Ethnobotanical study of selected monocot taxa from different geographical regions of Iran

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Research

Abstract

Background: Ethnobotanical knowledge of monocotyledonous plants in Iran is scattered across various local studies. Despite the rich diversity of monocots in the country, a comprehensive review of their medicinal applications has been lacking.

Methods: A comprehensive literature review was carried out across multiple reputable databases, including PubMed, Scopus, ScienceDirect, Web of Science, and Google Scholar, in addition to Persian academic sources and reference textbooks on botany. The time frame covered for this search extended from 1990 through 2026. Scientific names were verified using POWO and WFO. The extracted records encompassed ethnobotanical details, covering the utilized plant components, preparation procedures, and therapeutic roles, were extracted and analyzed using Microsoft Excel 2024 and SPSS v.27.

Results: A total of 68 medicinal species from 13 monocot families were recorded Poaceae (17 species, 14 genus) and. Amaryllidaceae (15 species, 1 genus) had the highest contribution. The most frequently treated ailments were carminative, general tonic and diuretic (3.4%), antipyretic and sedative (3%). *Avena sativa* (15 uses), *Secale cereale* (15 uses) and *Cynodon dactylon* (13 uses) were identified as the most multipurpose species. Leaf (16%) and Seed (14%) were the most commonly used plant parts.

Conclusions: Iranian monocots, especially Allium species, hold significant ethnomedicinal potential. However, lifestyle changes and overharvesting threaten both traditional knowledge and key species. Immediate community-based conservation programs and targeted pharmacological screening are recommended.

Keywords: Ethnobotany; Medicinal plants; Monocotyledons; Phytochemistry; Plant Ecology; Iran

Background

Ethnobotany represents a subdiscipline of indigenous knowledge that investigates the ways in which specific communities, cultural groups, or local populations utilize indigenous flora within their surroundings, with a primary emphasis on healing and therapeutic applications. The term “ethnobotany” was first introduced by the American botanist Harshberger (1896) and since then, it has been defined as a discipline that documents indigenous knowledge about plants uses, including the treatment of diseases (Amini *et al.* 2025). Ethnobotanical investigations hold significant value in uncovering medicinal flora

that various human groups have traditionally relied upon for their therapeutic properties. Moreover, such research serves as a documentation of unwritten information, which is essential for the rational utilization of natural resources, biodiversity conservation, and preservation of cultural heritage (Razmjoue *et al.* 2017).

Medicinal plants are defined as any plant species containing bioactive compounds that, after extraction, distillation, or other processing, exhibit therapeutic effects and can be used in pharmaceutical products (Alizadeh & Mahmoudi 2016). In recent decades, global interest in herbal medicine has grown considerably due to several factors, including increasing wealth in global societies, diversification of consumption patterns, growing evidence of destructive side effects of chemical drugs, increasing trust regarding the application of medicinal plants within industrialized communities, along with environmental pollution concerns. Consequently, growing interest has been directed toward conventional techniques of plant extraction, alongside the extensive incorporation of essential oils derived from therapeutic plants across a broad spectrum of food commodities (Alizadeh & Mahmoudi 2016). The methods and traditions of using medicinal plants vary across regions and cultures. Today, drugs processed from medicinal plants are increasingly regarded as a valuable biological alternative to chemical drugs, largely due to their lower side effects. However, the specific details about side effects of herbal drugs compared to chemical drugs require further investigation.

Iran possesses a remarkable plant flora and a long-standing tradition of herbal knowledge. Historical scientific centers in cities such as Isfahan, Shiraz, and Rey, along with prominent scholars like Avicenna (Ibn Sina) and Rhazes (Razi) and authoritative texts such as the Canon of Medicine, have deeply embedded phytotherapy in Iranian culture. Given this rich heritage, along with the country's diverse climatic conditions and its specific geological history (Assadi 2019), Iran stands as one of the foremost hubs of botanical richness and traditional healing wisdom within the Southwest Asian region. Among angiosperms, monocotyledons (monocots) form a highly distinctive group characterized by a single cotyledon, parallel leaf venation, trimerous flowers, and often hollow internodes—features first noted by John Ray in 1703. From an economic standpoint, monocotyledons are of great significance, providing foodstuffs, animal forage, textile fibers, pharmaceutical compounds, and decorative species. Families including Poaceae, Cyperaceae, and Juncaceae are particularly prominent, exerting dominance over grassland formations, meadow habitats, and aquatic environments (Mallick *et al.* 2023). Given their ecological and economic importance, compiling a comprehensive record of monocotyledonous flora in any given area is fundamental for effective resource stewardship and strategic development initiatives (Mallick *et al.* 2023).

Several countries, including China, Thailand, Mexico, and Nigeria, have conducted extensive ethnobotanical studies on medicinal plants. Specifically, regarding monocots, Bahadur *et al.* (2023) documented 26 medicinal monocot species from various regions of Pakistan, detailing their medicinal parts, uses, and active compounds. In West Bengal, India, Samanta *et al.* (2023) reported 59 medicinal monocot species with various medicinal properties Samanta *et al.* (2023). Similarly, Singh & Sharma (2018) conducted an ethnobotanical study of monocotyledonous medicinal plants in Manipur (India). These studies underscore that monocot taxa hold significant therapeutic value, which can be best revealed through ethnobotanical and ethnomedicinal documentation (Bahadur *et al.* 2023).

Despite Iran's rich floristic diversity and historical medical traditions, comprehensive studies on medicinal monocots are still scarce. The botanical composition of Iran includes upward of 8,100 vascular plant species, with nearly one-quarter of these being endemic to the country, while monocotyledonous taxa account for more than 1,150 of the totals (Rechinger, 1963–2015). Although several articles have mentioned the medicinal properties of Iranian monocots, no integrated inventory exists. Hence, this study seeks to remedy this deficiency by providing a detailed inventory of monocot taxa, coupled with an evaluation of their ecological and economic significance by: (1) identifying medicinal monocot taxa from different geographical regions of Iran, (2) documenting their traditional uses in treating diseases, (3) compiling scattered ethnobotanical and phytochemical data, and (4) providing validated botanical names to facilitate further scientific research. Given the increasing threats of drought and habitat loss, such documentation is crucial not only for preserving endangered species but also for unlocking new therapeutic applications of monocot-derived products. Additionally, since medicinal properties are closely linked to chemical constituents, this paper incorporates relevant phytochemical and ethnobotanical surveys (Nadaf *et al.* 2025).

Materials and Methods

Search Strategy and Information Sources

A systematic literature search was performed to identify all relevant publications documenting the ethnobotanical uses of medicinal monocotyledonous species by the Iranian population. The search period extended from January 1990 to December 2026, ensuring comprehensive coverage of both historical and contemporary sources. The following electronic databases

were systematically queried: PubMed, Scopus, ScienceDirect, Web of Science, and Google Scholar. In addition, Persian scientific databases including Magiran, SID (Scientific Information Database), and IranMedex were consulted to capture regional publications. Furthermore, authoritative botanical reference works (Zargari, 1998; Mozaffarian, 2018) and relevant Persian-language books on traditional medicine were hand-searched to supplement the electronic retrieval. The search strategy employed a combination of Medical Subject Headings (MeSH) and free-text terms, adapted appropriately for each database, using Boolean operators (AND, OR). The core search string comprised the following keywords and their Persian equivalents: ("ethnobotany" OR "traditional medicine" OR "folk medicine" OR "herbal medicine" OR "phytotherapy") AND ("monocot" OR "monocotyledon" OR "Liliaceae" OR "Amaryllidaceae" OR "Poaceae" OR "Cyperaceae" OR "Arecaceae" OR "Iridaceae" OR specific genus/species names) AND ("Iran" OR "Persian" OR "Iranian") AND ("medicinal use" OR "therapeutic application" OR "healing" OR "curative"). The detailed search strategy for each database is provided in Supplementary Table S1.

Eligibility Criteria

Articles were considered eligible for inclusion if they met the following criteria: (1) original research articles, case reports, or short communications providing primary ethnobotanical data on human use of monocot species in Iran; (2) studies documenting medicinal applications, preparation methods, and administration routes; (3) publications in English or Persian languages; and (4) full-text availability. Exclusion criteria were established as follows: (1) articles not in English or Persian; (2) duplicate publications from the same study or data source; (3) review articles, meta-analyses, conference abstracts, or editorials lacking primary data; (4) studies restricted to animal models or in vitro experiments without documented human application; (5) studies lacking sufficient information on plant identification or ethnomedicinal usage; (6) articles without accessible full-text despite reasonable retrieval efforts; and (7) studies conducted outside Iranian geographical boundaries.

Study Selection and Data Extraction

All retrieved records were imported into reference management software (EndNote X9), and duplicates were automatically and manually removed. The study selection process followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines (Page *et al.* 2021). Two independent reviewers (M.F. and R.O.) performed the initial screening of titles and abstracts against the eligibility criteria. Potentially relevant full-text articles were then retrieved and assessed independently by the same two reviewers for final inclusion. Any disagreements during the selection process were resolved through consensus discussion; if consensus could not be reached, a third reviewer served as an adjudicator. The complete PRISMA flow diagram illustrating the study identification, screening, eligibility, and inclusion process is presented in Figure 1. A standardized data extraction form was developed and piloted prior to use. From each included study, the following information was systematically extracted: (1) bibliographic details (authors, year, journal); (2) botanical nomenclature and family of the monocot species; (3) local/Persian vernacular name(s); (4) plant part(s) utilized; (5) preparation method(s); (6) mode of administration; (7) documented therapeutic indication(s); (8) geographical region/province within Iran; and (9) frequency of reported uses (if applicable).

Taxonomic Verification

To ensure nomenclatural accuracy and consistency, the scientific names and author citations of all recorded medicinal monocot species were verified and updated according to the latest taxonomic revisions. The primary reference databases consulted were the "Plants of the World Online (POWO)" (https://powo.science.kew.org) and the "World Flora Online (WFO)" (https://www.worldfloraonline.org). Accepted names, synonyms, and author abbreviations were cross-checked and corrected where necessary.

Data Analysis

The extracted data were compiled into Microsoft Excel 2024 spreadsheets for descriptive analysis. Quantitative data (e.g., number of species per family, frequency of plant parts used, percentage of preparation methods) were summarized using frequencies and percentages. Statistical analysis was performed using IBM SPSS Statistics for Windows, version 27.0 (IBM Corp., Armonk, NY, USA), where appropriate. The ethnobotanical data were categorized and presented in tabular and graphical formats to facilitate comparison across plant families, usage categories, and geographical regions.

Results and Discussion

In this review, the ethnobotanical usage of 68 species, 43 genera, and 13 families were identified. The list of species, along with the parts used, therapeutic properties, and references, is reported in Table 1. Many species are mentioned in the book "Medicinal Plants" by Zargari (1998) and Mozaffariaººn (2018) which were not mentioned in the articles reviewed in this

study, including *Arum maculatum*, *Agave americana*, *Yucca filamentosa*, *Desmostachya bipinnata*, *Imperata cylindrica*, *Lolium temulentum*, *Panicum antidotale*, *Allium ampeloprasum*, etc.

Table 1. List of plant species and their traditional medicinal uses

Family	Scientific name	Vernacular name	Part used	Medical uses (Human)	References cited
Acoraceae	*Acorus calamus* L.	Turkish elixir, Voj	Rhizome	Depurative, Stomachic, Sedative	Zargari 1998; Amiri & Joharchi 2013; Fathi *et al.* 2023
Amaryllidaceae	*Allium akaka* Gmelin.	Aneshk, Anesh, valk, Tare kohy	Whole plant	Appetizer, Antiseptic, Antilithic, Antiparasitic, Digestive tonic, Antitussive, Diuretic, Antirheumatic, Hepatoprotective	Zargari 1998; Ghasemi *et al.* 2013; Jafari Footami & Akbarlou 2017; Hatami & Zahedifar 2015; Mozaffarian 2018; Vafadar & Toghranegar 2020
Amaryllidaceae	*Allium ampeloprasum* subsp. *iranicum* Wendelbo.	Sir-e-vahshi, Tareh	Bulb, Leaf	Hypotensive, Antiurolithiatic, Carminative	Wendelbo 1977; Mosaddegh *et al.* 2012
Amaryllidaceae	*Allium atroviolaceum* Boiss.	Piyaz vahshy	Flower, Bulb	Antidiabetic, Antiscorbutic	Sharififar *et al.* 2010; Miri & Roughani 2019; Hosseini *et al.* 2021
Amaryllidaceae	*Allium austroiranicum* R.M.Fritsch.	lapo	Flower, Leaf	Emollient, Cytotoxic (ovarian and cervical cancer lines)	Khodayari *et al.* 2013; Mohammadi *et al.* 2016; Akhavan Roofigar 2024
Amaryllidaceae	*Allium cepa* L.	Piaz	Bulb, Seed	Hypolipidemic, Antidiarrheal, Antipyretic, Carminative, Cardiotonic, Antimicrobial, Antiallergic, Antifungal, General tonic, Hypocholesterolemic hypertension, Diabetes, Cancer,	Ghorbani 2005; Amiri & Joharchi 2013; Mozaffarian 2018; Miri & Roughani 2019; Arbabi *et al.* 2023
Amaryllidaceae	*Allium cristophii* Trautv.	Ajujeh, Valak setareee	Leaf, Bulb	Edible vegetable, Hypotensive, Antiurolithiatic, Antipyretic, Antitussive, Common cold treatment	Ghorbani 2005; Amini *et al.* 2025
Amaryllidaceae	*Allium haemanthoides* Boiss. & Reut. ex Regel.	Bon sorkh	Leaf	Renal analgesic, Pectoral (chest pain relief), Pharyngitis treatment	Khodayari *et al.* 2013
Amaryllidaceae	*Allium hirtifolium* Boiss.	Mousir	Bulb	Hypotensive	Khodayari *et al.* 2013
Amaryllidaceae	*Allium jesdianum* Boiss. & Buhse.	Lizak	Leaf	Urinary tract infections (UTIs), Antiurolithiatic	Mosaddegh *et al.* 2012; Nehzomi & Shirani 2024; Amiri *et al.* 2012; Mohsenzadeh 2024
Amaryllidaceae	*Allium paradoxum* (M.Bieb) G.Don.	Tareh-sughan	Leaf	Edible vegetable, Respiratory disorders, Gastrointestinal pain	Ghorbani, 2005
Amaryllidaceae	*Allium rubellum* M.Bieb.	Ajuvah, Sir-e-zangulei	Bulb, Leaf	Edible vegetable, Hyperlipidemia, Otitis treatment	Ghorbani 2005; Mosaddegh *et al.* 2012; Esmaeili *et al.* 2014; Vaziri 2018; Miri 2019
Amaryllidaceae	*Allium sativum* L.	Sarimsaq	Bulb	Cardiovascular disorders, Antimicrobial, Hyperlipidemia Antihypertensive, Ringworm, Antiesthetic, Diabetes, Cancer	Ghorbani 2005; Alizadeh & Mahmoudi 2016; Vaziri 2018; Miri & Roughani 2019; Arbabi *et al.* 2023; Jalali *et al.* 2026
Amaryllidaceae	*Allium scorodoprasum* L. subsp. *rotundum* L.	Sirmuk	Bulbs, Leaves	Antihypertensive, high cholesterol	Alizadeh & Mahmoudi 2016
Amaryllidaceae	*Allium stipitatum* Regel.	Musir	Bulb	Antiseptic, Digestive, Appetizer	Jalali *et al.* 2026

Amaryllidaceae	*Allium tripedale* Trautv.	Piaze tabstaneye, Aneshk	Aerial parts	Hypolipidemic	Ghollasimod & Asa 2024; Jalali *et al.* 2024
Amaryllidaceae	*Allium umbilicatum* Boiss.	Piyaz chatri	Whole plant	Edible vegetable, Antiseptic, Urinary tract infections (UTIs)	Ghollasimod & Asa 2024; Jalali *et al.* 2024
Arecaceae	*Areca catechu* L.	Fufal	Seed	Aphrodisiac, Antihemorrhagic, Stomachic	Amiri & Joharchi 2013
Arecaceae	*Cocos nucifera* L.	Nargil	Fruit	Nutritive, Hair tonic, Antianemic	Amiri & Joharchi 2013
Arecaceae	*Phoenix dactylifera* L.	Khorma	Fruit, Flower, Seed	Common cold treatment, Antidiarrheal, General tonic, Laxative	Khodayari *et al.* 2013; Hosseini *et al.* 2021; Nadaf *et al.* 2023
Asparagaceae	*Drimia maritima (*L.*)* Stearn.	Onsol	Bulb	Hair tonic, Emmenagogue, Analgesic (for arthrodynia), Antiarthritic	Amiri & Joharchi 2013; Jalali 2026
Asparagaceae	*Muscari neglectum* Guss. ex Ten. & Sangiov.	Kalagak	Bulb, Flower, Leaf	Stomachic	Ghollasimod & Asa 2024
Asparagaceae	*Ornithogalum brachystachys* K.Koch.	Gilae	Leaf	Anthelmintic	Esmaeili *et al.* 2014
Asparagaceae	*Ornithogalum persicum* Hausskn.ex Bornm.	Malmalias	Leaf, Stem	Laxative, Carminative	Khodayari *et al.* 2013
Asparagaceae	*Polygonatum orientale* Desf.	Shaghaghol	Root	Aphrodisiac, Nerve tonic	Amiri & Joharchi 2013
Asparagaceae	*Urginea maritima* Baker.	Gaav piazi	Bulb	Odontalgic (toothache relief), Antiurolithiatic, Antirheumatic, Analgesic (joint pain)	Mosaddegh *et al.* 2012
Asphodelaceae	*Aloe vera* (L.) Burm. f.	Sabre zard	Leaf, Latex	Vulnerary (burn healing), Antiobesity, Anti-hemorrhoidal, Purgative, Antihistaminic	Amiri & Joharchi 2013; Arbabi *et al.* 2023; Jalali *et al.* 2026; Ghahremaninejad *et al.* 2026
Asphodelaceae	*Asphodelus tenuifolius* Cav.	Gol-e esbid	Aerial parts	Analgesic, Vulnerary, Parturifacient (facilitates childbirth)	Esmaeili *et al.* 2014; Sharafatmandrad & Khosravi Mashizi 2020; Hosseini *et al.* 2021
Asphodelaceae	*Eremurus olgae* Regel.	Cherish	Root, Leaf	Edible vegetable, Dermal infection treatment	Amiri & Joharchi 2013; Hosseini *et al.* 2021
Asphodelaceae	*Eremurus persicus* (Jaub. & Spach) Boiss.	Serish	Leaf	Gastrointestinal diseases	Mosaddegh *et al.* 2012; Beiranvand & Beiranvand, 2022
Asphodelaceae	*Eremurus spectabilis* M.Bieb.	Serish	Root	Dermatological disorders, Hypolipidemic	Jalali *et al.* 2026
Asphodelaceae	*Eremurus stenophyllus* (Boiss. & Buhse) .	Seresh zaren	Root, Leaf	Anti-gout, Sedative, Emmenagogue	Ghollasimod & Asa 2024
Cyperaceae	*Cyperus rotundus* L.	Soadekufi, Oyarsalam argavani	Root	Cognitive enhancer, Antiicteric (jaundice treatment), Sedative, Antimigraine	Amiri & Joharchi 2013; Khodayari *et al.* 2013; Nadaf *et al.* 2019; Minaeifar *et al.* 2024, Manabi *et al.* 2025; Jalali 2026
Iridaceae	*Crocus sativus* L.	Zaffaron	Stigma	Nervine tonic, Antidepressant, Sedative, Dysmenorrhea treatment, Antiulcer, Asthma	Nadaf *et al.* 2019; Jalali *et al.* 2020; Arbabi *et al.* 2023; Jalali *et al.* 2026
Iridaceae	*Gladiolus atroviolaceus* Boiss.	Ghilayol	Flower	Hair and nail growth promoter	Ghahremaninejad *et al.* 2026
Iridaceae	*Gladiolus italicus* Mill.	Gol-e khastegari	Root, Fruit	Antitussive, Joint pain relief	Mosaddegh *et al.* 2012
Iridaceae	*Gynandriris sisyrinchium* L.	Zanbagh sa	Flower	Antitussive, Influenza treatment	Sharififar *et al* 2010
Iridaceae	*Iris drepanophylla* Aitch. & Baker.	Zanbagh	Flower, Root	Diuretic, Expectorant, Hepatostimulant	Ghahremaninejad *et al.* 2026

Iridaceae	*Iris kopetdaghensis* (Vved.) B. Mathew & Wendelbo.		Flower, Root	Anticough, diuretic, expectorant	Wendelbo 1977; Ghahremaninejad *et al.* 2026
Iridaceae	*Iris spuria* L.	Zanbagh	Root	Diuretic, Expectorant	Amiri & Joharchi 2013; Jalali 2026
Ixioliriaceae	*Ixiolirion tataricum* (Pall.) Schult. & Schult.f.	Khiarak	Aerial parts	Analgesic, Dermatological disorders	Sharififar *et al.* 2010; Heirany & Kolahi 2023; Ghollasimod & Asa 2024
Liliaceae	*Fritillaria imperialis* L.	Gol-e Negin	Bulb	Digestive disorders	Mosaddegh *et al.* 2012
Liliaceae	*Tulipa biflora* Pall.	Lale haft rang	Root	Antitussive	Sharififar *et al.* 2010; Hosseini *et al.* 2021
Poaceae	*Agropyron repens* (L) P. Beauv.	Morgh, Ghyagh, Gor gyah	Rhizom, Root	Depurative, Emollient, Anti-urolithiatic, Renal colic relief, Antihemorrhoidal, Spleen disorders, Prostate disorders, Hypocholesterolemic	Minaeifar *et al.* 2024
Poaceae	*Arundo donax* L.	Tabashir ghalam	Latex	Aphthous ulcer treatment, Thirst quencher, Depurative, Anti-acne, Antipyretic	Amiri & Joharchi 2013
Poaceae	*Avena sativa* L.	Jo dosar, Youlaf	Seed, Glumelle, Flower	General tonic, Antimicrobial, Nervine, Antiacne, Depurative, Analgesic, Vulnerary, Antigout, Antiurolithiatic, Sedative (for insomnia), Antitussive, Diuretic, Digestive, Laxative, Antihemorrhoidal	Zargari 1998; Iranmanesh *et al.* 2010; Amiri & Joharchi 2013; Mozaffarian 2018; Nadaf *et al.* 2019; Hosseini *et al.* 2021; Karimian *et al.* 2024; Minaeifar, *et al.* 2024; Amini *et al.* 2025
Poaceae	*Avena sterilis* subsp. *ludoviciana* (Durieu) Nyman.	Youlaf Irani	Whole plant	Laxative, Cardiotonic, Hypolipidemic, Anti-inflammatory, Antiseptic, Analgesic, Antiobesity	Manabi *et al.* 2025
Poaceae	*Cymbopogon citratus* (DC.) Stapf.	Alaf-e Limoo	Aerial parts	Antipyretic, Antitussive, Common cold treatment, Adaptogen, Immunomodulator, Edible	Jalali 2026
Poaceae	*Cynodon dactylon* (L.) Pers.	Pange morghy, Chamaniyan, Gandom, Margh	Whole plant	Hyperlipidemia, Hepatoprotective, Urinary disorders, Anti-icteric, Anti-cholelithiasis (gallstones), Antiemetic, Digestive, Dysgeusia (altered taste) relief, Dermatological disorders, Erysipelas treatment, Anti-inflammatory	Zargari 1998; Iranmanesh *et al.* 2010; Mozaffarian 2018; Heirany & Kolahi 2023; Minaeifar *et al.* 2024; Mivefroshan & Afsargharehbagh 2024; Ghollasimod & Asa 2024; Manabi *et al.* 2025
Poaceae	*Dactyloctenium aegyptium* (L.) Willd.	Arzan batlagi	Seed	Analgesic and Wound healing	Manabi *et al.* 2025
Poaceae	*Hordeum glaucum* steud.	Arpa	Whole plant	Hypolipidemic	Ghahremaninejad *et al.* 2026
Poaceae	*Hordeum marinum* Huds.	Jo wahshi	Seed	Hypocholesterolemic, Anxiolytic, and General tonic	Manabi *et al.* 2025
Poaceae	*Hordeum vulgare* L.	Jo	Seed	Antidiabetic, Anti-gout, Vulnerary, Antipyretic, Digestive, Diuretic, General tonic, Antigalactagogue, Sedative	Zargari 1998; Sharififar *et al.* 2010; Eslami Farouji & Khodayari 2016; Mozaffarian 2018
Poaceae	*Oryza sativa* L.	Chaltooke berenj, Rice	Seed, Coat	Hair tonic, Antianemic, Digestant, Antidiarrheal, Antidiabetic, Enteritis treatment, Carminative, Hepatoprotective	Zargari 1998; Amiri & Joharchi 2013; Mozaffarian 2018; Ghahremaninejad *et al.* 2026; Jalali *et al.* 2026

Poaceae	*Panicum miliaceum* L.	Arzan	Whole plant	Vulnerary, Antigonorrheal, Diuretic, Astringent, Antirheumatic	Eslami Farouji & Khodayari 2016; Mozaffarian 2018; *Jalali et al.* 2026
Poaceae	*Phragmites australis* (cav) Trin. ex. steud.	Ney	Leaf, Flower, Root stock	Diuretic, Antipyretic	Ghollasimod & Asa 2024; Manabi *et al.* 2025
Poaceae	*Secale cereale* L.	Chave dar,	Seed	Chest and stomach softener, for opening boils, relieving constipation	Razmjoue *et al.* 2024
Poaceae	*Sorghum halepense* (L.) Pers.	Gyagh	Seed	Sedative	Manabi *et al.* 2025
Poaceae	*Triticum aestivum* L.	Gandom	Seed	Appetizer, Disinfectant, Hypotensive, Purgative, Stomachic, Hypolipidemic, Malaise	Eslami Farouji & Khodayari 2016; Mozaffarian 2018; Hosseini *et al.* 2021
Poaceae	*Zea mays* L.	Balal, Zorat	Fruit, Seed, Corn silk	Hypocholesterolemia, Antimicrobial, Anti-urolithiatic, General tonic, Antipyretic, Laxative, Diuretic	Amiri & Joharchi 2013; Hosseini *et al.* 2021; Jalali 2026
Typhaceae	*Typha domingensis* Pers.	Loyi	Rhizom, Flower, Stem	Edible vegetable	Ghasemi *et al.* 2013
Zingiberaceae	*Alpinia galanga* Willd.	Ghost shirin	Rhizome	Antidysenteric, Antiosteoarthritic	Zargari 1998; Amiri & Joharchi 2013; Mozaffarian 2018
Zingiberaceae	*Alpinia officinarum* Hance.	Kholanjan	Fruit	Antirheumatic, General tonic, Sedative, Digestive	Amiri & Joharchi 2013; Jalali *et al.* 2026
Zingiberaceae	*Amomum subulatum* Roxb.	Hele bad	Fruit, Seed	Carminative, Flavoring agent, Antispasmodic (for colic), Cardiotonic, Stomachic, Odontalgic, General tonic	Zargari 1998; Amiri & Joharchi 2013; Amini *et al.* 2025; Jalali *et al.* 2026
Zingiberaceae	*Curcuma longa* L.	Zard Chubeh	Rhizome	Anticholelithiasis, Vulnerary (for bruises), Digestive, Emmenagogue	Amiri & Joharchi 2013
Zingiberaceae	*Curcuma zedoaria* (Christm.) Roscoe.	Zorombad	Rhizome	Hepatoprotective, Carminative, Flavoring agent, Antiobesity, General tonic	Zargari 1998; Amiri & Joharchi 2013
Zingiberaceae	*Elettaria cardamomum* (L.) Maton.	Hel	Fruit, Seed	Flavoring agent, Carminative, Appetizer	Zargari 1998; Amiri *et al.* 2012
Zingiberaceae	*Zingiber officinale* Roscoe.	Zanjafil	Rhizome	Spermatogenesis booster, Antiobesity, Flavoring agent, Analgesic, Carminative, Odontalgic, back pain	Zargari 1998: Amiri & Joharchi 2013; Mozaffarian 2018; Arbabi *et al.* 2023

In this review, ethnobotanical data were compiled for 68 species, 43 genera, and 13 families of medicinal monocots used in Iran (Table 1). The families Poaceae and Amaryllidaceae exhibited the highest frequency and diversity of medicinal applications (Figure 1), reflecting not only their species richness in Iran's flora but also the accumulation of bioactive secondary metabolites—particularly sulfur compounds and steroidal saponins—in their storage organs (bulbs, rhizomes). This pattern is consistent with reports from neighboring arid and semi-arid regions, such as Pakistan (Bahadur *et al.* 2023) and India (Mallick *et al.* 2023), where monocots similarly occupy a prominent position in traditional therapeutics. Several additional species documented in classical Persian botanical references (Zargari, 1998; Mozaffarian, 2018)—including *Arum maculatum*, *Agave americana*, *Yucca filamentosa*, *Desmostachya bipinnata*, *Imperata cylindrica*, *Lolium temulentum*, *Panicum antidotale*, and *Allium ampeloprasum*—were not captured in the reviewed articles, underscoring a gap between traditional literature and contemporary field studies.

The genus Allium (Amaryllidaceae), with approximately 1,000 species globally and 153 recorded in Iran across eight subgenera and 32 sections, represents the most diverse petaloid monocot genus in the country. Its species occupy a remarkable range of habitats—from coastal shores and salt-lake margins to subalpine zones—and are extensively used in Iranian ethnomedicine. The broad therapeutic spectrum of *Allium* (antioxidant, antimicrobial, antifungal, antiviral, anticancer, hypoglycemic, and cardioprotective) is attributable to its rich phytochemical arsenal, including alkaloids, flavonoids, organosulfur compounds, saponins, and phenolics. Specific species have been documented for distinct

indications: *A. ampeloprasum* and *A. hirtifolium* for hypotension; *A. stipitatum* for ACE-inhibitory activity (Faqiri *et al.* 2025); *A. rubellum* and *A. tripedale* for hyperlipidemia; *A. akaka* with the highest number of recorded uses; and *A. sativum* with the strongest historical documentation for cardiovascular benefits. A clinical trial further confirmed that garlic peel consumption over 12 weeks significantly reduced total cholesterol and LDL in hypercholesterolemic patients (Ebrahimi *et al.* 2019). Recent studies have also highlighted the cytoprotective potential of *A. jesdianum* against chemical toxicity (Nehzomi & Shirani, 2024) and the cytotoxic activity of *A. austroiranicum* against ovarian and cervical cancer cell lines (Akhavan Roofigar, 2024), suggesting promising avenues for anticancer drug development.

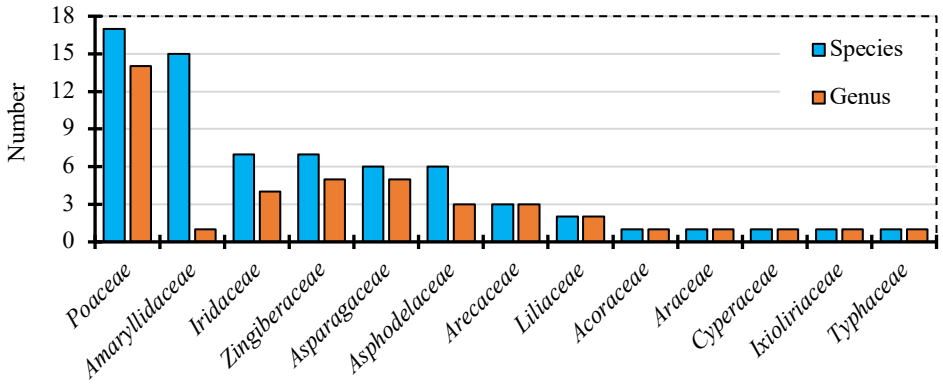


Figure 1. Plant family with the highest number of species of Iranian Monocot species

Allium cepa (onion) essential oil, obtained via steam distillation, contains a complex mixture of sulfur compounds with notable antioxidant and moderate antimicrobial activities (Ye *et al.* 2013). Beyond its culinary applications, onion oil is valued in the food industry as a preservative (anti-browning and antimicrobial) and flavor enhancer. Combined formulations with NVD vaccine have also shown efficacy against Newcastle disease (Vazquez-Armenta *et al.* 2016; Lebdah *et al.* 2022).

Cross-regional comparisons reveal functional similarities among *Allium* species across Iran, Turkey, and Pakistan, yet therapeutic priorities differ—for instance, *A. jesdianum* is used in Iran for urinary tract infections but for rheumatism in the Eastern Mediterranean. These discrepancies likely reflect cultural, dietary, and environmental factors rather than phytochemical variation alone. Similarly, *Cyperus rotundus* is employed in Iran as a memory enhancer and anti-migraine agent, whereas in Ayurveda it is primarily indicated for menstrual disorders (Singh & Sharma 2018), underscoring the powerful influence of cultural context on medicinal plant selection.

Beyond their nutritional significance, members of the Poaceae family exhibit diverse medicinal uses. *Hordeum vulgare* and *Triticum aestivum* are recorded for diabetes, gout, fever, and as general tonics, with *H. vulgare* also valued for its phosphorus, calcium, protein, and B-vitamin content. Wild grasses such as *Agropyron repens* and *Cynodon dactylon* display the greatest diversity of uses within Poaceae, with *C. dactylon* accounting for 13 distinct applications (hepatoprotective, anti-inflammatory, treatment of painful erection, etc.). A recent study has also confirmed the anti-obesity and lipid-lowering effects of *Avena sterilis* (Manabi *et al.* 2025). Meanwhile, *Avena sativa* (common oat) is documented for 10 ailments, including nervous disorders, acne, gout, urolithiasis, and insomnia, attributed to its high vitamin B content, gluten-free fiber, and digestive benefits (Razmjoue *et al.* 2017).

Imported species such as *Areca catechu* and *Zingiber officinale* have been fully integrated into Iranian traditional medicine, acquiring an independent medicinal identity despite their non-native origin. *A. catechu* seeds, widely used in Iran, contain over 59 identified compounds (alkaloids, tannins, flavones, triterpenoids, steroids, fatty acids) with a broad spectrum of pharmacological activities (antiparasitic, antidepressant, antioxidant, antimicrobial, antihypertensive, anti-inflammatory, anti-allergic, etc.). However, its principal alkaloid, arecoline, presents significant toxicity, including oral submucosal fibrosis (OSF) and apoptosis in normal human cells (Peng *et al.* 2015).

The genus *Iris*, with over 300 species globally and 20 in Iran, is distinguished by its diverse phytochemistry (flavonoids, acetophenones, iridals, sterols, phenolics, ceramides, anthocyanins, stilbenes, xanthones) and the presence of 48 flavonoid aglycones—a unique chemotaxonomic marker. *Iris germanica* holds considerable economic importance due to its essential oil, which is widely used in flavoring, perfumery, and cosmetics (Ghasemi *et al.* 2023). Similarly, the analgesic activity of *Cyperus longus* has been reported to surpass that of indomethacin (Ghasemi *et al.* 2014), while *Eremurus* species (Liliaceae) are traditionally used for jaundice, liver disorders, skin infections, diabetes, and hyperlipidemia, with pharmacological

evidence supporting their antioxidant, antidiabetic, antimicrobial, cytotoxic, and gastroprotective effects (Farhadi *et al.* 2023).

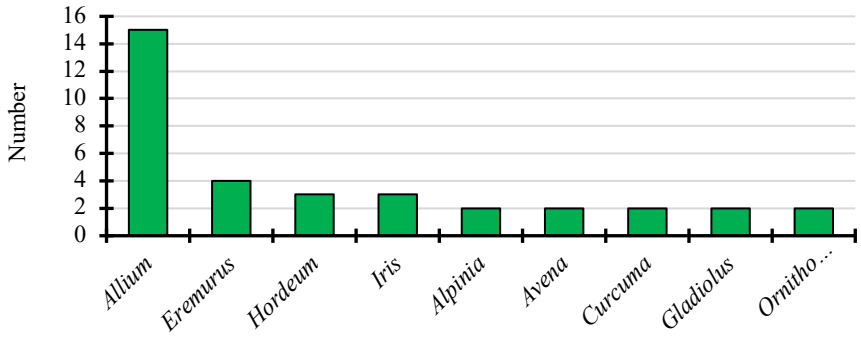


Figure 2. Plant genera with the highest number of species of Iranian Monocot species.

The most frequently utilized plant organs are leaves, seeds, and roots (Figure 3), which are primary sites for the accumulation of steroidal saponins and sulfur-based secondary metabolites. However, this pattern raises significant conservation concerns. Species such as *Allium hirtifolium*, *Fritillaria imperialis*, and *Eremurus spectabilis* are at elevated risk of extinction due to the harvesting of underground storage organs before flowering. Unlike dicots, where leaf removal may be sustainable, medicinal exploitation of these monocots often entails the complete removal of the plant. Balancing economic potential with conservation necessitates a shift from conventional harvesting toward sustainable wild-crafting strategies to ensure long-term species survival.

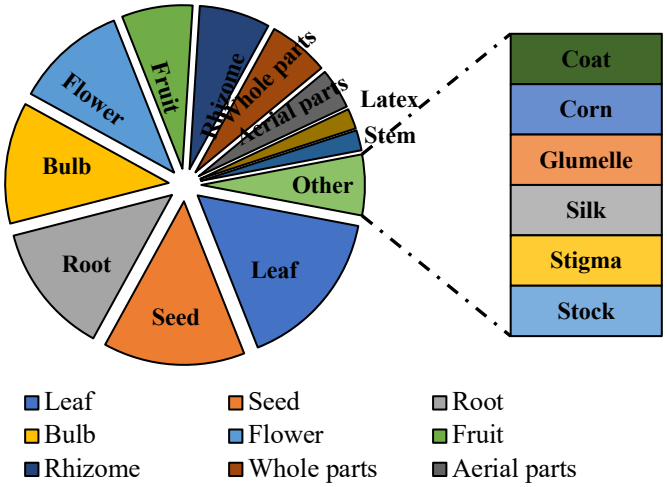


Figure 3. Plant parts used for medicinal applications based on data reported in the literature for Iranian Monocot species.

Among the monocot species with the highest use reports, *Avena sativa* (15 reports) and *Secale cereale* (14 reports) were the most prominent (Figure 4). The predominant therapeutic categories included carminative, diuretic, and general tonic (each 3.4%), followed by antipyretic and sedative (each 3%) (Figure 5).

This review acknowledges that for many species, only traditional use claims exist without supporting toxicological or clinical trial data. Future studies should focus on: (1) participatory documentation with local communities to preserve rapidly disappearing oral knowledge; (2) targeted pharmacological screening of high-frequency, understudied species (e.g., *A. rubellum*, *Eremurus olgae*); (3) development of sustainable harvesting protocols for endangered taxa; (4) systematic toxicity assessments for species such as *Asphodelus*, *Cyperus*, and *Arum maculatum*, as long-term side effects of their alkaloid compounds may be overlooked by traditional knowledge alone. Without immediate conservation planning for vulnerable species like *F. imperialis*, their future may be confined to herbarium records.

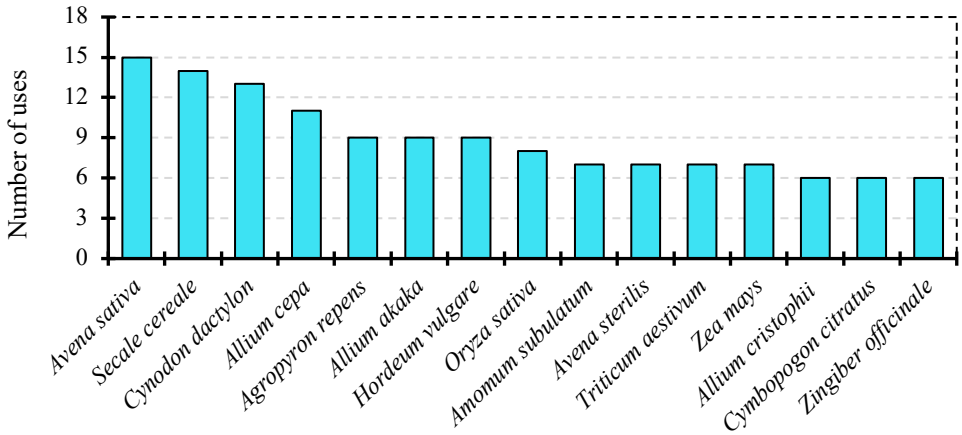


Figure 4. Iranian Monocot species with the largest number of uses in Iran.

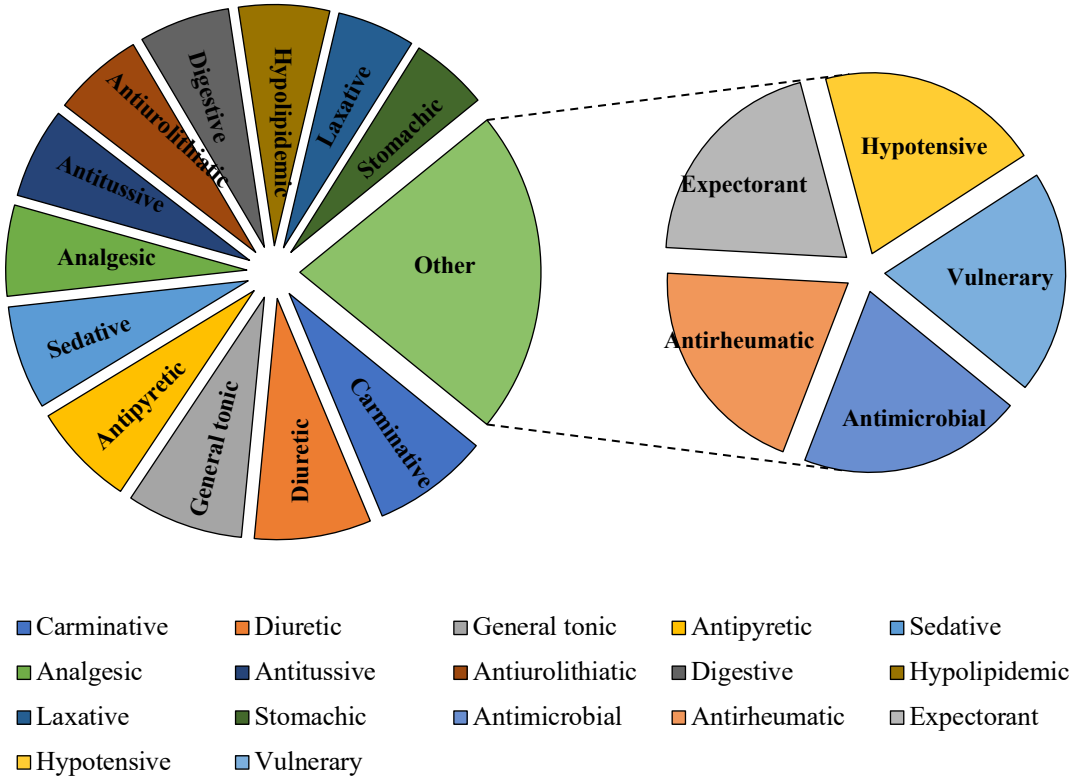


Figure 5. The most frequently cited health problems treated by the Iranian Monocot species

Conclusion

This ethnobotanical review offers a systematic documentation of medicinal monocot species utilized in Iran, underscoring their pivotal role in traditional healthcare and their relevance to contemporary pharmacological research. Our findings highlight the remarkable diversity within this plant group, particularly in the families *Poaceae* and *Amaryllidaceae*, with the genus *Allium* emerging as a principal source of bioactive compounds. The wide range of reported biological activities—including antimicrobial, antioxidant, cardiovascular, hypoglycemic, and anticancer effects—corroborates local empirical knowledge and aligns with recent phytochemical and pharmacological evidence. The therapeutic use of monocots in Iran extends beyond native flora; the incorporation of introduced species such as *Areca catechu* and *Zingiber officinale* into traditional practices reflects the historical adaptability and intercultural dynamism of Iranian ethnobotany. Moreover, the convergence of ethnopharmacological applications with modern scientific findings—particularly in genera such as *Iris*,

Cyperus, and *Eremurus*—positions these taxa as promising candidates for drug discovery and the development of novel therapeutics.

However, the heavy dependence on underground storage organs (bulbs, rhizomes, tubers) raises serious conservation concerns. Species including *Allium hirtifolium*, *Fritillaria imperialis*, and *Eremurus spectabilis* face increasing threats from overharvesting, as traditional collection frequently occurs before seed maturation, jeopardizing population viability. This necessitates the urgent formulation of sustainable wild-crafting protocols and conservation frameworks that reconcile traditional use with ecological sustainability. Looking forward, three complementary research priorities are proposed: (1) participatory documentation of oral knowledge to prevent its irreversible loss; (2) targeted pharmacological and toxicological studies on understudied yet frequently used species (e.g., *Allium rubellum* and *Eremurus olgae*), with special attention to safety profiles and long-term effects of alkaloid-rich taxa (*Asphodelus* spp., *Cyperus* spp., *Arum maculatum*); and (3) development of evidence-based harvesting guidelines for threatened species. Ultimately, the integration of traditional botanical wisdom with rigorous scientific investigation provides a robust framework for biodiversity conservation, cultural heritage preservation, and the sustainable discovery of nature-derived therapeutics. In the absence of proactive measures, the very plants that have sustained local health systems for centuries may become inaccessible to future generations—relegated to herbarium sheets rather than remaining living elements of Iran's natural and cultural legacy.

Declarations

Ethics approval and consent to participate: This study did not involve human participants, animal subjects, or clinical trials. Therefore, ethical approval and informed consent were not required. The research was conducted in accordance with the relevant guidelines and regulations for ethnobotanical field studies.

Consent for publication: Not applicable

Availability of data and materials: All data supporting the findings of this study are presented within the article. Additional datasets generated or analyzed during the current investigation are available from the corresponding author upon reasonable request.

Competing interests: The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Author contributions: M.N. conducted the field surveys, collected plant specimens, and contributed to the preparation and revision of the manuscript. R.O. performed data analysis and participated in manuscript writing and revision. All authors reviewed and approved the final version of the manuscript.

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