemic and hypolipidemic activities because of presence of chemical constituents like steroids, alkaloids, glycosides, flavonoids, tannins, carbohydrates¹⁸.

Anti-fertility activity: The methanolic root extract of *G. herbaceum* (2.2, 2.5, 3.0 g/kg/day) showed a significantly reduced the number of healthy small antral, Graffian follicles and corpora lutea associated with significant increased the number of atretic follicles in same stage with dose dependent manner. The extract also showed a significantly reduced the ovarian and uterine wet weights, epithelial cell height, myometrial and stromal thickness in a dose dependent manner. The methanolic root extract of *G. herbaceum* could cause atrophic changes in the uterus and disruption of ovarian folliculogenesis by inhibiting further development of the recruited ovarian follicles⁵.

Anthelmintic activity: The ethanol and ethyl ether leaf extracts of *G. herbaceum* showed a significant anthelmintic activity at highest concentration of 60, 80, 100mg/ml as compared to standard drug Albendazole (10mg/ml). The ethyl ether extract showed more potent vermucidal activity than ethanolic extract of *G. herbaceum*. The extracts showed anthelmintic activity because of presence of chemical constituents like alkaloids, glycosides, flavonoids, tannins, phenolic compounds¹⁹.

Anti-urolithiatic activity: The ethanolic and aqueous leaf extracts of *G. herbaceum* showed their maximum efficiencies in the dissolution of calcium oxalate crystals. Ethanolic extract showed highest dissolution of calcium oxalate crystals than aqueous extract. Neeri was used as standard drug in this study²⁰.

TABLE 3: PHARMACOLOGICAL ACTIVITIES REPORTED IN *G. HERBACEUM*

S.no	Extract	Part	Activity	Author and year
1.	Ethyl acetate & ethanol	Leaves	The diuretic activity was evaluated by using excretory parameters like total urine volume, body weight before and after the experiment, the concentration of sodium, potassium, chloride ions in the urine.	Narasimha DK et al, 2008 ¹³
2.	Ethanol	Seeds	The Anti-bacterial activity was evaluated by using In-vitro tissue culture method.	Chaturvedi A et al, 2010 ¹⁰
3.	Ethanol	Flowers	The Anti- ulcer activity was evaluated by using ethanol induced acute gastric ulcer in rats.	Khalid M.S et al, 2011 ¹⁴
4.	Hydro-alcoholic	Leaves	The Anti- oxidant(In-vitro)activity was evaluated by determining DPPH radical scavenging effect, Reducing power assay, Total phenolics content, Total flavonoids content.	Kumar SP et al, 2011 ⁸
5.	Methanol	Leaves	Evaluate the effect of <i>Gossypium herbaceum</i> on experimentally induced wounds in rats and compare the effects observed with an antiseptic agent, povidine iodine ointment. The models selected were, Excision wound model Incision wound model Dead space wound model.	Velmurugan C et al, 2012 ¹¹
6.	Aqueous	Leaves	The Anti-epileptic activity was evaluated by using electrically induced convulsion model(Maximal electroshock induced seizures) and chemically induced convulsion model (Pentylene tetrazole induced seizures).	Sumalatha G et al, 2012 ¹⁵
7.	Ethanol & ethyl ether	Leaves	Anti-hyperglycemic & hypolipidemic activity of <i>Gossypium herbaceum</i> was evaluated by using Dexamethasone induced model in rats.	Velmurugan C et al, 2013 ¹⁸
8.	Ethanol & ethyl ether	Leaves	Anti-diabetic activity of <i>Gossypium herbaceum</i> was evaluated by using Alloxan induced Model in rats.	Velmurugan C et al, 2014 ¹²
9.	Methanol	Roots	Anti –fertility activity: To Investigate the qualitative Aspects of follicular development in the ovaries and uterine histology in cyclic female albino rats.	Shahnaz Seyedi Dolatabad et al, 2014 ⁵
10.	Aqueous & ethanol	Seeds	The Anti- diabetic & hypolipidemic activities were evaluated by using Alloxan induced model in rabbits.	Uzzaman R et al, 2017 ¹⁷
11.	Chloroform	Leaves	The Anti-epileptic activity was evaluated by using electrically induced convulsion model(Maximal electroshock induced seizures) and chemically induced convulsion model (Pentylene tertazole induced seizures).	Sumalatha G et al, 2017 ¹⁶
12.	Ethanol & ethyl ether	Leaves	Anti-helminthic activity of <i>Gossypium herbaceum</i> was evaluated by using Earthworms (Pherethimapostuma).	Velmurugan C et al, 2017 ¹⁹
13.	Ethanol & aqueous	Leaves	Anti-urolithiatic activity of <i>Gossypium herbaceum</i> was evaluated by using Titrimetry.	Niharika M et al, 2018 ²⁰

CONCLUSION:

G.herbaceum is an old world cotton plant mainly used in Unani and Ayurvedic medicines in the treatment of bronchial asthma, inadequate lactation, diabetes, sexual debility, dysmenorrhea, general weakness, lung and skin diseases. Phytochemical studies on the plant revealed presence of various chemical constituents such as saponins, steroids, carbohydrates, glycosides, phenolic compounds such as tannins and flavonoids will help in designing new drugs and other pharmaceutical compounds to fight against widespread diseases like diabetes, skin diseases etc. The extract of the plant possess various activities like anti-bacterial, anti- viral, anti-convulsant, anti-depressant, anti-diabetic, anti-fertility, anti-helminthic, anti-malarial, anti-oxidant, anti-poisonous, anti-spermatogenic, anti-tumor and anti-ulcer. The purpose of this review was to gather the research work undertaken till date in order to arrange enough baseline for future works.

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CONFLICT OF INTEREST:

We declare that we have no conflict of interest.

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