Ilam University of Medical Sciences

Plant Biotechnology Persa

Online ISSN: 2676-7414

Homepage: https://pbp.medilam.ac.ir

Ethnobotanical Study of Medicinal Plants Utilized for the Management of Prostate Disorders in Abdanan city, Ilam Province, Western Iran

Foroozesh Seydi[1], Amir Soltanbeigi[2], Alireza Pourrahim[3], Reza Asadzadeh [4]✉

[1]Biotechnology and Medicinal Plants Research Center, Ilam University of Medical Sciences, Ilam, Iran
[2]Faculty of Pharmacy, Basic Pharmaceutical Sciences Dep., Medicinal & Aromatic Plants, Culture & Technology, Turkey
[3]Student Research Committee, Faculty of Medicine, Ilam University of Medical Sciences, Ilam, Iran
[4]Assistant Professor of Nephrology, School of Medicine, Ilam University of Medical Sciences, Ilam, Iran

Article Info

Article type:
Original Article

Article History:
Received: Jan. 21, 2024
Received: Mar. 09, 2024
Accepted: Dec. 29, 2024
Published Online: May. 17, 2025

✉ ***Correspondence to:***
Reza Assadzadeh

Email:
dr.r_asadzadeh@yahoo.com

A B S T R A C T

Objective: One of the common diseases among men is prostate problems, which include benign prostatic hyperplasia and prostate cancer. For centuries, medicinal plants have served as integral components in the management of prostate disorders, providing natural alternatives to conventional therapies. In this regard, using local and ethnobotanical knowledge in a region like Ilam can help to identify effective medicinal plants for these diseases. This research was conducted with the aim of identifying and investigating medicinal plants effective on the prostate in Abdanan city from an ethnobotanical point of view.

Methods: This study was conducted using a qualitative method and through semi-structured interviews with 25 traditional healers in Abdanan city (Ilam province, western Iran). The collected information included the names of the plants, how to use them, the parts of the plant used and their therapeutic effects on the prostate. Data analysis was done using quantitative analysis and qualitative content.

Results: The results showed that 10 types of medicinal plants in Abdanan city are known to be effective on prostate problems. Among the identified plants, we can mention clover, rose hip, chicory, yarrow, stinging nettle, camelthorn, flaxseed, puncture vine, borage, and hollyhock. Clover and rose hip plant with UR (usage report index) equal to 9, RFC (relative frequency of citation) equal to 0.62 and PFU (percentage of frequency of use) equal to 34.6% are the most medicinal plants used for prostate in Abdanan region.

Conclusion: The indigenous and ethnobotanical knowledge of Abdanan city shows that medicinal plants can be used as effective therapeutic supplements in the management of prostate problems. The findings suggest a potential for developing herbal-based treatments as complementary approaches.

Keywords: Ethnobotany, Medicinal plants, Prostate, Herbal therapeutics, Traditional medicine

➢ **How to cite this paper**
Seydi F, Soltanbeigi A, Pourrahim A, Asadzadeh R. Ethnobotanical Study of Medicinal Plants Utilized for the Management of Prostate Disorders in Abdanan city, Ilam Province, Western Iran. Plant Biotechnology Persa 2025; 7(2): 56-68.

[DOI: 10.61186/pbp.7.2.7]

DOI: 10.61186/pbp.7.2.7
Publisher: Ilam University of Medical Sciences

Introduction

The prostate gland is a vital component of the male reproductive system, weighing approximately between 15 to 20 grams and surrounding the urethra below the bladder [1]. This walnut-sized organ produces seminal fluid that nourishes and transports sperm [2]. With advancing age, the prostate becomes susceptible to various pathological conditions, including benign prostatic hyperplasia (BPH), prostatitis, and prostate cancer [3-5]. BPH, characterized by non-malignant enlargement of the prostate gland, affects approximately 50% of men by age 60 and 90% by age 85, leading to lower urinary tract symptoms (LUTS) such as frequent urination, nocturia, weak urine stream, and incomplete bladder emptying [6, 7]. These symptoms significantly diminish quality of life and can progress to severe complications including urinary retention, renal insufficiency, and urinary tract infections if left untreated [8]. Prostatitis, an inflammatory condition of the prostate, affects approximately 8.2% of men worldwide and manifests as pelvic pain, dysuria, and ejaculatory discomfort [9]. Prostate cancer represents the second most commonly diagnosed malignancy in men globally, with an estimated 1.4 million new cases and 375,000 deaths annually [10, 11]. The incidence varies significantly across geographical regions, with higher rates in developed countries, possibly due to widespread prostate-specific antigen (PSA) screening practices [12]. In Iran, prostate cancer ranks as the third most common cancer among men, with an increasing incidence rate of approximately 9.6% annually [13]. Early detection through PSA testing, digital rectal examination, and subsequent biopsy remains crucial for improved prognosis [14]. Treatment modalities for prostate conditions have evolved substantially, ranging from watchful waiting to pharmacological interventions, minimally invasive procedures, and radical prostatectomy, tailored according to disease severity, patient age, comorbidities, and preference [15]. Despite these advances, the management of prostate disorders continues to present significant healthcare challenges due to their high prevalence, chronic nature, and substantial impact on patient wellbeing.

Conventional pharmacological treatments for prostate disorders, while effective, often entail significant side effects with long-term use [16]. Alpha-blockers commonly cause orthostatic hypotension and sexual dysfunction [17], while 5-alpha-reductase inhibitors may lead to decreased libido, erectile dysfunction, and gynecomastia, substantially reducing treatment adherence and quality of life [18].

The utilization of medicinal plants for therapeutic purposes dates back to ancient civilizations, with documented evidence from Mesopotamian clay tablets (2600 BC) [19], Egyptian papyri (1500 BC) [20], and Persian medicine (PM) [21]. This historical reliance on plant-based remedies has formed the foundation of modern pharmacology, with approximately 25% of current prescription drugs derived directly from botanical sources [22].

Ethnobotany, the scientific study of the relationships between plants and human cultures, provides crucial insights into traditional knowledge systems and their applications in healthcare [23]. This interdisciplinary field combines elements of botany, anthropology, ecology, and pharmacology to document, analyze, and preserve indigenous medicinal plant knowledge [24]. Ethnobotanical research employs diverse methodological approaches, including field surveys, semi-structured interviews, participant observation, and quantitative analyses such as use-value calculations and informant consensus factors [25]. These investigations not only contribute to the conservation of cultural heritage but also identify promising candidates for pharmacological screening and drug development, fostering a bridge between traditional wisdom and modern scientific inquiry.

The application of herbal medicine for prostate health management has a rich historical precedent across diverse cultures [26]. Ancient Egyptian medical papyri documented plant-based treatments for urinary difficulties, while Traditional Chinese Medicine has employed Serenoa repens (saw palmetto) and Pygeum africanum for centuries to alleviate prostate-related symptoms [27]. The Greek physician

[DOI: 10.61186/pbp.7.2.7]

Dioscorides (40-90 AD) recorded the use of nettle root (Urtica dioica) for urinary complaints in his seminal work "De Materia Medica" [28]. Indigenous North American tribes utilized pumpkin seeds (Cucurbita pepo) and saw palmetto berries for similar conditions. Modern phytotherapy for prostate conditions incorporates both traditional knowledge and scientific validation, with standardized extracts of saw palmetto, pygeum, nettle root, and pumpkin seed oil widely used as complementary approaches to conventional treatments [29, 30].

Ilam Province, situated in the western region of Iran along the Iraq border, encompasses a unique geographical landscape characterized by mountainous terrain, diverse climatic zones, and rich biodiversity [31]. The region experiences Mediterranean and semi-arid climatic conditions with average annual precipitation of 400-500 mm and temperature fluctuations between -5°C in winter and 45°C in summer [32]. This ecological diversity has fostered an exceptionally rich flora, with botanical surveys documenting over 1,000 plant species across 87 families within Ilam Province. Abdanan's unique position at the intersection of the Zagros Mountains and Mesopotamian plains contributes to its noteworthy botanical wealth, harboring numerous endemic and rare species. Particularly significant is the abundance of medicinal plants, with ethnobotanical inventories identifying approximately 250 species traditionally utilized for therapeutic purposes by local communities, representing a valuable biocultural heritage that has evolved over millennia of human-environment interactions [31].

The research aimed to document and analyze the traditional knowledge concerning medicinal plants used for managing prostate health among the indigenous population of Abdanan city in Ilam Province, Western Iran. The study identified and cataloged plant species traditionally employed to treat prostate conditions, recorded the methods of preparation, the plant parts utilized, and the routes of administration, analyzed ethnobotanical indices to determine the cultural significance of the documented species, correlated traditional uses with existing scientific literature on bioactive compounds and pharmacological properties, and ultimately contributed to preserving valuable traditional knowledge that could inform future pharmacological research and drug development for prostate disorders.

Materials and Methods

Study Area, Design and Setting

The present ethnobotanical study was conducted in the city of Abdanan, located in Ilam Province of western Iran, a region chosen for its distinct geographical and cultural attributes. Ilam Province borders Iraq for 425 kilometers to the west and is flanked by Kermanshah Province to the north, Lorestan Province to the east, and Khuzestan Province to the south. Within this province, Abdanan city, located at coordinates 32°59′ N 47°25′ E (representing the city center), sits at an elevation of approximately 740 meters above sea level. Figure 1 illustrates a map of Ilam Province, highlighting Abdanan city. The city is located amidst the rugged landscape of the Zagros Mountains, featuring high mountains, deep valleys, and seasonal rivers that contribute to the region's biodiversity.

According to the 2024 census conducted by the Iran Statistics Center, Ilam Province had an estimated population of about 650,000, with Abdanan city accounting for 53,283 residents. The predominant language in the area was Kurdish, specifically the Feyli dialect, and the population mainly consisted of Kurdish communities that maintained a strong cultural and historical connection to traditional medicine.

To gather data on traditional herbal treatments for prostate health, a standardized questionnaire was designed and utilized. Data collection involved in-person visits to local herbal shops in Abdanan, where the researcher interviewed herbalists and knowledgeable practitioners in the field to collect ethnobotanical information. The questionnaire included demographic details, names of indigenous plants, plant parts used, methods of use, and traditional therapeutic effects on the prostate [25].

To ensure a comprehensive data set, a complete list of herbalists in Abdanan city was obtained from the Ilam Food and Drug Administration,

[DOI: 10.61186/pbp.7.2.7]

which allowed the researchers to systematically contact knowledgeable individuals.

To identify and verify the medicinal plants, the initial traditional data were cross-checked against confirmed plant names from the "The Plant List" database and the Flora of Ilam by Dr. Valiollah Mozafarian.

Data Analysis Method

Following data collection, statistical analyses were performed using ethnobotanical indices including *Informant Consensus Factor* (ICF), *Relative Frequency of Citation* (RFC), and *Use Report* (UR) which were extracted from the questionnaires to perform statistical analysis. The data were analyzed using SPSS software [25].

In this study, key indicators such as the *Use Report*, *Relative Frequency of Citation*, and *Informant Consensus Factor* were reported to assess the significance of plant species in local medicinal practices. The UR represents the total number of reports of use for each plant, as indicated by the informants. The RFC is calculated to assess the relative importance of plant species in local medicine, using the following formula [25]:

RFC Formula:

$$RFC = FC / N$$

Where the RFC value varies between 0 and 1; a value of zero indicates that none of the informants mentioned the use of the plant and a value of 1 indicates that all informants introduced it as a medicine.

Additionally, the ICF is used to measure the level of agreement among informants regarding the use of a particular medicinal plant. It is calculated using the following formula:

ICF Formula:

$$ICF = (N - n) / (N - 1)$$

Where N is the total number of plant references and n is the number of plants that have at least one reference.

These quantitative methods help identify plant species with the most therapeutic uses that can be further investigated in phytochemical and pharmacological studies. Traditional medicinal data on plants used for prostate health were collected through the standardized questionnaires based on guidelines from the *Journal of Ethnopharmacology*. In addition to interviewing herbalists, data were also collected from other local experts involved in herbal medicine.

Ethical Considerations

Ethical approval was obtained from the Ethics Committee of Ilam University of Medical Sciences under the ethics code IR.MEDILAM.REC.1401.069. The aims and methods of the study were fully explained to all participants, and written informed consent was obtained. Participant confidentiality was strictly maintained throughout the study, and ethical guidelines were adhered to at all stages of the research.

Limitations and Mitigation Strategies

One potential challenge in conducting this study was the lack of cooperation from some herbalists. To address this issue, a minimum of 25 standardized questionnaires were distributed, ensuring that reliable and credible data could be gathered and analyzed. This helped mitigate potential biases and increased the robustness of the study's findings.

[DOI: 10.61186/pbp.7.2.7]

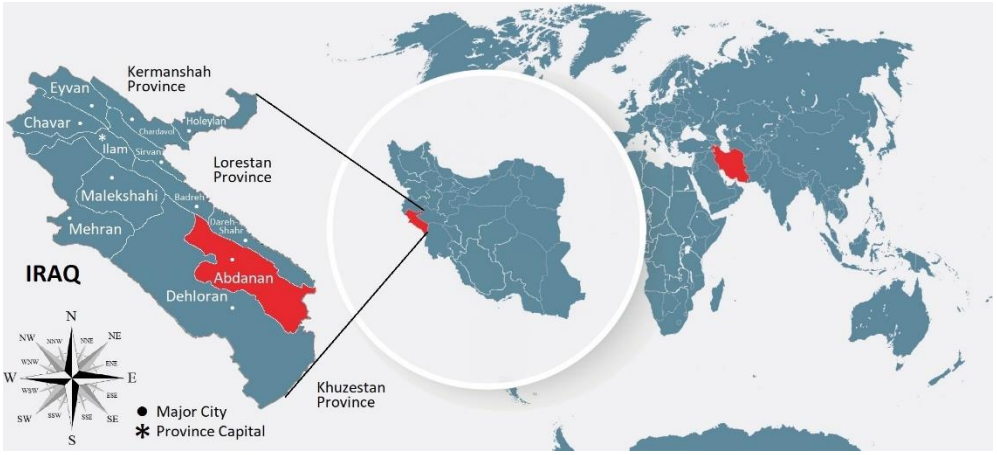

Figure 1: Map of Ilam Province, Iran, highlighting Abdanan city

Results

The demographic characteristics of the study participants, encompassing gender, education level, age range, and language, are detailed in Table 1, thereby illuminating the socio-cultural context of the informants and their contribution to the preservation of ethnobotanical knowledge. Data analysis revealed 10 medicinal plant species from 8 botanical families traditionally employed for prostate health conditions management in Abdanan city, with comprehensive botanical details provided in Table 2. Notably, the Papilionaceae and Compositae families were the most frequently utilized (Figure 2), with the leaf being the primary plant organ used (42%) (Figure 3), and infusion representing the dominant preparation method (35%) (Figure 4).

[DOI: 10.61186/pbp.7.2.7]

Table 1: Socio-demographic profile of the study participants (n=25)

Characteristics			Frequency	Percentage
	Gender	Male	23	92%
		female	2	8%
	Education level	Diploma	25	100%
		Associate degree	0	0%
		Bachelor's degree	0	0%
		Master's degree	0	0%
		Minimum age	25	
		Maximum age	48	
	Language	Kurdish	25	100%
		Lori	0	0%
		Persian	0	0%

Table 2: Ethnobotanical inventory of medicinal plants utilized for the management of prostate health conditions in Abdanan city, Ilam Province

Persian Name	Scientific name	Plant family	Common name	Organ used	Traditional method of using	Main compounds
Shabdar	*Trifolium pratense*	Papilionaceae	Red Clover	Flower	Infusion	Isoflavones (genistein, daidzein), coumarins, flavonoids
Nastaran	*Rosa canina*	Rosaceae	Dog Rose (Rose Hip)	Fruit	Infusion	Vitamin C, phenolic compounds, carotenoids
Kasni	*Cichorium intybus*	Compositae	Chicory	Aerial organs	Herbal distillate	Inulin, sesquiterpene lactones, coumarins

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Boumadaran	*Achillea millefolium*	Compositae	Yarrow	Leaf	Infusion	Flavonoids, sesquiterpene lactones, essential oils
Gazaneh	*Urtica dioica*	Urticaceae	Stinging Nettle	Leaf, Root	Herbal distillate & infusion	Histamine, serotonin, flavonoids, vitamins
Kharshotor	*Alhagi maurorum*	Papilionaceae	Camelthorn	Leaf	Oil & infusion	Flavonoids, tannins, phenolic compounds
Katan	*Linum usitatissimum*	Linaceae	Flaxseed (Linseed)	Seed	Oil	Omega-3 fatty acids (α-linolenic acid), lignans, dietary fiber
Kharkhasak	*Tribulus terrestris*	Zygophyllaceae	Puncture Vine	Leaf	Herbal distillate	Saponins (protodioscin), flavonoids
Goleh Gav Zaban	*Echium amoenum*	Boraginaceae	Iranian Borage	Leaf, Flower	Herbal distillate	Anthocyanins, flavonoids, rosmarinic acid
Khatmi	*Alcea rosea*	Malvaceae	Hollyhock	Flower	Infusion	Anthocyanins, flavonoids, mucilaginous polysaccharides

To evaluate the cultural significance of these plants, quantitative ethnobotanical indices such as UR, RFC, and Percentage of Frequency of Use (PFU) were calculated and are summarized in Table 3. *Trifolium pratense* and *Rosa canina* emerged as the most frequently cited medicinal plants effective for prostate health, recording a UR of 9, an RFC of 0.36, and a PFU of 36.0%. Furthermore, several species, including *Urtica dioica*, *Echium amoenum*, *Alhagi maurorum*, and *Tribulus terrestris*, were consistently referenced by participating traditional healers, underscoring their widespread utilization and therapeutic relevance in the region.

[DOI: 10.61186/pbp.7.2.7]

Table 3: Quantitative ethnobotanical metrics for medicinal plants employed in managing prostate health conditions in Abdanan city

The name of the plant	PFU	UR	RFC
Trifolium pratense	36.0%	9	0.36
Rosa canina	36.0%	9	0.36
Cichorium intybus	24.0%	6	0.24
Achillea millefolium	20.0%	5	0.20
Urtica dioica	32.0%	8	0.32
Alhagi maurorum	28.0%	7	0.28
Linum usitatissimum	24.0%	6	0.24
Tribulus terrestris	26.9%	7	0.28
Echium amoenum	28.0%	8	0.32
Alcea rosea	24.0%	6	0.24

Abbreviations: PFU: percentage of frequency of use, UR: usage report index, RFC: relative frequency of citation

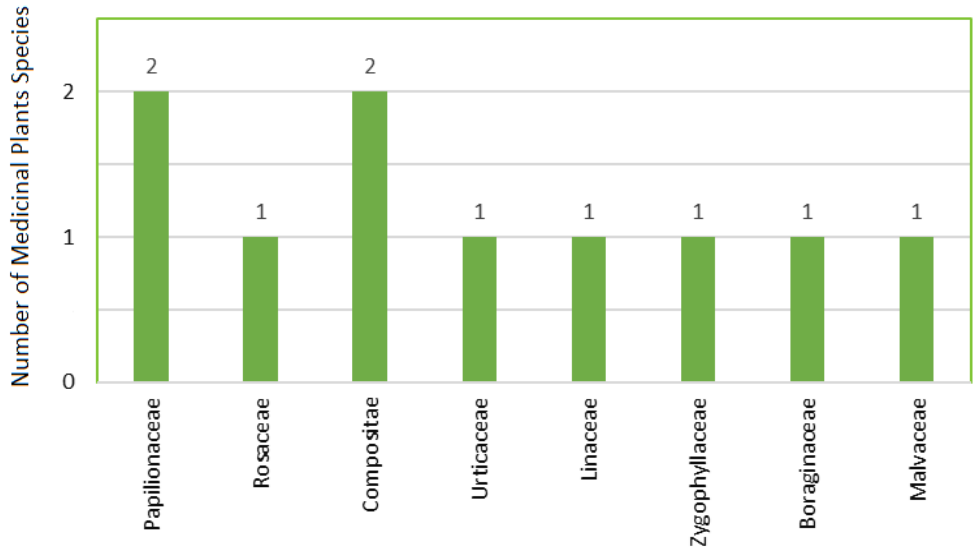

Figure 2: Distribution of medicinal plant usage across botanical families.

[DOI: 10.61186/pbp.7.2.7]

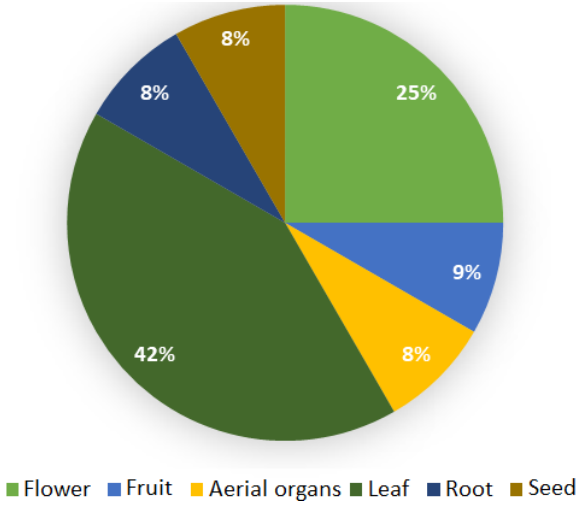

Figure 3: Percentage distribution of plant parts used in the management of prostate health conditions in Abdanan city.

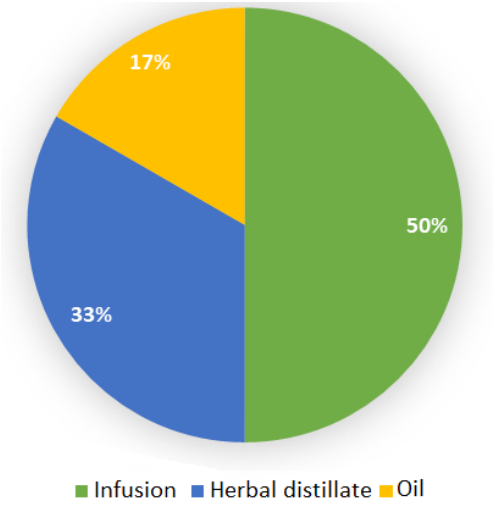

Figure 4: Percentage distribution of traditional preparation methods for medicinal plants applied to prostate health conditions in Abdanan city.

Discussion

The global resurgence of interest in complementary and alternative medicine (CAM), particularly herbal therapies, reflects a growing recognition of their potential in managing chronic conditions such as prostate disorders [33]. Prostate health issues, including BPH and prostate inflammation, affect millions worldwide, driving the search for effective, accessible treatments [34]. Among the various applications of herbal medicine, the management of prostate health has attracted considerable attention due to the inherent limitations and adverse side effects associated with conventional pharmaceutical treatments. Ethnobotany, the scientific study of the relationships between people and plants, plays a pivotal role in uncovering traditional medicinal practices that have evolved over millennia [23]. In rural and culturally rich regions such as Abdanan city, indigenous knowledge regarding the use of local flora for health management is transmitted through generations, serving both as a cultural heritage and as a practical healthcare resource. The region's diverse ecology, particularly in Ilam Province, supports a wide range of plant species that have been traditionally harnessed for their therapeutic properties. In the context of prostate health, ethnobotanical knowledge has guided the use of specific plants known for their anti-inflammatory, antioxidant, and hormone-modulating effects properties that are increasingly recognized in modern pharmacology.

The results of this study corresponded with earlier ethnobotanical research conducted in diverse regions, both within Iran and abroad, emphasizing the traditional use of medicinal plants for prostate health. In Dehloran, Iran, Abbasi et al. (2024) reported the use of *Achillea millefolium*, *Alhagi persarum*, *Urtica pilulifera*, and *Cichorium intybus* for prostatitis treatment [35]. These findings partially overlap with the present study, where *Achillea millefolium*, and *Cichorium intybus* were also identified for their medicinal benefits in prostate health management. The consistent use of these species across different regions of Ilam Province suggests their cultural and pharmacological significance. The study by Gegele et al. (2023) in Ilorin, Nigeria, identified 37 plant species including *Citrullus mucosopermus*, *Senna obtusifolia*, *Senna podocarpa*, *Chrysophyllum albidum*, and *Amaranthus indica* for the management of BPH [36]. Likewise, Chika et al. (2018) in Sokoto, north western Nigeria, recorded 44 plant species used for BPH treatment, emphasizing the importance of *Cassia sieberiana* and *Detarium microcarpum* in herbal medicine [37]. These studies highlight the widespread reliance on botanical remedies for prostate conditions, though specific plant choices appear to be regionally influenced. The research conducted by Emmanuel (2010) in Foumban, Cameroon, documented 40 plant species used for prostate ailments, including *Allium cepa*, *Allium sativum*, *Carica papaya*, *Cucurbita pepo*, and *Prunus Africana* [38]. Among these, *Cucurbita pepo* is particularly noteworthy, as it is rich in

[DOI: 10.61186/pbp.7.2.7]

phytosterols and fatty acids known for their beneficial effects on prostate health. Jaradat et al. (2017) in West Bank/Palestine reported the use of *Juglans regia*, *Quercus infectoria, Sambucus ebulus*, *Zea mays*, *Cucurbita pepo*, *Petroselinum crispum*, *Apium graveolens*, and *Cinnamomum verum* for prostate-related conditions [34]. The presence of *Cucurbita pepo* in both the Jaradat et al.'s and Emmanuel's studies further underscores its relevance in traditional prostate treatments. Overall, the findings from Abdanan city exhibit both similarities and regional variations when compared to previous studies. The recurrence of species such as *Urtica dioica*, *Achillea millefolium*, *Cichorium intybus*, and *Alhagi maurorum* across different geographic regions suggests their broad-spectrum therapeutic potential, particularly in inflammatory conditions associated with prostate health.

Red Clover (*Trifolium pratense*), traditionally employed for menopausal relief and respiratory ailments [39], contains isoflavones like genistein and daidzein, which may inhibit prostate cell growth by regulating hormone levels [40]. Similarly, Stinging Nettle (*Urtica dioica*), widely used for urinary tract issues and BPH [30], harbors beta-sitosterol, a phytosterol that reduces testosterone conversion to dihydrotestosterone (DHT), easing urinary symptoms [41]. Flaxseed (*Linum usitatissimum*), valued for cardiovascular health and digestive regularity, is packed with omega-3 fatty acids and lignans, which exert anti-inflammatory and hormone-modulating effects that may slow prostate cancer progression [42]. Rose Hip (*Rosa canina*), mostly used for joint health and immune support, offers vitamin C and polyphenols, which combat systemic inflammation linked to prostate disorders [43]. Chicory (*Cichorium intybus*), a digestive tonic and mild diuretic, contains inulin and sesquiterpene lactones, reducing inflammation that may benefit prostate conditions [44]. Yarrow (*Achillea millefolium*), known for its anti-inflammatory and antispasmodic effects, provides flavonoids and sesquiterpene lactones, potentially easing prostate-related inflammation [45]. Puncture Vine (*Tribulus terrestris*), a traditional remedy for libido and urinary health, includes saponins that may influence testosterone levels, though its prostate-specific effects require further study [46]. *Alhagi maurorum* (Camelthorn), used in Iranian medicine as a diuretic for urinary complaints, contains flavonoids and tannins, which may reduce inflammation and enhance urinary flow, offering potential BPH relief [47, 48]. *Echium amoenum* (Iranian Borage), cherished in Persian medicine for calming and respiratory benefits, yields anthocyanins and rosmarinic acid, antioxidants that may mitigate stress-related inflammation with indirect prostate benefits [49]. *Alcea rosea* (Hollyhock), applied to respiratory and digestive issues, provides mucilage and anthocyanins, soothing tissues and reducing inflammation with possible minor prostate advantages [50]. Ethnobotanical studies play a vital role in uncovering traditional knowledge related to medicinal plants, serving as a valuable foundation for future pharmaceutical research and the development of novel therapies [51-57].

Conclusion

This ethnobotanical study established Abdanan city, nestled within Ilam Province, Iran, as a key center of plant biodiversity with considerable promise for advancing herbal therapeutics, particularly in the realm of prostate health management. Systematic fieldwork revealed the presence of 10 medicinal plant species distributed across 8 botanical families, with prominent examples including *Trifolium pratense*, *Rosa canina*, *Urtica dioica*, and *Echium amoenum*. These species are distinguished by their well-documented medicinal uses and pharmacological attributes, as corroborated by local traditional knowledge. The rich floristic diversity of Abdanan positions it as a valuable supplier of raw materials for traditional medicine, yet this resource is increasingly jeopardized by the forces of modernization. Consequently, proactive conservation strategies and thorough documentation are critical to safeguarding this ethnobotanical legacy. Through the integration of indigenous knowledge with comprehensive scientific research, Abdanan's Herbal Resources is capable of developing potent and natural therapeutic solutions for prostate health challenges, fostering benefits not only for the local community but also for the broader herbal pharmaceutical industry.

Statements and Declarations

Funding support

The authors did not receive support from any organization for the submitted work

[DOI: 10.61186/pbp.7.2.7]

Competing interests:

The authors have no competing interests to declare that are relevant to the content of this article.

Ethics approval

This study was performed in line with the principles of the Declaration of Helsinki.

Consent to participate

Informed consent was obtained from all individual participants included in the study.

Author contributions

FS, RA: Conceptualization, the original draft writing, investigation, writing including reviewing and editing and investigation and formal analysis; AP and AS: Conceptualization, supervision, and project administration; AS, FS and AP: Conceptualization, the original draft writing, investigation, writing including reviewing and editing

Acknowledgments

The authors would like to express their gratitude to the Ilam University of Medical Sciences, for their support.

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