



PHYTOCHEMICAL AND PHARMACOLOGICAL STUDIES ON *JATROPHA GOSSYPIIFOLIA*

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ABSTRACT

Plants are being used from more than 1000 years to treat many diseases. *Jatropha gossypifolia* commonly known as “belly ache bush” is found all over India. The plant is taken in use in the name as “seema nepalamu. It belongs to family Euphorbiaceae. The plant is used traditionally as an anti-ulcer, purgative, emetic. The plant has been reported to have anti-inflammatory, anti-microbial, anti-bacterial, anti-oxidant activities. Bio active compounds such as alkaloids, flavonoids, phenols, coumarin lignans, terpenes have been isolated. This review emphasizes the current literature on *Jatropha gossypifolia* and explains its taxonomical classification, botanical, phyto constituents and pharmacological outcomes.



INTRODUCTION:

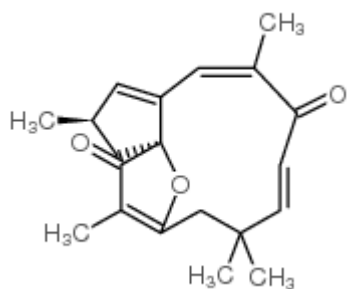
Medicinal plants are the only source for the treatment of diseases. In ancient studies and since then numerous herbs and plants have been recognized as medicinal plants because of their potency to cure ailments. The newly discovered and the existing medicinal plants are being screened for many diseases and to identify significant therapeutic importance. The name *Jatropha* is derived from the Greek words *jatros* and *trophe* which means doctor and food which is associated with its medicinal uses [1]. The *Jatropha* genus is divided in to two subgenera, *jatropha* and *curcas*, this subgenus *jatropha* has the widest distribution, with species found in Africa, India, South America [2,3].

Jatropha gossypifolia is widely used in folk medicine for various diseases by using different parts of plant like stems, leaves, roots, latex by different routes (oral or topical). It involves various uses like anti-inflammatory, anti-oxidant, anti-microbial agent have been justified [1-3]. Anti-microbial agent has been justified [1-3].

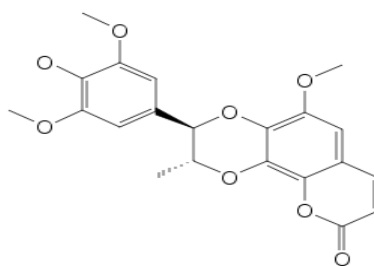
Vernacular names [11]



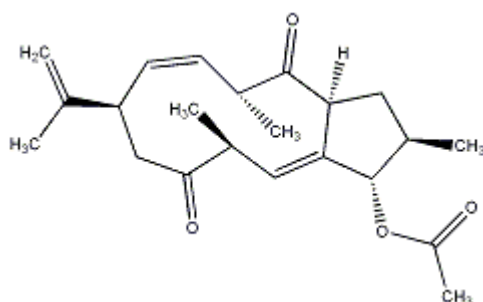
Structures of chemical constituents of *Jatropha gossypifolia*



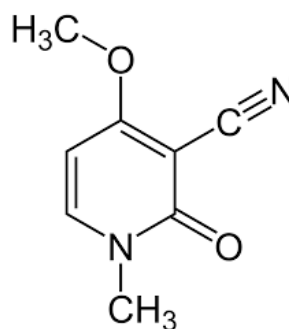
Jatrophone



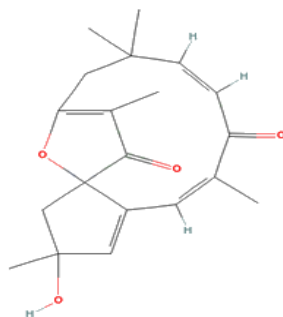
Propacin



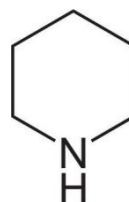
Jatrophenone



Ricine



2α-hydroxyjatrophone



Piperidine

Past pharmacological work on *Jatropha gossypifolia*

Plant part	Popular use	Reference
Whole plant	Anti-microbial Analgesic(tooth ache)	[1] [1]
Leaves	Anti-diabetic', Anti-ulcerogenic	[46],[47], [48]
Stem	Anti-cancer, Anti-anemic	[48], [49]
Roots	Anti-diarrheal, Anti-cancer	[50], [51]
Seeds	Anti-ulcerogenic, Anti-microbial	[1], [17]
Latex	Rheumatism, Wound healing	[52], [53]

Telugu: Seema -nepalamu, yerra dundimalu

Hindi : Mayla

Kannada : Chikka kaadu hapalu

Sanskrit : Dravanti

Tamil : Adali

Taxonomic classification ^[12]

Domain : Eukaryota

Kingdom : Plantae

Sub-kingdom: Viridiplantae

Infra-kingdom : Streptophyta

Super division: Embryophyta

Division : Tracheophyta

Sub-division : Spermatophyta

Class : Magnoliopsida

Super-order : Rosanae

Order : Malpighiales

Family : Euphorbiaceae

Genus : *Jatropha*

Species : *Jatropha gossypifolia*

Taxonomy: Dehgan and webster (1979) divided the genus in to 2 subgenera (curcas&jatropha) with 10sections and 10subsections.

✚ They postulated that physic nut (*Jatropha curcas* L.) is the most primitive form of genus and that *Jatropha gossypifolia* evolved from physic nut. It belongs to Euphorbiaceae family consists of 300genera, 7,800 species and 5 sub families worldwide ^[1, 2].

Habit ^[13] It is a shrub or small tree usually growing 1-3m tall. It is deciduous.

Habitat ^[13] It is mostly found in drier tropical environments. It is a weed of degraded pastures, open woodlands, monsoon vine forests, grasslands, riparian vegetation, coastal foreshores, roadsides, disturbed sites waste areas and old or abandoned gardens.

Botanical description ^[3-9] It is a small shrub with 16-19 cm length, 10-13.8cm width.

Leaves: Dark green and purplish -red dark leaves. Alternate, palmate with an acuminate apex, chordate base and serrated margin.



Flower: Asexual, purple and in cymose units with the calyx having 5 petals which in male flowers it may having a petiole tube.



Fruit: It is capsular with three furrows, containing a dark seed with black spots.



Distribution ^[3] Mexico, South America, Caribbean Islands, Africa & America, India -Gujarat.

Some other species of *Jatropha gossypifolia* ^[14]

Jatropha gossypifolia, *Jatropha latifolia* pax, *Jatropha multifida* L, *Jatropha purpurea* rose, *Jatropha tupifolia*,

Jatropha glandulifera roxb,
Jatropha aethiopica mull.Arg.

Phytochemical constituents [10,15-18]

Alkaloids, flavonoids, saponins, steroids, tannins, phenols, diterpenes have been reported to be present in various extracts of *Jatropha gossypifolia*.

Traditional uses [10,19-24] The young stem is chewed as mouth cleanser. The whole plant has wound healing property. The decoction of aerial parts used as anti-infective and alopecia, the pounded leaves applied locally for boils and burns

Past work on Phytochemistry [25-45]

Priliminary phyto chemical examination of *J.gossypifolia* revealed the presence of diterpenes in whole plant^[25]. The entire plant consists of jatrophene, propacin, piperidine [44,45]. The latex is reported to contain protein (cyclogossine A and B)^[26,27]. The leaves are reported to contain triterpene (2, 24, 25-trihydroxylanosta-1, 7-diene-3-one and 2, 24, 25-trihydroxylanost-7-en-3-one)^[28] and an alkaloid (ricinine)^[29].The aerial parts are reported to contain flavonoids (gossypiline and gossypifan)^[30,31,32]. The seed is reported to contain terpene - ester(12-deoxy-16-hydroxylphorbol and 9-acetoxynerylidol)^[17,33]. The stem is reported to contain coumarin lignoids (prasanthaline, Isogadain, cleomiscosin A, gossypidien, jatrodien, gadain)^[34-37]. The roots are reported to contain Diterpenes (Jatropholone A, Jatrophone B, Jatrophone, citlalitrione, falodone, 2 β -hydroxy-5,6-isojatrophone)^[38-45].

Past pharmacological studies

Anti-hypertensive action: The ethanolic extracts of roots and aerial parts of *Jatropha gossypifolia* results in the hypotensive and vaso relaxant effects were tested. The extract of about 125 and 250 mg/kg, over 4 weeks, by oral route in rats takes place. In a dose dependant manner,

produced a reduction of systolic blood pressure in conscious normotensive animals. It also inhibited, in a concentration-dependant and non-competitive manner, the contractile response induced by norepinephrine or CaCl₂^[54].

Anti-microbial action: The alcoholic leaf extracts by using agar disc diffusion method it exhibits significant antibacterial activity. It was reported that from the whole plant the macrocyclic diterpene jatrophene is isolated and exhibits in vitro antibacterial activity. The methanolic extracts of the leaf, seed and stem bark have been shown to have anti-bacterial, anti-fungal, anti-viral and anti-parasitic activities. The organisms like E.coli, s.aureus, b.subtilis have been reported to be sensitive the different extracts of the plant^[55, 56].

Immunomodulatory activity: The immunity of the host is modulated by significantly increasing the proliferation of mouse spleen cell in vitro by using both synthetic and naturally occurring 1-phenylnapthalene lignans and extracts from the whole plant of *J.gossypifolia*^[57].

Analgesic and anti-inflammation: The methanolic extract of *J.gossypifolia* leaves exhibited systemic acute and chronic anti-inflammatory activities. The extract, at 500 and 1000mg/kg oral doses, inhibited the acute carrageenan-induced paw oedema in rats and at 50 and 100mg/kg oral doses, inhibited the chronic cotton pellet-induced granuloma formation in rats^[58,59]. The leaf paste at 0.5and 1mg/ear showed significant reduction in TPA-induced local inflammatory changes in mouse ear oedema model. At 100 and 200mg/kg, for 7 days, by oral route, the methanol extract of *J.gossypifolia* aerial and bark parts demonstrated significant analgesic activity in Eddy's hot plate and tail -flick models and anti-inflammatory activity in carrageenan-induced paw oedema in mice. The ethanol and water extracts from

J.gossypiifolia leaves have anti-inflammatory, using the in vitro human red blood cell membrane stabilization method. The human red blood cell membranes are similar to the lysosomal membrane components, the prevention of hypotonicity-induced membrane lysis of these cells could be taken as a measure in estimating the anti-inflammatory property of compounds^[60].

Anti-oxidant activity: The ethyl acetate extract of the *J.gossypiifolia* whole plant exhibited profound DPPH scavenging, total antioxidant capacity, and lipid peroxidation activities due to its high phenolic content. The methanol, ethyl acetate, and aqueous extracts of *J.gossypiifolia* leaf exhibited antioxidant activities in DPPH free radical, ferric thiocyanate and nitric oxide scavenging in vitro models^[61,62]. The ethanolic extract of *J.gossypiifolia* in the dose of 500 mg/kg, p.o., significantly increased glutathione, catalase, and peroxidase levels significantly in vitro and can be used in combating oxidative stress^[63].

Haemostatic activity: *J.gossypiifolia* latex and fresh juice, is widely used as a haemostatic agent for preventing bleeding disorders. The results of whole blood clotting time using lee and white method and bleeding time using Ivy's method were significantly reduced when stem latex was introduced, signifying procoagulant activity. The mechanism of action is based on the precipitating action of the latex on bovine albumin, the latex has been reported to precipitate clotting factors thus bringing the coagulation factors in to close contact, the activation of coagulation cascade leads to the generation of thrombin leading to the formation of a clot^[64].

Hepatoprotective activity: The hepatoprotective action of *J.gossypiifolia* aerial plant extracts in carbon tetra chloride induced liver damage in rats were demonstrated. The methanol, petroleum

ether and water extracts from the aerial parts of *J.gossypiifolia* significantly restored the serum levels of serum glutamate oxaloacetate transaminase, serum glutamate pyruvate transaminase, serum alkaline phosphatase, total bilirubin, superoxide dismutase, and catalase^[65].

Anti-diabetic activity: The extracts from *J.gossypiifolia* plants showed significant α -glycosidase comprises a family of enzymes hydrolase, which is located in the brush-border surface membrane of small intestinal cells and it is the key enzyme by which the final step of digestion is catalyzed, so glycosidase inhibitors can stop the liberation of D-glucose from complex dietary carbohydrates and can delay glucose absorption which in turn reduce plasma glucose level and decrease hyperglycaemia^[66-69].

CONCLUSION

Literature survey suggests the medicinal importance of *J. gossypiifolia* phytochemical investigation revealed the presence of various chemical constituents like triterpene, flavonoid, coumarin lignoids, diterpenes. Pharmacological studies revealed that *J.gossypiifolia* is having anti-oxidant, anti-microbial, anti-inflammatory, hepatoprotective, anti-diabetic activity. Thus there remains a tremendous scope for further scientific exploration of *Jatropha gossypiifolia* to establish their therapeutic efficacy and commercial exploitation.

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Conflicts of interest

There are no conflicts of interest.

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