

# Pharmacognostic and Phytochemical Investigation of *Jatropha L.* (Euphorbiaceae)

<sup>1</sup>Shelke Karan Balaji, <sup>2</sup>Khajekar Vikas Ramesh, <sup>3</sup>Rathod Ajit Madhukar, <sup>4</sup>Bankar A.S, <sup>5</sup>Dr.Kolhe S.D

<sup>123</sup> Student of Bachelor of pharmacy, <sup>4</sup> Assistant professor (Department of pharmacognosy), <sup>5</sup> Principal,  
<sup>12345</sup> Anand Charitable Santha's College of Pharmaceutical Science and Research, Ashti, Beed.

**Abstract:** From very long time plants play important role in various diseases treatment. *Jatropha gossypifolia* is one of them. This plant is being used as traditional medicine in various regions over different parts of our planet. It is used for different purposes in different regions. It's is widely used in Asian countries and Africa this plant consist different secondary metabolites such as coumarin lignoids, diterpens, flavonoids, lignans, phenols, steroids ,tannins, triterpenoids, cardiac glycosides protein,saponins, terpenoids , triterpens , alkaloids, phenols, ester, fatty acids,fibres.

Many different chemical are found in this plant propacin, venkotasin ,jatrophene,arylnaphthalene ,ricinine , apigenin ,isovitexin ,orientin,schoftosides ,vitexin, gossypiden ,isogadain , jatrodein , gadain ,jatrophane ,gossypiline ,prasantnaline , falodone , jatropholone A , jatropholone B , piperidine , imidazole alkaloid , arachidic acid , caprillic acid , lauric acid , lignoceric ,lelignoceric , linoleic , myristic acid ,oleic acids , palmitic acid , palmitaloic acid , relinoleic acid , steric acid , vernolic acid . It shows many pharmacological activities Anti-leprotic, Anti-inflammatory, Antifertility, Contraceptive, Antiulcer, Anticancer Antimicrobial and many more.

**Keywords:-** *Jatropha gossypifolia*, schoftosides,biflavonoidellagic, isovitexin,febrifage.

**Introduction :-** *Jatropha gossypifolia L.* (Euphorbiaceae) is also known as belly ache bush, black physic-nut and by different names in different regions over the globe. But in India it is oftenly termed as "lal-bherenda" or "ratanjot" plant. It is mainly found in America and Africa and also found in 36 countries including India. The name *Jatropha* is derived from Greek words "*Jatros*" means "doctor" and "*trophe*" means "food"[20].This plant since ages is used as medicine in humans and animals. It is being used as a traditional medicine in different region of the globe such as in Asia(china,India,korea,etc.),Africa and America. In this shrub many secondary metabolites are found which having many different medicinal properties. Different parts (leaves,stem,root ,seeds and latex) and preparations (infusion, decoction and maceration). the secondary metabolites found in this plants are alkaloids,tannins,terpenoids,triterpenes,phenols,flavonoids,saponins,diterpene. In Ayurveda, Chinese and Thai traditional literature mentioned that this shrub is used to treat fever pain and dysentery. As per old record in history it is used as contraceptive.Other than medicinal use it is also used as for biodiesel production,pesticide,insecticide,vermifuge,ornamentations religious rituals[20].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

## • Taxonomic Classification

1. Kingdom:- Plantae
2. Order :- Malpighiales
3. Family :- Euphorbiaceae
4. Subfamily :- Crotonoideae
5. Tribe :- Jatropeae
6. Genus :- *Jatropha*
7. Species :- *Gossypifolia*

**Common Name:** Belly-Ache Bush, Black Physic-Nut, Cotton-Leaf Physic-Nut, Vilayati-Erandi Plant

**Occurrence (Special Areas):** Gujarat Forestry Research Foundation, Indroda Park, AyurvedicUdyan, Kendra About *Jatropha gossypifolia*

Van Chetana

✓ **Plant Habit:** A small, much-branched shrub.

## • Macroscopic characteristics:

- ✓ **Stems:** The older stems are relatively thick and either somewhat succulent or softly woody. These older stems contain a watery or soapy sap. The younger branches are purplish in color and densely covered in hairs (i.e. they are pubescent). The stems are 1-2 meter long.
- ✓ **Leaves:** The alternately arranged leaves (4.5-10 cm long and 5-13 cm wide) have three or five deep spreading lobes (i.e. they are palmately lobed). These leaves are purplish and covered in sticky (i.e. glandular) hairs when immature, but usually turn bright green as they age. The leaf blades are borne on stalks (i.e. petioles) 6-9 cm long which are also covered in sticky (i.e. glandular) hairs. The margins of the leaves are entire, but they are adorned with a line of hairs.



- ✓ **Inflorescence:** Terminal cymes.
- ✓ **Flowers:** Monoecious, Calyx cup-like with 5 lanceolate sepals. Petals 5, dark red, broadly ovate, stamens 6-8, dark-red, broadly ovate, anthers horse-shoe shaped, red, filaments connate in a central column on a glandular disk. Ovary seated on a glandular disk. Styles 3, united below, each ending in bifid stigma. Asexual, purple and in cymose units with the calyx having 5 petals which in male flowers it may have a petiole tube.



- ✓ **Fruits:** The fruit is a slightly three-lobed capsule that is slightly hairy (i.e. puberulent). It is oval or oblong in shape (about 12-13 mm long and 10 mm wide) and usually contains three large seeds. These fruit are initially glossy green in colour but turn brown as they mature. The egg-shaped (i.e. ovoid) seeds (7-8 mm long and about 4 mm wide) are orange-brown or dark brown in colour.



### • 3.2 Microscopic Characteristics

#### ✓ **Petiole**

The petiole was oval shaped towards the distal end to the laminal side. The epidermis was single layered with dark pink coloured cells. The hypodermis was collenchymatous with 5-7 layers. The ground tissue was with parenchymatous cells, and vascular bundles were conjoint collateral open type, the size of the vascular bundles varied from centre to margin that is large to small. These were centripetal arranged i.e. xylem was surrounded by the phloem, cluster crystals of calcium oxalate were also observed.

#### ✓ **Leaf**

The leaf lamina was dorsiventral in nature. The upper epidermis and lower epidermis were single layered, the cuticle was surrounded with dark pink coloured rectangular cells. The palisade tissue was single layered, compact with radially elongated cells, the spongy parenchyma were 4-6 layered and many distinct ordinary cut veinlets were seen. The mesophyll was large with 6-8 layers, of thick cellulose cell walled parenchymatous tissue, vascular bundles were present towards the ventral surface. The hypodermis was 4-5 celled with chlorenchymatous tissue; centrally located collateral vascular bundles were conjoint collateral open Eudarch type. Cluster crystals of calcium oxalate and simple starch grains were present. Flowers have five deep purple to bright red coloured petals and five small sepals. Flowering occurs throughout the year, but mostly during late summer and autumn.

- **Secondary Metabolites :** coumarin lignoids, diterpens, flavonoids, lignans, phenols, steroids, tannins, triterpenoids, cardiac glycosides Protein, saponins, terpenoids, triterpens, alkaloids, phenols, ester, fatty acids, fibres.
- **Chemical :-** propacin, venkotasin, jatrophenone, aryl naphthalene, ricinine, apigenin, isovitexin, orientin, schoftosides, vitexin, gossypidin, isogadain, jatrodin, gadain, jatrophane, gossypiline, prasantnaline, falodone, jatropholone A, jatropholone B, piperidine, imidazole alkaloid, arachidic acid, caprillic acid, lauric acid, lignoceric, jelignoceric, linoleic, myristic acid, oleic acids, palmitic acid, palmitoleic acid, relinoleic acid, steric acid, vernolic acid

#### • **Pharmacological Activities**

##### 1. **Antimicrobial:**

Antibacterial activity Dhale et al. 9 observed all the bacteria tested the Gram-positive (*Staphylococcus* spp., *Bacillus* spp.) were slightly more susceptible to the extracts than the Gram-negative bacteria (*Escherichia* spp., *Pseudomonas* spp.) [23]. The antimicrobial effects of the methanolic leaves crude extract of *Jatropha gossypifolia* were evaluated against three bacteria: *Bacillus*

subtilis DSM10 (Gram positive), *Escherichia coli* BW25113 and *Escherichia coli* JWO451-2 (Gram negative), as well as filamentous fungi such as *Mucorhiemalis* ATCC 20020. According to the reference [25]. We can say that *Escherichia coli* JWO451-2 (Gram negative) and *Mucorhiemalis* ATCC 20020 exhibited sensitivity to the methanolic crude extract.

**2. Antipyretic:** Leaves febrifuge for intermittent fever[21]

**3. Wound healing:**

Decoction prepared from the leaves of *J. gossypifolia* is used for disinfecting wounds[15]. The whole plant has wound healing property

**4. Anticancer :** The anticancer effects of apigenin have been mainly studied in in vitro cancer cells and preclinical animal models

**5. Antidiabetic:**

The biflavonoidellagic acid was shown to be the most promising inhibitor of the enzyme aldose reductase, so the use of medicines, nutritional supplements and foods that contain it can contribute to the management of complications of diabetes mellitus.

**6. Anti inflammatory:-**

Schaftoside is the chemical constituent found in leaves of *Jatropha gossypifolia*. Schaftoside potency against LPS-induced lung inflammation in mice. Its action on TLR4- induced neuroinflammation and mitochondrial dynamics in microglia is still unknown[1]. Inflammation of host cells for the treatment of COVID-19. The anti-inflammatory activity of schaftoside was further confirmed on an LPS-induced acute-lung injury mice model. Vitexin and isovitexin were reported to possess anxiolytic properties, anticancer effects, anti-asthma, and anti-inflammatory properties. A natural flavonoid compound and a promising treatment for inflammation, has demonstrated potency against LPS-induced lung inflammation in mice[2]. Schaftoside regulates the inflammation of host cells infected with SARS-CoV-2. It is also confirmed on LPS induce acute lung injury mice model[3] methanol extract of *Jatropha gossypifolia* exhibited more significant activity than petroleum ether extract in the treatment of pain and inflammation[23]

**7. CVS :-**

Vitexin and Isovitexin found in this plant and it plays a cardioprotective role during ischaemia-reperfusion injury and angiogenesis. It is also found that isovitexin decreases perfusion pressure and increases the bioavailability of nitric oxide [4]. Vitexin and isovitexin were reported to possess activities against myocardial ischaemia-reperfusion injury. Exerting cardioprotective actions against ischaemia reperfusion injury. Evidence for the clinical use of schaftoside in treating ischemia stroke[2]. Vitexin regulates nitric oxide levels to protect the brain blood vessels and elicits antihypertrophic effects by exerting cardioprotective actions against ischaemia reperfusion injury[4]

**8. Contraceptive:** Contraceptive as old record in history[21]

**9. Healing:** The stem sap stops bleeding and itching of cuts and scratches[15]

**10. Antidiabetic :-**

biflavonoidellagic acid was shown to be the most promising inhibitor of the enzyme aldose reductase, so the use of medicines, nutritional supplements and foods that contain it can contribute to the management of complications of diabetes mellitus[19]

**11. Antifertility:**

they produce infertility in animal. Ability to find an activate the nuclear estrogen receptor Revealed significant activity with increase in uterine weight[21]. The antifertility activity of the ethanol and aqueous extracts of leaves may be mainly due to their estrogenic activity[23].

**12. Antineoplastic:**

That vitexin and isovitexin exerted antineoplastic effects through the promotion of apoptosis and autophagy while also inhibiting cell proliferation and migration through multiple signalling pathways[3]. vitexin and isovitexin exhibiting a wide range of pharmacological effects, including effects against cardiovascular disease and its risk factors such as hypertension, endothelial dysfunction, dyslipidaemia, and platelet activation beneficial in the prevention of the key steps in angiogenesis by inhibiting endothelial activation.[3] through down regulation of proinflammatory and apoptotic signaling pathways and superegulating cell survival pathways [3a] Apigenin shows antitumor activities by modulating multiple signaling pathways, including PI3K/AKT, NF- $\kappa$ B, JAK/STATs, Wnt/ $\beta$ -catenin, AMPK, MAPK/ ERK, and JNK.[4] bioflavonoid mixture, with 20 mg apigenin and 20 mg epigallocatechingallate, is served as a daily nutritional supplement to patients with resected colorectal carcinomas to evaluate the prevention of the recurrence of neoplasia[4].

**13. CNS:** Induced seizures in zebrafish via suppressing apoptosis modulating inflammation and oxidative stress[2].

**14. Neuroprotective:**

Vitexin regulates nitric oxide levels to protect the brain blood vessels and neuroinflammation, reducing the toxicity induced by the protein aggregates by inhibiting its aggregation or even purifying the toxic oligomers observed mainly in AD and PD. vitexin has the ability to effectively cross the blood brain barrier and can act on a multiplicity of molecular targets, either by reducing the EO through its antioxidant effects or by even inducing the expression of the endogenous antioxidant enzymes contributes to the reduction of neural cell death {neurodegenerative diseases} orientin also improves the structure of neuronal cell injuries in D-galactose-aged mice[10].

**15. Leprosy :** Roots used in leprosy [21] Roots employed against leprosy[23].

**16. Snakebites :** Antiophidic property of *Jatropha* Inhibit enzymatic and biological activity induced by snake venom[22] Root can antidote of snake bite venom[12].

**17. Gastrointestinal disorder:** Where methanol extracts of *Jatropha gossypifolia* fruits highly inhibited diarrhea[23]. Decoction prepared from the leaves of *Jatropha gossypifolia* used for stomach ache[15]

**18. Bite of venomous animal :** Antiophidic property of *Jatropha* Inhibit enzymatic and biological activity induced by snake venom[22].

**19. Purgative:** Decoction of leaves.[20]

**Conclusion:** From this investigation we can conclude that this plant consist of many metabolites and chemicals which has versatile medicinal uses. This plant in future can be very helpful in treatment of different kinds of diseases. The chemical constituents from this plants can be used in preparation of different kind of formulations further which can used to cure and treat diseases as mention in this investigation. The chemical constituents can also be used in treating the harmful effects of venomous insect bites and snakes bites.

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