



Trianthema portulacastrum Linn. and its Utility -A Review

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ABSTRACT:

Now a days, about 80% of the world population depends on traditional medicine for primary healthcare need. *Trianthema portulacastrum* Linn. (family: Aizoaceae) is a small perennial weed found in the Americas, Africa, India, and other regions of the world, is used extensively in Indian traditional medicines and also consumed as a vegetable throughout Asia for its perceived health benefits. Phytochemical investigation of *T. portulacastrum* reveals the presence of alkaloids, flavonoids, terpenoids, saponins, and phenolic compounds. Emerging studies demonstrate that crude extracts as well as bioactive phytoconstituents of *T. portulacastrum* manifests potent antioxidant, anti-infective, analgesic, and anti-inflammatory activities. A growing number of *in vitro* and *in vivo* studies demonstrate various biological and pharmacological activities, including prevention and amelioration of hepatotoxicity, nephrotoxicity, hyperglycemia, hyperlipidemia, infectious diseases and cancer. This review aims to present and analyze available literature to understand the potential of *T. portulacastrum* in health promotion and disease prevention.

Keywords: *Trianthema portulacastrum* Linn. Aizoaceae, anti- inflammatory, and hepatotoxicity, nephrotoxicity, abortifacient.

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INTRODUCTION

Compounds found in natural products have served as either templates or specific agents for the treatment of a number of different types of diseases. It has been reported that approximately 50% of approved drugs since 1994 were based on natural products^[1]. Today, use of natural products is still prevalent in traditional and folkloric systems of medicine worldwide,

particularly in developing countries where access to modern therapies may be challenging or expensive^[1-3]. Specifically, India is considered to be one of the largest producers of medicinal herbs, where 2 500 species of plants known to have medicinal properties are found, and 150 of which are harvested for commercial use on a grand scale^[4,5]. India is also one of the countries that produces large amounts of herbal raw materials. *Trianthema portulacastrum* Linn. (also known as *Trianthema monogyna* Linn.; family: Aizoaceae), also known as horse purslane, carpetweed, giant pigweed, Punarnava, Gadabani and Labuni, has historically been valued by Indian and African cultures for its numerous medicinal effects^[6-8]. It is widespread in Southeast Asia, tropical America, and Africa. The plant is capable of growing in sunny desert areas such as in Arizona, United States, and also grows abundantly as a “weed” in well irrigated and high-rainfall areas, particularly in India and neighboring countries.

Scientific Classification ^[9]:

Kingdom - Plantae

Phylum - Tracheophyta

Class - Magnoliopsida

Subclass - Caryophyllidae

Order - Caryophyllales

Family - Aizoacea

Genus - Trianthema – Linnaeus

Botanical name- *Trianthema portulacastrum* Linn.

Vernacular Names^[10-14]:

Bengali: Gadabani, Kulphasag, Godabani, Swetpunarnova

Hindi: Sabuni, Svetsabuni, Salsabuni, Vishakhapara, santhi

Kannada: Bili komme, Muchchugoni

Malayalam: Tavailama, Talutama

Sanskrit: Dhanapatra, Chiratika, Dirghapatrika, Vishakha

Tamil: Sharunnai, Charu velai, Shavalai,

Telugu: Ghelijehru, Ambatimadu, Galijeru,

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

Unani: Lotoos Aghryoos

Macroscopic Descriptions

It is a prostrate somewhat succulent herb; stem more or less angular, glabrous or pubescent, much branched. Leaves sub fleshy, obliquely opposite, unequal, broadly obovate, rounded and often epiculate at the apex, cuneate at the base, glabrous; petioles 6-13 mm long, much dilated and membranous at the base. Flowers aresolitary, sessile, almost concealed by the pouch of the petiole. Calyx-lobes are ovate, and acute. Stamens 10-20. Ovary is truncate; style 1. Capsule small, almost concealed in the petiolar pouch, lid truncate, slightly concave, with 2 spreading teeth carrying away at least one seed, the lower part 3-5 seeded. Seeds are reniform, muriculate, and dull black in colour. ¹⁰



Plant of *Trianthema portulacastrum* Linn.

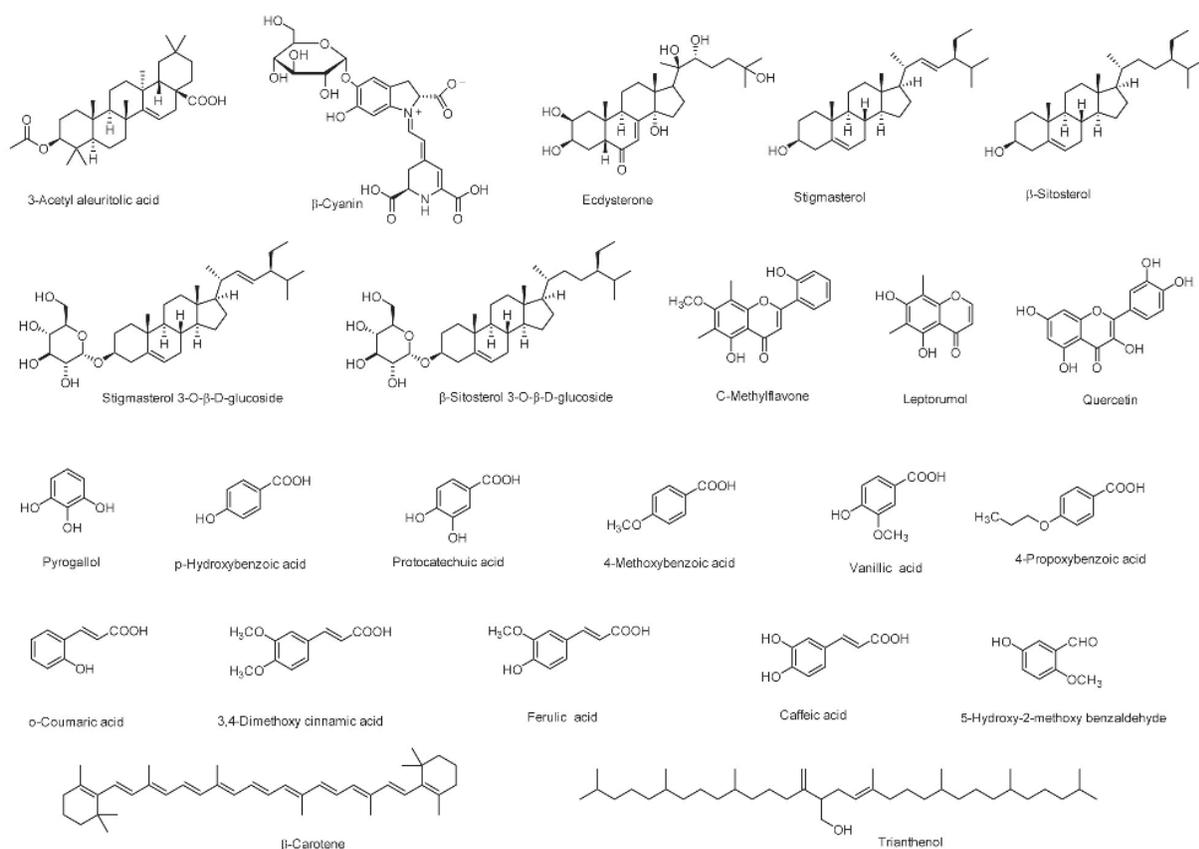


Showing seeds containing pocket

Phytochemical Studies:

Phytochemical studies of the plant *Trianthema portulacastrum* L.(TP) gave moisture content 91.3; protein 2.0; fat 0.4; carbohydrate 3.2; crude fibre 0.9; ash 2.2 gm; calcium 100; phosphorous 30; iron 38.5; ascorbic acid 70 mg/100 gm of the edible matter. Carotene has also been reported 2-3 mg/100 gm. An analysis of the leaves of the plant from Kanpur gave (dry basis); ash 17.0; oxalate, total 9.99 and soluble 8.64; calcium 0.73 and phosphorous 0.36%. The plant also contains large amount of potassium nitrate- white variety, 1.71% and red variety- 2.64%¹⁵. Karim S 2011, add the information of Total ash, 19.69±0.065%, acid insoluble, 2.05±0.2% and water soluble ash 14.4±0.3%. Moisture content by loss on drying method and by toluene distillation method was found to be 5.56±0.06, and 6±0.01 respectively. TP contains steroids, flavonoids, fats, triterpenes, carbohydrates, tannins glycosides, phenolic compounds and alkaloids^{16,17}. The principal constituents of TP are ecdysterone¹⁸, trianthemine punarnavine¹⁹, Beta-cyanin and 3,4-dimethoxy cinnamic acid²⁰ and the other constituents are trianthenol, 3-acetylaleuritolic acid, 5,2'- dihydroxy-7-methoxy-6,8-dimethylflavone (C-methylflavone), 5,7-dihydroxy-6,8-dimethylchromone (leptorumol) and long chain alcohols like stigmasterol, β -sitosterol, and their β - glucopyranosides^{16, 21}, 5-hydroxy- 2- methoxy benzaldehyde, p-

methoxybenzoic acid, and beta cyanin²¹, 3-acetyl aleuritic acid, 5-hydroxy-2-methoxy benzaldehyde, p-methoxy benzoic acid, and p-propoxy benzoic acid¹⁶. 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) ¹⁶. (Figure-1)



ETHNOPHARMACOLOGICAL AND TRADITIONAL USE

The dried plant is reportedly used against throat troubles and anti-fungal agent. The plant is alexiteric, analgesic, stomachic, laxative, alterative; cures “Kapha,” bronchitis, “Vata,” piles and ascites. 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 blindness. The root is cathartic, abortifacient with mild irritant properties. The administration of root cures many diseases like jaundice, strangury, and dropsy, antipyretic, analgesic, spasmolytic and anti-inflammatory activity. Recent studies have investigated that the leaves are potentially hepatoprotective, nephroprotective, anthelmintic, antioxidant antihypertensive and hypolipidemic activity. The leaves are diuretic and applied in the treatment of edema, jaundice, strangury and dropsy. A decoction of the herb is used as a vermi fuge and is useful in rheumatism; it is considered an antidote to alcoholic poisoning. 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 Islands.

PHARMACOLOGICAL ACTIONS

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 blindness²¹. 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**.

Pharmacological uses mentioned in Unani text:

Md Shafat Karim et al., 2015 reported several uses of *Trianthema portulacastrum* Linn plant as unani medicine, as Its decoction induces diuresis and menstruation, and also used in thoracic pain (due to *balgham*), stomach pain (due to coldness) and in expulsion of *reyah* (gas) from stomach. Its extract is *habis shikam* (constipating) and useful in cholera. A *zamad* (paste) made from its oil with sirka and sonth (*Zingiber officinale*) and applied locally in the early stage of ascites and anasarca. Its oil is very effective in case of joint pain. Its decoction is used for bathing the infants to grow and walk earlier, massage of its oil has the same effect. Beneficial in *balghami wa saudavi* diseases, hepatitis, inflammation of spleen and uterus and also useful in cough. Leaves of Biskhapra pounded along with black pepper subsides inflammation when applied over the affected part. 6-9 ratti (750-1125 mg) of root powder is very useful in periodic attack of fever (*tape balghami* or *tape saudavi*) used before the onset of fever, it subsides fever within 2-3 days. Pounded alone or with wine or *Tukhme Khayar* (seed of *Cucumis sativus*) is useful in pain of urinary bladder. Fresh juice of the leaves is useful in *kalaf* (black spot), when applied locally. Its decoction is used in eye diseases like cataract and night blindness. Application of its expressed extract over the site of scorpion bite relieves from pain and irritation. ^[22-25]

Table 1: Pharmacological Uses of *T. Portulacastrum*

| Category | Type of extract | Control | Reference |
|--------------------------------|--|---|-------------------------|
| Antioxidant | Ethanollic extract | Paracetamol And Thioacetamide | Kumar G et al., 2005 |
| | Methanolic extract | ascorbic acid | Anchuri SS et al., 2010 |
| | Hydrolysates of <i>T. portulacastrum</i> in acidified methanol | | Yaqoob S et al., 2014 |
| Anti microbial activity | Methanolic, Aqueous, and Chloroform extracts of <i>T. portulacastrum</i> | <i>Pseudomonas aeruginosa</i> , <i>Staphylococcus aureus</i> <i>Klebsiella pneumoniae</i> , <i>Salmonella typhi</i> , <i>Shigella flexneri</i> and <i>Escherichia coli</i> . | Kavitha D et al., 2013 |
| | Ethanollic extract of the whole plant of <i>T. portulacastrum</i> | Against Gram-positive organisms. | Vohora SB et al., 1983 |
| Anti fungal activity | Methanolic and Chloroform extracts of <i>T. portulacastrum</i> | <i>Aspergillus spp</i> , <i>Candida albicans</i> and <i>Rhizopus oryzae</i> | Kavitha D et al., 2013 |
| | Chloroform extraction of <i>T. portulacastrum</i> | Invitro, miconazole and ketoconazole | Nawaz HR et al., 2001 |
| Anthelmintic activity | Crude aqueous Methanolic extract <i>T. portulacastrum</i> | | Hussain A et al.,2011 |

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|---|---|-------------------------------|-----------------------------|
| Anti inflammatory | Ethanollic extract of the whole plant of <i>T. portulacastrum</i> | Indomethacin | Kendri SS et al.,2015 |
| Analgesic activity/ antinociceptive activity | Ethanollic extraction of <i>T. portulacastrum</i> whole plant | Acetic acid and Aspirin | Shanmugam SK et al., 2007 |
| | Ethanollic extract of <i>T. portulacastrum</i> | acetic acid | Vohora SB et al, 1983 |
| Antipyretic activity | Ethanollic extract from <i>T. portulacastrum</i> | sodium salicylate. | Vohora <i>et al.</i> , 1983 |
| Antihyperglycemic effects | Methanollic extracts of whole plant <i>T. portulacastrum</i> | Streptozotocin | Shyam Sunder A et al.,2009 |
| | Methanollic extract of <i>T. portulacastrum</i> | Alloxan | Anreddy RNR et al., 2010 |
| Antifertility activity | Aqueous, Chloroform, and Alcoholic extracts of <i>T. portulacastrum</i> stem, leaves, and roots | ----- | Pare S et al., 2013 |
| Diuretic properties / anti lithiatic effect | Crude aqueous extracts of <i>T. portulacastrum</i> [| Furosemide | Asif M et al., 2013 |
| | Ethanollic extracts of <i>T. portulacastrum</i> | ----- | Sree Lakshmi K et al., 2014 |
| Hepatoprotective effects | Ethanollic extract of <i>T. portulacastrum</i> | Paracetamol and Thioacetamide | Kumar G et al., 2004 |
| | Ethanollic extract of <i>T. portulacastrum</i> | Carbon tetrachloride | Sarkar A et al.,1999 |

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|---------------------------------|--|---------------------------|------------------------------|
| | Ethanollic extract of <i>T. portulacastrum</i> leaves | Aflatoxin | Sharmila Banu G et al., 2009 |
| | Ethanollic extract of <i>T. portulacastrum</i> leaves | Aflatoxin | Sharmila Banu G et al., 2009 |
| | Methanollic extract of <i>T. portulacastrum</i> | atherosclerotic diet | Shyam Sunder A et al., 2010 |
| | Ethanollic extract of <i>T. portulacastrum</i> | Carbon tetrachloride | Mandal A et al., 1998 |
| | Ethanollic extract of <i>T. portulacastrum</i> | Carbon tetrachloride | Mandal A et al, 1997 |
| | Ethanollic extract of <i>T. portulacastrum</i> | Carbon tetrachloride | Bishayee A et al.,1996 |
| Nephroprotective effects | Ethanollic extract of <i>T. portulacastrum</i> | gentamicin | Balamurugan G et al., 2009 |
| | Ethanollic extract of <i>T. portulacastrum</i> | adriamycin | Karim SM et al.,2011 |
| Anticarcinogenic effect | Aqueous, Chloroform and Ethanollic extract of aerial parts of <i>T. portulacastrum</i> | diethylnitrosamine (DENA) | Chatterjee M et al., 1998 |
| | Chloroform and Ethanollic extract of aerial parts of <i>T. portulacastrum</i> | diethylnitrosamine (DENA) | Bhattacharya S et al., 1999 |

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|------------------------------|--|---------------------------------------|-----------------------------|
| | Chloroform and Ethanol extract of aerial parts of <i>T. portulacastrum</i> | diethylnitrosamine (DENA) | Bhattacharya S et al., 1998 |
| | Ethanol extract of <i>T. Portulacastrum</i> . | 7,12-dimethylbenz(a)anthracene (DMBA) | Mandal A. et al., 2014 |
| Larvicidal properties | Crude aqueous and Acetone extracts of <i>T. portulacastrum</i> leaves | - | Singh SP et al., 2011 |

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