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ETHNOBOTANICAL AND PHARMACOLOGICAL STUDY OF SHIVLINGI (*DIPLOCYCLOS PALMATUS* (L.) C. JEFFRE)

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ABSTRACT: The plant Shivlingi (*Diplocyclos palmatus* (L.) C. Jeffre) is the seasonal climber plant rich in medicinal properties. Present study is mainly based on ethnobotanical and pharmacological study of shivlingi. Fruit of this plant contains numerous seeds that look like Shivling Icon of lordshiva, so named as Shivlingi. This plant is also known as the lollipop plant. This plant have many medicinal properties and is used for curing several diseases. The plant parts are used to treat inflammation, inducing diuresis and used as tonic. Another uses of this plant is curing bronchitis, cholera carbuncles, cholic convulsions, cough, paralysis, snakebites paralysis and fertility. The seed of this plant helps to balance the hormone and help in infertility treatment. It is the natural remedy for the treatment of female infertility, obesity and diabetes also. In totality *Diplocyclos palmatus* (L.) C. Jeffre have analgesic, antidiabetic, antioxidant, androgenic, antitumor, fertility and antipyretic properties. An effort has been made in this paper to scientifically review and explain the ethnobotanical and pharmacological importance of shivlingi plant.

INTRODUCTION: Medicinal plant belongs to family Cucurbitaceae. Generally, it is known as native bryony or striped cucumber. It is also named as Shivlingi because its seed looks like Shiv-ling. Shivlingi Seeds are used in the treatment of female infertility. It is the good uterine tonic that boost the chances of conception in women suffering from infertility. This is also known as Putra jeevak Beej. In Ayurveda it is used to decrease Kapha Dosha, this is the reason why the Shivlingi is useful for the disease showing enhanced Kapha. But if the patient's Pitta Dosha has risen or aggravated, it is not appropriate¹.

It is an annual plant found throughout India, Phillipines as well as Africa. It is included under the Vrishya Rasayana in Ayurvedic medicinal system. It has many medicinal uses. Traditionally, the Shivlingi plant is used to treat inflammation, diuresis and also acts as a tonic². The various plant parts are used to treat bronchitis, cholera, carbuncles, colic, convulsions, cough, fertility, paralysis as well as snakebite³. The seeds of the plant having potential to cure sterility, female infertility, oligospermia, constipation, diabetes, obesity and weight loss⁴.

The fruits of the plant are used to treat leukoderma, abdominal disease and inflammation⁵. The roots of the plant are associated with kidney stone removal, diuretic, antitumor and hepatoprotective properties⁶. The pharmacological properties of plants also include its antipyretic, anti-diabetic, anti-hyperlipidemic, antioxidant, spermatogenic, aphrodisiac, fertility booster and also used as

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uterine tonic⁷⁻⁹. This plant is now considered as an endangered species because of overexploitation by the people for medicinal and other.

Taxonomic Position:

TABLE 1: TAXONOMIC DESCRIPTION OF *DIPLOCYCLOS PALMATUS (L.) C. JEFFRE*

Taxonomical Rank	Taxon
Kingdom	Plantae
Sub-kingdom	Tracheobionta
Superdivision	Spermatophyta
Class	Magnoliopsida
Subclass	Dilleniidae
Order	Violales
Family	<i>Cucurbitaceae</i>
Genus	<i>Diplocyclos</i>
Species	<i>Diplocyclospalmatus (L.) C. Jeffre</i>

Vernacular Names:

TABLE 2:

Language	Common names
Hindi	Gargumaru, Ishwara
Marathi	lingi, shivalingi
Gujrati	Shivlingi, Vaduballi
Tamil	Shiva lingani
Telugu	Iyaveli/Iyvirali
Sanskrit	LingadandaPastambhini, Bakapushpha, Shiva Mallika
Malayalam	Neohmaka
Kannada	<i>Linga tondeballi</i> , Lingatondeballi, Lingatonde, Shivalinga
Bengal	Shiva lingani
Siddha	Iyaveli, iyaviraali
Nepal	Ghurmiyahara, Ghuru
English	Indian bryony

Geographical Distribution: The Shivlingi were found mainly tropical areas of the world as Australia, Bhutan, China, India, Indonesia, Nepal, Pakistan, South Korea, Sri Lanka, Tropical Africa, Thailand and the Philippine Islands. Among the Indian states, it is found in Andhra Pradesh, Bihar, Chhattisgarh, Goa, Gujarat, Himachal Pradesh, Jammu & Kashmir, Jharkhand, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Manipur, Rajasthan, Tamil Nadu, Tripura, and Uttar Pradesh¹⁰.

Morphology:

Stem: Stem is thin, densely branched. The rings are slender striate and glabrous. It is an annual climbing herb with a thin and spreading stem.

Leaves: Membranous, 10-15 cm long and expansive, green and rough above, paler, and

smooth underneath. 5-lobed cordate at base, processes elongated, lanceolate, midrib sometimes serrated. Petioles are 2.5-7.5 cm long, striate and slim.

Flowers: With little fascicles of 3-6, peduncle 5-20 mm long, filiform, glabrous. Calyx is glabrous with longer about 205 mm, teeth is subulate. Corolla 3-5 mm long, segmented, clap, ovate, intense, pubescent, females-single or few or many stalked, shorter than males.

Fruits: The fruits are smooth, globose, pale blue green, bright red (ripened) in colour about 1.3-2.5 cm in diameter, streaked with wide vertical lines and having seeds longer about 5-6 mm with yellowish cocoa **Fig. 1**.

Seed: Yellowish Cocoa, upper surface of the seeds resembles like a "Shivling". It is 5-6 mm long.

Parts used: It is a medicinal plant and its leaves, fruits, seeds, roots, all are used for medicinal purposes. The whole plant is galactagogue and laxative. Plants are also used in venereal diseases. It belongs to Bitter gourd (*cucurbitaceae*) family and the leaves of plant are given in case of diabetes to control blood sugar. Shivlingi Beej or seeds are usually used for the treatment of female infertility. Seeds have anti-fungal, antihyperlipidemic, antimicrobial, anti-inflammatory, spermatogenic, analgesic, and antipyretic properties¹¹ **Fig. 1-2**.

Phytochemical Constituents of Shivlingi (*Diplocyclos palmatus (L.) C. Jeffre*): The main chemical constituent present in the plant is Bryonin. The seeds of the plant contain saponin molecules, flavonoids, phenolic acids, sugars, punicic acid, goniothalamine and glucomannan¹³. The polysaccharides and fatty acids were isolated from the pulp part of plant¹⁴. These polysaccharides include d-glucose, d-mannose and L-arabinose in the ratio of 5:3:4. However, detailed studies and phytochemical screening of the plant is not reported yet.

Ethnobotany: The plant holds a vital part in tribal society and customs furthermore utilized for many purposes. It is ordinarily known as "Shivlingi" and 'Gargumaru in India, a yearly climber with splendid red organic products **Fig. 2** and is accounted for to be exceedingly therapeutic. Gond and Bharia tribes

of Pathalkot valley venerate this plant. As per them, this herb is aid for the childless folks. They also claim that the seeds of the plant have a stimulating agent to enhance sperm quality and sexual desire. Additionally, it acts as a tonic to improve physical and psychological health and enhances youthfulness in advancing age. The home-grown healers (Bhumkas) set up certain mix of herb and recommend it to the required individual

Interestingly, Bhumkas in Harra-Ka-Chhar town in Patalkot recommend the seeds of this herb for imagining male children. In Gaildubba, customary healers make a mix of Shivlingi seeds with Tulsi (*Ocimum sanctum*) leaves and blend it in Jaggery (the conventional grungy sugar utilized as a part of India) what's more, offer it to the woman who is not imagining infant because of any reason^{12]}.

Medicinal/Pharmacological Aspect of Shivlingi (*Diplocyclos palmatus* (L.) C. Jeffre):

Ayurvedic aspect: In Ayurveda, *Diplocyclos palmatus* (L.) C. Jeffre is categorized under Vrishyarasayana i.e medicines used for maintaining sexual performance and fertility. The seeds of the plant are an important ingredient in the ayurvedic

formulation 'Strirativallabhug pak'. In ancient scriptures, Strirativallabhug pak is used as a reproductive and aphrodisiac tonic which is also used to improve sexual behavior^{13]}. This formulation is also associated with anti-inflammatory, anti-diabetic, antipyretic and analgesic properties^{14]}. The whole plant is bitter and has laxative properties. Shivlingi seeds used to treat obese or overweight patients, swelling during the premenstrual and menstrual period, light menstruation and when feeling heaviness in the lower abdomen. It acts as Vajikaran Rasayana that is used to treat impotence and other sexual disorders. The various rasapanchak (properties) of *Diplocyclos palmatus* (L.) C. Jeffre are shown in **Table 3 Fig. 3.**

TABLE 3: RASAPANCHAK (PROPERTIES) OF *DIPLOCYCLOS PALMATUS* (L.) C. JEFFRE PLANT

Sanskrit / English	Sanskrit / English
Veerya / Potency	Ushna / Hot
Vipak / Metabolic property	Katu / Pungent
Guna / Physical property	Laghu / light, ruksha / dry, tikshna / sharp
Rasa / Taste	Katu / pungent, Tikta / bitter



FIG. 1-4: SHIVLINGI PLANT, FUITS, FLOWER AND SEEDS

Actions and Properties¹⁴:

Kaphashamak: It alleviates the aggravated Kapha dosha. It also reduces the blockage of several channels in the body by clearing the excess Kapha.

Pittavardhak: It increases Pitta dosha.

Vranshodhan: It is associated with wound healing property.

Shothahara: It is used as an anti-inflammatory agent.

Madhumehnashak: It is used to treat diabetes and act as an antidiabetic agent.

Medahar: It is associated with an anti-obesity property.

Swaskashara: It is used to treat asthma.

Garbhdharan: The seeds of the plant are used to promote conceiving.

Jwarghna: It acts as an antipyretic agent.

Alpaartab: It is used to treat oligomenorrhea and regulates the menstrual cycle.

Kashtaartab: It is used to cure dysmenorrhea.

Vajjikaran: It acts as an aphrodisiac agent.

Garbhashya-shothahara: It is used to treat oligospermia.

Therapeutic and Pharmacological Properties:

As per WHO, herbal medicines are plant-derived drugs or formulations which contain raw or processed ingredients from one or more plants. The consumption of herbal drugs has increased worldwide because its availability and lower risk.

Various therapeutic and pharmacological properties of *Diplocyclos palmatus* (L.) C. Jeffrey (Shivlingi) are described as follows **Fig. 4**.

Antimicrobial: The ethanolic extract of the leaf, stem, seed and fruit of *Diplocyclos palmatus* plant possessed the antimicrobial activity against different pathogenic microorganisms.

The leaf and stem extracts also have antimicrobial activity against different microbes. A significant growth inhibitory effect of each extract was

observed against the bacterial strain *Staphylococcus aureus*, *Micrococcus luteus* and *Bacillus cereus*. The minimum inhibitory effect was reported by the stem extract of the plant against gram-positive and gram-negative bacteria i.e the *D. palmatus* possesses to have antimicrobial property¹⁵.

Antibacterial: The aqueous extract isolated from *D. palmatus* leaf was examined to possess the antibacterial activity against *Staphylococcus aureus*, *S. pyogenes*, *E. coli* and *K. aerogenes*. The extract showed antibacterial activity against *E. coli* at different dosage¹⁶.

Analgesic: The alcoholic extract of the dried aerial parts of *D. palmatus* was examined for analgesic activity in the mice model using Eddy's hot plate analgesio meter. The model was administered with the standard drug and placed on an electrically heated plate at 550C +/- 0.50C and the time was noted. The same test was carried out in the animals administered with the plant extract.

Results showed a significant analgesic activity after 30 to 60 minutes when compared with the standard drug. *B. laciniosa* *D. palmatus* treated group exhibit an increase in response time to pain stimuli when compared to the control group i.e. the increase in response time was from 5.83 to 8.50 seconds at 30 minutes and from 5.67 to 10.5 seconds after 1 hour of treatment¹⁷.

Anti-inflammatory: The chloroform extracts of the *D. palmatus* leaves were evaluated for anti-inflammatory activity against carrageenan, dextran, serotonin and histamine-induced rat paw oedema and cotton pellet induced granuloma (chronic) models in rats. The oral administration of the plant extract in the mice model was performed by carrageenan peritonitis test.

Results showed significant anti-inflammatory activity of the plant extract against the mice model at a dosage of 50,100 and 200 mg/kg in a dose-dependent manner. The extract showed maximum inhibitory effect (52.4%) at a dosage of 200 mg/kg after 3 hr. of drug treatment in the animal model while the standard drug showed 62.1% of inhibition. In the case of dextran-induced paw oedema, the chloroform extract exhibits significant inhibition (34.4, 43.2, 52.1%) in a dose-dependent

manner as compared to the control group. In histamine and serotonin-induced paw oedema, 54.9 and 52.3% of inhibition was exhibited by the chloroform extract at a dosage of 200 mg/kg whereas 59.8 and 59.5% of inhibition were shown by indomethacin. In the cotton pellet-induced granuloma (chronic model), the decreased rate of granuloma tissue was exhibited by CEBL (chloroform extract of *B. laciniosa D. palmatus*) (200 mg/kg) at 50.1 and 57.3% respectively. The inhibition of peritoneal leukocyte migration at a dosage of 50, 100 and 200 mg/kg was also inhibited by CEBL¹⁸.

Androgenic: The ethanolic extract of *D. palmatus* seeds was examined for the androgenic activity against the male albino rat model. The groups of male albino rats were orally administered with the plant extract at a dosage of 50, 100 and 150 mg/kg body weight per day for 28 days.

Results showed an increase in body weight, prostate, seminal vesicle, epididymis and weight of testis. A significant increase in sperm count, fructose level, serum testosterone, luteinizing hormone levels and spermatogenesis was also observed. Thus, showed androgenic activity¹⁹.

Antipyretic: The methanolic extract of the plant was evaluated for antipyretic activity against standard animal model by evaluating normal body temperature and yeast-induced hyperpyrexia. Results showed a significant decrease in the body temperature up to 4 hours after the administration of the extract. Thus, showed antipyretic activity²⁰.

Antidiabetic: The ethanolic extract and the saponin fraction of the *D. palmatus* seeds were evaluated for the antidiabetic activity in neonatally streptozotocin-induced diabetic rats for 10 weeks. Results showed a significant reduction in the glucose level, cholesterol, triglycerides, low-density lipoprotein, high-density lipoprotein, serum creatinine, serum urea and decline in the aspartate transaminase and alanine transaminase activities was also observed. Also, a significant increase in catalase, superoxide and levels of glutathione was noticed in n-STZ diabetic rats²¹.

Anti-asthmatic: The alcoholic extract of the plant was evaluated for the anti-asthmatic activity by mesenteric mast cell count by the Atopic allergy

method in rats. The number of intact and disrupted mast cells, in ten randomly selected fields for each tissue, was counted. Results showed an increase in granulation percentage in *B. laciniosa D. palmatus* treated samples compared to the control group of samples²².

Antioxidant: The chloroform extract of the *D. palmatus* fruits was examined to evaluate *in-vitro* antioxidant activity using DPPH (1,1-diphenyl-2-picryl-hydrazil), ABTS, hydrogen peroxide and FRAP assay³². Results showed a degree of reduction of absorbance which was recorded using UV-Vis spectrophotometer at 517 nm where ascorbic acid (AA), 95% ethanol and DPPH solution were used as standard and control samples respectively²³.

Antitumor: The experimental study was conducted in a mice model to evaluate the antitumor activity of the methanolic extract of the plant. The extract was administered in the mice model for 14 days after 24 h of tumor inoculation in a dosage of 62.5, 125 and 250 mg/kg. Results showed a significant decrease in the tumor volume and viable cell count thereby increasing the life span of EAC-bearing mice. The increase in the levels of glutathione (GSH), superoxide dismutase (SOD), catalase and decrease in the level of lipid peroxidation was also observed²⁴.

Toxicity: The hexane extract of *D. palmatus* plant was studied for the cytotoxicity at different dosages i.e. 62.5 µg/ml, 125 µg/ml, 250 µg/ml, 500 µg/ml, and 1000 µg/ml in MCF-7 cell line using MTT (3-(4,5-dimethylthiazol - 2 - yl) - 2, 5 - diphenyl - 2H-tetrazolium hydrobromide) assay.

It was observed that the hexane extract of the plant showed cytotoxicity in a dose-dependent manner and increases with increased concentrations. The maximum cytotoxicity evaluated was 75.25 ± 2.4 % at 1000 µg/mL concentration with an IC₅₀ value of 453.33 ± 1.6 µg/ml²⁵.

CONCLUSION: Literature available has shown that the Shivlingi plant is of great medical importance. It is regarded as a fantastic treatment for infertility. The seeds of the plant are mainly used for medicinal purposes. In Ayurvedic and folk medicine, the seeds of the *D. palmatus* plant are used to treat a variety of conditions including male

and female infertility, obesity, weight loss, diabetes, inflammation, constipation, and abdominal ailments. Reports have found that plants are associated with various therapeutic and pharmacological properties such as antidiabetic, androgenic, Antiasthmatic, antipyretic, antibacterial, and antibacterial activity.

However, this plant has been poorly studied for its phytochemical constituents and therapeutic properties. Therefore, plants should receive more attention from researchers and scientists for experimental and clinical studies to identify beneficial pharmacological properties for the development of important therapeutics.

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