

Exploring the Medicinal Potential of *Opuntia elatior* Mili and *Opuntia ficus indica*: A Comprehensive Review of Traditional Uses and Scientific Evidence

Assitant Professor Prajakta Chandrakant Patil

Department of Pharmaceutical Chemistry
SMBT Institute of Diploma Pharmacy, Affiliated to MSBTE

Abstract- The potential of cacti in managing diabetes is one of the findings of the Innovative Review on their therapeutic uses. According to studies, certain of the substances in cacti, especially the prickly pear cactus, may help reduce blood sugar levels by preventing the activation of enzymes that are involved in the digestion of carbohydrates. This may result in the creation of safe and efficient natural diabetic treatments. Folk medicine has long used *Opuntia elatior* Mili and *Opuntia ficus indica*, also referred to as nopal or prickly pear cactus. Their therapeutic value is derived from a variety of bioactive components, including vitamins, phenolic compounds, betalains, and flavonoids. The anti-inflammatory, antioxidant, blood-sugar-regulating, digestive-healthy, wound-healing, and weight-management qualities of these plants have all been utilized. Skin diseases, gastritis, and arthritis have all been treated with *Opuntia ficus indica* and *Opuntia elatior* Mili's anti-inflammatory qualities. The plants' anti-inflammatory properties are partly attributed to the presence of flavonoids and phenolic chemicals in them.. Species of *Opuntia* have long been used for their hypoglycemic properties and for diabetes management. Prickly pear cactus extract may help control blood sugar levels and enhance insulin sensitivity when taken. For those who already have diabetes or are at risk of getting it, this may be helpful. Additionally, these cacti have historically been used to cure gastrointestinal issues. Indigestion, constipation, and gastric ulcers can all be relieved by the mucilage found in cactus pulp, which has a calming effect on the digestive tract. Additionally, it can support general digestive health and aid in better digestion. For burns and wound healing, the gel that was taken out of the cactus pads has been applied topically. Its calming and antibacterial qualities aid in accelerating the healing process and encouraging skin tissue renewal. The gel can be immediately applied to burns or wounds to aid with pain relief and speed up the healing process. Additionally, it can enhance digestion and support good digestive health in general. Burns and wounds have been treated topically with the gel that was taken from the cactus pads. Its antibacterial and calming qualities hasten the healing process and encourage skin tissue renewal. To assist reduce discomfort and speed up healing, the gel can be put directly to burns or wounds. There may be anti-obesity qualities in *Opuntia* species. Prickly pear cactus high fiber content can decrease the absorption of dietary fat and promote feelings of fullness. This can assist people in maintaining a healthy weight and supporting weight management initiatives. More investigation is required to completely comprehend the methods of action and possible adverse effects of *Opuntia elatior* Mili and *Opuntia ficus indica*, despite their many potential medical applications. Before taking these herbs medicinally, it's crucial to speak with medical authorities.

Keywords- *Opuntia elatior*, *Opuntia ficus indica*, nagaphani, phytochemistry, red prickly pear, and Fadya Nivdung.

I. INTRODUCTION

The plant recognized by legend as Nagaphani is actually *Opuntia elatior* Mili and *Opuntia ficus indica*, also known as the Nopal cactus, Barbary fig, and Indian fig (family: Cactaceae). Parts of Punjab, Uttar Pradesh, Madhya Pradesh, Orissa, and specifically the Saurashtra area of Gujarat are home to this plant in India.¹ Prickly pear fruit has long been used in traditional medicine to cure a variety of conditions, including liver problems, wounds, weariness, and conditions including ulcer, glaucoma, and dyspnea. In addition to being a good source of fiber, nopal helps lower blood sugar and plasma cholesterol levels. The fruit of the cactus pear is considered a functional food due to the presence of bioactive components like vitamin E and C, polyphenols, carotenoids, and flavonoids.² Cactus fruit's betalain and potassium levels aid with digestion. Only about ninety varieties of opuntia, or harvest cactus fruit, are found in the United States.³ The cactus fruit is also known by other names, such as barbary pear, nopal fruit, tuna, Sabra, Indian fig, prickly pear, and so on. (1, 4) About 130 genera and 1,500 species of cactaceae make up the prickly pear family. There are many different sizes and shapes of cacti. The largest is *Pachycereus pringlei*, which has an officially recognized height of 19.2 meters, while *Blossfeldia Lilliputian* is the smallest, with a developmentally altered diameter of roughly 1 centimeter.⁵

Opuntia elatior Mili and *Opuntia ficus indica*, popularly referred to as nopal or prickly pear cactus, are two plant species whose therapeutic qualities have been utilized for millennia. These plants are indigenous to North and South America and are members of the genus *Opuntia*. Their colorful fruits and blooms, as well as their flat, paddle-shaped stalks coated with spines, are what define them. In Gaziantep, Turkey, an *Opuntia ficus indica* community is commonly growing spontaneously. Folk medicine has traditionally used these cacti for a very long time, especially in indigenous societies. The medicinal qualities of several plant parts, including as the fruits, leaves, and stems, have been used. Several bioactive substances, including vitamins, phenolic compounds, betalains, and

flavonoids, contribute to their therapeutic properties.

Opuntia ficus indica and *Opuntia elatior* Mili are both used medicinally in a variety of ways. Among them are:

1. Anti-inflammatory Qualities

These plants' extracts have been used to treat inflammation-related illnesses such skin problems, gastritis, and arthritis. The presence of phenolic compounds and flavonoids is thought to be responsible for the anti-inflammatory properties.

2. Antioxidant Activity

The strong antioxidant qualities of prickly pear cacti are well-known. These plants' abundant antioxidant content can aid in shielding cells from oxidative stress and dangerous free radical damage.

3. Blood Sugar Regulation

Because of its possible hypoglycemic effects, *Opuntia* species have long been used to treat diabetes. Consuming prickly pear cactus extract may help control blood sugar levels, according to certain research.

4. Digestive Health

For a long time, gastrointestinal problems have been treated with *Opuntia ficus indica* and *Opuntia elatior* Mili. Indigestion, constipation, and gastric ulcers can all be relieved by the mucilage found in cactus pulp, which has a calming effect on the digestive tract.

5. Wound Healing

Burns and wounds have been treated topically with the gel that was taken from the cactus pads. It supports skin tissue renewal with its calming and antibacterial qualities.

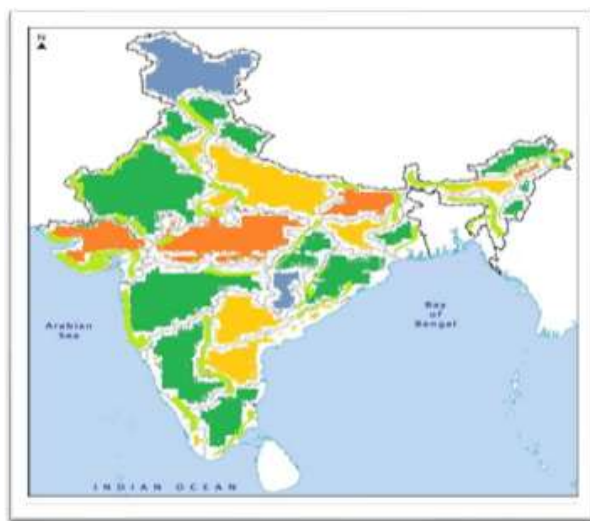
6. Weight Control

According to certain research, several *Opuntia* species may be able to prevent obesity. Prickly pear cactus fiber promotes weight management by lowering the absorption of dietary fat and raising feelings of fullness.

II. CULTIVATION OF CACTUS

Opuntia ficus-indica is native to Australia, southern Europe, southern Africa, Louisiana, southern Asia, southern USA, and a few warm-weathered marine islands. Additionally, a sizable plain region spanning the states of Punjab, Haryana, and Uttar Pradesh (UP) in the western and central Indo-Gangetic Plain (IGP) was found to fall into the category of somewhat appropriate.

Furthermore, isolated areas of high to moderate suitability classes are also seen in the foothill regions of the northern mountains in the north-west region, which includes Jammu & Kashmir, Himachal Pradesh, and Uttarakhand, as well as in the southern part of Gujarat's coastline, the southern portion of Tamil Nadu's coastline, and the southwest portion of West Bengal.



These areas are located in eastern India. Similar trends can also be observed in Arunachal Pradesh, Mizoram, Tripura, and Manipur, where the mix of precipitation and soil texture permits land to fall into the category of somewhat appropriate land. The great majority of the Indo-Gangetic Plains, northeast India, and southern India are classified as marginally suitable (0.4–0.6) regions.

On the other hand, the majority of central India, which includes the northern highlands, Madhya Pradesh (MP), and eastern Maharashtra, falls into

the low appropriate group (0.2–0.4). A very low appropriate category (0–0.2) predominates throughout the northern Indian Himalayan Mountain zone. An overview of the state-by-state area distribution of the different land suitability groups is shown in the following figure17.

The distribution of cacti natively. The global distribution of *Opuntia ficus indica*

	Densely populated region with cactus farming
	A moderately sized space with a cactus garden
	Less area consisting of a cactus cultivation
	Non-suitable area consisting of a cactus cultivation
	Adapted area consisting of a cactus cultivation

The Best Cactus for Skin Care is which one?

For skin, the prickly pear cactus is the best.

For Pimples: Cactus oil has antibacterial qualities that can treat skin prone to acne and help you permanently get rid of your pimples. The oil is readily accessible, and you should regularly apply a few drops to skin that is prone to acne.

For Dry Skin: Simply chop the cactus (carefully, as it contains spines) and remove the plant gel. Apply this gel to the skin to prevent moisture loss because it has strong antibacterial qualities. Similarly, for smooth and shiny hair, use cactus gel to your hair twice a week.

For Dull Skin- All you need is one spoonful of cactus gel to treat dull skin



One tablespoon each of aloe Vera, lemon juice, and honey



Blend all of the ingredients together



Apply to your face for skin that glows



Fig no-2: Skin benefits of prickly pear cactus

Get Rid of that Tan

Apply the cactus juice or gel, which has antioxidants that help prevent UV damage and electrolytes that moisturize the skin, to get rid of that tan. Indeed, the gel aids in shielding the skin from UV ray damage

III. OPUNTIA ELIATOR PLANT'S MEDICINAL PROPERTIES (BOOK REF.HERBAL)

Fruit juice is recommended for both whooping cough and asthma. Prior to that, the fruit's tiny spikes should be removed with the aid of fire, and the juice should then be released. Urine turns a reddish color after consuming juice. The throat will become irritated if the spikes continue. Pregnant ladies are also encouraged to use it. When treating heart conditions, whole plant ash is recommended. Excessive urine and loose motion are symptoms of a high dose. For persistent joint discomfort and swelling, root decoction is recommended. It is purgative, the latex. Analgesic and anti-inflammatory, anticancer, antioxidant, diuretic, antidiabetic, antiulcer, anti-hyperlipidemic and anti-hypercholesterolemia, neuroprotective, and immunomodulatory, Opuntia eliador species have been utilized for these purposes.

The Cactus Plant's Anatomy

Flower: The flower on this cactus is stunning and magnificent. The flowers often have an orange or yellow-orange color and measure 2 to 2¾ inches (5-7 cm) in diameter. They carry out the role of reproduction.

Roots

These are employed in development and anchoring. Because of their shallow and widely dispersed roots, cacti are able to efficiently absorb water and nutrients from the soil.

Fruits

These fruits have seeds and are frequently plump. Fruit from cacti can be an important source of food for wildlife in desert ecosystems.

Stems

They are able to hold onto water, which keeps them dry. It is thick and plump, covered in a waxy covering, and frequently has certain tissues in it.

Spines

These are structures that resemble sharp-edged pointers. They supply the plant's exterior while shielding it from herbivores.

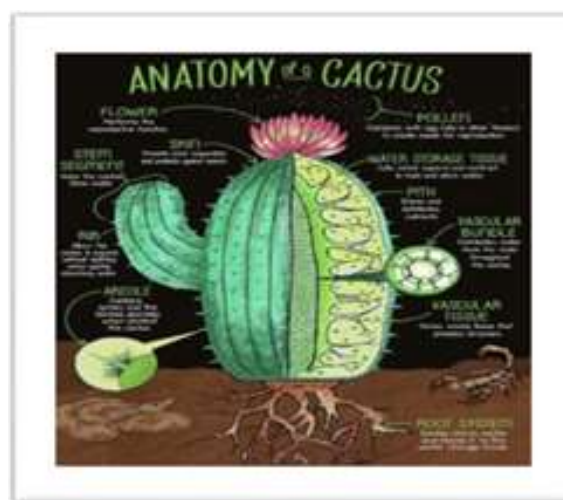


Fig 3-Anatomy of Cactus Plant

Health Benefits of Cactus: Cactus plants contain a good amount of nutrients that can help with a variety of health issues.

Cholesterol

The high fiber content of cactus pads and fruits can lower blood cholesterol levels. 17

Antioxidants

Antioxidants help shield our cells from harm that comes from free radical damage.20

Digestive health is enhanced by the betalain and potassium found in cacti. Your body needs potassium to help absorb nutrients, while betalains have anti-inflammatory and digestive tract-protecting properties. 18

Immune System

One of the best ways to support the immune system is with vitamin C, which is abundant in cactus fruit. Frequent vitamin C dosages enhance the synthesis of white blood cells, which could support your body's viral defenses. 19

Prickly pear cactus fruit is the source of cactus water, a plant-based beverage with amazing health and skin benefits. Compared to coconut water, it's better. Compared to many coconut water products on the market, cactus water has half the calories and sugar. Additional advantages of cactus water.

It Is Brimming with Brain-Aging Antioxidants

Leaf cactus includes phenolic and flavonoids. They both contain antioxidant and anti-aging properties for the body. They could be able to shield your body's cells from specific malignancies. Furthermore, several of the chemicals found in cactus plant stems are thought to function as neuroprotectors, shielding brain cells from harm.

It Aids In Body Cleaning and Detoxification

With a combination of electrolytes, vitamins, minerals, and a rare antioxidant called betalain—which is thought to protect against some degenerative diseases—the mixture of cactus extract and puree, water, organic cane sugar, and organic lemon juice is claimed to cleanse and detoxify the body. They can also encourage a healthy appearance and are beneficial to the skin.

Your Immunity is Strengthened by it

Because it contains taurine, cactus water has several health benefits when consumed, including protection against pollutants, UV/UB ray damage, and free radical damage. Strong and rich in antioxidants, taurine helps your skin become less inflammatory and detoxified. It also contains iron, calcium, potassium, magnesium, and the vitamins B

and C, all of which can strengthen your immune system.

Hydration is Increased

Water from cacti helps the body stay more hydrated. Cactus water is far more effectively absorbed by our systems and kept by our thirsty skin cells, neurons, muscles, organs, and other tissues than most other water, which is lost through our system. It also contains a lot of electrolytes, which help women avoid cramping and offer us glowing skin, better sleep, and more vitality. - Susie Wang, founder and cosmetic chemist who is 100% pure.

It's Really Beneficial to Your Skin

According to dermatologist Rachel Nazarian, MD, one of the best anti-agers you can include in your diet is cactus water: The benefits for the skin stem from an abundance of antioxidants and anti-inflammatory compounds. These hydrate the skin without adding too much sugar and help reduce redness and puffiness. In the end, there are no proven anti-aging miracles, but cactus water is at the top of the list because of its abundance of vitamins and antioxidants that improve skin.

Remaining hydrated is one of the best things we can do for our skin, and cactus water gives your cells the moisture they require to work correctly. Cactus water is a natural source of electrolytes, which the body needs to stay adequately hydrated, when it is consumed. Skin that is healthy and supple requires hydration, according to dermatologist Engelman.

More Use of Cacti for Beauty and Wellness

You can use the cactus plant and its water for the following health and beauty advantages in addition to drinking it.

You can use the cactus plant and its water for the following health and beauty advantages in addition to drinking it.

Use Cactus Topically to Hydrate the Skin

Dr. Nazarian claims that topically applying cactus water in oil form is really beneficial for skin health.

Because of its high fatty acid content, it hydrates your skin similarly to many other face oils. The main advantage is that it keeps your skin from losing water, which means that it stays hydrated for longer.

Infuse Skin with Revitalizing Cactus Water

Wang adopts a more do-it-yourself method, misting her skin with cactus water in a spray bottle throughout the day. In order to help with my swollen eyes in the morning, I also store cotton pads soaked in cactus water in my refrigerator and use them on my eyes. I also adore using the water from cacti as a toner. After using cactus water, my damp skin absorbs my face oil more readily.

Eating Cactus Leaves Can Help Regulate Blood Sugar Levels

Cactus leaves are also safe for diabetics to eat because they are believed to effectively regulate blood sugar levels.

Classification of Opuntia Ficus Indica Botanically

Plantae, the Kingdom

Class: Dicotyledons, Magnoliopsida

The Archichlamydeae subclass

Order: Cactales, or Caryophyllales

Cactaceae is the family.

Opuntiodeae subfamily: opuntieae; eliator mill species

Opuntia Genus 3



Fig 4: Opuntia Eliator Mill

Nutrition

The definition of nutrition is the process by which living things use food. The human body requires a balanced diet to promote growth, immune system maintenance, muscle support, reproduction, and the maintenance of both breastfeeding and successful pregnancies. Food intake, absorption, distribution, biosynthesis, digestion, catabolism, anabolism, and excretion are all included.⁴ The macronutrients are lipids, carbohydrates, and protein.

While your body still needs micronutrients (such as vitamins and minerals) in smaller amounts, macronutrients give your body energy in the form of calories and are essential for immune system and cellular development. Aside from amino acids, proteins are essential for the health of the brain, neurological system, blood, skin, and hair.⁵ The average human body needs 15% from protein and 85% from fat and carbohydrates for daily functioning. Magnesium is an essential component of nutrition that helps the immune system and promotes healthy cell, tissue, and organ growth in humans. Six of the minerals that are necessary for health are as follows:

Calcium

An adult man contains between one and 1.5 kilograms of calcium overall. Up to 99% of it is found in the teeth and bones. Calcium's primary roles include blood coagulation, muscle contraction, nerve transmission, and its composition in bones and teeth.

Two categories of sources exist:

Best Sources

Milk and milk products include it.

Foods high in nutrients include eggs, cabbage, seafood, beans, and green vegetables.

Phosphorous

The finest supplies of meat, eggs, dairy, grains, and green vegetables are found here. Phosphorus is mostly used as a component of bones and teeth, and the phosphate buffer system is crucial for preserving blood pH (pH7.4).

Magnesium

An adult's body has 20g of magnesium, with 70% of that amount being contained in bones. The remaining thirty percent is found in bodily fluids and soft tissues. Important role in blood glucose regulation, blood pressure regulation, muscle and neuron function, and protein synthesis. Moreover, glycolysis and energy production depend on it. (7, 8)

Iron

Egg yolks, dried fruits, fortified cereals, green vegetables, liver, heart, and other organ meats are good sources of iron. The biochemical role of heme components, such as myoglobin and hemoglobin, is essential for energy metabolism and is involved in the transfer of O₂ and cellular oxidation.⁸

Cladodes

Depending on the species, harvested vegetables have different weights and lengths. Vitamins, antioxidants, and plant pigments like betalains and carotenoids found in prickly pear cacti may all help reduce inflammation in the body. (10, 9). Proteins, carbohydrates, and water are cladodes' main byproducts.¹¹ The carbohydrates are divided into two groups: (a) the storing starches created by monosaccharides such as glucose, galactose, arabinose, glucuronic acid, xylose, mannose, and fructose; and (b) the organizing ones that are a component of the cell wall, such as fiber [21.6wt%], hemicelluloses [8.19%], and fructose. Mucilage is used in the food manufacturing process as a coating agent, emulsifier, and additive to extend the shelf life of food items. (12, 13)



Figure no 5 -Maturity Modifies Cladodes' Chemical-Bromatological Composition

The goal of this study is to determine which stage of maturity cactus cladodes have the optimum forage characteristics. In a 5 × 3 factorial layout randomized block design experiment, five accessions of spineless forage cactus (CBG, No. 1270, No. 1271, No. 1308, and Bianca Macomer) and three cladode maturity phases (young, middle, and mature) were investigated.

Opuntia ficus indica is a plant that can reach a height of 5 meters. It has dense, delicious leaves that grow well on cladodes, or spatulate stems. The fruits of cladodes, which are 1-2 years old, range in color from light green to deep red.

Different Types of Prickly Pear Fruit

The elliptical-shaped prickly pear plant yields fruit that is usually between two and five inches long. The pulp has a sugary flavor that is frequently distinguishable from melon or berry. Depending on the class, prickly pear fruit's skin and pulp can vary. Prickly pear fruits come in a variety of colors, including yellow, purple, ruby-red, and chocolate.¹⁴ It is an arboreal plant with a maximum height of five meters. The thick, highly split root grows horizontally and can extend laterally up to 10 to 15 meters from the plant's base. The fruit has a thick peel with tiny prickles, and the pulp has a constant amount of seeds that are, for the most part, accepted by the pulp and consumed. Despite this, some differences in size, shape, and color are typically noticed.¹⁵



Fig no 6 -Prickly Pear Fruit

Cactus fruit's nutritional profile: Cactus fruit and pads contain a variety of important vitamins and minerals that are well-known for having anti-inflammatory properties. These consist of Omega 3s, Potassium, Calcium, Copper, Vitamin C, Vitamin A, and Vitamin E. Prickly pear fruit's high fiber content helps to maintain digestive health by encouraging regular bowel movements. Prickly pears are a delicious way to nourish your skin, so consider including them in your diet. Significant amounts of ascorbic acids, alpha tocopherol, carotenoids, fibers, amino acids, and antioxidant composites (phenols and flavonoids) have been found in cactus fruit, which has led to arguments for its health benefits, including its ability to lower blood sugar and cholesterol and its antioxidant qualities.²²The benefits of cactus fruit are

The fruit of prickly pears and its phytochemistry Cladodes are widely used as an ointment to treat ulcers, diabetes, and wounds. The cactaceae family of plants includes prickly pears, which were domesticated in Africa, Europe, Australia, North America, and Asia.¹⁶

Cacti Applied in Conventional Medicine

Opuntia ficus indica has been used in traditional medicine to treat catarrhal gastritis, obesity, burns, wounds, and edema. Alcoholic extracts are recommended for hypoglycemic, antiviral, and anti-inflammatory purposes.²¹

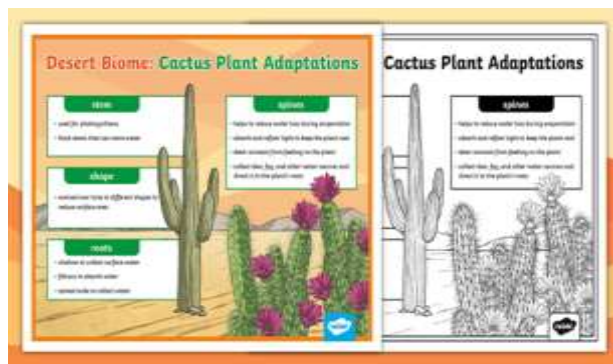


Fig no 7- Cactus desert plants' adaptation

Cactus plant adaptations include:

- Thick, waxy surface to minimize water loss
- Slender spines on leaves to ward off predators.

- Widely dispersed root structure: facilitates easy water collection
- Their robust green stems compensate for their lack of leaves
- Using deep roots to access groundwater
- Long, shallow roots that disperse widely
- Instead of leaves, cacti have spines, which minimize surface area and water loss through evaporation.

IV. CONCLUSION

A variety of medical applications have been traced back to the anti-inflammatory, antioxidant, blood sugar-regulating, digestive health, wound-healing, and weight-management qualities of *Opuntia elatior* Mili and *Opuntia ficus indica*. To completely comprehend the mechanisms of action and potential adverse effects connected to the use of these plants for medical purposes, additional research is necessary, it is crucial to remember.

REFERENCES

1. Shashikant Prajapati, Rabinarayan Acharya, *Opuntia elatior* Mill. (Nagaphani): A Review on its Ethnobotany, Phytochemical and Pharmacological Properties. *Annals Ayurvedic Med.* 2014;4 (3-4)107-1161
2. Sanjay P Chauhan, Navin R Shet. Analgesic and Anti-inflammatory action of *Opuntia elatior* mill fruits 2015 Apr-Jun; 6(2): 75–812
3. Krishna N. Patel and Kalpeshkumar B. Ishnava. Evaluation of Nutritional and Medicinal Properties of *Opuntia elatior* Mill.10.5772/intechopen.77081
4. Ref. satyanarayan book
5. Anoop A. Shetty, M. K. rana, S. P. Preetham. *Journal of Food Science and Technology.*
6. Ref. satyanarayan book
7. Ref book kuntal das biochemistry
8. The University of Arizona Cooperative Extension. Prickly pear cactus: Food of the desert.
9. Nutritional and medicinal use of cactus pear (*Opuntia* spp.) Cladodes and fruits. DOI:10.2741/1992

10. Madeleine Perucini- Avendano and Mayra Nicolas- Garcia. Cladodes: chemical and structural properties, biological activity, and polyphenols profile. DoI: 10.1002/fsn3.2388
11. Google scholar
12. Tania Goncalves Albuquerque, Paula Pereira. Nutritional Composition and Antioxidant Properties of Fruits and Vegetables
13. Medically Reviewed by Kathleen M. Zelman, MPH, RD, LD
14. Medicinally reviewed by Debra Rose Wilson, Ph.D., MSN, IBCLC, AHN-BC, CHT-By Ana Gotter
15. Nopal Cactus (*Opuntia ficus indica*) as a source of bioactive compounds for Nutrition, Health and Disease. Karym El- Mostafa, Youssef Kharrassi, Asma Badreddine, Pierre andreoletti, Joseph Vamecq, M'Hammed Said El Kebbj, Norbert Latruffe, Gerard Lizard, Boubker Nasser and Mustapha Cherkaoui Malki.
16. Nopal Cactus (*Opuntia ficus indica*) as a source of bioactive compounds for Nutrition Health and Disease. Karym El- Mostafa,1,2 Youssef El Kharrassi,1,2, Asmaa Baredidine ,1,2, Pierre Andreoletti,1 Joseph Vamecq,3 M'Hammed Said El Kebbj,4 Norbert Latruffe,1 Gérard Lizard,5 Boubker Nasser,2 and Mustapha Cherkaoui-Malki 2014 Sep; 19(9): 14879–14901.
17. 2024 International Center for Agricultural Research in the Dry Areas (ICARDA)