Ethnobotany of the apricot tree (*Prunus armeniaca* L.) in the Batna Region, Algeria: Traditional knowledge, uses, and socio-economic importance

Ayache Laabassi, Azzedine Fercha, Smail Chafaa, Fateh Mimeche

Correspondence

Ayache Laabassi[1]*, Azzedine Fercha[2], Smail Chafaa[1], Fateh Mimeche[3]

[1]Department of Ecology and Environment, Faculty of Science of Nature and Life, University of Batna 2, Batna, Algeria.
[2]Department of Agronomy, Faculty of Nature and Life Sciences, Abbes Laghrour University, Khenchela, Algeria.
[3]Department of Agricultural Sciences, University of M'Sila, M'Sila, Algeria

*Corresponding Author: a.laabassi@univ-batna2.dz

Research

Abstract

Background: The apricot tree (*Prunus armeniaca* L.) is deeply embedded in the agricultural and cultural traditions of the Batna region in northeastern Algeria. It holds significant economic value and is associated with a rich body of traditional knowledge, encompassing a wide range of uses that remain largely undocumented and are at risk of being lost.

Methods: Ethnobotanical surveys were conducted from March 2023 to August 2024 in 15 Batna municipalities. Data were collected from 150 local informants using semi-structured interviews and participant observation. Quantitative data were interpreted using ethnobotanical indices such as Use Value (UV), Fidelity Level (FL%), and Informant Consensus Factor (ICF).

Results: Prunus armeniaca is a versatile species with profound socio-economic and cultural value in the Batna region. A total of 28 distinct uses were recorded, distributed across four categories: food (56% of use-reports), medicinal (25%), handicraft (11%), and fodder (8%). All parts of the tree are utilized, with the fruit being the most commonly used (92% of informants). Quantitative indices revealed a high overall Use Value (UV = 0.89) and a significant knowledge gap between older and younger generations (p < 0.001).

Conclusions: This study provides a crucial baseline record of the traditional knowledge associated with *P. armeniaca* and highlights the urgent need for its conservation in light of the observed intergenerational knowledge erosion. The findings underscore the species' integral role in local livelihoods and identify potential for developing sustainable value-added products, that could support local economies and help preserve this intangible cultural heritage.

Key words: Ethnobotany; *Prunus armeniaca*, Traditional Knowledge; Quantitative Indices, Batna; Algeria, Conservation

Background

Ethnobotany, as an interdisciplinary science, bridges human societies and the plant world, playing a critical role in documenting indigenous and local knowledge (Martin 1995). This knowledge, traditionally transmitted orally from generation to generation, represents an invaluable source of information on the use, management, and conservation of biodiversity (Heinrich *et al.* 2018). However, with the rapid progress of globalization and urbanization in the last centuries, this traditional knowledge is increasingly threatened, making its scientific documentation a pressing necessity (Benz *et al.* 2000).

The apricot tree, *Prunus armeniaca* L., is believed to have originated in Northeastern China (Faust *et al.* 1998). Cultivated for thousands of years and disseminated along the Silk Road, it has become a major temperate horticultural crop worldwide (Vavilov 1951). Algeria is an important producer in the Mediterranean basin, with one of its major production areas being the Batna region in the Aurès Mountains area, due to favorable climatic conditions (DSA 2022). The region is famous for the quality of its fruits, e.g., local varieties like 'Hamid' and 'Canino', which form the core of the local agricultural economy.

Beyond its economic value, the apricot tree is deeply embedded in the daily life and culture of Batna. It features prominently in household gardens, agricultural plots, and collective memory. While research on apricot in Algeria has focused on pomological, phytopathological, and agricultural aspects (Benaziza & Makhloula 2020; Chafaa *et al.* 2019), little has been published on its ethnobotany. Although anecdotal evidence suggests a wide variety of traditional uses for different parts of the tree—from fruit and kernels to wood and leaves—a comprehensive ethnobotanical study of this plant in the Batna region is lacking.

Therefore, this study was conducted to fill this gap. We hypothesize that *Prunus armeniaca* is a multi-purpose species in Batna, holding abundant and sophisticated traditional knowledge, particularly among the elderly. The specific objectives of this research are:

To document and tabulate all the traditional uses (alimentary, medicinal, artisanal, fodder) of different parts of P. armeniaca. To order the relative importance of these uses quantitatively by the application of quantitative ethnobotanical indices (UV, FL%, ICF).

To analyse the effect of informant demographics (gender, age) on levels of retained knowledge.

To quantify the socio-economic value of the apricot tree to local families.

Materials and Methods

Study Site

The study was conducted in the Batna Province (Wilaya), north-east Algeria (34°50'N, 6°20'E) (Figure 1). Covering a surface area of approximately 12,192 km², Batna province is in northeastern Algeria, part of the Aurès Mountains region, characterized by a semi-arid climate region with cold winters and dry hot summers (ONM, 2023). The region's agriculture relies heavily on arboriculture, with the apricot tree being a major fruit crop. Fifteen municipalities in the province were selected for the survey to ensure representative geo-cultural and socio-cultural coverage.

Ethnobotanical Data Collection

Data were gathered on two complete phenological cycles from March 2023 to August 2024. Semi-structured questionnaires and participant observation were applied to interview the total of 150 informants (68 men and 82 women). Informants were recruited using a combination of random and "snowball" sampling techniques (Alexiades & Sheldon 1996). To be eligible, participants had to be long-term residents (≥20 years) of the surveyed municipalities and have practical or inherited knowledge of apricot tree cultivation and/or use, such as farmers, herbalists, housewives involved in food processing, or local artisans. This criterion ensured that respondents possessed the traditional ecological knowledge relevant to the study's objectives. Informed consent was obtained orally by all participants, in accordance with the Code of Ethics of the International Society of Ethnobiology (ISE 2006).

The questionnaire was designed to obtain information on:
- Informant demographics (age, gender, occupation).
- Local names of the plant.
- Plant parts used (fruit, kernel, wood, leaves, gum, etc.).
- Particular use (food, medicine, handicraft, etc.).
- Modes of preparation and administration.
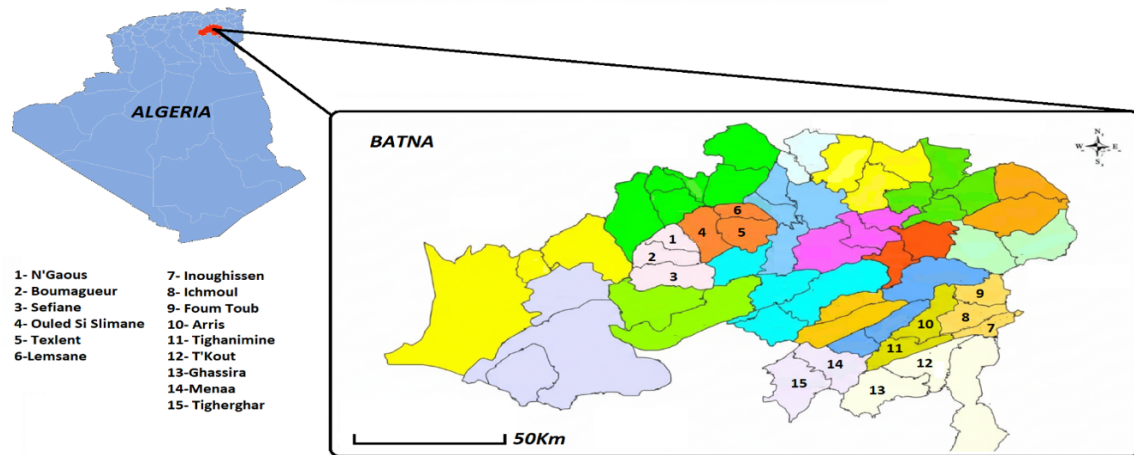- Perceived effectiveness and socio-economic significance.

Figure 1. Map of the Batna Region, Algeria.

Plant Identification
The species of the plant was botanically identified in the field using standard flora (Battandier & Trabut 1888).

Data Analysis
• *Qualitative Analysis*: All the above-listed uses were grouped into wider categories: Food, Medicinal, Handicraft, and Fodder.
• *Quantitative Analysis*: The following indices were calculated:
- Use Value (UV): $UV = \Sigma U_i / N$, where U_i is the number of uses mentioned by each informant and N is the total number of informants (Phillips & Gentry 1993).
- Relative Frequency of Citation (RFC): $RFC = FC / N$, where FC is the number of informants mentioning a specific use of the plant, and N is the total number of informants in the survey (Ralte *et al.* 2024).
- Fidelity Level (FL%): $FL\% = (N_p / N) * 100$, where N_p is the number of informants reporting a specific use of a given purpose, and N is the total number of informants reporting the plant for any use (Ralte *et al.* 2024).
- Informant Consensus Factor (ICF): $ICF = (N_{ur} - N_t) / (N_{ur} - 1)$, where N_{ur} is the frequency of use reports in a particular category of uses and N_t is the number of species employed in that category. In this one-species study, N_t will always be equal to 1, thus the ICF was calculated over the ailment categories in the medicinal uses (Trotter & Logan 1986).

Statistical Analysis: Statistical analysis was performed using SPSS software (Version 26). A one-way Analysis of Variance (ANOVA) was used to determine significant differences in the number of reported uses among different age groups. A p-value of less than 0.05 was considered to be statistically significant.

Results and Discussion

Demographic Profile of Informants
The 150 informants ranged in age from 22 to 89 years, with a mean of 58.7 years. The sample consisted of 45.3% males and 54.7% females. 65.3% listed farming as their primary occupation. The above sample profile mirrors that of the traditional knowledge holders in the community, who were typically older and actively engaged in farming activities (Table 1).

Variety in Uses and Parts Used
The apricot tree exemplifies a principle of optimal foraging, where human populations maximize the utility of available resources to limit waste (Turner & Turner 2008; Albuquerque *et al.* 2013). Our survey documented 28 different uses for *P.*

armeniaca, categorized as Food (56% of use-reports), Medicinal (25%), Handicraft (11%), and Fodder (8%). This multi-purpose usage pattern is characteristic of traditional agro-ecosystems, which are known for high resource-use efficiency and profound experiential knowledge of local biodiversity (Altieri 2004; Gómez-Baggethun & Reyes-García 2013).

Table 1. Demographic profile of the informants (n=150).

Category	Sub-Category	Number	Percentage (%)
Gender	Male	68	45.3
	Female	82	54.7
Age	20-39	25	16.7
	40-59	52	34.7
	≥ 60	73	48.6
Occupation	Farmer	98	65.3

Indeed, every part of the tree was utilized. The fruit was the most widely used part (92% of informants), followed by the kernel (58%), wood (35%), and leaves (18%). This comprehensive utilization highlights the tree's deep integration into the local livelihood system and reflects a sustainable, near-zero-waste approach to resource management (Altieri 2004).
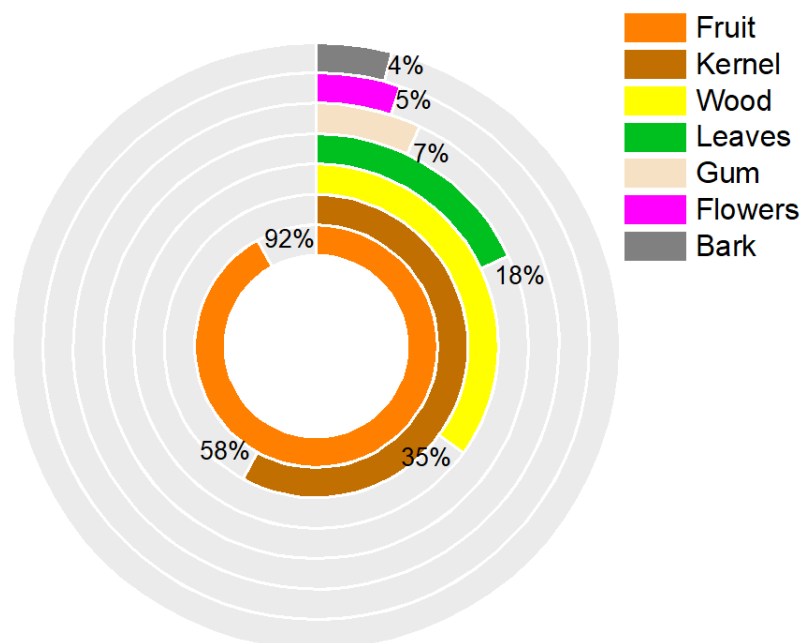

Figure 2. Percentage of use-reports for different plant parts of *Prunus armeniaca* L. in the Batna region.

Figure 2 shows the percentage use-reports by plant part, highlighting the multi-purpose contribution of the whole tree to the local livelihood system. The multi-purpose utilisation is characteristic of the traditional agro-ecosystems, in which high resource utilisation efficiency is a general pattern (Altieri 2004).

Table 2. Batna region ethnobotanical inventory of *Prunus armeniaca* L.

Plant Part	Use Category	Specific Use	Preparation Mode	RFC
Fruit	Food	Fresh consumption	Raw	0.92
Fruit	Food	Jam (*Konfitura*)	Cooked with sugar	0.85
Fruit	Food	Dried apricots	Sun-dried	0.78
Kernel	Medicinal	Cough, Cold	Eaten raw (small quantities), infused in oil	0.58
Kernel	Medicinal	Constipation	Eaten raw	0.51
Wood	Handicraft	Tool handles, furniture	Carved, joined	0.35
Wood	Other	Fuel	Firewood	0.31

Food Uses and Nutritional Importance

Apricots are a major component of the local diet and economy in Batna. Beyond fresh consumption, traditional processing methods like sun-drying and jam-making (*Konfitura*) are essential for preserving the highly perishable fruit. These methods

ensure year-round availability and are central to the region's food culture and culinary identity (Guarrera & Savo 2016; Pieroni & Quave 2014).

There is abundant evidence on the nutritional significance of apricots. They are a plentiful source of vitamins (especially A and C), minerals (potassium, iron), dietary fibre, and antioxidants like carotenoids and phenolics (Fatima *et al.* 2018 ; Akin *et al.* 2008). Thus, these processed products become a major reservoir of nutritional security especially when fresh fruits are not in supply. The making of traditional concentrates, juices, and pastes is just another way of proving local people's knowledge and their creativity in turning a simple agricultural product into a value-added one (Boutiti *et al.* 2022).

Medicinal Uses and Quantitative Analysis

Themedicinal use of *Prunus armeniaca* in Batna comprises numerous methods and is highly consensual to a great extent of the informants. Out of all the plant parts, kernels were the most frequently mentioned in folk medicine, mainly in the treatment of respiratory (cough, cold) and digestive (constipation) diseases. The high Informant Consensus Factor (ICF) for gastrointestinal disorders (ICF = 0.81) reflects the sharing of knowledge among apricot kernels' users for these matters. The pharmacological studies lend some support to this traditional use; apricot kernels are equipped with amygdalin, which in small doses can have a laxative effect (He *et al.* 2020; Jaszczak-Wilke *et al.* 2021).

Table 3. *Prunus armeniaca* medicinal applications with Fidelity Level (FL%).

Ailment Category	Plant Part	Use Reports	FL%
Digestive (Constipation)	Kernel	77	84%
Respiratory (Cough, Cold)	Kernel	71	79%
Dermatological	Kernel Oil	25	52%
Pain Relief (Rheumatism)	Kernel Oil	18	41%

Nevertheless, it is very important to emphasize that amygdalin can be converted into cyanide, so dosage-controlled and preparation method-aware are two indispensable elements of the traditional practice, thus, local knowledge is quite intricate in this respect (Bolarinwa *et al.* 2014). Additionally, apart from the aching muscle relieving by massaging kernel oil, the ear pain alleviation was mentioned, albeit with lower Fidelity Levels (Jaafar, 2021), thus, less frequently used.

Other Uses: Handicraft, Fodder, and Socio-economic Role

The apricot tree also serves important socio-economic functions through material culture and livestock husbandry. The wood, which is appreciated for its hardness and attractive grain, is employed by local craftsmen in making tool handles and small pieces of furniture, and it is also used as a kind of fuelwood of the highest quality (Bruno *et al.* 2021). Furthermore, leaves and pruned branches are used as fodder for goats and sheep, a practice particularly valuable during dry periods. This represents a sustainable, integrated system where agricultural by-products are recycled on-farm (Guarrera & Savo 2016).

Economically, the sale of fresh and processed apricot products (e.g., dried apricots, jam, kernels) provides a vital supplementary income for many households. This income diversification underpins the local economy, operating through both formal and informal channels and contributing to community resilience (Shackleton & Shackleton 2004; Padoch 2013).

Statistical Analysis and Knowledge Transmission

The high overall ethnobotanical value of *Prunus armeniaca* was supported by the quantitative analysis with a general Use Value (UV) of 0.89. A one-way ANOVA indicated that there was a statistically significant difference ($F_{(2, 147)} = 12.45$, $p < 0.001$) in the average number of uses cited by different age groups. Post-hoc comparisons revealed that the group of informants aged 60 and above (mean = 8.2 uses) mentioned significantly more uses than those aged 40-59 (mean = 5.1 uses) and 20-39 (mean = 2.3 uses). The sharp decrease in knowledge among younger generations is a very strong argument for the existence of an intergenerational knowledge gap, which has been recognized as a common phenomenon in the majority of ethnobotanical studies conducted worldwide (Reyes-García *et al.* 2005; Aswani *et al.* 2018). The loss is primarily due to globalization, urbanization, and the abandonment of traditional agrarian lifestyles and therefore represents a serious threat to the transmission of this intangible cultural heritage (Benz *et al.* 2000).
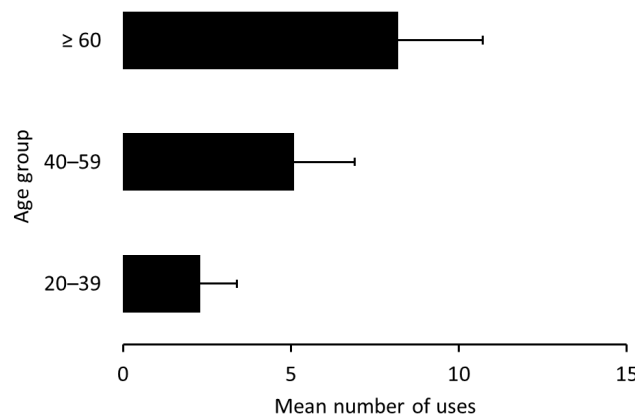
Figure 3. Relationship between informant age groups and the mean number of uses reported for *Prunus armeniaca* L. Error bars represent standard error. *** p < 0.001

Conclusion

The work constitutes the first systematic ethnobotanical documentation of *Prunus armeniaca* L. in Batna province of Algeria. The findings confirm that the apricot tree is a deeply integrated, multi-purpose species whose uses extend far beyond commercial fruit production. Its applications in medicine, crafts, and livestock keeping underscore its pivotal role in traditional agro-sylvo-pastoral livelihood systems.

The vast intergenerational gap of knowledge uncovered in this study sounds a warning for the urgent need to preserve such eroding heritage. We recommend:

1.Documentation and Dissemination: The results should be integrated into local school curricula and community workshops to facilitate knowledge transfer to the young generation.
2.Value-Added Development: The traditional products (kernel oil, jams) documented provide concrete prospects for community-based enterprises, making sustainable local economic development feasible.
3.More Research: Phytochemical and pharmacological analyses should be conducted to validate the safety and efficacy of the medicinal uses, particularly in relation to kernel toxicity. Agronomic research should aim at conserving and characterizing local landraces.

Briefly, Batna's apricot tree is a living heritage. Its conservation is not only an agricultural challenge but a multidisciplinary process essential for safeguarding the cultural identity of the region and promoting its sustainable development.

Declarations

List of abbreviations: ANOVA: Analysis of Variance, DSA: Direction des Services Agricoles (Direction of Agricultural Services), FL%: Fidelity Level, ICF: Informant Consensus Factor, ISE: International Society of Ethnobiology, ONM: Office National de la Météorologie (National Office of Meteorology), RFC: Relative Frequency of Citation, SPSS: Statistical Package for the Social Sciences,UV: Use Value.
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