

## MINI REVIEW

# Pharmacological and therapeutic potential of *Oxalis corniculata* Linn.

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## ABSTRACT

*Oxalis corniculata* is commonly known as Indian wood Sorrel. In Unani it is called as Hummaz and distributed in the whole northern temperate zone, United State of America, Arizona and throughout India. *Oxalis corniculata* is used in Unani medicine in the management of liver disorders, jaundice, skin diseases, urinary diseases etc. The plant been proven to possess various pharmacological activities like liver tonic, appetizer, diuretic, anthelmintic, emmenagogue, anti-inflammatory, analgesic, anti-pyretic, blood purifier etc. Here we summarize the therapeutic potential of *Oxalis corniculata*.

**Keywords:** Hummaz, Unani medicine, *Oxalis corniculata*, Indian wood sorrel

## Introduction

*Oxalis corniculata* Linn. is a well-known plant described in ancient text of Unani physician by the name of Hummaz. It belongs to the family Oxalidaceae which comprises 8 genera and 900 species being prevalent in the tropics and subtropics and having richest representation in Southern Hemisphere. In India 2 genera and a dozen of species have been reported. It has delicate-appearance, low growing and herbaceous plant. Some varieties have green leaves, while other has purple viz. *Oxalis corniculata* var. *atropurpurea*.<sup>1</sup> The leaves of *Oxalis corniculata* are quite edible with a tangy taste, it is well known for its medicinal value and as a good appetizer.<sup>2</sup>

The name *Oxalis* is derived from the Greek word 'Oxys' meaning sour, in reference to the sour flavour of the leaves known as Creeping Wood Sorrel. The Latin species name *corniculata* means horned and refers to the appearance of the fruits. This plant is called Amlalonika and Changeri in Sanskrit, and is considered by the Hindus to be cooling, refrigerant and stomachic. The fresh juice is given to relieve intoxication from *Datura* and said to be useful in the treatment of dysentery and prolapse of the rectum. In Madras Presidency, the fresh herb made into a poultice with hot water is used as a healing application to various eruptions. Ainslie describes it and mentions its use as a cooling medicine in doses of two teaspoonful twice a day.<sup>3</sup>

## Therapeutic uses

Bustani Hummaz (garden variety) is beneficial in the treatment of safrawi amraz (bilious diseases). Gargling with decoction of its leaves relieves marze akala (stomatitis), it has beneficial effect in treating bilious vomiting, and palpitation. Its lotion is used as a wash for snake bite, the decoction of leaves is used in treatment of Khanazir (cervical lymphadenitis) and paste of leaves is used to treat skin diseases like Quba (ringworm), Shiqaqe Nakhun and Dakhas (Koilonychia). Its local application with vinegar is useful in ailment of Azme tehal (splenomegaly). It is also useful in treating Qarahe Isnaa shari (duodenal ulcer) and diarrhoea if cooked in Raughane Zaitoon (Olive oil) with Zeera (Cumin seed), Kishneez (Coriander seed), and Anardana (Pomegranate). It is used in Bars (leucoderma) and Qarahe Shahdia along with Rose oil and Saffron. The juice of leaves is Mukhrije Sang Gurdah wa Masana (lithotripter). It is one of the best remedy for treating Gaseeyan wa Safravi Qai (nausea and bilious vomiting), Pica (eating soil and chalk habit), Alcoholism (Wine addiction), Yarqan (Jaundice), Warme Muzmin (chronic inflammation), Ehtebase tams (Amenorrhoea), Wajae Dandan (toothache), Illate Tahrike Mevi (Irritable bowel syndrome), Wajaul uzn (Otitis media), Warme Meda (Gastritis) and Gazeedane Aqarab (scorpion sting). The great Unani physician Ibne Sina (Avicenna) said that hummaz is useful in management of cuts, wounds, swelling, insect

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stings, snakebite, corns, dysentery, fever, rickets and stomach-ache.<sup>4</sup>

Leaves of Jungali Hummaz (wild variety) are beneficial in bilious diarrhoea and abdominal pain. The mizaj (temperament) of hummaz is Barid (cold), application of paste of whole plant is very useful in treating gout and arthritis caused by excessive heat. A paste is made with its leaves and root of Karela (*Momordica charantia*) or seeds of gogul (*Commiphora mukul*) with Raughane mom (wax) and applied externally on pile mass, both are beneficial and cure it. Externally the application of paste of whole plant is effective in reducing warme har (inflammation) and pruritus.<sup>5</sup>

### Pharmacological actions

A wide range of pharmacological actions of *Oxalis corniculata* Linn. have been reported in ethno botanical literature such as antibiotic, antiviral, anti-allergic and anti-septic. Its anti-inflammatory, analgesic, antipyretic, antioxidant activities have also described. It purifies blood and acts as diuretic, lithotriptic and emmenagogue. It increases appetite and has anti-amoebic, anti-diarrheal, and anthelmintic properties. Hummaz is tonic to heart and liver and has refrigerant, astringent, vermifuge, laxative, and anaphordisiac properties.<sup>6</sup>

**Wound healing activity:** The alcoholic and petroleum ether extract of whole plant has been evaluated for its wound healing activity by using excision, re sutured incision and dead space wound models in rats. The result showed significant wound healing activity by producing an increase in wound contraction rate, wound breaking and significant decrease in epithelization period.<sup>7</sup>

**Cardio relaxant and cardio protective activity:** In anaesthetized rats, a fall in diastolic blood pressure with a lesser fall in systolic blood pressure was also observed.<sup>8</sup> Aqueous extract has been proved to be cardio protective in experimental model of myocardial infarction induced by isoproterenol (ISO) in rats.<sup>9</sup>

**Antioxidant and anti-inflammatory activity:** Sachin et al. (2010) reported in vitro anti-inflammatory activity of methanolic extract of *Oxalis corniculata*.<sup>10</sup> In another study, its anti-oxidant effect was observed.<sup>11</sup> One more study was done to evaluate its antioxidant activity using

free radical scavenging activity of 1,1-diphenyl-2-1,1-diphenyl-2-picrylhydrazyl radical, total anti-oxidant capacity by phosphomolybdenum method using ethanolic extract of whole plant (500 µg/ml, po). The extract significantly reduced 1,1-diphenyl-2-picrylhydrazyl radical and reduced (62.7%) malondialdehyde levels of murine hepatic tissue. The anti-oxidant potential was found to be comparable to that of standard ascorbic acid.<sup>12</sup> Reddy et al. (2010) also conducted a detailed evaluation of anti-oxidant activity and found positive results.<sup>13</sup>

**Antitumor activity:** Antitumor activity of ethanolic extract of *Oxalis corniculata* against Ehrlich ascites carcinoma on Swiss mice was carried out. Ethanolic extract at the doses of 100 and 400 mg/kg significantly ( $p < 0.05$  and  $p < 0.01$ ) reduced tumor volume and packed cell volume in a dose dependent manner as compared to that of the control groups. This study showed that the ethanolic extract of *Oxalis corniculata* was effective in inhibiting the tumor growth in ascetic and solid tumor models.<sup>11</sup>

**Anti-epileptic activity:** A study was performed to evaluate the antiepileptic activity of methanol extract of leaves of *Oxalis corniculata* L. (MEOC) on Maximal Electroshock (MES) and pentylenetetrazole (PTZ) induced seizures models in Wistar rats. Animals were pretreated with MEOC at the doses of 200 and 400 mg/kg body weight. In MES model MEOC showed significant reduction in duration of hind leg extension with 200 mg/kg and duration of hind leg extension was dramatically reduced with 400 mg/kg. While in PTZ induced rats MEOC significantly reduced the duration of convulsion and delayed the onset of clonic convulsion. A dose dependent results were obtained in PTZ model by delayed the onset of clonic convulsions. The complete protective effect against mortality was reported in both the tests.<sup>14</sup>

**Hepatoprotective activity:** Anil et al.<sup>15</sup> reported hepatoprotective activity of *Oxalis corniculata* leaves against Carbon tetrachloride induced hepato toxicity in female Wistar rats. The aqueous extract (500 mg/kg) significantly reduced carbon tetrachloride induced damage in the liver which is measured by the serum level of aspartate aminotransferase (AST), alanine aminotransferase (ALT), alkaline phosphatase (ALP) and bilirubin.

Another study was carried out by Nadeem et al.<sup>16</sup> to evaluate the hepatoprotective activity of *Oxalis corniculata* against carbon tetrachloride (CCl<sub>4</sub>) and phenyl hydrazine hydrochloride (PHH) induced hepatotoxicity. Hydro-alcoholic extract of test drug in the dose of 200 mg/kg and 400 mg/kg was used and silymarin (100 mg/kg) was used as a standard drug. In acute test hepatotoxicity was induced by single dose of CCl<sub>4</sub> (1.25 ml/kg) and the animals were treated with 5 doses of test drugs at 12 hours, while in chronic test the animals were treated with test drug in both the doses and CCl<sub>4</sub> (0.7 ml/kg) simultaneously daily for 7 days. Hemolytic jaundice was induced by administration of PHH (14 mg/kg, ip) for 5 days with simultaneous administration of test drug in both the doses. Significant reduction in biochemical markers AST, ALT, ALP and bilirubin and improvement in histopathological features of liver was observed in Hummaz treated groups. On the basis of results it was concluded that hydroalcoholic extract of Hummaz is able to counter act the hepatotoxic effect induced by CCl<sub>4</sub> and PHH .

Another study was done to evaluate anti-oxidant and hepatoprotective activity of *Oxalis corniculata* against paracetamol induced hepatotoxicity in Wistar rats. Rats pre-treated with *Oxalis corniculata* (100 mg/kg) for 4 days showed significant reduction in the serum enzymes such as glutamate pyruvate trans aminase, alkaline phosphatase and serum bilirubin showed almost normal histological liver architecture of the treated group, indicating hepatoprotective potential of *Oxalis corniculata*.<sup>17</sup>

**Anxiolytic activity:** The anti-anxiety effect of ethanolic extract of *Oxalis corniculata* (EEOC) in Swiss albino mice using the open-field, elevated plus-maze and anti-fighting tests was examined. After oral administration of EEOC (100 and 300 mg/kg), each mouse was put in a corner of the open-field with dimensions of 92 cm x 92 cm with 16 squares division and observed for 15 min in three min periods. During the test period, the number of squares crossed, the time spent in and total faecal pellets were recorded. A significant increase in the number of squares crossed, but significantly decreased both the immobility and fecal pellets were observed in test groups when compared with control. The plus-maze with two closed arms and two open arms measuring 25 x 5 cm and height 30 cm elevation 25 cm from the

floor in a dimly illuminated room was used. Male mice were placed individually in the center of the maze, facing an enclosed arm and the time spent on the open and closed arm were recorded during the next 5 min. An arm entry was defined as all four feet in the arm. It was observed that 100 and 300 mg/kg of EEOC significantly increased the number of entries, and also time spent. In fighting test, Pairs of male mice were placed under a glass beaker on a grid constructed of stainless steel rods. Foot shocks of 2-mA intensity were delivered for 3 min and the frequency of fighting episodes was noted. Mice that showed 5 or more fighting episodes were selected for this study. The mice pairs were re-tested after drug treatments and fighting episodes were recorded during the 3 min observation period. *Oxalis corniculata* (100 and 300 mg/kg) decreased the fighting episodes significantly when compared with control mice. In addition these results were found to be consistent with anxiolytic effect produced by diazepam.<sup>18</sup>

**Hypolipedemic activity:** The hypolipidemic and antioxidant activities of leaves of *Oxalis corniculata* were evaluated. Hyperlipidemia was induced in rats by high fat diet consisting of coconut oil and vanaspati ghee, in a ratio of 2: 3 v/v at a dose of 10 ml/kg. The extract was given at a dose of 500 mg/kg showed a significant decrease in total cholesterol, triglycerides, low density lipoprotein (LDL) and Malondialdehyde (MDA) in blood. On the other hand, high density lipoprotein (HDL), catalase (CAT) and Superoxide dismutase (SOD) were increased significantly.<sup>19</sup>

**Anti-ulcer activity:** The anti-ulcer activity of aqueous and ethanolic extracts of *Oxalis corniculata* was investigated in Wistar adult albino rats. Results showed that *Oxalis corniculata* at dose of 400 mg/kg has reduced ulcer incidence when compared to the standard drug omeprazole (20 mg/kg po). There was decrease in gastric volume and reduction in free and total acidity in the animals treated with extracts in pylorus ligated rats. The antiulcer activity may be due to the presence of flavonoids, tannins, terpenes, steroids, saponins, alkaloids and glycosides in extract.<sup>20</sup>

**Anti-nociceptive activity:** Ethanolic extract of *Oxalis corniculata* Linn. at doses of 200 and 400 mg/kg has been evaluated for its anti-nociceptive activity in diabetic neuropathy in rats. Diabetic

rats showed significant reduction in tail flick latency by 49% in hot water tail immersion test and decreased paw withdrawal by 47% in hot plate test by the end of 5th week of study.<sup>21</sup>

### Concluding remarks

*Oxalis corniculata* is an important medicinal plant which has both medicinal as well as nutritional uses. This article briefly reviews the traditional knowledge and ethno medicinal reports on therapeutic activities of *Oxalis corniculata* Linn. The phytochemical and pharmacological studies of this plant provide a scientific basis for its therapeutic use.

This review is an attempt to provide well assembled scientific data on *Oxalis corniculata*. It is expected that this review will attract attention towards medicinal potential, application and commercialization of various phytochemical and pharmacological profiles of *Oxalis corniculata*. It is used for the treatment of several diseases, considering these facts many scientific studies were carried out. Thus the above findings clearly indicate that the traditional use of Hummaz has a logical and scientific basis. Large scale clinical studies are needed to prove the clinical efficacy of this *Oxalis corniculata* and its bioactive components.

### Conflict of Interest

None

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