Ethnobotanical assessment of traditional uses and valorization of *Opuntia ficus-indica* cladodes in Western and Eastern Algeria

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Research

Abstract

Background: Opuntia ficus-indica (OFI) is commonly found in arid and semi-arid regions and has traditionally been recognized for its medicinal, environmental, and socioeconomic value. The present study investigated and compared the traditional uses of *OFI* cladodes in two Algerian wilayas, Bordj Bou Arreridj (BBA) and Sidi Bel Abbes (SBA). The study aimed to document the knowledge held by local communities and identify differences in the ways cladodes are utilized between the two regions.

Methods: A comparative ethnobotanical survey was conducted among 995 informants (495 in BBA and 500 in SBA) using a standardized questionnaire. Ethnobotanical indices specifically, relative frequency of citation (RFC), use value (UV), and fidelity level (FL), this research was supplemented with some statistical work, mainly the chi-square and correlations methods.

Results: Women represented the majority of respondents, while illiteracy was the predominant educational level. Therapeutic use was the principal application of cladodes, accounting for 52.8% of responses in BBA and 79.3% in SBA. Burns, arthritis, skin diseases were the most frequently treated conditions. Cosmetic uses mainly involved skin hydration and hair care. Ethnobotanical indices indicated a higher Relative Frequency of Citation in SBA (RFC = 0.36), whereas the highest Use Value was recorded in SBA (UV = 793), reflecting a greater diversity of traditional uses.

Conclusions: The findings demonstrate the richness of traditional knowledge associated with *Opuntia ficus-indica* cladodes and confirm their importance in healthcare, cosmetic, and environmental practices. These results provide valuable baseline information for the conservation, sustainable management, and future valorization.

Keywords: *Opuntia ficus-indica*; ethnobotany; ethnopharmacology; traditional knowledge, Algeria.

Background

The plants have formed part of health systems since antiquity and used for the treatment of different diseases suffered by humans (Davis et *al* .2024) Since humans have lived and created close link to nature, and in communities it's possible to generate great traditional information about the medicinal plants (Domingo-Fernández *et al.* 2023). Approach of Traditional medicine has been adopted by the World Health Organization, due to the importance it takes part since it's treatments, professionals or medicines provides services and health treatment for millions of people (Patwardhan *et al.* 2023). It has been calculated that still more 80% of world's population utilizes herbal traditional medicines, being from 50% up to 95% in developing countries (Hemmami *et al.* 2023; Aremu *et al.* 2024).

Opuntia ficus-indica (L.) Mill. commonly called "prickly pear" is special among the culturally and economically important species present in Algerian flora (Bouras *et al.* 2025). This species can adapt very easily to a variety of climatic environments. Its main growing regions are located in the Mediterranean basin, with a large presence in North Africa (Inglese *et al.* 2024). This type of plant can be recognized by its aerial part, which is distinguished with cladodes or "paddles" that serve to maintain the plant and retain water. Furthermore, according to previous studies, cladodes are a valuable source of bioactive elements with beneficial health properties (Koufan *et al.* 2024; Dinangayi *et al.* 2025; Bishikwabo *et al.* 2026; Santana *et al.* 2026).

Cladodes have recently gained more attention for their high water (88–95%), protein (4–10%), fat (1–4%) and carbohydrate content (64–71%) composition, as well as fiber content (~18%) along with vitamins and minerals. They are a promising feedstock on animal feeds, renewable fuels characterisation and the production of chemical compounds for industrial applications, food use – and pharmaceutical and cosmetic products.

However, the use of cladodes continued to be low in Algeria. This observation emphasizes on the importance of updated, multidimensional ethnobotanical studies considering demographic factors (age, gender, educational level, and occupation) affecting plant utilization and knowledge transmission. In this perspective, we conducted a comprehensive ethnobotanical study of the diverse uses of cladodes in western and eastern Algeria.

Despite a rich background of ethnobotanical studies in North Africa, the traditional therapeutic uses of *Opuntia ficus-indica* cladodes still vary significantly depending on local practices and environmental contexts. While previous regional surveys in Algeria have documented general uses of cacti, there is a clear lack of comparative quantitative data between different agro-ecological zones.

Our study provides a comparative assessment of *Opuntia ficus-indica* cladodes utilization across two contrasting regions: Sidi Bel Abbes and Bordj Bou Arreridj. Rather than offering a simple inventory, we applied quantitative ethnobotanical indices specifically RFC, UV, and FL to measure how traditional knowledge is structured locally. Moreover, by crossing sociodemographic data and usage patterns, we also tried to grasp how such empirical knowledge finds its way into daily life in contemporary Algerian societies, thus being a necessary starting point for phytochemical and pharmacological valorization.

Materials and Methods

Study area

The bioclimatic characteristics and geographic location of the study area are shown in Table 1, Fig.1

Table 1. Presentation of the communities studied.

Parameters	**Region**	
	Sidi Bel Abbes	Bord Bou Arreridj
Latitude	35° 11′ 34″ N	36° 04' 31" N
Longitude	0° 38′ 28″ E	4° 45' 54"E
Altitude (m)	450-500	913
Temperature (C°)	17.0	17.1
Precipitation (mm)	374	365
Climate	**Semi-arid**	**Semi-arid /Arid**

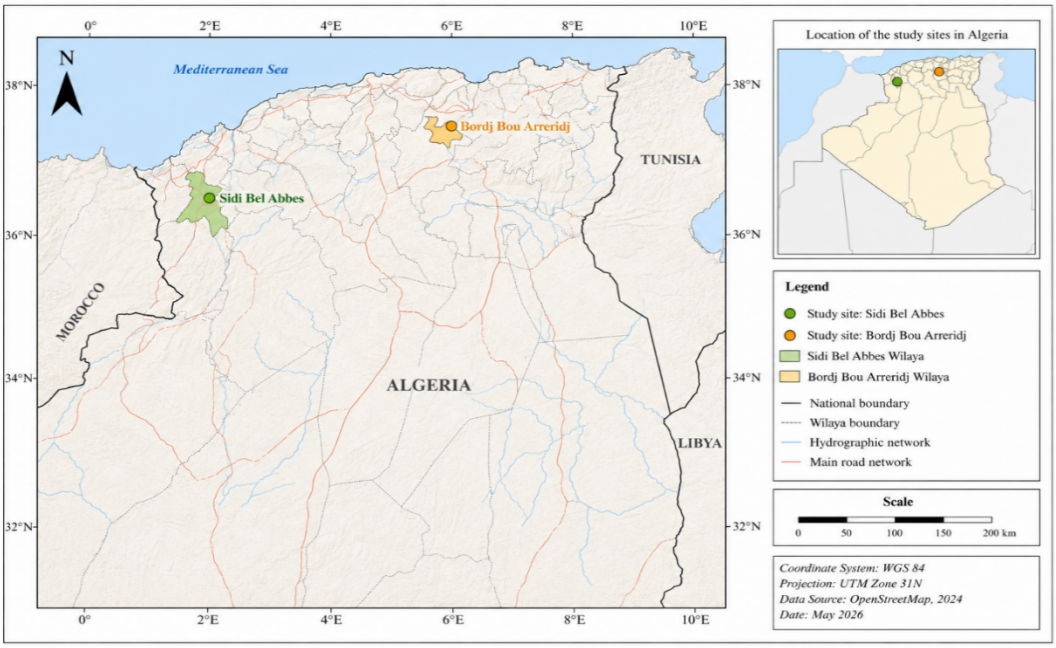


Figure 1. Geographic location of the studied regions, showing the wilayas of Sidi Bel Abbes and Bordj Bou Arreridj in Algeria.

Quantitative ethnobotanical indices

A comparative ethnobotanical study was conducted via a stratified random sampling method at several spots in both wilayas Sidi Bel Abbes in the west and Bordj Bou Arreridj in the high-plateau area Algeria. Choosing these regions was aimed at getting an overall picture of variations and the role of *Opuntia ficus-indica* cladodes in the local communities' knowledge base and their modes of transmission. Over the 2022–2024 period, a total of 995 questionnaire forms (500 for Sidi Bel-Abbes and 495 for Bordj Bou Arreridj) were collected through direct engagement with the local community. Besides villagers, respondents included herbalists and local traditional healers. Fieldwork was conducted through interviews after a prior explanation of study aims and obtaining informed consent from each participant. The questions mainly targeted two directions: the description of participants (age, gender, educational attainment, and occupation) and the ethnomedical aspect (vernacular names of plant parts used, preparation methods, administration routes, and specific ailments treated). Communication was maintained in the respondents' native tongues and dialects (Arabic and Berber) to avoid misinterpretation and ensure exact recording of local names and treatments.

Four ethnobotanical indices were calculated to determine both the prominence of *Opuntia ficus-indica* as a species and the traditional knowledge about its various uses.

Frequency of Citation (FC): It corresponds to the total number of people who identified *Opuntia ficus-indica* as a remedy for a specific disease or the use of the plant was linked to a certain disease.

Relative Frequency of Citation (RFC): To estimate the importance of the species in the locality, RFC was calculated by dividing the FC by the overall total of people (N).

$$RFC=\frac{FC}{N}$$

This parameter indicates the local degree of a plant's popularity. It fluctuates from being practically zero if hardly anyone mentions the plant to 1 if the plant is the only one that everyone mentions.

Use Value (UV): The degree of importance of the plant according to the local people as determined by the multiple uses of a plant.

$$UV=\frac{U}{N}$$

Where 'U' is the number of uses of plant reports cited by each informant for the species, and 'N' is the total number of informants.

Fidelity Level (FL): For a specific ailment that the communities treat frequently, the fidelity level indicates the plant or the part of the plant most widely used. FL was calculated by the formula:

$$FL=\frac{Ip}{Iu}\times 100$$

Ip is the number of informants suggesting the use of the plant for a specific disease category, and Iu is the total number of informants reporting therapeutic uses.

Statistical Analysis

To assess the relationship between ethnobotanical variables and the sociodemographic characteristics of the informants, statistical tests (correlation tests and chi-square tests) were conducted. The results were then processed and presented in graph form using Microsoft Excel.

Results

Population Profile

Table 2. Distribution of participants by sociodemographic variables

Parameters	Categories		SBA (%)		BBA (%)	
Gender	Male	Female	38.8	61.2	35.6	64.4
Age range	<20		0	8.4	0.6	9.9
	[21-30]	[31-40]	8.0	9.4	5.5	14.3
	[41-50]	[51-60]	18.8	19.0	14.3	18.8
	[61-70]	[71-80]	18.6	17.8	21.4	15.2
	[81-90]					
Family situation	Single		13.0	86.4	19.8	74.7
	Married		0.6	0	0.6	4.0
	Divorced					
	Widower					
Level of education	Illiterate		32		34.6	
	Primary		24.4	28.2	22.6	24.7
	Secondary		15.4		18.1	
	University					
Occupation	Not working		2.8		6.1	
	Retired		34.8		31.5	
	Students		6.2	1.0	8.9	3.8
	Farmers		21.2	34.0	20.0	
	Civil	Servants			29.7	
	Housewife					
Location	Urban		58.8	41.2	60	40
	Rural					

Knowledge and Perceptions of Cladodes

The results presented in Table 3 show that the family is the main source (50–54%) of knowledge about herbal medicine, followed by the community (38–42%), while the contribution of schools and herbalists remains limited (< 6%). Both regions show a neutral perception of cladodes, with a more pronounced tendency (30.3%) in Bordj Bou Arreridj BBA. Daily use is more common in BBA (53.5%) than in Sidi Bel-Abbes SBA (29%).

The primary use of cladodes remains therapeutic (79.3% SBA; 52.8% BBA). On the other hand, cosmetic use is most prevalent in SBA (13.8%), while agricultural (20%) and environmental (19.2%) uses are more common in BBA. The incorporation of cladodes into the food sector remains marginal (<2%). The therapeutic effects of cladodes are reported by (36%) of respondents in SBA and (34.7%) in BBA. The main indications raised are burns, digestive disorders, diabetes, and ulcers, with prevalence rates of (34.3%), (10%), (7.1%), and (6.4%), respectively, in BBA. As well as arthritis, skin diseases, and rheumatism, with percentages of (23.8%), (23.4%), and (16.7%), respectively, in SBA.

Preparation methods, administration routes, measurement units, and side effects

The results confirm that the most common form of preparation in both regions (≈ 40–43%) remains the cataplasm, followed by the infusion (21.4%) and cooking (14.3%) method in SBA. However, in BBA, powder remains the most commonly used form (20.0% vs. 10.7% in SBA), while decoction and consumption of the raw plant remain marginal. Regarding routes of

administration, topical use predominates, with rates of (65.7%) in BBA and (57.1%) in SBA, followed by oral administration (≈ 33%). Massage is reported exclusively in SBA (10.7%).

Furthermore, the predominance of topical use may be due to the mucilaginous texture characteristic of cladodes, which are known for their calming effects on arthritis, burns, and superficial wounds.

Most people in both regions use the cladodes “by the handful” (≈ 70%), relying on an empirical method of measurement. The cladodes are utilized for environmental and agricultural purposes, particularly in BBA: erosion control (64.7%), the creation of natural defensive hedges (56.4%), firebreaks (43.6%), and land reclamation (35.3%).

Table 3. Sources of knowledge, perceptions, uses, and therapeutic applications of cladodes

Parameters	**SBA (%)**	**BBA (%)**
Knowledge of cladodes		
Yes	100	100
No	0	0
Sources of information		
Family	54	50.5
Community	38	42.4
School/Training	1.6	2
Herbalist	6.4	5.1
Knowledge in the community		
Positively	19.4	30.3
Negatively	26	24.4
Neutral	54.6	45.3
The use of cladodes in daily life		
Yes	29	53.5
No	71	46.5
The uses of cladodes		
Food	1.3	0.8
Medicinal	79.3	52.8
Cosmetic	13.8	5.7
Agricultural	2.1	20
Environment	3.5	19.2
Food animals	0	1.5
Therapeutic applications		
Yes	36	34.7
No	64	65.3
Diabetes	0.8	7.1
Rheumatism	16.7	12.1
Digestive tract	2.4	10
Joint pain	23.8	14.3
Skin disorders	23.4	15.7
Burns	29.8	34.3
Ulcers	3.2	6.4

Table 4. Methods of preparation, application, units of measurement, and side effects

Parameters	**SBA (%)**	**BBA (%)**
Mode of preparation		
Infusion	21.4	14.3
Decoction	0	2.8
Powder	10.7	20
Poultice	42.9	40
Raw	10.7	9.3
Cooked	14.3	13.6
Modes of application		
Local application	57.1	65.7
Massage	10.7	0
Oral	32.2	34.3

Measurment units		
Handful	67.9	72
Spoonful	32.1	28
Side effect		
Yes	0	0
No	100	100
Others use		
Fight against erosion	44.4	64.7
Conquest of soils	55.6	35.3
Fire barrier	50	43.6
Natural formation of defensive hedges	50	56.4

Ethnobotanical indices

The results derived quantitatively showed that the local uses of the plants in question differ to some extent between these regions. SBA had a Relative Frequency of Citation (RFC) greater than 0.36 whereas BBA's RFC was 0.347 and at the same time showed greater Use Value (UV = 0.793 vs. 0.528 in BBA). Based upon the Fidelity Level (FL) scores, one can see that the uses of cladodes in healing by the inhabitants of each region are very distinct. From SBA came the highest share of burn treatments, joint pains and skin ailments (82.78%, 66.11% and 65.00% respectively), and this would suggest that the people are very knowledgeable about using the cladodes part of the plant. On the other hand, BBA still primarily justifies burn treatments (98.84%) followed closely by skin conditions (45.35%) and joint pains (41.28%).

Table 5. Quantitative assessment of ethnobotanical indices of *Opuntia ficus indica* cladodes

Locality	**N**	**FC**	**RFC**	**UV**
Sidi Bel Abbes	500	180	0.36	0.793
Bordj Bou Arreridj	495	172	0.347	0.528

N: number of informants; FC: frenquency of citation; RFC: relative frequency of citation; UV: use value

Table 6. Therapeutic indications, fidelity level, and numbers of citations of *Opuntia ficus indica* cladodes

Therapeutic Indication	**NC (SBA)**	**FL (%) SBA**	**NC (BBA)**	**FL (%) (BBA)**
Diabetes	4	2.22	35	20.35
Rheumatism	83.5	46.39	60	34.88
Digestive tract	12	6.67	50	29.07
Joint pain	119	66.11	71	41.28
Skin disorders	117	65.00	78	45.35
Burns	149	82.78	170	98.84
Ulcers	16	8.89	32	18.60

FL: fidelity level; NC: number of citations; SBA: Sidi Bel Abbes; BBA: Bordj Bou Arreridj

Chi-square test and Cramer's V analysis

The information in Table 7, in essence, depicts the differences between the various parameters measured in the regions, as well as their distribution within the regions. According to the results, it is clear that there are major differences in the level of the measured values. Moreover, it points to some regional factors that are behind these differences in terms of the use and characteristics of *Opuntia ficus-indica* cladodes. Fascinatingly, the findings match with the ethnobotanical patterns seen on the ground, which indicate that in terms of customs, local factors and practices, as well as other factors that determine these local conditions, they change from one region to another.

Table 7. Chi-square χ^2 and Cramer's V coefficient tests for different variables in the two study regions.

Parameters	**Categories**	**SBA (N = 500)**	**BBA (N = 495)**	**χ^2 value**	**df**	**P-value**	**Interpretation**
Gender	Male	194 (38.8%)	176 (35.6%)	0.986	1	0.321	NS
	Female	306 (61.2%)	319 (64.4%)				
Age range	<20	0 (0.0%)	3 (0.6%)	16.189	7	0.023	S
	[21-30]	42 (8.4%)	49 (9.9%)				
	[31-40]	40 (8.0%)	27 (5.5%)				
	[41-50]	47 (9.4%)	71 (14.3%)				
	[51-60]	94 (18.8%)	71 (14.3%)				

	[61-70] [71-80] [81-90]	95 (19.0%) 93 (18.6%) 89 (17.8%)	89 (18.0%) 106 (21.4%) 75 (15.2%)				
Family situation	Single Married Divorced Widower	65 (13.0%) 432 (86.4%) 3 (0.6%) 0 (0.0%)	98 (19.8%) 370 (74.7%) 3 (0.6%) 20 (4.0%)	**31.395**	3	0.001	**S*** **
Level of education	Illiterate Primary Secondary University	160(32%) 122 (24.4%) 141 (28.2%) 77 (15.4%)	171(34.6%) 112 (22.6%) 122 (24.7%) 90 (18.1%)	3.284	3	0.350	NS
Occupation	Retired Students Farmers Civil Servants Housewife	14(2.8%) 174(34.8%) 31 (6.2%) 5 (1.0%) 106 (21.2%) 170 (34.0%)	30(6.1%) 156(31.5%) 44 (8.9%) 19 (3.8%) 99 (20.0%) 147 (29.7%)	19.103	5	0.002	S
Location	Urban Rural	294 (58.8%) 206 (41.2%)	297 (60.0%) 198 (40.0%)	0.103	1	0,748	NS

*NS: Not significant (p≥0.05). S: Statistically significant difference (p < 0.05) S** Highly significant (p<0.01).*

Table 8 demonstrate there exists a very strong difference (p<0.001) in the way *Opuntia ficus-indica* cladodes are valued between Sidi Bel Abbes and Bordj Bou Arreridj. The medicinal (396 references) and cosmetic (69 references) uses are mainly the two directions Sidi Bel Abbes is pointing to when it comes to *Opuntia ficus-indica*. Meanwhile in Bordj Bou Arreridj the plant resource is being exploited mainly towards agriculture (99 references) and nature (95 references). On the contrary, food use does not present a statistically significant difference between the two localities (p=0.555) and it remains minor anyway. Such changes are the evidence of different ways of life being adopted locally in response to different characteristics of socio-ecological situation in each area as well as the fact that *Opuntia ficus-indica* as a species is very versatile and provides multiple functions

Tabe 8. Chi-Square test results comparing usage categories between SBA and BBA

Usage Category	**FC (SBA)**	**FC (BBA)**	**Chi-Square (χ^2)**	**p-value**	**Statistical Significance**
Food	7	4	0,348	0,5554	(NS)
Medicinal	396	261	76,541	< 0.001	S (***)
Cosmetic	69	21	26,469	< 0.001	S (***)
Agricultural	10	99	80,785	< 0.001	S (***)
Environmental	18	95	58,53	< 0.001	S (***)

Comparison of usage of cladodes by region

From the cladodes used for therapeutic purposes alone, it is Figure 2 which reveals both wilayas. However, such dominance of therapeutic applications is more prominent in Sidi Bel-Abbes, where in over 79% of surveys it is mentioned, and it is around 53% for the other wilaya. On the other hand, the peak utilization of cosmetic aspects by the Sidi Bel-Abbes population was recorded, whereas the agricultural and environmental uses gained popularity in Bordj Bou Arreridj. These results suggest that while both the wilayas show common therapeutic use patterns, the people of Bordj Bou Arreridj use a significantly larger range of other applications of the cladodes, especially in different agricultural and environmental aspects.

The box plot (Fig. 3) illustrates that age is positively correlated with cladode use. Young persons aged 18, 25 are shown to use them least and most uniformly, in contrast to the oldest age group (>65) which shows much greater use and dispersion of data values. This finding supports the notion that the acquisition and implementation of cladode techniques are primarily influenced by intergenerational exchange and personal experience.

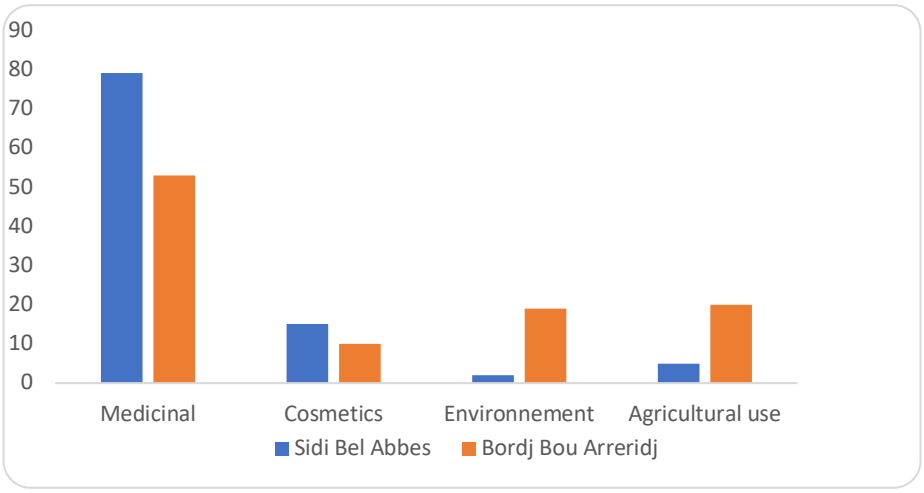


Figure 2. Regional comparative analysis of the use of OFI cladodes.

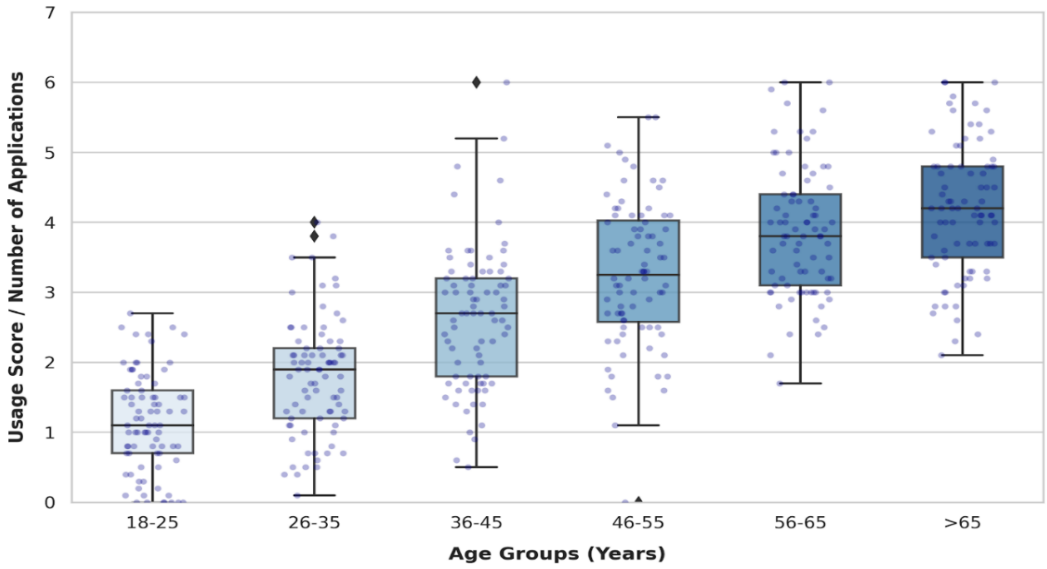


Figure 3. Distribution of cladode usage frequency and application score across different informant age groups in the studied regions.

Discussion

The sociodemographic factors influence the uses and benefits of OFI cladodes. Similarly, the predominance of older participants observed in both regions indicates that ethnobotanical knowledge is primarily preserved and transmitted across generations; this has been highlighted in several ethnobotanical studies in Algeria (Belmouhoub *et al.* 2024; Sraoui *et al.* 2026), in Bulgaria (Cherneva & Ivanov 2023), and in Saudi Arabia (Qari *et al.* 2024).

The predominance of female participants observed in our study is consistent with Gherib *et al.* 2024, Belhacini *et al.* 2024, and Vardeman *et al.* 2024, which confirm the vital role of women in preserving traditional knowledge and practicing traditional medicine.

Despite the fact that the majority of participants were illiterate, the presence of individuals with a university education indicates an interest in the various uses of cladodes. A number of studies conducted in Algeria have reported comparable results (Torche *et al.* 2024; Belhacini *et al.* 2024; Radjai *et al.* 2025), as well as internationally, notably in India and Ethiopia, where ethnobotanical surveys confirm that illiterate individuals are the most actively engaged in herbal medicine (Ralte *et al.* 2024; Misganaw *et al.* 2025). However, a renewed interest in medicinal plants is also observed among individuals with a high school or college education, as reported by Miara *et al.* 2018.

Furthermore, the use of cladodes is primarily limited to retirees and house wives. This tendency is similar to that observed by Bendif *et al.* (2023) and confirmed by several international studies: women, as a group, are responsible for family health (Joshi *et al.* 2020; Mahwasane *et al.* 2022; Mantuan & Sannomiya 2024).

The use of cladodes is more common in urban areas than in rural areas. This could be explained by better dissemination of information and a higher level of education in cities. The same findings were reported in South Africa (Prinsloo *et al.* 2023). This finding contradicts a study conducted in Brazil, which shows that women in rural areas have a more extensive knowledge of medicinal plants than those in urban areas, even though the latter generally have a higher level of education (Sousa *et al.* 2020). The traditional pharmacopoeia plays a very important role in Algerian culture, as reported by Djarmouni *et al.* 2023.

therapeutic results of cladode use are similar to those described by Armas Diaz *et al.* 2022, Amrane-Abider *et al.* 2023, Nam *et al.* 2023, and Salamone *et al.* 2024, which demonstrated the anti-inflammatory, antioxidant, antidiabetic, antiviral, and anticancer abilities of cladode extracts. Recently, studies confirmed the anti-aging effects of OFI extracts (Abbas *et al.* 2023; Jarray *et al.* 2025).

The methods of preparation are consistent with much of the ethnobotanical research conducted in the Mediterranean basin. Mouhaddach *et al.* 2018 report that Moroccans use cladodes in salt brine to treat and reduce hypercholesterolemia; similarly, Maruca *et al.* 2019 note that the external use of cladodes contributes to the treatment of burns and furuncles. The popularity of the topical application of cladodes is supported by pharmacological studies confirming the anti-inflammatory, regenerative, and wound-healing effects of the bioactive polysaccharides in cladodes (Liu *et al.* 2025; Adjafre *et al.* 2023; Bahloul *et al.* 2024; Adjafre *et al.* 2024; Ktari *et al.* 2024; Liu *et al.* 2025). Furthermore, Zeghbib *et al.* 2022 demonstrated that the decoction method leads to the efficient extraction of phenolic compounds with antioxidant effects.

Furthermore, the predominance of topical use may be due to the mucilaginous texture characteristic of cladodes, which are known for their calming effects on arthritis, burns, and superficial wounds. Benmoussa *et al.* 2023 highlight the predominance of external uses of *Opuntia ficus-indica* cladodes. Furthermore, oral consumption, which is particularly focused on the herbal treatment of gastrointestinal disorders and diabetes, is also supported by recent research identifying the biological properties of cladode extracts that have gastroprotective effects and inhibit the pro-inflammatory functions of neutrophils, thus confirming their therapeutic value (Ammam *et al.* 2023; Ferjani *et al.* 2024).

Several researchers have highlighted the tolerability of *Opuntia ficus-indica* cladodes (Benítez *et al.* 2020; Medina-Torres *et al.* 2019), as well as the absence of adverse effects of polysaccharide extracts from the cladodes on wound healing, with low cytotoxicity (Adjafre *et al.* 2024 ; Kendir *et al.* 2023). Furthermore, clinical trials have shown that supplementation with cladodes has no adverse effects (Mellai *et al.* 2024).

The environmental and agricultural uses are consistent with the findings of Jarray *et al.* 2025. Several studies have confirmed that *Opuntia ficus-indica* contributes to water management in arid areas, the provision of ecosystem services, soil conservation, carbon sequestration, and the maintenance of sustainable agriculture (Mekki *et al.* 2019; Bautista-Cruz *et al.* 2018; Stavi 2022).
The data presented in Tables 5, and Figures 2, 3 collectively indicate that the traditional valorization of *Opuntia ficus-indica* cladodes is heavily influenced by geographical and sociodemographic factors. A significant variation can be observed between different study areas: Sidi Bel Abbes mainly refers to the use of the plant for therapeutic and cosmetic purposes, while on the contrary, Bordj Bou Arreridj is characterized by agricultural and environmental uses of the plant ($p < 0.001$). These dissimilarities can be accounted for by the differences in local ecological challenges and the development of adaptive rural strategies. The knowledge about the plant is preserved and used mainly by the people living in a particular region. It can easily be seen that with increase in age; there is a decline in the number of times someone would use the plant (Fig. 3). This is actually a sign of elders being key players for carrying the local plant knowledge to younger generations, this is a finding that is supported by other research done both globally and in the Mediterranean regions (Bouras *et al.* 2025; Qari *et al.* 2024). Moreover, characteristics such as gender, level of education, household type and other factors largely explain the variability among users (Gherib *et al.* 2024). These factors show how women and rural families are at the heart of preserving the knowledge and usage of traditional herbal medicines. It is mainly women belonging to rural families who have been carrying on this treasure of traditional medicines through generations of their families. (Ralte *et al.* 2024, Prinsloo *et al.* 2023). Finally, the statistical results of these studies clearly illustrate that *Opuntia ficus-indica* is a bioresource with a potential of various applications that is subject to a convergence of cultural heritage, social division, and environmental aspects at a local level.

Conclusion

This research paper focuses on the ethnobotanical knowledge the native people have about the uses of cladodes of the plant *Opuntia ficus-indica* in two regions Sidi Bel-Abbes and Bordj Bou Arreridj. Based on the survey results, it is concluded that the use of the cladode is a function of the local features with therapeutic uses being predominant in Sidi Bel-Abbes where a great part of the population still relies on the traditional medical practices, while in the case of Bordj Bou Arreridj, agricultural and environmental uses of the cladode are the most popular ones. Besides that, traditional knowledge appears very often to be transmitted by age, and in fact, older people know much about it and are the ones to pass it on. These results further reinforce the need for such traditional knowledge to be preserved, and at the same time to open doors for research aiming at the therapeutic, agricultural and environmental potentiality of this species so that the benefits can be realized through sustainable means.

Declarations

List of abbreviations: BBA – Bordj Bou Arreridj ; SBA – Sidi Bel Abbes; OFI – *Opuntia ficus-indica*; FC – Frequency of Citation; RFC – Relative Frequency of Citation; UV – Use Value; FL – Fidelity Level.

Ethics approval and consent to participate: Ethics approval and consent to participate: This ethnobotanical survey was conducted in accordance with ethical principles for research involving human participants. Participation was entirely voluntary, and all informants were informed about the objectives of the study before being interviewed. Verbal informed consent was obtained from each participant prior to data collection. No personal identifying information was recorded. According to the institutional requirements applicable to this study, formal ethics committee approval was not required.

Consent for publication: Not applicable

Availability of data and materials: The datasets generated and analyzed during the current study are available from the corresponding author upon reasonable request.

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Author contributions: Abdallah Touati Djihene conceived and designed the study, conducted the ethnobotanical survey, collected the data, performed the statistical analyses, interpreted the results, carried out the botanical identification of *Opuntia ficus-indica*, and wrote the original manuscript. El Kadi Fatima Zohra critically revised the manuscript, edited and finalized the English version, and approved the final version for publication. Zellit Rania Soumia provided scientific guidance and contributed to the study design. Rokkaya Sami and Asif Wali provided valuable support in reviewing the methodology and assisted in data validation.

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