# Ethnopharmacological survey and therapeutic potential of *Atriplex halimus* L. in the management of Polycystic Ovary Syndrome in Algeria

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## Research

## Abstract

*Background*: This ethnopharmacological study investigated the traditional use of *Atriplex halimus* L. for the management of polycystic ovary syndrome (PCOS) among 102 Algerian women from northern and southern regions, including rural and urban areas.

Methods: A questionnaire-based survey was carried out between March 15 and April 9, 2025. Statistical analyses, including the two-sided Fisher's exact test for categorical data, were performed using GraphPad Prism 10.5.0 for Windows (GraphPad Software, San Diego, CA, USA). A significance level of $p < 0.05$ was applied to indicate statistical significance.

*Results*: Of the participants, 44% had been diagnosed with PCOS, and 80% of those with PCOS reported using *Atriplex halimus* L. Leaves were the most frequently used plant part (54.5%). Among users, 86.44% reported clinical improvement and 16.95% reported side effects; 83.05% reported no adverse effects. Side effects were reported exclusively among users ($p = 0.0046$).

*Conclusions*: These findings highlight interest in phytotherapy for hormonal disorders and the need for rigorous research to establish the efficacy and safety of *Atriplex halimus* L. in PCOS management.

*Keywords*: *Atriplex halimus* L., Polycystic Ovary Syndrome (PCOS), Ethnopharmacological investigation, Algeria

## Background

Polycystic ovary syndrome (PCOS) is a prevalent and multifaceted endocrine disorder that affects between 6% and 20% of women of reproductive age worldwide (Deswal et al. 2020). Characterized by hyperandrogenism, ovulatory dysfunction and polycystic ovarian morphology, PCOS presents a complex pathophysiological profile that involves dysregulation of the hypothalamic-pituitary-ovarian axis, steroidogenic and neuroendocrine abnormalities, insulin resistance, chronic inflammation, oxidative stress, and genetic and environmental influences (Crespo et al. 2018, Witchel et al. 2020).

The clinical manifestations of PCOS are diverse, ranging from menstrual irregularities, infertility, hirsutism, acne and alopecia to obesity, dyslipidemia, impaired glucose tolerance and an increased risk of type 2 diabetes and cardiovascular disease. Insulin resistance and hyperinsulinemia play a central role in exacerbating hyperandrogenism and disrupting ovarian function, thereby contributing to anovulation and metabolic complications (Sills et al. 2001, Norman et al. 2007).

Therapeutic strategies for PCOS emphasize a multidisciplinary approach. Lifestyle modifications including dietary interventions such as low-glycemic-index, Mediterranean and ketogenic diets have shown efficacy in improving insulin sensitivity and hormonal balance. Pharmacological treatments such as clomiphene citrate and oral contraceptives, as well as surgical options, are tailored to symptom severity but are often limited by side effects, contraindications and the lack of regulatory approval for PCOS-specific indications (Widmer *et al.* 2015, Kwon *et al.* 2020).

Given the limitations of conventional therapies, there is growing interest in alternative treatments. In this context, ethnopharmacology and research on medicinal plants offer a promising field of investigation. In Algeria and across various regions of the Mediterranean basin, *Atriplex halimus Linné* (*Amaranthaceae*), a halophytic plant known as Mediterranean saltbush, or "Ktaf" or "Guetaff" grows spontaneously in the semi-arid and arid bioclimatic stages, with the largest areas of distribution corresponding to the so-called steppe zones (Batna, Biskra, Boussaâda, Djelfa, Saïda, M'sila, Tébessa and Tiaret) (Chikhi et al. 2014). *Atriplex halimus* L. is widely employed in traditional medicine for the treatment of numerous ailments, including hypertension, eczema, scabies, intestinal inflammation, diabetes mellitus, breast cancer and cervical cancer, as well as certain gynecological and fertility disorders (Walker *et al.* 2014, Mechaala *et al.* 2022).

Several ethnobotanical surveys conducted in Algeria; particularly in the regions of Sétif and the High Plateaus have documented the use of this species specifically for the management of ovarian cysts and disorders related to female reproductive health (Taïbi *et al.* 2021).

In the present study, an ethnopharmacological survey was conducted across several regions of northern, eastern and southern Algeria, targeting women diagnosed with Polycystic Ovary Syndrome (PCOS). The research seeks to provide scientific evidence supporting the traditional use of *Atriplex halimus* L. and to explore its potential therapeutic value in the management of PCOS. By doing so, it aims to bridge traditional knowledge with scientific validation, thereby contributing to the rational valorization of this locally available medicinal resource.

## Materials and Methods

**Study area**

The survey covered several regions spread across northern, eastern and southern Algeria, (Figure 1), making it possible to document the traditional use of the plant across a wide range of contexts.

**Data collection**

A questionnaire-based ethnopharmacological survey was carried out between March 15 and April 9, 2025. Data were collected through two complementary approaches: a digital version of the questionnaire distributed via social media and targeted groups, and a paper-based version administered locally in healthcare facilities (clinics and gynecological practices). This dual strategy ensured broad geographical coverage.

The questionnaire, designed specifically for this survey, included questions on the traditional use of *Atriplex halimus* L., specifying the parts used, preparation methods, duration of treatment and other information related to phytotherapeutic practices. Most of the questions were multiple choice, but participants were also able to provide additional answers. Within the questionnaire, the plant was referred to by its scientific name *(Atriplex halimus* L.) together with the local vernacular name commonly used in Algeria, namely "ktaf / القطف", in order to minimize the risk of confusion with morphologically similar taxa.

The questionnaire consisted of three main sections:
**Personal information :** age, place of residence, marital status.
**General health information :** medical history, PCOS diagnosis, types of treatments followed (conventional or herbal), lifestyle.
**Experience with *Atriplex halimus* L.:** knowledge of the plant, specific use against PCOS, modalities of use (form, frequency, duration, source, preparation method), observed effects, perceived efficacy, and side effects.

The questionnaire was prepared and disseminated in Arabic, English and French *via* Google Forms (link: https://docs.google.com/forms/d/e/1FAIpQLSdNgkDsAT6SwSdjjcwEeyG6QP7gKofAfH1erl8bLj9lEJ3Dhw/formResponse).

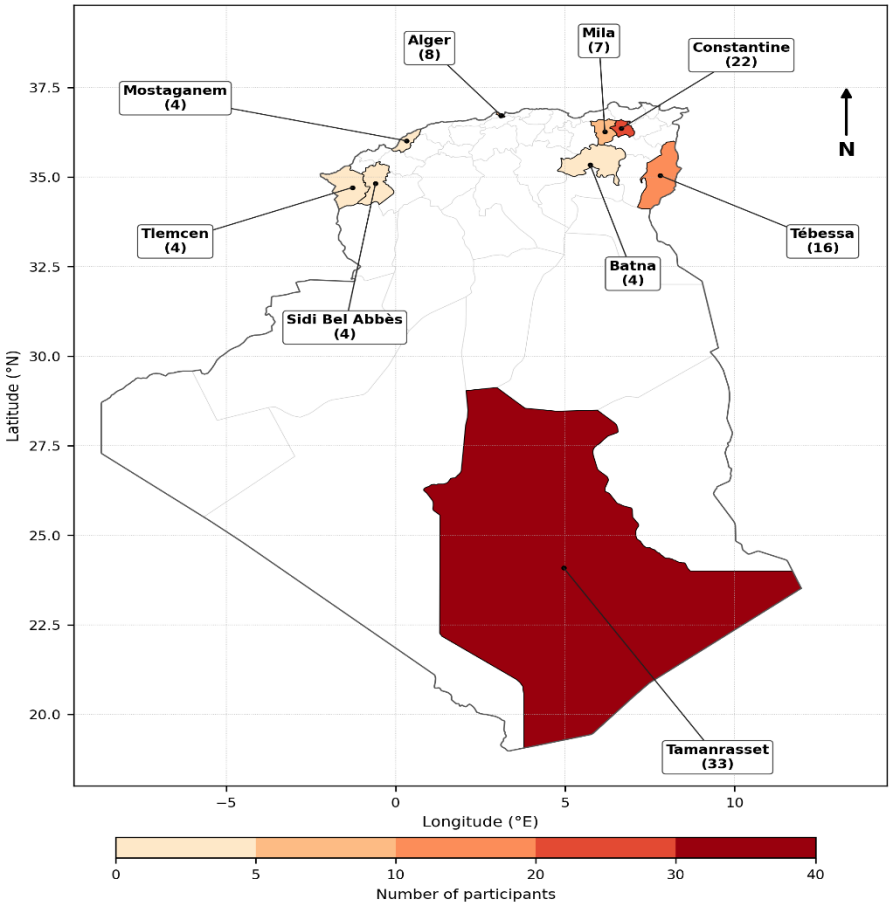



Figure 1. Location map of the surveyed areas in Algeria

**Target population**

The survey was conducted among 102 women from different regions of Algeria. Participants were adult women (≥ 18 years) of reproductive age, distributed across three age brackets (≤ 30 years, 30–50 years, and > 50 years), including both the north and south of the country, as well as rural and urban areas. The respondents were women of reproductive age and included both patients diagnosed with PCOS and women without a PCOS diagnosis, ranging from young women to married women with or without children, and representing diverse sociocultural backgrounds. This geographic and social diversity provided a comprehensive understanding of cultural variations, access to traditional healthcare, and direct experiences with PCOS, particularly in relation to the potential use of herbal treatments such as *Atriplex halimus* L.

**Statistical analysis**

Statistical analyses were performed using GraphPad Prism 10.5.0 for Windows (GraphPad Software, San Diego, CA, USA). Associations between categorical variables, including the occurrence of side effects, perceived clinical improvement, PCOS diagnosis, and sociodemographic characteristics (age group, marital status and area of residence), were assessed using the two-sided Fisher's exact test. Fisher's exact test was preferred over the chi-square ($\chi^2$) test because several contingency tables contained expected cell counts below 5 and structural zero cells (for example, no reported clinical improvement or side effects among non-users), conditions under which the chi-square approximation is unreliable. A p-value < 0.05 was considered statistically significant.

## Results

**Sociodemographic characteristics of the participants**

A total of 102 women were included in the study. The sociodemographic analysis revealed a predominance of single participants, who represented 50 % of the study population. Married women accounted for 24.5% of the respondents, while

25.5% were married with children. This profile corresponds to a population particularly affected by hormonal imbalances such as PCOS, and one that appears receptive to the use of natural therapies.

Among the participants, 44% had been diagnosed with polycystic ovary syndrome (PCOS), while 19% presented with other medical conditions and 37% were healthy (Figure 2). These findings indicate a notably high prevalence of PCOS within the studied population, highlighting the importance of paying greater attention to this condition in both clinical practice and public health.

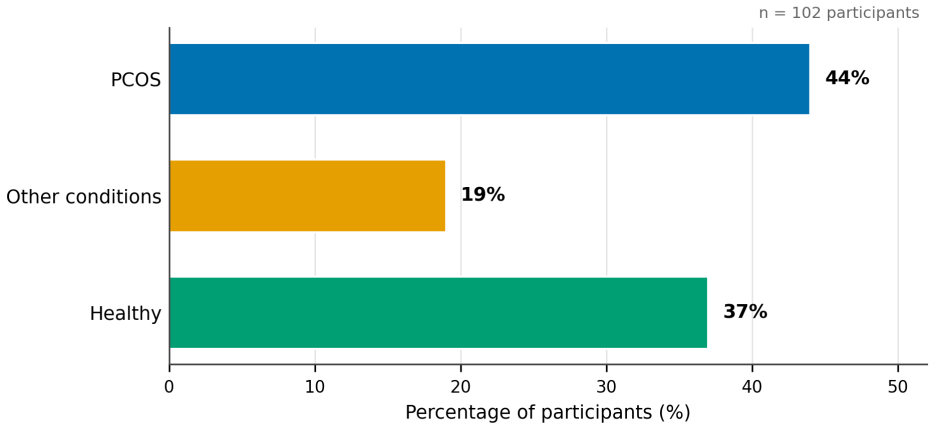



Figure 2. Percentage distribution of female participants according to health status

**Experience with *Atriplex halimus***

***Plant parts of Atriplex halimus used by users***

The leaves were found to be the most frequently used part of the plant, with a usage rate of 54.5%. The whole plant (stem and leaves) accounted for 38.2%, and stem and leaves together accounted for 7.3% (Figure 3).

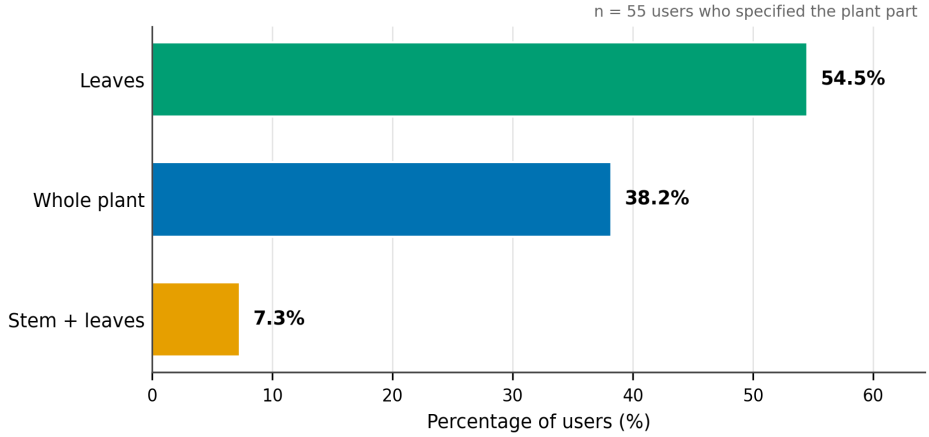



Figure 3. Distribution of the used parts

***Analysis of Participants' Consumption Patterns of the Plant***

The detailed data of the plant use by participants are presented in Table 1.

The preparation methods used by users were distributed as follows: infusion accounted for 67.3 %, decoction for 26.9 %, and other techniques for 5.7 % (among the 52 users who specified the preparation method). These figures indicate a clear predominance of infusion as the preferred preparation method.

Regarding the period of use and given that participants could report more than one phase, 50.0 % of users applied it during the menstrual phase, 44.4 % during the intermenstrual or other phases, and 33.3 % during ovulation (among the 54 users who specified the period; percentages sum to more than 100 % owing to multiple responses).

The main sources of knowledge were the media and social networks (33.9 %), experienced elderly women (32.1 %), and family and friends (32.1 %), while medical advice was rarely mentioned (1.8 %) (n = 56 users). These results highlight the central role of interpersonal relationships and traditional knowledge transmitted by elders, while also pointing to the expanding role of contemporary media in the dissemination of such information.

Table 1. Detailed data of the plant usage among users

| **Characteristics** | | **n (%)** |
|---|---|---|
| **Preparation methods of plant** | - Infusion | 35 (67.3 %) |
| | - Decoction | 14 (26.9 %) |
| | - Other | 3 (5.7 %) |
| **Periods of use according to the menstrual cycle** | -Menstrual phase | 27 (50.0 %) |
| | -Ovulation phase | 18 (33.3 %) |
| | -Intermenstrual / other phase | 24 (44.4 %) |
| **Source of knowledge** | - Friends and relatives | 18 (32.1 %) |
| | - Elderly women experienced in herbal medicine | 18 (32.1 %) |
| | - Media and Social networks | 19 (33.9 %) |
| | - Medical advice | 1 (1.8 %) |

*Of the 59 women classified as users, 56 provided details on their modalities of use; denominators therefore vary (n = 52–56) owing to item non-response. Period of use was a multiple-response item, so percentages may sum to more than 100%.*

**Statistical Analysis of Associations Between *Atriplex halimus* Use and Clinical Parameters in Participants with PCOS**

This study examined the relationships between the use of *Atriplex halimus* and various clinical aspects in participants with polycystic ovary syndrome (PCOS). The analysis focused on the associations between PCOS status and *Atriplex* consumption, the clinical improvements observed, the side effects reported , patient recommendations, and the overall efficacy of the treatment according to PCOS status. Cross-tabulation analyses were carried out using Fisher's exact test for categorical variables.

***Association between Polycystic Ovary Syndrome (PCOS) status and Atriplex halimus use :***

Table 2. Association between Polycystic Ovary Syndrome (PCOS) status and *Atriplex halimus* use among the studied women

| **PCOS status** | ***Atriplex halimus* use n (%)** | **No *Atriplex halimus* use n (%)** | **Total (n)** | **p-value** |
|---|---|---|---|---|
| **PCOS (Yes)** | 36 (80.0%) | 9 (20.0%) | 45 | <0.0001* |
| **PCOS (No)** | 23 (40.4%) | 34 (59.6%) | 57 | |
| **Total** | 59 (57.8%) | 43 (42.2%) | 102 | |

* Fisher's exact test (two-sided)

Cross-tabulation (Table 2) revealed the following: Among women diagnosed with PCOS (n = 45), 80% reported using *Atriplex halimus*, while only 20% did not use this plant. In contrast, among women without PCOS (n = 57), the majority (59.6%) did not use *Atriplex halimus*, whereas 40.4% reported using it.

A statistically highly significant association was observed between PCOS status and the use of *Atriplex halimus* (Fisher's exact test, $p < 0.0001$). Compared with the 40.4% of women without PCOS, 80% of women with PCOS reported using *Atriplex halimus*. These results indicate that women diagnosed with PCOS were significantly more likely to use *Atriplex halimus* than those without PCOS.

***Association between Atriplex use and clinical improvement:***

Table 3. Association between *Atriplex halimus* use and reported clinical improvement among the studied women

| ***Atriplex halimus* use** | **Improvement n (%)** | **No improvement n (%)** | **Total (n)** | **p-value** |
|---|---|---|---|---|
| **Yes** | 51 (86.44%) | 8 (13.56%) | 59 | <0.0001* |
| **No** | 0 (0.00%) | 43 (100.00%) | 43 | |
| **Total** | 51 (50.0%) | 51 (50.0%) | 102 | |

* Fisher's exact test (two-sided)

The analysis presented in Table 3 revealed a statistically significant association between the consumption of *Atriplex halimus* and reported clinical improvement (Fisher's exact test, two-sided, $p < 0.0001$).

Among users (n = 59); 86.44% (51/59) reported improvement, while only 13.56% (8/59) reported none. By comparison, no improvement was reported among non-consumers (n=43), indicating that improvement was strongly associated with plant consumption.

***Association between Atriplex halimus use and reported side effects:***

Table 4. Association between *Atriplex halimus* use and the occurrence of self-reported side effects among the studied women

| ***Atriplex halimus* use** | **Side effects n (%)** | **No side effects n (%)** | **Total** | **p-value** |
|---|---|---|---|---|
| **Yes (n=59)** | 10 (16.95%) | 49 (83.05%) | 59 | 0.0046* |
| **No (n=43)** | 0 (0%) | 43 (100%) | 43 | |

*Fisher's exact test (two-sided)

A statistically significant association (Table 4) was observed between the consumption of *Atriplex halimus* and the occurrence of adverse effects (Fisher's exact test, two-sided, p = 0.0046). Among the 59 participants who used *Atriplex halimus*, 10 (16.95%) reported experiencing adverse effects, while 49 (83.05%) did not report any side effects. In contrast, no adverse effects were reported among the 43 non-users (0%), all of whom indicated the absence of side effects. These results show that reported adverse effects were observed exclusively among users of the plant, although the majority of users did not experience any complications. Overall, The plant appears to be associated with clinical improvement, even though mild side effects were reported in a minority of users.

***Association between Atriplex halimus use and recommendation:***

Table 5. Association between *Atriplex halimus* use and participants' willingness to recommend the plant

| **Plant use** | **Would recommend n (%)** | **Careful n (%)** | **Would not recommend n (%)** | **Non-users n (%)** | **Total (n)** | **p-value** |
|---|---|---|---|---|---|---|
| **Yes (n=59)** | 39 (66.1%) | 19 (32.2%) | 1 (1.7%) | 0 (0%) | 59 | <0.0001* |
| **No (n=43)** | 0 (0%) | 0 (0%) | 0 (0%) | 43 (100%) | 43 | |

*Fisher's exact test (two-sided)

Out of the 59 users, 39 participants (66.1%) who had used *Atriplex halimus* reported that they would recommend it, 19 (32.2%) made a cautious recommendation, and 1 participant (1.7%) stated that they would not recommend it. The remaining 43 participants (42.2%) had not used the plant.

Statistical analysis (Table 5) using Fisher's exact test demonstrated a highly significant association between *Atriplex halimus* use and recommendation ($p < 0.0001$), indicating that users were significantly more likely to recommend the plant than non-users.

***Effect of treatment on improvement according to PCOS status:***

Table 6. Association between PCOS status and clinical improvement following treatment among the studied women

| **PCOS Status** | **Improvement (Yes) n (%)** | **Improvement (No) n (%)** | **Total (n)** | **p-value** |
|---|---|---|---|---|
| **Yes (n=45)** | 29 (64.4%) | 16 (35.6%) | 45 | 0.0163* |
| **No (n=57)** | 22 (38.6%) | 35 (61.4%) | 57 | |

*Fisher's exact test (two-sided)

The data (table 6) show that participants with PCOS showed a significantly higher rate of improvement than those without the condition (64.4% versus 38.6%, p = 0.0163). A p-value below 0.05 indicates a statistically significant difference, supporting the conclusion that the observed effect is unlikely to be due to chance.

## Discussion

By exploring the use of *Atriplex halimus* L. among Algerian women, this study offers a fresh and well-documented perspective on Algerian ethnopharmacology, particularly with regard to the plant's role in the management of polycystic ovary syndrome (PCOS).

A total of 102 women from southern and eastern Algeria took part in the survey, most of them from Saharan regions, which suggests a more widespread use of *Atriplex halimus* L. in the southern part of the country

The sociodemographic profile showed that the majority of participants were young women, a group particularly prone to PCOS, which typically develops during the reproductive years. This finding is in line with previous research identifying PCOS as one of the most common endocrine disorders affecting women of reproductive age (Azziz *et al*. 2016).

The relatively high proportion of participants reporting PCOS (44%) may reflect both increased awareness of the condition and its rising global prevalence. This trend could also be linked to improvements in diagnostic practices, as well as to lifestyle factors such as diet and physical inactivity, which are recognized risk factors for PCOS (Teede *et al.* 2018).

The findings further indicate a clear tendency among women with PCOS to use *Atriplex halimus,* supported by the strong association observed between PCOS status and plant use ($p < 0.0001$). This suggests that many patients turn to alternative or complementary approaches to manage their condition. Similar patterns have been reported in previous studies, in which women with chronic hormonal disorders often rely on herbal medicine, either out of dissatisfaction with conventional treatments or because of concerns about their side effects (Arentz *et al.* 2014).

The predominance of leaf use observed in this study is not merely a practical choice; it most likely reflects an empirically acquired pharmacological knowledge transmitted across generations. This finding is consistent with phytochemical studies showing that the leaves of *Atriplex halimus* accumulate higher concentrations of bioactive compounds, including flavonoids, saponins, and phenolic acids, particularly under arid stress conditions (Ksouri *et al.* 2012). These metabolites are known for their antioxidant and anti-inflammatory activities and may help reduce oxidative stress, improve insulin sensitivity, and modulate hormonal imbalances, all of which are key pathophysiological features of polycystic ovary syndrome (PCOS). In particular, flavonoids such as quercetin have shown, both in vitro and in vivo, the potential to inhibit androgen biosynthesis and enhance insulin sensitivity (Rezvan *et al.* 2017). The convergence between traditional leaf selection and contemporary phytochemical evidence therefore points to an empirical rationality underlying this ethnopharmacological practice. Our results are also in agreement with previous ethnobotanical investigations conducted in Algeria by Chibani (2024) and Talhi and Belkhier (2022), which reported a high prevalence of *A. halimus* leaf use, reaching up to 93% in Mostaganem for the management of PCOS. Taken together, these findings suggest that the therapeutic use of *A. halimus* leaves represents a well-established and widely shared practice across different regions of Algeria, even though it remains relatively underrepresented in formal pharmacopoeias.

The diversity of preparation methods observed in this study, with a clear predominance of infusion alongside decoction and less common preparations, reflects the richness of traditional knowledge and the absence of standardized therapeutic practices. Rather than pointing to inconsistency, this variability appears to represent cultural and ecological adaptations, as has also been reported in comparative ethnobotanical studies conducted in North Africa. For instance, Zougagh *et al.* (2019) documented regional differences in plant preparation methods in Morocco and attributed them to local environmental and cultural contexts rather than random variation. Similarly, the preference for infusion in the High Plateaus and decoction in Saharan regions observed in the present study may reflect practical adaptations to local conditions. From a pharmacological perspective, such variability is particularly relevant because extraction methods can significantly influence the yield, composition, and biological activity of phytochemicals (Azwanida, 2015). Aqueous infusions generally favor the extraction of polar phenolic compounds, whereas decoctions may enhance the release of certain constituents while simultaneously degrading thermolabile molecules. Consequently, differences in preparation techniques may affect the bioavailability and therapeutic efficacy of *Atriplex halimus* and potentially contribute to variations in reported treatment outcomes. These observations highlight the need for future studies aimed at characterizing the phytochemical profiles associated with different preparation methods and establishing standardized protocols for therapeutic use.

Interestingly, the use of *Atriplex halimus* was reported at different stages of the menstrual cycle, with a noticeable preference for administration during the menstrual phase. This pattern may reflect women's attempts to regulate menstrual irregularities or alleviate symptoms associated with polycystic ovary syndrome (PCOS) based on accumulated personal and community experience. In many traditional medical systems, the timing of remedy administration is considered an integral component of treatment efficacy; however, the scientific basis for cycle-specific use of *A. halimus* remains largely unexplored and warrants further investigation. In addition, knowledge regarding the medicinal use of the plant was transmitted predominantly through informal channels, including family members, relatives, and social networks. This observation is consistent with ethnobotanical studies highlighting the central role of oral tradition in preserving and disseminating medicinal plant knowledge (Heinrich 2013). However, this mode of knowledge transmission represents both a strength and a limitation. On the one hand, it contributes to the resilience and continuity of traditional practices across generations; on the other, it

operates largely outside formal regulatory and quality-control frameworks. This dual nature has been increasingly recognized in discussions surrounding the integration of traditional medicine into modern healthcare systems (World Health Organization 2019). In Algeria, particularly in remote Saharan regions where access to healthcare services may be limited, such community-based pharmacopoeias often function as de facto first-line therapeutic resources. These findings underscore the importance of systematically documenting and scientifically evaluating this traditional knowledge before it is gradually lost, while also facilitating its potential integration into evidence-based healthcare approaches.

One of the most striking findings of this study is the strong association between the use of *Atriplex halimus* and reported clinical improvement ($p < 0.0001$). A large majority of users (86.44%) reported an improvement in symptoms, whereas no comparable improvement was observed among non-users. Although these findings do not establish a causal relationship, they suggest a potential therapeutic benefit of the plant in the management of PCOS symptoms, while also highlighting the need to monitor possible mild adverse effects. The remarkably high self-reported improvement should nevertheless be interpreted with caution, as patient-reported outcomes are inherently subject to several sources of bias, including placebo effects, recall bias, and social desirability bias. Comparable rates of perceived benefit have, however, been documented in ethnopharmacological surveys investigating herbal remedies for hormonal disorders (Arentz *et al.* 2014). Importantly, the observed improvement gains additional credibility when considered alongside the statistically significant difference between women with PCOS and those without the condition ($p = 0.0163$), which suggests a potentially condition-specific effect rather than a generalized placebo response. This observation is consistent with current phytopharmacological evidence indicating that the bioactive constituents of *A. halimus*, particularly its flavonoids and phenolic compounds, may act on key pathological mechanisms involved in PCOS, including oxidative stress, chronic low-grade inflammation, insulin resistance, and hormonal dysregulation. Although these findings remain preliminary, they support the hypothesis that the reported benefits may reflect genuine biological activity and provide a strong rationale for future controlled clinical and mechanistic studies aimed at confirming efficacy and elucidating the underlying therapeutic pathways.

Side effects were reported only among users (16.95%), but their overall frequency was relatively low, indicating that *Atriplex halimus* appears to be generally well tolerated. Even so, these limited reports underline the need for more comprehensive toxicological and pharmacological investigations to better define its safety profile. This is especially relevant in cases of prolonged use or when the plant is combined with other herbal remedies.

Moreover, the high rate of recommendation among users further supports the perceived effectiveness of the plant. Such forms of social validation can play a key role in the wider adoption of herbal treatments, particularly in settings where access to conventional healthcare may be limited.

Finally, the higher rate of improvement observed in participants with PCOS compared with those without ($p = 0.0163$) may suggest that the effects of *Atriplex halimus* are more pronounced in individuals experiencing hormonal imbalance. This could be related to the plant's potential endocrine-modulating or anti-inflammatory properties, although further experimental and clinical studies are needed to better understand the underlying mechanisms.

In line with the work of Benarba (2016), which highlights the therapeutic potential of Mediterranean plant species, these findings support the idea that traditional pharmacopoeias represent valuable sources of therapeutic knowledge. However, their potential can only be fully realized through rigorous scientific investigation.

Taken together, these findings position *Atriplex halimus* as a priority candidate for translational research in the context of PCOS. The triangulation of widespread traditional use reported clinical improvement, apparent condition-specificity, and existing phytochemical evidence constitutes what Fabricant and Farnsworth (2001) termed an "ethnopharmacological lead" i.e., a convergence of evidence sufficient to justify rigorous preclinical and clinical investigation. Future studies should therefore prioritize: (1) standardized extraction and phytochemical profiling of leaf preparations; (2) in vitro and in vivo evaluation of anti-androgenic, anti-inflammatory, and insulin-sensitizing activity using validated PCOS models; and (3) controlled clinical trials employing standardized PCOS outcome measures. Such an integrative approach would help bridge the gap between traditional empirical knowledge and evidence-based phytomedicine.

## Conclusion

Based on an ethnopharmacological approach, the present study provides insight into the therapeutic potential of *Atriplex halimus* L. in the management of Polycystic Ovary Syndrome (PCOS) in Algeria.

The survey results revealed a frequent use of *Atriplex halimus* L. among women affected by PCOS, within the framework of traditional healthcare practices that are increasingly enriched by modern contributions.

Building on the findings of this study, it would be worthwhile to conduct in vivo experiments, particularly using animal models that replicate the pathophysiological features of Polycystic Ovary Syndrome (PCOS). Such investigations would allow for a thorough assessment of the actual impact of *Atriplex halimus* L. extract on endocrine, metabolic, and reproductive parameters.

Ultimately, *Atriplex halimus* L., far from being merely a desert plant, represents a promising candidate for future ethnopharmacological, phytochemical, toxicological and clinical investigations.

## Declarations

**List of abbreviations:** PCOS- polycystic ovary syndrome; L- Linné;

**Ethics approval and consent to participate:** This study was reviewed and approved by the Scientific Council of the Pharmaceutical Sciences Research Center (CRSP), Constantine, Algeria (approval No.200). The study was conducted in accordance with the Declaration of Helsinki and the Code of Ethics of the International Society of Ethnobiology. All participants were adult women (≥ 18 years of age). Participation was entirely voluntary and all responses were collected anonymously, with no personally identifiable information recorded. Participants were informed of the study's objectives and of the voluntary and anonymous nature of the survey; their informed consent was obtained through their voluntary completion and submission of the questionnaire.

**Consent for publication:** Not applicable

**Availability of data and materials:** All the figures and tables are original, the outcomes of this work.

**Competing interests:** the authors declare that they have no competing interests

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**Author contributions:** Conceptualization and article writing were carried out by L.B, A.S.B. participated in the theoretical background and discussion, Statistical analysis is done by R.T, data collection and investigation study are done by H.I and L.T., the other three authors contributed to the theoretical framework and reviewed the text.

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