

Abstract

Opuntia Ficus-Indica a Mediterranean Diet Product [†]

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Abstract: During last decades, several researches and scientific studies were conducted on the « *Pontiac ficus indica* » a wild edible plant which the fruit is commonly known as prickly pear, promoting its nutritional value, due to a rich composition in polyphenols, polyunsaturated fatty acids, vitamins and amino acids. The current work intends to highlight uses of hole plant parts in different fields such as medical field including anti-inflammatory, antioxidant, antibacterial, antiulcer, dietetic, anticancer and antidiabetic activities. *Pontiac ficus indica* is also wildly used in the culinary field as jam and food coloring; in the agronomic and ecological field as regenerator of exhausted soils; as supplement in fodder use, and in dermacosmetics and parapharmaceutical industry in shampoo and anti-wrinkle skin creams. However; the use of this plant remains very limited. Consequently; this work is a global revue came to open the way for other more targeted investigations; particularly in Biotechnology

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1. Introduction

Seasonal fruits and vegetables are main elements in Mediterranean diet, basically based on local products such as prickly pear. This spontaneous and invasive specie adapts to the harshest climatic conditions which permitted its implantation in the Mediterranean region since middle ages, and becomes a far product commonly used as fruit, forage or traditional remedy.

In fact nowadays, nutrition becomes crucial element in health prevention, thus establish and follow national nutritional recommendations and balanced diet could decrease and prevent developpement of several chronicle and degenerative diseases related to nutrition and extend life expectancy, in this context Mediterranean diet scientifically proved its efficiency in prevention of many of it [1-4].

The present mini review aims to promote renewable local bioresources for an agriculture based on responsible and durable Eco-economy.

2. Experiments

Intensive and rigors researches using several national and international references (articles, books, reviews in Electronic databases:MDPI, Science Direct,Springler, ACS, RS, PubMed, Pub Chem, Google Scholar...) were performed since 1981 until our days, to study evolution of scientific research on *Opuntia ficus-indica* in time, and how it performs in regard of varying fields: ethnobotany, ethnopharmacology, Chemistry, Nutrition, Biological and Biotechnological applications in order to extract maximum informations concerning investigated plant.

3. Results and discussion

According to histogram (Fig.1), which represents reviewing investigations results; scientific researches are generally increasing, highlighting by the way growing interest, currency and relevance of studied plant. Obtained results, lead to enumerate achievements and lacks which could be interesting to investigate in the future.

3.1. Origin and geographic distribution

Opuntia ficus-indica is Mexican native, [5-6] and grows in the wild in arid and sub-arid regions in south America, Africa and Mediterranean area. Nowadays, it is considered as a cosmopolitan plant introduced and cultivated in more than 30 countries around the world, and mainly consumed as fruit or forage in our country Algeria.

3.2. Nutritional value

Opuntia ficus-indica is a providential plant, fruits are rich in vitamin C and young cladodes rich in copper, magnesium and iron are consumed as salad. Glucids are essential energy source with 44 kcal /100g, it is considered as moderately energetic [7].

3.2.1. Chemical composition

Chemical composition is not absolute and depends on several ecological factors: variety, soil, season and age of the plant. [8].

- **Water content**
This value is not constant and very (81-90 %) according to the climate and season humidity
- **Glucids**
Glucose and fructose are the main monosaccharide present in pulp fruit [9].
Glucids average content is (10,16-16,61%) [10], related and controlled by agronomic and environmental factors as well as maturity stage.
- **Fatty acids**
Several researches and chromatographic analysis exhibit *puntia ficus-indica* as an excellent fatty acids source, particularly linoléique, oléique and palmitique acids in the whole fruit with a high level of linoléique oméga-6 acid in seeds oil [11].
- **Minerals**
The plant is rich in oligoelements (0.28 -0.39 %) with a predominance of Potassium, Calcium and Magnesium [9, 12].
- **Fibers**
Pulp fiber content is (0.02–3.15 g /100 g dry weight) [13,14], pectin is in part responsible of pulp viscosity which is an advantage in juice and jam production, fruit pulp pectine content is (0,17-0,21%) but still not sufficient for gels production [10].
- **Phenols**
All plant parts (flowers, pulp, seeds, skin, leaves) are rich in phenols: flavols, flavones, phenols acids, but pulp still the richest one with 218mg/100g followed by seeds with 89mg/100g [11].
Quercétine is the main flavonoïd in the plant followed by isorhamnétine, lutéoline and kaempférol. Whereas there is a predominance of nicotiflorine (146.5mg/100g) in cladodes.
- **Betalains**
Opuntia ficus indica contains bétalaines, a hydrosoluble nitrogen based pigments, responsible the plant color; which also give strong antioxidant proprieties [15,16].
- **Carotenoids**
 β - carotene a liposoluble pigment present in small amounts in fruit chloroplast cells (2.6–478 μ g en 100g fresh weight).
- **Vitamins**
Plant seed oil is rich in lipo tocophérols, particularly isomorphes γ et α -tocophérol [17].
- **Phytosterols**

According to El- Moustafa et al, (2014), fruit skin is the richest in phytosterols (*Campestérol*, *Stigmastérol*, *Lanostérols*, β -*Sitostérol*, *Ergostérol*).

3.3. Biological activities

3.3.1. Antioxydant activity

Several phytochemical studies were realized on different plant' parts showing its phenol profile which confers to the plant a very interesting antioxidant activity [18].

- *Antioxydant activity of juice*

DPPH test realized on fruit juice extract exhibit phenols, flavonoids, betalains pigment like as having an antiradical activity even higher than vitamin C. Besides, secondary metabolites have synergetic action in crud juice, and purpul juices are more actif than yellow/orange ones [19].

- *Antioxydant activity of seeds oil*

Seeds oil antioxidant activity was measured by DPPH and β -carotène bleaching tests, which highlighted an important dose-depending activity similar to that of ascorbic acid and hydroxytoluènebutylé[20].

- *Antioxydant activity of Leaves*

Opuntia ficus indica leaves' ethanol extract antioxidant activity is related to an important phenols content and was estimated for DPPH, superoxide anions ($O_2^{* -}$) and hydroxyls ($OH^{* -}$) radicals, and a great capacity to protect plasma DNA from breaking up by hydroxyl radicals [21].

3.3.2. Atimicrobial activity

An important inhibiting effect against two gram negative bacterial strains *Staphylococcus aureus* and *Escherichia coli* in addition to a fungi *Candida albicans* was reported [22].

3.3.3. Antiulcer activity

Pontiac focus indicia cladodes are used in traditional medicine to treat gastric ulcer, in fact its richness in fiber (pectin polysaccharides) stimulates gastro-intestinal mucus regeneration [29].

3.3.4. Antiflamatory activity

Several studies reported analgesic and antiflamatory activities of *Opuntia* gender either on lyophilized cladodes or its phytosterol extracts, more over β -sitostérol was identified as active principal of such activity in cladods [30].

3.3.5. Cytotoxic activity

Betanines (red pigment belonging to betacyanines) present in the plant, pecess an important

Antioxidant and anticancer activities, so it can be used for prevention [25].

3.3.6. Glecimic activity

Opuntia fucus indica was used since ancient times by Mexicans as traditional remedy to treat diabetes, nowadays *in vivo* assays reported hypoglycemic effect of cladodes extract on rats either combined with insulin or not [26].

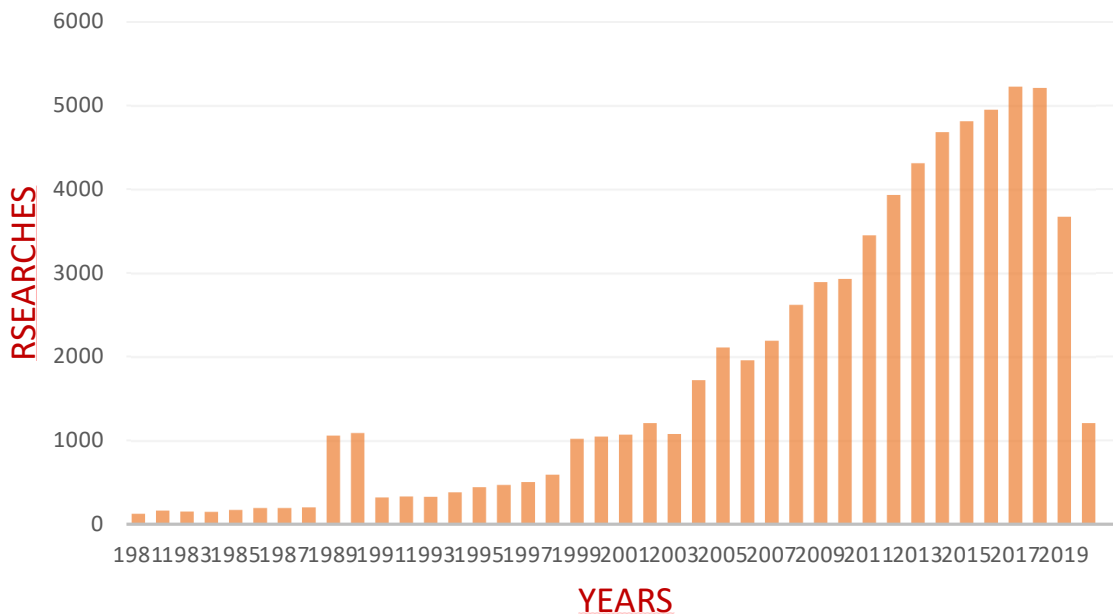


Figure 1. Evolution of researches number on *Opuntia ficus indica* between 1981 and 2019.

5. Conclusions

Opuntia ficus indica is a whispered plant in Mediterranean region, characterized by its remarkable adaptation to arid, sub-arid and tropical climates. An intensive mini review was conducted on the « *Opuntia ficus indica* » plant commonly known as prickly pear promoting its nutritional value, due to its rich composition in essential nutriment.

The current work intends to highlight the use of the fruit in different fields such as; the medical field including anti-inflammatory, antioxidant, antibacterial, antiulcer, anti-cancer and antidiabetic activities. It can be used in the culinary field as jam and food coloring; and also employed in the agronomic and ecological field against erosion and as regenerator of exhausted soils; or supplement in fodder use. And in the cosmetic and parapharmaceutical industry which they are integrated in the composition of shampoo and anti-wrinkle skin creams.

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