

Research Article

Pharmacological Properties of *Trianthema portulacastrum* L and its Therapeutic Potential as Complementary Medicine

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ABSTRACT

Trianthema portulacastrum L. (Aizoaceae) (TP) is commonly distributed in tropical America, South East Asia and Africa. A terrestrial annual prostrate herb grows wild in open field and road side during September - November. In Indigenous system the plant is used as medicine having analgesic, laxative cathartic and stomachic properties. Also used as emmenagogue, diuretic and for the treatment of Jaundice, blood disease anemia, inflammation, night blindness and dropsy. Alkaloid trianthemine and the steroid ecdysterone are important chemical constituents. The aim of this review is to provide broad information on the conventional uses, phytochemistry, pharmacological actions and toxicity study of TP to explore their curative potential and future research opportunities. All the related information of TP was collected through MEDLINE/PUBMED. The substantiation presented in this review has showed that TP has great potential to be integrated into conventional medical practice for the healing of various dreaded diseases such as diabetes, cancer, inflammation, hepatotoxic and other disease complications. Prospect research on TP would offer much knowledge about pharmacological uses and socio-economic impact.

Keywords: *Trianthema portulacastrum*, Pharmacology, Phytochemistry, Toxicity.

1. INTRODUCTION

Trianthema portulacastrum (TP) commonly known as Bishkhapra is an annual indigenous prostrate herb found in South Africa that is widely distributed in South East, West Asia, and Tropical America. In India and in neighbouring countries, it is most common weeds during summer season found in road sides and also grown in the major field crops such as sugarcane, pulses, rice, cotton, oilseeds and maize. It is often found on clay soils and muddy coastal zones of the sea upto 200m altitude¹. Its infestation in cotton, maize and direct seeded rice especially in rainy season is a matter of great concern and could reduce crop yields by 32-60%².

2. BOTANICAL DESCRIPTION

Scientific Classification

Kingdom	- Plantae
Sub Kingdom	- Tracheobionta
Super division	- Spermatophyta
Division	- Magnoliophyta
Unranked	- Angiosperms
Unranked	- Eudicots
Unranked	- Core eudicots
Class	- Magnoliopsida
Subclass	- Caryophyllidae
Order	- Caryophyllales
Family	- Aizoaceae
Genus	- <i>Trianthema</i> L.
Species	- <i>Trianthema portulacastrum</i>

Trianthema is a genus of Aizoaceae belonging to flowering plants in the ice plant family. Members of the this genus are annuals or perennials succulent herb, upto 40cm long, generally characterized by smooth-margined leaves, unequal, fleshy, opposite, Stem procumbent, rounded, solid, hairy and succulent repeatedly branched, glabrous with

a firm tap root or finely pubescent. It has five perianth segmented flowers, single, axillaries, regular, bisexual, the lower part hidden by the sheath and a fruit with a winged lid. Two species of *T. portulacastrum* widely occur in India. The red biotypes usually grows larger and its stem with long internodes and green bracts and pods and white sepals. The red type is spread plentiful over throughout the places, but the green biotype appears in advance in the season³.

2.1. Regional Names

Bengali: Gadabani, Kulphasag, Godabani, Swetpunarnova

Hindi: Sabuni, Svetsabuni, Salsabuni, Vishakhapara

Kannada: Bili komme, Muchchugoni

Malayalam: Tavilama, Talutama

Marathi: Pundhari-ghentuli

Nepali: Seto punarnava

Oriya: Luduru sag

Sanskrit: Dhanapatra, Chiratika, Dirghapatrika

Tamil: Sharunnai, Charu velai, Shavalai,

Telugu: Ghelijehru, Ambatimadu, Galijeru,

English: Giant pigweed, Desert Horse Purslane, Horse-Purslane

Punjabi: Bishkapa, itsit.

3. ETHNOPHARMACOLOGICAL AND TRADITIONAL USE

The dried plant is reportedly used against throat troubles and anti-fungal agent^{4, 5}. The plant is alexiteric, analgesic, stomachic, laxative, alterative; cures "Kapha," bronchitis, "Vata," piles and ascites^{1, 6}. A decoction of the roots are lithotriptic, cardioprotective, diuretic, ascetic, analgesic, laxative, alterative and reputedly used as an emmenagogue, and its larger doses used as abortifacient. The root applied to the eye cures corneal ulcers, itching, dimness of sight, and night blindness¹. The root is cathartic, abortifacient with mild irritant properties. The administration of root cures many diseases like jaundice, stranguary, and dropsy^{3, 7}, antipyretic, analgesic, spasmolytic and anti-inflammatory activity⁸.

Recent studies have investigated that the leaves are potentially hepatoprotective^{9, 10}, nephroprotective¹¹, anthelmintic¹², antioxidant¹³, antihypertensive and hypolipidemic activity¹⁴. The leaves are diuretic and applied in the treatment of edema, jaundice, stranguary and dropsy¹⁵. A decoction of the herb is used as a vermifuge and is useful in rheumatism; it is considered an antidote to alcoholic poisoning¹⁶. The fleshy nature of leaves makes them suitable for use as a wound-dressing. The old leaves are used in a

treatment against gonorrhoea in Nigeria. In the Gold Coast, plant applied as wound dressing or as poultice. In India, the plant is used for edema of the liver and spleen, asthma, severe cough, amenorrhoea, dropsy and uteralgia. Plant is considered lithotriptic for the kidney and bladder. Also used as diuretic. The powdered root is used as a cathartic in Philippine Islands¹.

4. PHYTOCHEMISTRY

TP has a potential source of organic and inorganic matter such as Crude Protein, calcium, phosphorus, nitrogen, magnesium, iron, copper, zinc, potassium, manganese, Carotene, nicotinic acid, ascorbic acid^{7, 17, 18}. TP contains steroids, flavonoids, fats, triterpenes, carbohydrates, tannins glycosides, phenolic compounds and alkaloids^{19, 20}.

The principal constituents of TP are ecdysterone²¹, trianthemine punarnavine¹⁶, Beta-cyanin and 3,4-dimethoxy cinnamic acid^{15, 22} and the other constituents are trianthenol, 3-acetylaleuritic acid, 5,2'-dihydroxy-7-methoxy-6,8-dimethylflavone, leptorumol and long chain alcohols like stigmasterol, β -sitosterol, and their β -glucopyranosides^{19, 23}, 5-hydroxy-2-methoxybenzaldehyde, p-methoxybenzoic acid, and beta cyanin²³, 3-acetyl aleuritic acid, 5-hydroxy-2-methoxy benzaldehyde, p-methoxy benzoic acid, and p-propoxy benzoic acid¹⁹.

Trianthenol, a tetraterpenoid has been isolated from the chloroform extract and established by high resolution Mass spectroscopy and Nuclear Magnetic Resonance techniques as 15-hydroxymethyl-2,6,10,18,22,26,30-heptamethyl-14-methylene-17-hentriacontene (Trianthenol)^{5, 19}. Also hydrocarbons from the surface wax of the fresh leaves of plant have been isolated and characterized and their relative distribution determined through gas liquid chromatography studies²².

5. PHARMACOLOGICAL ACTION

World Health Organization (WHO) has recommended that traditional health and folk medicine systems are proved to be more effective in health problems worldwide. *T. portulacastrum* Linn. is a herb used in Ayurvedic medicine. Different parts of TP are traditionally used as analgesic, laxative, and treatment of blood disease, jaundice, inflammation, and night blindness²³. Laboratory investigations on extracts of the plant have demonstrated significant pharmacological activities, such as antioxidant, hepatoprotective, antidiabetic, anticarcinogenic, antifertility, antibacterial,

antifungal and larvicidal properties listed in **Table-1**.

6. CONCLUSION

The supportive information presented in this review has showed that *Trianthema portulacastrum* L. has great potential to be incorporated into conventional medical practice for the healing and management of various metabolic syndromes, hepatotoxic, diabetes, cancer and other disease complications. Development and research on

TP through modern pharmaceutical technologies and analytical protocols is essential to promise its quality, safety and efficacy. It is anticipated that this review will provide some valuable information for ongoing explorations of this fascinating species and its phytochemicals. Future research on TP would not only offer knowledge of popular herbal medicine, but also give a clear socio-economic impact in turning a common weed into beneficial nutraceutical and pharmaceutical products.

Table 1: Pharmacological Uses of *T. Portulacastrum*

Type of plant extract	Dose ranges	Animal model/ Microorganisms	Toxic control	Duration of the study	Results	References
Ethanollic extract of plant	50, 100 and 200mg/kg body weight	Wistar rats	7,12-dimethylbenz (a) anthracene	16 weeks	Breast cancer chemopreventive agents	24
Crude aqueous and acetone extracts of leaves	1.0, 0.75, 0.75 and 1.0%	Anopheles stephensi, Culex quinquefasciatus and Aedes aegypti	-	4 weeks	Larvicidal properties	25
Crude aqueous methanolic extract	2.41 µg mL	female Haemonchus (H.) contortus: in vitro and in vivo model	-	15 days	Anthelmintic activity	26
Ethanollic leaf extract	100mg, 200mg	Wistar rats	Aflatoxin	21 days	Antihepatotoxic effect	27
Ethanollic leaves extract	100mg, 200mg	Wistar rats	Aflatoxin	7 days	Hepatoprotective	10
Whole plant	-	In vitro	-	-	Fodder - potential nutritive value	17
Ethanollic extract	100mg, 200mg	Wistar rats	Paracetamol and Thioacetamide	28 days	Hepatoprotective	9
chloroform extract	-	In vitro	Fungus	2 days	Antifungal	5
Ethanollic extract	150 mg/kg basal diet, per os	Mice	Carbon tetrachloride	13 weeks	Hepatoprotective	8
Chloroform extract	100mg, 200mg	Male Sprague-Dawley rats	Diethylnitroso-amine	22 weeks	Anticarcinogenic	28
Chloroform extract	100mg, 200mg	Male Sprague-Dawley rats	Diethylnitroso-amine	22 weeks	Anticarcinogenic	28, 29, 31
Ethanollic extract	100mg, 150mg	Mice	Carbon tetrachloride	5 weeks	Antihepatotoxic effect	30
Ethanollic extract	100mg, 150mg	Mice	Carbon tetrachloride	5 weeks	Antihepatotoxic effect	32
Ethanollic extract	50, 100mg, 150mg	Mice	Carbon tetrachloride	3 days	Hepatoprotective	33
Methanolic whole plant extract	4mg	In vitro	Diphenyl-2 picryl hydrazyl	2 days	free radical scavenging effect	34
Methanol extract	100mg, 200mg,	Wistar albino rats	Alloxan	7 days	hypoglycemi	35

	300mg				c and hypolipidemic	
Leaves extract	-	In vitro	-	48 hrs	antibacterial activity, antifungal activity	36
Chloroform, alcohol and aqueous extracts of the stem, leaves and roots	100mg, 200mg, 400mg	Wistar albino rats	-	15 days	Antifertility activity	37
Ethanol extract	-	Mice	Acetic acid and Aspirin	7 days	Analgesic activity/antinociceptive activity	14
Methanolic extract	100mg, 200mg,	Wistar albino rats	Streptozotocin	7 days	Antihyperglycemic	15
Ethanol extract	100mg, 200mg	Wistar rats	Paracetamol and Thioacetamide	10 days	Antioxidant	13
Ethanol extract	100mg, 200mg	Wistar rats	Atherosclerotic diet	10 days	Hepatoprotective and renoprotective	38

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