



# A systematic review of randomized controlled trials on the efficacy of purslane for the treatment of systemic disorders

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## Abstract

Purslane or *Portulaca oleracea* L. is traditionally used as a nutritious food across the globe. Various phytochemical studies have demonstrated the presence of numerous nutrients in this plant ranging from its leaves, flowers to the seeds. The aim of the present systematic review is to evaluate the experimental evidence to support the use of purslane as the primary therapy systemic diseases and disorders. The systematic review was performed as per the PRISMA guidelines. Searches were performed in PubMed/Medline, Scopus, EMBASE, and Cochrane Library databases up to June 2022. Of the 5 studies conforming to the inclusion and exclusion criteria, 4 studies demonstrated statistically positive results to the administration of purslane. According to the studies examined in the present systematic review, the administration of purslane may be useful in attenuating several aspects of systemic disease. The efficacy of purslane as a therapeutic agent is attributed to its potent antioxidants and anti-inflammatory activities.

**Keywords:** Diabetes mellitus”, “Fatty liver”, “Oral lichen planus”, “Recurrent aphthous ulcer”, “Phytochemicals”, “Purslane”

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## 1. Introduction

The products obtained from nature have been used from time immemorial in folk medicine for several health purposes. One among them, purslane is gradually garnering an increased interest due to its varied pharmacological actions. Commonly known as purslane, *Portulaca oleracea* L. is distributed all over the world and easily grows in diverse soil and climatic conditions. It has been traditionally used as a nutritious food across the globe[1]. The phytochemical studies demonstrated that purslane is one of the most abundant terrestrial sources of  $\omega$ -3 and  $\omega$ -6 fatty acids, ascorbic acid, tocopherols, glutathione and  $\beta$ -carotene advocating its prospects pertaining to nutrition. It is purported that per 100 g of fresh weight leaves comprise approximately 300–400 mg of alpha-linolenic acid, 12.2 mg of  $\alpha$ -tocopherol, 26.6 mg of ascorbic acid, 1.9 mg of  $\beta$ -carotene, and 14.8 mg of glutathione. Additionally, it is an important source of specialised metabolites like alkaloids,

catecholamines, phenolic acids, anthocyanins, flavonoids, lignans, terpenoids and betalains [2,3].

## 2. Action and pharmacology

A list of possible versatile actions of purslane include anti-inflammatory, antidiabetic, skeletal muscle relaxant, hepatoprotective, anticancer, antioxidant, anti-insomnia, analgesic, gastroprotective, neuroprotective, wound healing and immunomodulation[2]. Other actions include treatment of abnormal uterine bleeding, diuretic, antiscorbutic, antipyretic, antiasthma, anti-inflammatory and antitussive uses[4].

## 3. Mechanism of action

The various action mechanisms of purslane may be understood by reviewing research findings on some of the compounds observed in it. It is beyond challenging to delve into the mechanism of actions of multiple or all the present compounds at a time. The anti-inflammatory action is

bought about by the polysaccharides within *P. oleracea*, which down regulate the inflammatory cytokines like TNF, IL-1 and IL-6 and nitric oxide. Specifically, an animal study attributed this action to Oleracone, a novel alkaloid carrying the ability of quick distribution and bioavailability. Also, the aqueous extract of Purslane (AP) inhibits the intracellular free radical production and NF- $\kappa$ B activation as well as the reduction of adhesion molecule expression in TNF- $\alpha$ -induced HUVEC. It exerts an overall protective function against vascular inflammation and injury [5,6]. Purslane additionally, upregulates anti-inflammatory cytokines production. The complexes of polysaccharides extracted from aerial parts of the plant stimulate CD4 /CD25 and CD8 /CD25 (human T-cells), CD14 and CD64 cells (activated phagocytes) and elevates IL-6 production.<sup>1</sup> The immune stimulatory action comes into play by the anti-inflammatory action. And the AP prevents oxidative DNA damage to human lymphocytes, thereby exerting an antioxidative action [5,6]. (Table 1- Important phytochemicals in purslane)

## 4. Methodology

### 4.1. Search strategy

We systematically searched Scopus, PubMed, Embase, and Cochrane Library up to June 20th, 2022, for published clinical studies examining the use of purslane in medical management of systemic disorders. The systematic review was conducted in accordance with the PRISMA statement guideline. The search terms or text terms were: (purslane OR *Portulaca oleracea* L. OR oral mucosa or medical disorders). The searches were filtered to include only randomised controlled clinical trials written in English on human subjects and using purslane as a primary agent. In addition, relevant articles were manually searched.

### 4.2. Study selection

Two independent reviewers screened the abstracts and titles for eligibility. The full text of the articles was assessed when the two reviewers ascertained that the abstract or title represented a potentially relevant study. The reviewers critically evaluated the methodology and results of the included studies. The data were extracted independently, and discrepancies were adjudicated by consensus.

### 4.3. Eligibility Criteria

The studies were screened according to the following inclusion criteria: (a) human clinical trials; (b) evaluation of topical or oral products containing purslane consumption with reports on ingredients; (c) independent data from the original papers and sufficient information to calculate the outcomes.(d) the population comprised if individuals over 18 years of age.(e) The selected population was free of additional systemic diseases and not on any medication.(f) The selected population suffered from medical disorders. Studies were excluded if they (a) were not original articles (e.g., review, case report, or comments); (b) were not human studies (e.g., animal study or in vitro study); (c) were duplicate publications; (d) were articles without the necessary information; or (e) were not published in English.

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## 5. Results

We initially identified 57 eligible studies using the aforementioned search strategy. Excluding duplicates, 37 titles and abstracts remained for further screening. After title/abstract screening and text study, 5 studies consistent with the study scope were included. Both these studies were carried out on humans in which systemic or topical purslane was administered. (Fig. 1: Schematic flowchart depicting article selection and Table 2: The characteristics and main outcomes of the included studies tabulated below.)

## 5. Discussion

To the best of our knowledge, this is the first systematic review of the literature evaluating the impact of purslane on various aspects of medical disorders. Based on the results of clinical trials, purslane has been reported to effectively improve the inflammation and ulceration. The lines of evidence support this assertion, which are discussed below. In a study by Agha-Hosseini et al, a randomized double-blind placebo-controlled clinical trial was conducted for the efficacy of purslane in the management of oral lichen planus (OLP). OLP is a relatively common autoimmune oral mucosal disorder demonstrating inflamed squamous epithelium with an unknown etiopathogenesis. Its symptoms include debilitating burning sensation when consuming food and multiple areas of atrophy, erosion and ulcers on the mucosa. The buccal mucosa, tongue and lips are the most predominant areas of disease manifestation with characteristic white striae termed Wickham's striae. The study comprised of two groups who were administered 235mg capsule of alcoholic extract of purslane leaves (n=20) and a placebo (n=17) respectively. Approximately 83% of the purslane patients showed partial to complete clinical improvement. It was to be noted that no patients demonstrated any worsening of symptoms. No side effects were noted during the study period or in the follow up period of 6 months. The authors attributed the healing effect to the antioxidant activity of melatonin, anti-inflammatory and anti-cancer effects of omega3 fatty acids within purslane.<sup>7</sup> The limitation in this study was the lack of inflammatory or antioxidant marker recording, and the healing was subjective to both the patients and observers [17].

A study by Mohammadzadeh et al, a randomized, placebo-controlled, triple-blinded, clinical trial evaluated the efficacy of purslane in recurrent aphthous stomatitis (RAS) management. RAS is a common oral ulcerative inflammatory disorder of unknown etiology, characterized by painful, round or ovoid ulcers with circumscribed margins, white-grey pseudo membrane and erythematous haloes in non-keratinized mucosa specially the lips, the wall of the cheeks, soft palate and ventral surface of the tongue and floor of the mouth. The study group comprised two groups was administered 235mg capsule of alcoholic extract of purslane leaves and seeds (n=25) and placebo (n=25) respectively for 3 months. 96 % patients in the intervention reported improvement in pain over various degrees. The intervention group experienced longer intervals between lesion recurrence and a decrease in healing duration in comparison. The study also estimated the antioxidant levels in the blood through total antioxidant status (TAS) and super

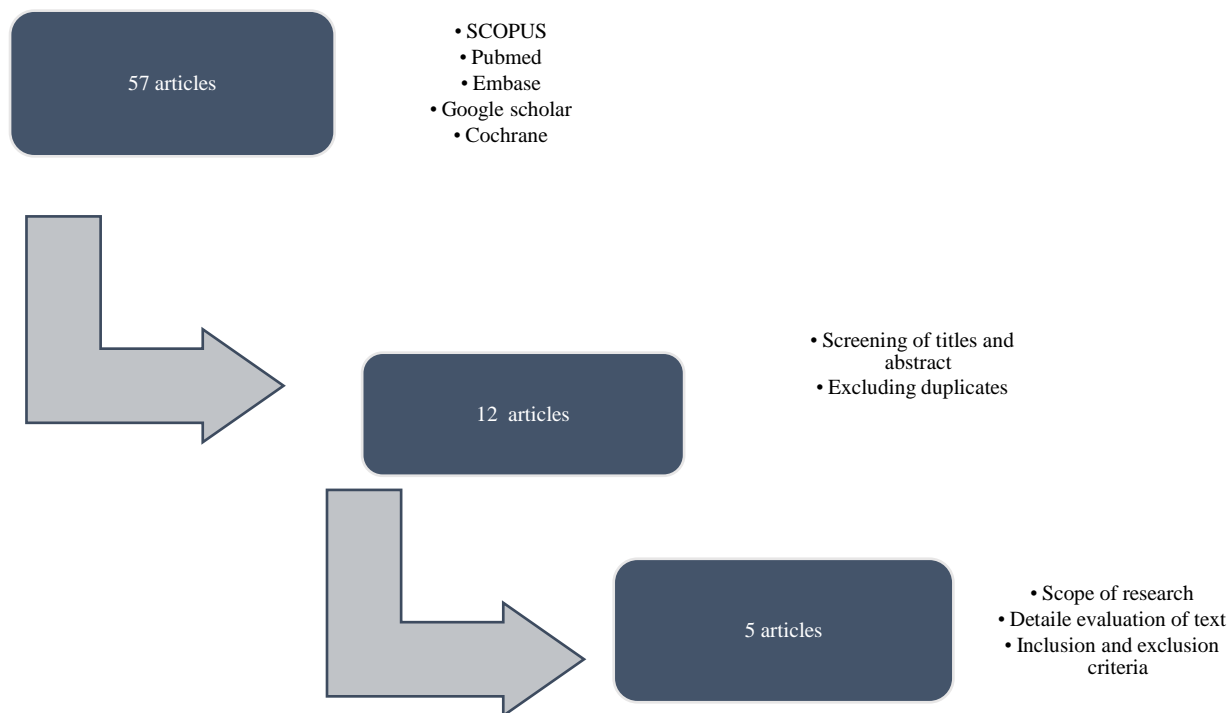
oxide dismutase (SOD) and glutathione peroxidase (GSHPx). Also, the change in the number of lesions over the follow up sessions was recorded. Both the values, however, were statistically insignificant. The researchers also pointed to the absence of adverse effects during the course of use of intervention among patients [18].

A study by Niazi et al, a randomized, double-blinded, clinical trial evaluated the efficacy of purslane cream in breast fissures developed during lactation. Nipple fissure is a disorder caused due to repeated irritation by baby sucking and exposing to the baby's oral flora. The main symptoms include pain and bleeding eventually causing stoppage of natural feeding, detrimental to a newborn baby's health. The study group comprised of 86 lactating women with nipple fissure, divided into two groups: 43 in purslane cream group and 43 in lanolin ointment group. The pain and symptom scale of nipple fissure before the intervention and on the third and eighth day after the study was measured. The conclusion drawn was that the group treated with

purslane cream showed a significant decrease in symptoms at the third day and eighth day. And the recovery process occurred faster in the purslane group. Also, no adverse effects were demonstrated during the study course [19]. In a study by Damavandi et al. on the effect of systemic purslane on patients with non-alcoholic fatty liver disease was assessed. It was a randomized double-blinded clinical trial comprising 74 patients receiving 300 mg purslane extract or placebo capsules for 12 weeks. However, no significant changes were observed in liver steatosis grade, insulin, liver enzymes, total bilirubin, lipid profile, and blood pressure among the study groups [20]. A study by Sabzghabae et al. researched the effects of powdered purslane seeds on the lipid profile obese adolescents. A dose of 500mg of the said compound was administered orally twice daily to the study group and a placebo to the control group. A statistically significant improvement was noted in the serum lipid profiles of the purslane group and the absence of adverse effects were commented upon [21].

**Table 1:** Important phytochemicals in purslane

Component	Action	Reference
Alkaloids	Cytotoxic activity against cancer cells Antioxidant activity Antidiabetic activity Neuroprotective activity Anticholinesterase activity	Tian et al. [7] Yang et al. [8] H. Roozi, M.N.A. Bojar, V. Eidi, K.N.R. Ali.[9] Sun et al. [10] Xiu et al. [11]
Catecholamines	Neuroprotective activity	Martins et al. [12]
Flavanoids	anti-oxidative activity anti-inflammatory activity antitumor activity antiviral activity antibacterial activity	T.P.T. Cushnie, A.J. Lamb.[13]
Homoisoflavanoids	Anti-inflammatory activity	Siddaiah et al. [14]
Lignans	Antioxidant activity	Ma et al. [15]
Fatty acids	Nutraceutical property	Uddin et al. [16]



**Fig. 1:** Schematic flowchart depicting article selection

**Table 2:** The characteristics and main outcomes of the included studies tabulated below.

Sl no:	Author,Year,Country	Study	Purslane origin	Dose	Route	Duration	Oral mucosal disorder	Finding
1	Agha-Hosseini et al,2010,Iran	Human	Iran	235mg	Oral	3 months	OLP	Reduced symptoms
2	Mohammadzadeh et al,2013,Iran	Human	Iran	235mg (twice daily)	Oral	3months	RAS	Reduced symptoms
3	Niazi et al.2019	Human	Iran	2 % cream	Topical	2 weeks	Breast fissure in lactation	1.Reduced symptoms 2.Faster recovery
4	Damavandi et al.2020	Human	Iran	300mg	Oral	12 weeks	Non-alcoholic fatty liver disease	No significant changes noted
5	Sabzghabae et al.2014	Human	Iran	500mg	Oral (twice a day)	1 month	Obese adolescent	Total cholesterol, triglycerides, and LDL: reduction

## 6. Conclusions and future directions

According to the studies examined in the present systematic review, the administration of purslane may be useful in attenuating several aspects of systemic disease. The studies also demonstrate the various aspects of the plant seem to have equally promising effect; from the seeds to the leaves. The evidence in effective and complete disease eradication is meagre but in the broad range of medical aspects hold much potential if developed and researched further. The efficacy of purslane in disease management of different aetiologic origin might be attributed to its potent antioxidants and anti-inflammatory activities. However, in future studies, extraction of a particular phytochemical compound and the study of its effect on the disease profile is advocated. This discovery may prompt further uses of the drug even perhaps as a prophylactic agent in patients prone to certain disorders.

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