The Raf is originally cactus featured plant that *Opuntia humifusa* grows near the ground surface of tropical and arid parts the world (et al., 2006). The various parts of plant abundantly filled with nutritionally edible components and classically used for its known biological properties. Due its chemical compositions the plant is therapeutically practiced to treat both local, chronic diseases acting as boon for mankind. The plant exhibits various phenolic derivatives, antioxidants like ascorbic acid, gallic acid, Vanillic acid, p-coumaric acid, ferulic acid, syringic acid, 4-hydroxybenzoic acid, protocatechuic acid, salicylic acid, caffeic acid, gallic acid, etc., compelled the plant to use to its maximum utility. The isolated phytoconstituents of plants such as flavonoids, polyphenol, and ascorbic acid proved for its antioxidant property and also, the plant possesses other components particularly calcium, minerals, amino acids, etc. The different parts of plants were preclinically tried and conformed to the potency of the therapeutic strategy of a plant. The important pharmacological properties especially anticancer, antifungal, antihypertensive, antiulcer, antimicrobial, antiatherosclerosis, hepatoprotective, type-2 diabetes, and coronary heart diseases have been proved the plant as traditionally and medicinally important. hence the present review was focused to collect and summaries the overall brief information on various parts of the plant *Opuntia humifusa*.raf based on chemical constituents, ayurvedic, modern usage, and its biological activities.

**Keywords:** Therapeutically, *Opuntia humifusa*, antioxidant, phytoconstituents, flavonoids

---

**Introduction**

The *Opuntia humifusa* Raf is originally cactus featured plant that grows near the ground surface of tropical and arid parts the world (Kim et al., 2006). The various parts of plant abundantly filled with nutritionally edible components and classically used for its known biological properties. Due its chemical compositions the plant is therapeutically practiced to treat both local, chronic diseases acting as boon for mankind. The plant exhibits various phenolic derivatives, antioxidants like ascorbic acid, gallic acid, Vanillic acid, p-coumaric acid, ferulic acid, syringic acid, 4-hydroxybenzoic acid, protocatechuic acid, salicylic acid, caffeic acid, gallic acid and also possesses pigmented carotenoids such as flavonoids, polyphenol- kaemperol, rutin, betalains. Opuntia aerial and underground parts have beneficial properties.

---

*Address for Corresponding Author:*
Prakash Dabadi
Department of Pharmacology, Bapuji Pharmacy College, Davangere-577 004. Karnataka, India
Email: prakashdabadi@gmail.com

*O. humifusa* possess aerial and subsurface parts of plants consisting of spines cladodes, flowers, fruits Glochids etc (Christiana et al., 2018). According to previous research reports, the Cactaceae family reported with 130 different genera and about 1500 various species, all of which are well adapted to the arid lands and a variety of climates and have become common for all the locations around the world (Alice et al., 2015). *O. humifusa* extract has been widely used for topical-cosmetic, biomedical, and as well as food-additive applications because to its excellent characteristics *O. humifusa* is well known for their high moisture, vitamins, minerals, antioxidant anti-inflammatory, hypoglycemic, anticancer, antifungal dermatitis, gastric ulcer, Antihypertension, antimicrobial, and anti-diabetes (Kyungmi et al., 2017; Ah-Ram Han et al., 2018). The *O. humifusa* extracts were found to effectively alter the expression of inflammatory cytokines. According to a recent study of *O. humifusa* plant reported with reduces the risk of disease like stroke, coronary heart disease, and obesity (Ah-Ram Han et al., 2010; Park et al., 2010).
Geographical Distribution
It is widely distributed in semi-arid countries throughout the world. It has been cultivated for a long time; it can be cultivated during a winter even with the temperature reaching below 20°C usually grows near the surface of ground. Some arid growth locations like Karnataka, Rajasthan, Tamilnadu. This biodiversity determines the component profile of each species as well as other factors such as growth locations prevailing climatic conditions and soil conditions (Jae Youl Cho et al., 2006; Christiana et al., 2018).

Identification of Opuntia humifusa plant
The prickly pear grows to a height of 6 feet or more and has the largest pad with white spines, measuring 8 to 16 inches long. It can be found all over the world especially near the desert regions. Plains prickly pear is a short, spreading variety native to the Rolling and High Plains regions.

Morphological Characters of Opuntia humifusa
In general, O. humifusa is a low, decumbent plant although it can reach heights of 30 to 40 cm during the growing season when the cladodes are turgid. Depending on the amount of suitable habitat, it develops small to enormous populations (>5 hectares).

Cladodes
Cladodes are lime to dark green in colour, and as they mature, they become cross-wrinkled. During the winter months or when there is a water shortage, Cladode sizes vary widely depending on the environment. The length, width, and height range from 3.1 to 8.5 (17.7) cm, 2.0 to 5.2 (9.0) cm, and 4 to 10 cm, respectively. The thickness is 19 mm. Obovate, ovate, orbicular, and elliptical are some of the shapes available. The major chemical constituents found in cladodes are Gallic acid, Coumaric acid, 3,4-dihydroxybenzoic, 4-hydroxybenzoic acid, Ferulic, Salicylic, Vanillic Syringic, Synaptic acids, Protocatechuic acid, etc. Phenolic acids - Gallic acid, Coumaric acid, 3,4-dihydroxybenzoic, 4-hydroxybenzoic acid, Ferulic, Salicylic, Vanillic Syringic, Synaptic acids, Narcissin Terpenoid volatiles (Taxonomic revision of the Opuntia humifusa complex (Opuntiaeae: Cactaceae) of the eastern United).

Fruits
The fruits are juicy, elliptical in shape, and edible this fruit is developed into reddish pink colour and it is around 7cm in length. According to the study the total amounts of vitamin C and polyphenol in O. humifusa fruits were found to be much higher than in other plant parts comparatively root, cladodes, and seeds. The fruit encompass Betanin, isobetanin, betanidin, isobetanidin, and phylloclactin are among the betalains found in cactus pear fruits, as well as minerals, amino acids, flavonoids, and phenolic acids (ferulic acid, syringic acid, and caffeic acid). Flavonoids Rutin Isorhamnetin Myricetin Quercetin Kaempferol Luteolin Glycosides of isorhamnetin Glucosides of kaempferol (Park et al., 2011).

Root
Cactus pear is a shallow-rooted crop with a fleshy root coating. The spines appear light cream, light yellow, or even colourless when this is rubbed off (e.g., after a hurricane). Depending on the age of the cladode from which it is created and the areole from which it is produced, spines can be upright, spreading, or some what collapsed. Spines can become deflexed and appressed to the cladode if another cladode or flower is formed from the same areole. (Taxonomic revision of the Opuntia humifusa complex (Opuntiaeae: Cactaceae) of the eastern United.)

Glochids
Glochids come in a variety of colours, including pale yellow, brown, and even colourless. As a result of exposure to external stimuli, glochids darken with age (sunlight). The glochids of plants growing in a greenhouse were virtually blackened by a terrestrial alga. This has also been proved in natural populations. There will almost probably be glochid colour misinterpretations as a result of this. Glochids can grow to be up to 6 mm in length (Ecology of eastern prickly pear cactus (Opuntia humifusa) in oak openings preserve).

Flowers
The inner tepals of this type are completely yellow. On the outside, the tepals are green. The filaments of the stamens are yellowish or creamy in colour. The anthers are a bright golden colour Chemical compounds such as Gallic acid can be found in the plant O. humifusa. Kaempferol 3-O-Rutinoside, Quercetin 3-O-Rutinoside, Quercetin 7-O-Rutinoside, Glucoside, Isorhamnetin 3-O-Robinobioside Isorhamnetin 3-O-Galactoside, Isorhamnetin 3-O-Rutinoside, Isorhamnet 3-O-Hamnosyl 7-O-rutinoside isorhamnetin 3-O-arabinoside of kaempferol (Ecology of eastern prickly pear cactus (Opuntia humifusa) in oak openings preserve).
system that can spread horizontally from 4 to 8 meters away from the mother plant after a few years. Flavonoids are found in the root. Glycosides Tannins, Coumarins Polysaccharides Fatty acids are a type of fatty acid. O. humifusa is high in nutrients (betalains, vitamins, minerals, phenolic compounds, flavonoid compounds, and polysaccharides). Vanillic acid, p-coumaric acid, syringic acid, 4-hydroxybenzoic acid, protocatechuic acid, salicylic acid, caffeic acid, gallic acid, and sinapic acid are among the phenolic acids found there, while flavonoid compounds such as rutin, narcissi, kaempferol, and quercetin are among the flavonoid compounds. Based on the excellent characteristics of O. humifusa (for example high moisturization, high antioxidant activity, anti-inflammation and anti-diabetes) various ailments, including arteriosclerosis, gastritis, diabetes mellitus, and hyperglycemia, had been successfully treated with O. humifusa (Cho et al., 2009).

**Therapeutic uses**

O. humifusa can withstand extreme cold (-20°C) and hard climatic conditions. Nutrient-dense environments and contains a wide range of minerals, including in addition to calcium, mineral matter, and amino acids, Flavonoids, polyphenols, vitamin C, and tocopherol (which is related to vitamin E) are all antioxidants (Kwon, 2005).

Opuntia Shown to be effective against geriatric illnesses, diabetes, Hypertension, arthritis, gastritis, and constipation are all symptoms of hypertension. Moreover, Opuntia has also been proven to help with improvement. Appetite stimulation and bowel movement stimulation (Lee, 2005).

Against the free radical diphenyl-1-picryl hydrazyl, O. humifusa showed antioxidant and scavenging action (DPPH). Furthermore, the O. humifusa extracts were found to effectively

alter the expression of inflammatory cytokines (Youl Cho et al., 2006; Pritchard et al., 1986).

The vulnerability to oxidative damage is determined by cellular antioxidant status, which is frequently altered in response to oxidative stress. As a result, there has recently been a surge in interest in the role and application of natural antioxidants in the prevention of oxidative damage in diabetes (Pritchard et al., 1986). O. humifusa extracts work well. Reduced-matrix transcription factor, which is linked to microphthalmia was suppressed. MMP-1 (metalloproteinase-1) and c-Jun N-terminal kinases (JNK) phosphorylation. As components in a variety of functional cosmetics, they can help with whitening and wrinkle reduction (Park et al., 2017). Further studies proved the skincare application potential of O. humifusa by controlling UVB-induced hyaluronic acid synthesis to aid in the suppression of water loss and erythema development (Zhao et al., 2012).

**Pharmacological Activities.**

![Figure 1. Reported Pharmacological Activities of Opuntia humifusa](image)

---

**Table 1. The reported pharmacological activities of various parts of Opuntia humifusa**

<table>
<thead>
<tr>
<th>Slno</th>
<th>Parts of plant used</th>
<th>Inducers</th>
<th>Pharmacological Activity Proved</th>
<th>Type of Animal Used</th>
<th>References</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>Cladode</td>
<td>Biostir AD- Dermatitis</td>
<td>Dermatitis</td>
<td>Mice</td>
<td>Jin-A Lee et al., (2015)</td>
</tr>
<tr>
<td>02</td>
<td>Fruit</td>
<td>UVB Radiation</td>
<td>Inflammation and Proliferation in Hairless</td>
<td>Mouse</td>
<td>Jin-A Lee et al., (2015)</td>
</tr>
<tr>
<td>03</td>
<td>Stems</td>
<td>streptozotocin</td>
<td>lower blood glucose and cholesterol levels in diabetes high-fat-diet-fed</td>
<td>Rats</td>
<td>Sahng-Wook Hahma et al., (2011)</td>
</tr>
<tr>
<td>04</td>
<td>Stem</td>
<td>water-soluble polysaccharides</td>
<td></td>
<td>Mice</td>
<td>Eun-In Yang et al., (2018)</td>
</tr>
<tr>
<td>05</td>
<td>Leaves</td>
<td>Microwave-Assisted</td>
<td>Human Keratinocyte Skin Cell</td>
<td></td>
<td>Ju-Young Moon et al., (2020)</td>
</tr>
<tr>
<td>06</td>
<td>Seeds</td>
<td>ovariectomy</td>
<td>Treatment on the Mass, Quality, and the Turnover of Bone in Ovariectomized</td>
<td>Rats</td>
<td>Jieun Park et al., (2011)</td>
</tr>
<tr>
<td>07</td>
<td>Stem</td>
<td>Ameliorated Cerulein</td>
<td>Acute Pancreatitis</td>
<td>Rats</td>
<td>Sun Bok Choi et al., (2013)</td>
</tr>
<tr>
<td>08</td>
<td>Stems</td>
<td>Endophytic fungi</td>
<td>antifungal activity</td>
<td></td>
<td>Alice F. Silva-Hughes et al., (2015)</td>
</tr>
<tr>
<td>09</td>
<td>Leaves</td>
<td>Ethanol</td>
<td>Gastric ulcer</td>
<td>Mouse</td>
<td>Chi-YeolYoo et al., (2021)</td>
</tr>
<tr>
<td>10</td>
<td>Leaves</td>
<td>DPPH radical</td>
<td>Radical scavenging</td>
<td>Cell culture</td>
<td>Jae Youl Cho et al., (2005)</td>
</tr>
<tr>
<td>11</td>
<td>Roots</td>
<td>Endophyte</td>
<td>Arterosclerotic mycorrhizal fungal</td>
<td>Mycorrhizal fungal</td>
<td>Deotare PW et al., (2014)</td>
</tr>
<tr>
<td>12</td>
<td>Roots</td>
<td>DPPH radical</td>
<td>Antioxidant and Inflammatory Mediators</td>
<td>Rats</td>
<td>Kim Ye Jin et al., (2014)</td>
</tr>
</tbody>
</table>
Anticancer Properties of Extracts from *Opuntia humifusa* Against Human Cervical Carcinoma Cells

In this study, the antioxidant content of *O. humifies* was determined. The stem of *O. humifies* has a higher level of b-carotene than the rest of the plant. High diets of carotenoid-rich vegetables and fruits, as well as high blood levels of carotenoids, have been linked in epidemiological studies. b-carotene is linked to a lower risk of some diseases like cancer (Cai et al., 2004).

The antioxidant and anticancer properties of extracts from medicinal plants and herbs are linked to the presence of phenolic substances such as phenolic acids, quinines, flavonoids, and tannins (Dinicola et al., 2013). Fruit and vegetable seed extracts are commonly utilized as anticancer and antioxidant treatments (Birasuren et al., 2013). Many investigations have recently revealed that the cactus has antiproliferative effect against a variety of cancers. Extracts of *O. humifies* were found to suppress the proliferation of human cervical cancer HeLa cells by stopping the cell cycle at the G1 phase by upregulating and downregulating cyclin D1 and Cdk4 in this study (Garcia-Solis et al., 2009). The growth arrest that occurs when cultured cells are treated with polyphenolic substances like genistein (Chan et al., 2003) curcumin (Das, Chaudhuri et al., 2002) and tea catechins coincides with the decreased proliferation found in HeLa cells treated with *O. humifies* extracts (Bhesh et al., 2017).

*Opuntia humifusa* aqueous extract alleviates ethanol-induced gastric ulcer in a mouse model

Aqueous extract alleviates ethanol-induced gastric ulcer in a mouse model. Gastric ulcer on ethanol-induced animal model, the gastroprotective properties of *O. humifies* aqueous extract were investigated. Polyphenolics, flavonoids, and dietary fibers are found in greater amounts in this plant than in any other subtropical plant. The anti-ulcer properties of *O. humifies*, on the other hand, are unknown. As a result, we used an ulcer model to test the gastroprotective efficacy of this plant extract. *O. humifies* extracts have anti-inflammatory (Hahm et al., 2009; Ahn et al., 2014) anti-diabetic, anti-aging, skin whitening, anticancer, and antioxidant properties (Hahm et al., 2011).

*Opuntia humifusa* Ameliorated Cerulein-Induced Acute Pancreatitis: In this work, the protective benefits of *O. Humifusa* were shown in a mouse model of cerulein-induced Acute Pancreatitis. Our findings show that *O. Humifusa* reduces pancreatic damage and the resulting lung harm. The activity of serum amylase, lipase, cytokine, and MPO was lowered both before and after *O. Humifusa* therapy. And also discovered that the inhibitory effects of *O. Humifusa* on acute pancreatitis are mostly due to a decrease in pancreatic cell death (Huang et al., 2005).

*Opuntia humifusa* stems lower blood glucose and cholesterol levels in streptozotocin-induced diabetic rats

In the Diabetics mellitus (DM) groups, STZ-induced diabetes resulted in a rise in blood glucose levels and a reduction in insulin levels. The blood glucose levels of the *O. humifusa* stems groups were considerably lower than those of the DM controls after the rats were given *O. humifusa* for 7 weeks. Furthermore, comparable to other high-fiber–containing foods, *O. humifusa* dietary fibre content and maybe other carbohydrate components may explain for its glucose-lowering impact (Cho et al., 2001; Platt and Bailey, 1982). Insulin non-starch carbohydrate in the diet was linked to a markedly low glucose response (Coskun et al., 2005). Flavonoids have been linked to an increase in beta cell mass, with flavonoids either preventing apoptosis or boosting beta cell proliferation. In terms of beta cell actions in vivo, the flavonoid-rich portion of Egyptian moru alba root has been shown to protect against STZ-induced damage. Similar effects were reported in diabetic rats fed *O. humifusa* in this investigation. In rats
with STZ-induced diabetes, administration of *O. humifusa* resulted in a drop in serum glucose levels and a modest rise in serum insulin concentrations. Flavonoids such as quercetin and its derivatives are abundant in the stems of *O. humifusa*. Vitamin C and E deficiency has been found in diabetes individuals and experimental animals in several investigations (Butterworth et al., 2005; Eklund Långvik et al., 2005).

**Treatment on the Mass, Quality, and the Turnover of Bone in Ovariectomized Rats**

The current research shows that regular oral treatment of *O. humifusa* stem extract can prevent bone loss in rats caused by ovarian hormone deprivation. In Ovariectomized rats, it increased bone mass, quality, and mechanical strength. The high concentration of polyphenolic chemicals found in *O. humifusa* appears to be responsible for these benefits. As a result, it might be a competitor for the development of innovative herbal techniques to treating osteoporosis in postmenopausal women (Alves et al., 2005; Yen Hsieh 2002; Ahn et al., 2017).

**Biological activities of water-soluble polysaccharides (WSP) from *O. humifusa* stem in high-fat-diet-fed mice**

Finally, high molecular weight water soluble acidic heteropolysaccharides, most likely arabinogalactans, were isolated from the stems of *O. humifusa*. They were mostly constituted of arabinose, galactose, and uronic acid. In high fat diet fed mice, the biological activity of the polysaccharide indicated their benefits in avoiding cardiovascular illnesses, diabetes, gastrointestinal ulcer, immunological function, and constipation improvement. These findings show that the WSP of *O. humifusa* stem has the potential to be exploited for pharmacological and therapeutic purposes (Campanile et al., 1994).

**Cactus cladodes (*Opuntia humifusa*) extract minimizes the effects of UV irradiation on keratinocytes and hairless mice**

In photo damaged human keratinocytes, *O. humifusa* extract has been shown to greatly increase HAS (Hyaluronic acid synthase) expression, which regulates HA (hyaluronidase) production. The protective effect of *O. humifusa* was attributed to increased HAS transcript expression and reduced HYAL (hyaluronidase) transcript expression, not to skin cell proliferation stimulation. In hairless mice exposed with UV, *O. humifusa* extracts treatments prevented trans epidermal water loss and erythema formation, it appears that *O. humifusa* extracts protects the skin against photodamage caused by UVB rays. As a result, *O. humifusa* extracts has the potential to be employed in cosmetics (Hashizume et al., 1997; Alam et al., 2020).

**Discussion and Conclusion**

The present review on plant demonstrates that daily oral administration of *O. humifusa* extract is effective in preventing in various diseases. *O. humifusa* includes an abundance of antioxidant components that have great therapeutic and cosmetic applications. The cladode of *O. humifusa* appear to have the potential to be used as a functional food item in the future. *O. humifusa* is a good source of dietary fibre and contain nutritional components. These findings might indicate that *O. humifusa* is a viable drug with therapeutic benefits. the results of this study show that *O. humifusa* may be regarded a functional food for the development of bone strength. Other unidentified components yet to be reveal.

The *O. humifusa* has been used from many decades in Ayurveda because of its pharmacological importance. *O. humifusa* have lots of pharmacological properties i.e., antimicrobial, antifungal, anticancer antidiabetic, antioxidant, radical scavenging and anti-inflammatory (ascorbic acid, Vanillic acid, p-coumaric acid, ferulic acid, syringic acid, 4-hydroxybenzoic acid, protocatechuic acid, salicylic acid, caffeic acid, gallic acid). It can also be used to treat breast cancer very effectively. *O. humifusa* have been recommended for the treatment of diarrhea, skin diseases and high fat diet. *O. humifusa* disclose the strong medicinal properties of the plant. The use of *O. humifusa* aqueous extract as a safe and effective technique for controlling and treating stomach ulcers is highlighted by the above-mentioned findings. therefore, they seem to be interesting for investigation of new pharmaceuticals.

In terms of phytochemical constituents and pharmacology, a vast reservoir of selected species remains untapped, and this is the research gap for future studies. Further research into *Opuntia humifusa* plant and their phytochemical constituents is required to fully understand the molecular mechanisms of their action in vivo and in vitro, as well as to ensure that plant extracts are safe for human consumption.

**Conflict of interest**

The authors have no conflicts of interest regarding this exploration.

**Acknowledgments**

The authors are thankful to Principal of Bapuji Parmacy College, Davanagere, Karnataka, India, for providing necessary facilities during this study.

**References**


Bhesh Raj Sharma, Park CM, Choi JW, Rhyu DY. 2017. Anti-nociceptive and anti-inflammatory effects of the


Taxonomic revision of the Opuntia humifusa complex (Opuntieae: Cactaceae) of the eastern United. 2.


www.ajpp.in


