International Journal of Environmental Sciences
ISSN: 2229-7359
Vol. 11 No. 8, 2025
https://theaspd.com/index.php

Use Of Tamarix Gallica In Traditional Saharan Pharmacopoeia (Region Of Adrar, Algeria)

Mohammed Souddi[1]*, M'hammed Bouallala[1, 2]
[1]Laboratory of Saharan Natural Resources, Faculty of Nature and Life Sciences, University of Ahmed Draia - Adrar 01000, Algeria
[2]Higher School of Saharan Agriculture, 01000, Adrar, Algeria
* **Corresponding author:** souddi01@hotmail.com

Abstract
Tamarix gallica L. plays a major ecological role in arid and Saharan ecosystems. It is characterized by its high tolerance to salinity, its ability to thrive in poor soils, and its contribution to the stabilization of dunes and wadi banks. This study aims to investigate the traditional therapeutic uses of Tamarix gallica in arid environments (the region of Adrar). To achieve this, around twenty ethnobotanical surveys were conducted in the study area, collecting both socio-demographic data and information on local medicinal practices. The results reveal the significant role of women in traditional Saharan medicine. Furthermore, the oldest members of the community possess the most extensive knowledge of Tamarix gallica phytotherapeutic properties. Ethnobotanical analysis revealed clear relationships between the plant parts used and the methods of remedy preparation. The main categories of diseases treated include respiratory, digestive, ophthalmological, sensory, and musculoskeletal disorders. In conclusion, the ethnobotanical knowledge preserved within traditional Saharan medicine constitutes a valuable cultural and scientific heritage. It deserves particular attention for the sustainable promotion and valorization of Saharan bioresources within an integrated development framework.
Key words: *Ethnobotany, traditional medicine, Sahara, traditional knowledge, Tamarix gallica.*

1. INTRODUCTION

Since ancient times, medicinal plants have been used to prevent and treat a wide range of health disorders, and they continue to play a fundamental role in traditional medicine. Indeed, plants remain a major source of active compounds in the modern pharmacopoeia and represent an inexhaustible reservoir of bioactive molecules for contemporary pharmaceutical research (Awaad et al., 2014; Ekor, 2014). Numerous studies have confirmed that medicinal plants contain a diverse array of secondary metabolites, including flavonoids, tannins, and alkaloids, which can be exploited for the treatment of both chronic and infectious diseases (Roy et al., 2022; Chaachouay & Zidane, 2024).

Beyond their ecological importance, species of the genus Tamarix are also well known for their numerous traditional applications. Since antiquity, they have been valued for their therapeutic and medicinal properties, particularly in the Maghreb, where they are among the plants reputed to possess anticancer potential in folk medicine. Various parts of the plant (leaves, galls, roots, and fruits) are traditionally used for their astringent, aperitif, diuretic, and sudorific properties (Ateeq & Firdose, 2024; Li et al., 2024). Phytochemical analyses have revealed that Tamarix species are rich in polyphenolic compounds such as flavonoids, phenolic acids, tannins, and coumarins, which confer significant antioxidant and antimicrobial activities (Lefahal et al., 2010). These secondary metabolites account for the plant's therapeutic efficacy in treating disorders such as rheumatism, eye diseases, digestive troubles, and spleen dysfunctions (Chehma & Djebar, 2008; Lakhdari et al., 2016; Adli et al., 2021; Oulad Hadj Youcef et al., 2025; Souddi et al., 2025).

From a socio-economic perspective, Tamarix gallica constitutes a plant resource of major importance for populations inhabiting arid and Saharan regions. Tamarix species are used as ornamental plants and as a source of forage, especially during dry seasons (Souddi & Ghezlaoui, 2020a). They also play a role in combating desertification and are widely employed in traditional medicine (Villar et al., 2014). Indeed, several parts of the plant, including the leaves, bark, and twigs, are traditionally used to treat a wide range of diseases (Souddi et al., 2022; Souddi et al., 2024). These empirical practices reflect ancestral knowledge transmitted orally from generation to generation, which remains poorly documented scientifically despite its cultural and therapeutic relevance. In Algeria, the genus Tamarix occupies an important place and is represented by ten species adapted to diverse and often extreme environments, including Tamarix aphylla and Tamarix gallica, both characteristic of arid ecosystems (Quézel & Santa, 1962-1963).

In this context, the present ethnobotanical study aims to investigate the traditional therapeutic uses of Tamarix gallica among local populations in the region of Adrar (southwestern Algeria).

2. MATERIALS AND METHODS

2.1. Study area

The study was carried out in three localities of the Adrar region, situated in the Algerian Sahara: the municipality of Tamentit (27°46′00″ N, 0°16′00″ W), Fenoughil (27°40′00″ N, 0°18′00″ E), and Reggane (26°43′12″ N, 0°10′16″ E). This region is characterized by a hyper-arid climate, with extremely high summer temperatures that can exceed 45°C and very low annual rainfall, often below 20 mm. The diurnal and seasonal temperature variations are considerable, reflecting an environment subject to intense abiotic stress. These sites were selected due to the natural occurrence and abundance of Tamarix gallica in various local ecosystems across the study area.

2.2. Biological material

Tamarix gallica L., belonging to the Tamaricaceae family, is a species widely distributed across arid and semi-arid regions of the Mediterranean basin (Quézel & Santa, 1962; Ozenda, 2004). It is a shrub or small tree usually reaching 2-5 m in height and occasionally up to 8 m (Villar et al., 2019). The plant exhibits a bushy habit with slender branches that range in color from reddish-brown to greyish, depending on age. The leaves are alternate, imbricate, and small (1-2 mm long), sessile, scale-like and partially cover the branches. They possess salt-excreting glands, a typical adaptation to saline environments (Flowers & Colmer, 2008).

This flowers are small, hermaphroditic, and grouped in elongated spikes measuring 2-5 cm, borne at the ends of the branches. Each flower has five pale pink to rosy petals. Flowering occurs from April to August, depending on local climatic conditions (Akhani et al., 2019). The fruit is a small, trilocular ovoid capsule (2-3 mm), which opens at maturity to release minute seeds equipped with a tuft of silky hairs, facilitating their anemochorous (by wind) and occasionally hydrochorous (by water) dispersal (Villar García, 2016).

T. gallica develops a deep taproot system that allows access to groundwater, while its extensive lateral roots promote effective colonization of alluvial habitats. These morphological and physiological traits explain its high drought tolerance and capacity for regeneration in disturbed ecosystems, particularly along wadi banks and in sandy areas (Khabtane & Rahmoune, 2012; Souddi & Ghezlaoui, 2020b).

2.3. Ethnobotanical surveys

The ethnobotanical survey was conducted in three localities in the wilaya of Adrar (Tamentit, Fenoughil and Reggane), where local populations remain highly dependent on plant resources for primary healthcare. The study followed the standardized ethnobotanical data collection protocols proposed by Martin (2004) and Albuquerque et al. (2014), emphasizing methodological rigor and respect for local knowledge. This approach is part of a participatory perspective, where the transmission of indigenous knowledge is an essential element in preserving and promoting ethnobotanical heritage.

The selection of informants was based on specific criteria, including experience, community recognition, and active practice of traditional herbal medicine. A total of twenty knowledgeable informants, including traditional healers with extensive experience in the use of medicinal plants, were interviewed.

The survey was carried out during 2020 using a semi-structured questionnaire, administered through direct individual interviews. The questionnaire consisted of two main sections:

i) **Sociodemographic data** of the informant (sex, age, education level, and family status);

ii) **Ethnobotanical data** concerning the medicinal uses of plants, including plant parts used, therapeutic indications, preparation methods, routes of administration, and diseases treated.

2.4. Data analysis

The collected ethnobotanical data were compiled and processed using Microsoft Excel 2016, which provided an efficient interface for data entry, organization, and structuring. The data were then summarized and analyzed through tables and graphical representations to highlight the frequency of use of Tamarix gallica, the therapeutic categories cited, and the methods of preparation reported by the informants.

3. RESULTS AND DISCUSSION

3.1. Sociodemographic profile of informants

Table 1 presents the sociodemographic characteristics of the respondents, including gender, age, educational level, and family situation.

Table 1. Sociodemographic characteristics of respondents

Categories	Sub-categories	Proportion (%)

Gender	Men	15 %
	Women	85 %
Age groups	[40-50 years[	30 %
	[51-60 years[	25 %
	> 61 years	45 %
Educational level	Illiterate	75 %
	Primary	25 %
Family situation	Married	95 %
	Single	5 %

Overall, women are significantly more represented than men (85% versus 15%). This finding reflects a socio-cultural pattern commonly observed in Saharan and rural societies of Algeria, where women are the main custodians and transmitters of ethnobotanical knowledge (Boudjelal et al., 2013; Benarba, 2016). Women with a rich heritage of traditional knowledge passed down orally from generation to generation play a central role in the preparation and use of medicinal plants within households (Lahsissene et al., 2009). Their daily responsibilities in family health care, especially concerning children and pregnant women, contribute to the development of empirical expertise in natural remedies and local healing practices. This observation is consistent with previous studies from the Algerian Sahara and other arid regions of the Maghreb, which emphasize the predominant role of women in the preservation and transmission of phytotherapeutic knowledge (Benkhnigue et al., 2012).

The use of Tamarix gallica is particularly common among older respondents, notably those aged over 61 years (45%), followed by 40-50 (30%) and 51-60 (25%) age groups. This distribution highlights the central role of older generations in preserving and transmitting traditional ethnobotanical knowledge. Several ethnobotanical studies in Algeria confirm that older individuals possess deeper and more comprehensive knowledge of the medicinal properties of local flora, being the principal custodians of traditional phytotherapy practices (Benarba et al., 2015; Kadri et al., 2018; Miara et al., 2019). This tendency is likely linked to the fact that older generations grew up in contexts where traditional medicine represented the main form of healthcare, especially in rural and Saharan regions where access to modern medical services remains limited (Ouelbani et al., 2016). Conversely, younger generations, more exposed to conventional medicine, tend to show declining interest in traditional practices, which could threaten the intergenerational transmission of this valuable cultural and therapeutic heritage (Hammiche & Maiza, 2006; Boudjelal et al., 2013).

Regarding educational level, 75% of the informants are illiterate, and 25% had only primary education. This result illustrates that ethnobotanical knowledge is predominantly transmitted orally and independently of formal education (Benarba, 2016; Bouasla & Bouasla, 2017). Nevertheless, the generally low literacy rate may limit exposure to modern scientific knowledge and consequently hinder the integration of traditional medicine into complementary and sustainable public health strategies (Teklehaymanot & Giday, 2007; Giday et al., 2009).

3.2. Traditional medicinal uses of Tamarix gallica

The analysis of ethnobotanical data highlights clear relationships between the plant parts of Tamarix gallica used by local populations and the traditional preparation methods employed (Figure 1). Leaves occupy a dominant position, cited by the majority of informants, confirming their central role in Saharan traditional pharmacopoeia. This predominance is consistent with previous ethnobotanical studies conducted in the Algerian Sahara (Chehma & Djebar, 2008; Kemassi et al., 2014; Ould El Hadj et al., 2014; Bouallala et al., 2014; Meddour et al., 2022). The preferential use of leaves may be attributed to their richness in bioactive secondary metabolites, particularly flavonoids, tannins, and polyphenols compounds recognized for their antioxidant, anti-inflammatory, and antimicrobial properties (Younos et al., 2005; Ksouri et al., 2009). Their accessibility, year-round availability, and non-destructive harvesting further reinforce their use within a logic of sustainable ethnopharmacological practices (Yaseen et al., 2015).

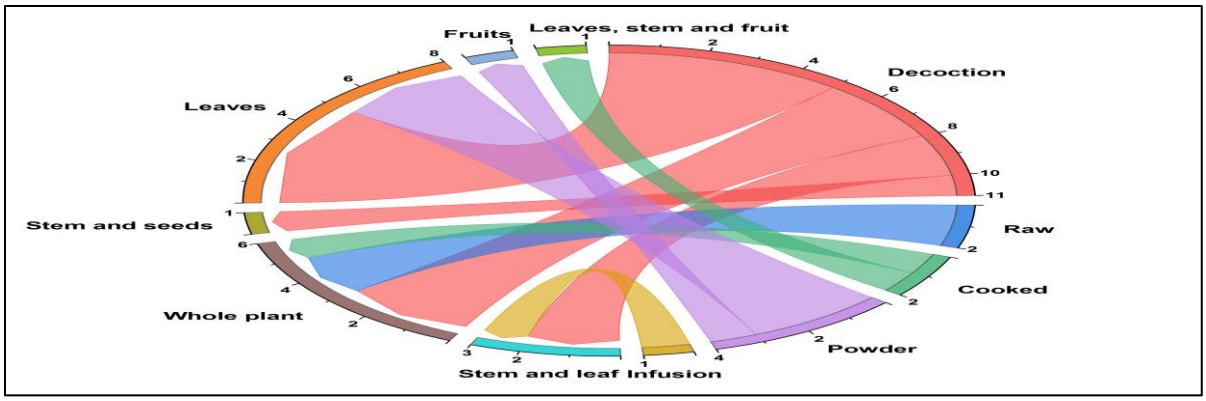

Figure 1. Chord diagram illustrating the relationships between the parts of Tamarix gallica used and the preparation methods

Decoction is the predominant preparation method and is mainly associated with leaves, but also with whole plants and stems. This method allows efficient extraction of water-soluble compounds such as tannins and flavonoids, which are often responsible for the species' astringent and anti-inflammatory properties (Chaturvedi et al., 2012). The common use of decoction also reflects a search for synergistic therapeutic effects among the various compounds present in different plant parts (Elamin, 2020). Stems and branches are occasionally used for their astringent and healing properties, attributed to their high tannin and mineral content (Li et al., 2024).

Other preparation methods, such as raw consumption and infusion, are present but less common. Raw use is mostly associated with leaves or the whole plant, often applied externally (poultices, compresses) for rapid relief. Infusion used for more tender parts, such as young stems and leaves, suggests a gentler preparation method intended for internal treatments, particularly for respiratory or digestive diseases. Powdered or cooked forms remain marginal, probably corresponding to specific therapeutic needs or the combination of Tamarix with other medicinal plants.

Combinations of plant parts, such as "leaf, stem, and fruit" or "stem-seeds," though infrequent, reveal a nuanced empirical understanding of complementary therapeutic properties. These mixtures reflect local strategies aimed at enhancing treatment efficacy or addressing several symptoms simultaneously.

The analysis of plant parts used relative to the types of diseases treated (Figure 2) shows a marked predominance of respiratory disorders, followed by digestive, dermatological, and ophthalmological disorders. This distribution of uses reflects the main health problems encountered in Saharan environments, where extreme environmental conditions directly influence the nature of common pathologies.

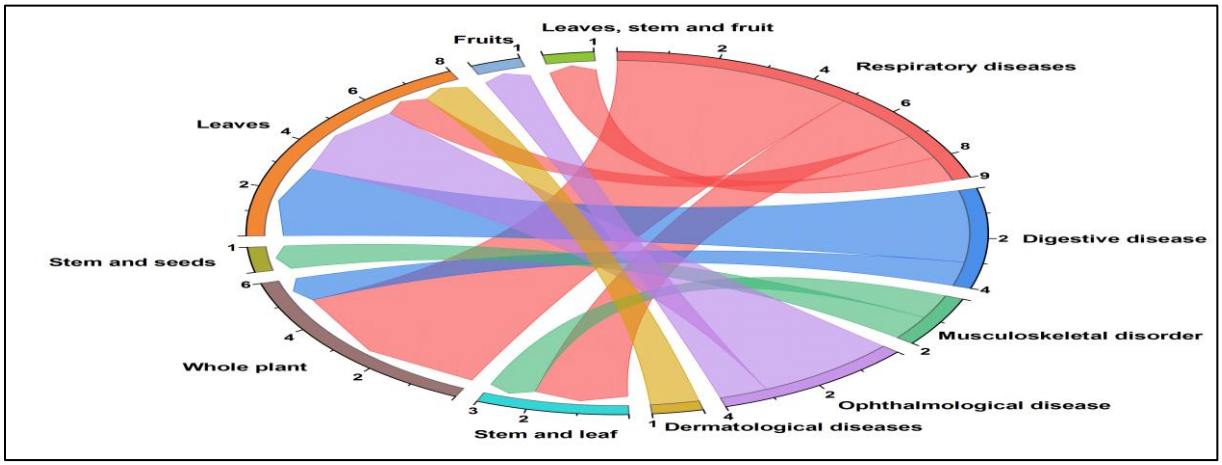

Figure 2. Chord diagram illustrating the relationships between the plant parts of Tamarix gallica and the categories of diseases treated.

Respiratory diseases constitute the most represented category, with predominant use of leaves and the whole plant. This finding corroborates with ethnobotanical studies conducted in Algeria (Benarba, 2016; Bouredja et al., 2017; Benaiche et al., 2019; Chohra & Ferchichi, 2019). In these areas, the prevalence of respiratory diseases is closely linked to environmental conditions (dust, drought, sandstorms, and

temperature variations) that promote lung irritation, allergies, and respiratory infections. Studies conducted in other arid regions of North Africa and the Middle East confirm the use of Tamarix gallica to treat respiratory illnesses, conjunctivitis, and skin conditions (Hadjadj et al., 2015). These shared patterns suggest a common ethnomedicinal core centered on the recognized therapeutic efficacy of the species. Biochemically, Tamarix gallica is rich in polyphenols, flavonoids, and condensed tannins-compounds with potent antioxidant, anti-inflammatory, and antimicrobial activity, which explain its relevance in treating respiratory and skin disorders (Fellah et al., 2018).

Digestive diseases represent the second most frequent therapeutic category. Leaves, stems, and seeds are most commonly used, in agreement with previous studies in Saharan and Mediterranean traditional pharmacopoeias (Bellakhdar, 1997; Bouasla & Bouasla, 2017). The digestive benefits attributed to Tamarix gallica likely derive from tannins, which exert astringent effects capable of reducing intestinal inflammation and regulating gastrointestinal motility (Chaturvedi et al., 2012; Elamin, 2017).

Ophthalmological and sensory disorders, although less frequently cited, are specifically associated with aerial parts, particularly leaves. Their use mostly in the form of lukewarm infusions points to soothing, anti-inflammatory, and antiseptic properties, valuable for treating conjunctivitis or eye irritation caused by dust-laden winds (Ksouri et al., 2012).

Dermatological disorders represent another important category, especially for treating wounds, burns, ulcers, and eczema. Stems, leaves, or the whole plant are commonly prepared as poultices, macerations, or decoctions. These uses exploit the healing, antiseptic, and anti-inflammatory effects of polyphenol-rich extracts, whose antibacterial and antioxidant activities have been confirmed experimentally (Ksouri et al., 2012; Boulaaba et al., 2015).

Finally, the treatment of musculoskeletal disorders, such as joint pain and cramps illustrates the therapeutic versatility of Tamarix gallica. Similar uses are documented in the Algerian Sahara, where the plant is applied as a poultice or added to therapeutic baths to ease joint inflammation (Hadjadj et al., 2015). These effects are likely linked to polyphenolic compounds capable of inhibiting pro-inflammatory enzymes such as cyclooxygenases (Elamin, 2017).

4. CONCLUSION

In arid regions, preserving traditional medicinal knowledge represents a promising pathway toward sustainable development, as it reinforces the contribution of local medicinal plants to community health strategies while promoting their socio-economic value. In this context, our ethnobotanical investigation of the medicinal uses of Tamarix gallica reveals the central social and cultural role played by women, who act as key custodians and transmitters of traditional therapeutic practices. The study also shows that the oldest members of the community hold the most extensive knowledge concerning the phytotherapeutic applications of T. gallica, reflecting the intergenerational accumulation of empirical expertise. Ethnobotanical analysis highlights clear relationships between the plant parts used and the methods of remedy preparation. Overall, respiratory ailments represent the most frequently cited therapeutic category, most often treated with leaves or the whole plant. Digestive disorders rank second and involve a broader range of plant parts, including leaves, stems, and seeds. Tamarix gallica is also employed for ophthalmological and sensory conditions, as well as for musculoskeletal problems, demonstrating the wide pharmacological versatility attributed to this species by local populations. Given this diversity of uses and the growing pressure on natural resources in arid environments, the adoption of protection and conservation measures is essential to ensure the sustainable management of medicinal plant species such as Tamarix gallica.

5. REFERENCES

[1] Adli, B., Touati, M., Yabrir, B. B., Bezini, E., Hachi, M., Yousfi, I., and Dahia, M., 2021. "Consensus level and knowledge of spontaneous medicinal plants used in Algerian central steppe region (Djelfa) ". Agric. Conspec. Sci., 86 (2), pp 139-152.

[2] Akhani, H., Samadi, N., Noormohammadi, A., and Borsch, T., 2019. "A new species of Tamarix (Tamaricaceae) from Hormozgan Province, S Iran, supported by morphology and molecular phylogenetics". Willdenowia, 49 (1), pp 127-139.

[3] Albuquerque, U. P., Ramos, M. A., de Lucena, R. F. P., and Alencar, N. L., 2014. "Methods and techniques used to collect ethnobiological data". In Methods and techniques in ethnobiology and ethnoecology (pp. 15-37). New York, NY: Springer New York.

[4] Ateeq, I., and Firdose, K. F., 2024. "A Comprehensive Review of Tamaric gallica Linn: A Herbal Haemostat with special reference in Unani Medicine". J. Drug Deliv. Ther., 14 (3), pp. 121-125.

[5] Awaad, A. S., Zain, M. E., Al Othman, M. R., and Al-Dosary, S. K., 2014. "Phytochemical analysis and antimicrobial activity of medicinal plants against pathogenic microorganisms". Life Sci. J., 11 (7), pp. 350-354.

[6] Bellakhdar, J., 1997. La pharmacopée marocaine traditionnelle : médecine arabe ancienne et savoirs populaires. Editions Le Fennec, Casablanca/Ibis Press, Paris, 764 p.
[7] Benaiche, H., Bouredja, N., and Alioua, A., 2019. "Ethnobotanic study of medicinal plants used in Oran, Algeria". Bangladesh J. Bot., 48 (4), pp 1163-1173.
[8] Benarba, B., Belabid, L., Righi, K., Bekkar, A. A., Elouissi, M., Khaldi, A., and Hamimed, A., 2015. "Ethnobotanical study of medicinal plants used by traditional healers in Mascara (North West of Algeria) ". J. Ethnopharmacol., 175, pp 626-637.
[9] Benarba, B. 2016. "Medicinal plants used by traditional healers from South-West Algeria: An ethnobotanical study". J. Intercult. Ethnopharmacol., 5 (4), pp 320-330.
[10] Benkhnigue, O., Zidane, L., Fadli, M., Elyacoubi, H., Rochdi, A., and Douira, A., 2010. "Etude ethnobotanique des plantes médicinales dans la région de Mechraâ Bel Ksiri (Région du Gharb du Maroc) ". Acta Bot. Barc., 53, pp 191-216.
[11] Bouallala, M., Bradai, L., and Abid, M., 2014. "Diversité et utilisation des plantes spontanées du Sahara septentrional algérien dans la pharmacopée saharienne. Cas de la région du Souf". Revue El Wahat pour les recherches et les études, 7 (2), pp 18-26.
[12] Bouasla, A., and Bouasla, I., 2017. "Ethnobotanical survey of medicinal plants in northeastern of Algeria". Phytomedicine, 36, pp 68-81.
[13] Boudjelal, A., Henchiri, C., Sari, M., Sarri, D., Hendel, N., Benkhaled, A., and Ruberto, G., 2013. "Herbalists and wild medicinal plants in M'Sila (North Algeria): An ethnopharmacology survey". J. Ethnopharmacol., 148 (2), pp 395-402.
[14] Boulaaba, M., Snoussi, M., Saada, M., Mkadmini, K., Smaoui, A., Abdelly, C., and Ksouri, R., 2015. "Antimicrobial activities and phytochemical analysis of Tamarix gallica extracts". Ind. Crops Prod., 76, pp 1114-1122.
[15] Bouredja, N., Mekdad, H., and Baghdadi, K., 2017. "Ethnobotany and floristic study of medicinal plants used in the treatment of respiratory diseases in the industrial region (Arzew) Oran, Algeria". GSC biol. pharm. sci., 1(2), pp 41-48.
[16] Chaachouay, N., and Zidane, L., 2024. "Plant-derived natural products: a source for drug discovery and development". Drugs Drug Candidates., 3 (1), pp. 184-207.
[17] Chaturvedi, S., Drabu, S., and Sharma, M. (2012). "Anti-inflammatory and analgesic activity of Tamarix gallica". Int. J. Pharm. Sci, 4, pp 653-658.
[18] Chehma, A., and Djebar, M. R., 2008. "Les espèces médicinales spontanées du Sahara septentrional algérien : distribution spatio-temporelle et étude ethnobotanique". Synthèse : Revue des Sciences et de la Technologie., 17, pp 36-45.
[19] Chohra, D., and Ferchichi, L., 2019. "Ethnobotanical study of Belezma National Park (BNP) plants in Batna: East of Algeria". Acta Sci. Nat., 6 (2), pp 40-54.
[20] Ekor, M., 2014. "The growing use of herbal medicines: issues relating to adverse reactions and challenges in monitoring safety". Front. Pharmacol., 4, pp 177.
[21] Elamin, M. M., 2020. "Solvent extraction and spectroscopy identification of bioactive compounds from medicinal shrub Tamarix gallica". Funct. Food Health Dis., 10 (11), pp 456-464.
[22] Fellah, O., Hameurlaine, S., Gherraf, N., Zellagui, A., Ali, T., Abidi, A., Altun, M., Demirtas, I., and SahinYaglioglu, A., 2018. Anti-proliferative activity of ethyl acetate extracts of Tamarix gallica L. grown at different climatic conditions in Algeria. Acta Sci. Nat., 5 (2), pp 23-31.
[23] Flowers, T. J., and Colmer, T. D. 2008. "Salinity tolerance in halophytes". New Phytol., 179 (4), pp 945-963.
[24] Giday, M., Asfaw, Z., Woldu, Z., and Teklehaymanot, T., 2009. "Medicinal plant knowledge of the Bench ethnic group of Ethiopia: an ethnobotanical investigation". J. ethnobiol. ethnomed., 5 (1): 34.
[25] Hadjadj, S., Bayoussef, Z., Ould El Hadj-Khelil, A., Beggat, H., Bouhafs, Z., Boukaka, Y., Khaldi, I. A., Mimouni, S., Sayah, F., and Tey, M., 2015. "Ethnobotanical study and phytochemical screening of six medicinal plants used in traditional medicine in the Northeastern Sahara of Algeria (area of Ouargla)". J. Med. Plants Res., 9 (41), pp 1049-1059.
[26] Hammiche, V., and Maiza, K., 2006. "Traditional medicine in Central Sahara: Pharmacopoeia of Tassili N'Ajjer". J. Ethnopharmacol., 105 (3), pp 358-367.
[27] Kadri, Y., Moussaoui, A., and Benmebarek, A., 2018. "Etude ethnobotanique de quelques plantes médicinales dans une région hyperaride du Sud-ouest algérien, cas du Touat dans la wilaya d'Adrar", J. anim. plant sci., 36 (2), pp 5844-5857.
[28] Kemassi, A., Darem, S., Cherif, R., Boual, Z., Sadine, S. E., Aggoune, M. S., Ould Elhadj-Khalil, A., and Ould Elhadj, M. D., 2014. "Recherche et identification de quelques plantes médicinales à caractère hypoglycémiant de la pharmacopée traditionnelle des communautés de la vallée du M'Zab (Sahara septentrional Est Algérien) ". J. Adv. Res. Sci. Technol., 1 (1), pp 1-5.
[29] Khabtane, A., and Rahmoune, Ch., 2012). Effet du biotope sur la diversité floristique et le polymorphisme phénotypique des groupements Tamarix africana Poir. dans les zones arides de la région de Khenchela (Est Algerien). J. Agric. Environ. Int. Dev., 106 (2), pp 123-137.
[30] Ksouri, R., Falleh, H., Megdiche, W., Trabelsi, N., Mhamdi, B., Chaieb, K., Bakrouf, A., Magné, Ch., and Abdelly, C., 2009. "Antioxidant and antimicrobial activities of the edible medicinal halophyte Tamarix gallica L. and related polyphenolic constituents". Food Chem. Toxicol., 47 (8), pp 2083-2091.
[31] Ksouri, R., Smaoui, A., Isoda, H., and Abdelly, C., 2012. "Utilization of Halophyte Species as New Sources of Bioactive Substances". J. Arid Land Stud, 22 (1), pp 41-44.
[32] Lahsissene, H., Kahouadji, A., Tijane, M., and Hseini, S., 2009. "Catalogue des plantes médicinales utilisées dans la région de Zaër (Maroc Occidental) ". Lejeunia. 186, pp 1-27.
[33] Lakhdari, W., Dehliz, A., Acheuk, F., Mlik, R., Hammi, H., Doumandji-Mitiche, B., Gheriani, S., Berrekbia, M., Guermit, K., Chergui, S., 2016. "Ethnobotanical study of some plants used in traditional medicine in the region of Oued Righ (Algerian Sahara) ". J. Med. Plants Stud., 4 (2), pp 204-211.
[34] Lefahal, M., Benahmed, M., Louaar, S., Zallagui, A., Duddeck, H., and Akkal, S., 2010. "Antimicrobial activity of Tamarix gallica L. extracts and isolated flavonoids". Advances in Natural and Applied Sciences, 4 (3), pp 289-292.
[35] Li, F., Xie, W., Ding, X., Xu, K., and Fu, X., 2024. "Phytochemical and pharmacological properties of the genus Tamarix: a comprehensive review". Arch. Pharm. Res., 47 (5), pp 410-441.
[36] Martin, G. J. (2004). Ethnobotany: A methods manual. Earthscan, London, United Kingdom. 268 pp.

[37] Meddour, R., Sahar, O., and Babkar, A., 2022. "Savoirs locaux sur les plantes spontanées chez les populations de la wilaya de Tamanrasset (Sahara Central, Algérie) ". VertigO-la revue électronique en sciences de l'environnement, pp 1-22.
[38] Miara, M.D., Teixidor Toneu, I., Sahnoun, T., and Bendif, H., 2019. "Herbal remedies and traditional knowledge of the Tuareg community in the region of Illizi (Algerian Sahara)", J. Arid. Environ., 167, pp 65-73.
[39] Ouelbani, R., Bensari, S., Mouas, T. N., and Khelifi, D., 2016. "Ethnobotanical investigations on plants used in folk medicine in the regions of Constantine and Mila (North-East of Algeria)". J. Ethnopharmacol., 194, pp 196-218.
[40] Oulad Hadj Youcef, K., Djemlaoui, N., Saad, S. and Karoune, S., 2025. "Les plantes sahariennes de la région d'El Meniaa (Sahara septentrional) utilisées en pharmacopée traditionnelle". Journal Algérien des Régions Arides., 18 (1), pp 7-21.
[41] Ould El Hadj, M., Hadj-Mahammed, M., and Zabeirou, H., 2014. "Place des plantes spontanées dans la médicine traditionnelle de la région de Ouargla (Sahara septentrional est) ". Courrier du Savoir scientifique et technique, 3 (3), pp 47-51.
[42] Ozenda, P., 2004. Flore et végétation du Sahara. Centre National de la Recherche Scientifique, Paris. 662 p.
[43] Quézel, P. and S. Santa., 1962-1963. Nouvelle Flore de l'Algérie et des régions désertiques méridionales. Centre National de la Recherche Scientifique. Paris. vol. 1 et 2, 1170 p.
[44] Roy A, Khan A, Ahmad I, Alghamdi S, Rajab BS, Babalghith AO, Alshahrani MY, Islam S, Islam, MR., 2022. "Flavonoids a bioactive compound from medicinal plants and its therapeutic applications". BioMed Res. Int., 2022 (1), 5445291.
[45] Souddi, M., and Ghezlaoui-Bendi-Djelloul, B. D. (2020a). "Bioclimate and diversity of Tamaricaceae in Oranie, West Algeria". Environ. Exp. Biol., 18 (3), pp 193-205.
[46] Souddi, M., and Ghezlaoui-Bendi-Djelloul, B. D. (2020b). " Phylogenetic Relationships of Tamarix Species (Tamaricaceae) Based on I.T.S Sequences: A bioinformatic simulation for Algeria". Int J Agri Biosci, 9(5), pp 226-231.
[47] Souddi, M., Bendidjelloul-Ghezlaoui, B. D., Nouar, B. (2022). "Floristic diversity and therapeutic proprieties of medicinal plants in the region of Tlemcen (Western Algeria) ". Biodivers. J., 14 (3), pp 441-448.
[48] Souddi, M., Fandougouma, O., and Bouallala, M., 2024. "Plants associated with water towers in the Saharan environment: Floristic diversity and therapeutic virtues". Nova Geod., 4 (3), 211.
[49] Souddi, M., El Zerey-Belaskri, A., El Zerey, W., and Bouallala, M. (2025). "Therapeutic properties of trees and shrubs cultivated in the green spaces of the Algerian Sahara". Ethnobot. Res. Appl., 32, pp 1-17.
[50] Teklehaymanot, T., and Giday, M. (2007). "Ethnobotanical study of medicinal plants used by people in Zegie Peninsula, Northwestern Ethiopia". J. ethnobiol. ethnomed., 3 (1), 12.
[51] Villar, J. L., Alonso, M. Á., Vicente, A., Juan, A., and Crespo, M. B., 2014. "The genus Tamarix (Tamaricaceae) in Crete (Greece) ". Willdenowia, 44 (3), pp 321-326.
[52] Villar García, J. L., 2016. "El género Tamarix en el Mediterraneo Occidental y áreas adyacentes: aspectos taxonómicos, filogenéticos y nomenclaturales» Ph.D. thesis, Universidad de Alicante, Spain.
[53] Villar, J. L., Alonso, M. Á., Juan, A., Gaskin, J. F., and Crespo, M. B., 2019. "Out of the Middle East: New phylogenetic insights in the genus Tamarix (Tamaricaceae) ". J. Syst. Evol., 57 (5), pp 488-507.
[54] Yaseen, G., Ahmad, M., Zafar, M., Sultana, S., Kayani, S., Cetto, A. A., and Shaheen, S., 2015. "Traditional management of diabetes in Pakistan: ethnobotanical investigation from traditional health practitioners. J. Ethnopharmacol., 174, pp 91-117.
[55] Younos, C., Soulimani, R., Seddiqi, N., Baburi, O., and Dicko, A., 2005. "Étude ethnobotanique et historique des tamaris (Tamarix sp., Tamaricaceae) et leurs usages actuels en Afghanistan". Phytothérapie, 3 (6), pp 248-251.