GMR
The Original

THERAPEUTIC POTENTIAL OF INDIGENOUS PLANTS IN PCOS MANAGEMENT: ETHNOMEDICINAL INSIGHTS FROM QUETTA, PAKISTAN

Yaroosha Sardar[1], Tahira Bibi[2], Nelofer Jamil[3], Shazia Irfan[4], Rabail Rabail Urooj[5], Hina Ali Ahmed[6], Nosheen Rafiq[7], Farah Naz Channa[8]

[1] Department of Botany Sardar Bahadur Khan Women's University. Yarooshasardar9@gmail.com
[2] Department of Botany Sardar Bahadur Khan Women's University, Quetta tahira_botany@yahoo.com
[3] Department of Environmental Sciences Sardar Bahadur Khan Women's University, Quetta, nelofer.sbkwu@gmail.com
[4] Department of Botany, Sardar Bahadur Khan Women's University Quetta, Pakistan. irfanshazia16@gmail.com
[5] Department of Environmental Sciences Sardar Bahadur Khan Women's University, Quetta. rabail.urooj@sbkwu.edu.com
[6] Department of Zoology Sardar Bahadur Khan Women's University, Quetta, Pakistan hina29_zoo@yahoo.com
[7] Department of Zoology Sardar Bahadur Khan Women's University, Quetta, Pakistannosheenyasirzafar@gmail.com
[8] Department of Biotechnology, Sardar Bahadur Khan Women's University Quetta farah.naz@sbkwu.edu.pk

ABSTRACT

Polycystic ovarian syndrome (PCOS) is a prevalent endocrine illness affecting approximately single in fifteen females universal, commonly manifested through hirsutism, acne, and raised androgen heights. This research marked to explore the ethnomedicinal vegetation traditionally recycled for the management of PCOS in the Quetta region of Baluchistan, Pakistan. Statistical figure was collected from 197 local respondents concluded surveys and structured as well as unstructured interviews. The results were analyzed by using several ethnobotanical indices such as Use Report (UR), Use Value (UV), Frequency of Citation (FC), Relative Frequency of Citation (RFC) and Family Importance Value (FIV). 30 species (from 30 families) were recorded, the most dominant being Lamiaceae. Leaves (26%) and roots were the most commonly used parts of plants (26%), while decoctions represented the primary mode of preparation (33%), followed by infusions, extractions, and powders in smaller proportions. Among the reported species, *Azadirachta indica* A. Juss (Neem) recorded the highest RFC (0.05) and FC (10), *Salvia hispanica* L. (Chia/Tukham-e-sharbati) exhibited the highest UV (1.8), and *Vitex agnus-castus* L. (Chaste tree/Bana) had the highest UR (7). The findings reveal that indigenous communities of Balochistan rely extensively on medicinal plants for managing gynecological conditions, particularly PCOS. This documentation provides the first quantitative ethnobotanical record of therapeutic herbs recycled for females' reproductive fitness in the region. This research underscores the therapeutic prospective of these plants and highlights the need for further phytochemical and toxicity analyses to validate their usefulness and support the expansion of safe, plant-based remedies for PCOS management.

KEYWORDS: Ethnobotany, Medicinal plants, Polycystic Ovary Syndrome (PCOS), Traditional medicine, Herbal remedies, Phytotherapy, Ethnomedicine

1. INTRODUCTION

Ethnobotany is the study, how human societies utilize native plants, provides valuable insights into the relationship between culture, geography, and plant use. Various vegetable portions including seeds, flowers, roots, stems, bark and leaves have long been recognized for their therapeutic potential in preventing and treating a wide range of illnesses (Bangulzai *et al*., 2022; Ali *et al*., 2023; Dalal *et al*., 2023). Conferring to the World Health Organization (WHO), any plant containing compounds with therapeutic properties or precursors for pharmaceutical development qualifies as a medicinal plant (Brasil, 2004). These plants often referred to as ethnobotanical resources, remain central to traditional medical systems worldwide. Herbal medicines, derived from naturally occurring ingredients with minimal processing, continue to serve as primary therapeutic tools within complementary and alternative medicine (MCA) and traditional medicine (MT) frameworks (Brasil, 2012). The global importance of medicinal plants was highlighted by Alma Ata Declaration 1978, which recognized their preventive, curative and palliative applications. Since then, WHO has formally acknowledged phytotherapy and herbal medicine as integral to healthcare systems (Ibiapna, 2014). Within this framework, ethnogynecology the traditional medical practice addressing women's health has gained recognition. Medicinal plants are widely employed to treat infertility, menstrual disorders, leucorrhea, menopause, delivery complications, and other gynecological conditions (Amorim and Santos, 2003; Faria *et al*., 2004; Geller and Studee, 2005; Clarke *et al*., 2007; Sadeghi and Mahmood, 1998; Suneghi and Mahmood, 2002). Indeed, nearly 18% of the worldwide infection burden is associated with sensual and generative fitness disorders (Kaingu *et al*., 2011). In Pakistan, rural women are particularly vulnerable to reproductive health problems due to poverty, inadequate healthcare infrastructure, and challenging living conditions. The country harbors about 6,000 flowering plants, of which nearly 600 are used medicinally (Nasir and Ali, 1971–1991). Much of this knowledge is preserved and transmitted by local midwives ("Daiya"), who rely heavily on plant-based remedies for gynecological care (Tareen *et al*.,

2010). However, ethnomedicinal studies in Pakistan have largely concentrated on northern mountain systems such as the Himalayas (Khan *et al*., 2023), Karakoram (Qureshi *et al*., 2007), Hindu Kush (Abbas *et al*., 2017; Shah *et al*., 2012; Ali *et al*., 2018), and Salt Range (Iqbal *et al*., 2011; Bibi *et al*., 2014). The Sulaiman Mountains and other parts of Balochistan, including Quetta, remain underexplored. Polycystic ovarian syndrome (PCOS) is an assorted endocrine illness that predominantly affects females of generative age. Clinically, it establishes as infertility, irregular menstruation, spots, hirsutism, fatness, and metabolic syndrome (Dargham *et al*., 2017; Norman, 2007; Knochenhauer *et al*., 1998). Pakistan reports one of the highest prevalence rates globally up to 52% which is considerably higher than in Western countries (Bangulzai *et al*., 2022; Ali *et al*., 2023; Dalal *et al*., 2023). PCOS is associated with multiple follicular cysts visible on ultrasound, hormonal imbalance, and insulin resistance. Over time, it intensifications the hazard of type 2 diabetes, circulatory infection, endometrial cancer, and other chronic circumstances (L. Manneras *et al*., 2007; Kovacs, 2007; Zahra *et al*., 2018). Existing organization of PCOS is primarily symptomatic, relying on pharmacological interferences such as hormonal contraceptives, insulin sensitizers, and anti-androgens (Ahmed and Abubaker, 2011). While often effective, these treatments are costly, have limited accessibility in pastoral areas, and are supplementary with significant side effects, including gastrointestinal problems, menstrual irregularities, and weight gain (Nowak *et al*., 2007). In contrast, medicinal plants used in Ayurveda, Chinese, Persian, and Unani traditions offer more affordable, culturally acceptable, and potentially safer alternatives. Several herbs have remained exposed to progress insulin sensitivity, regulate reproductive endocrinology, and alleviate medical symptoms of PCOS (Choudhary *et al*., 2019; Latha *et al*., 2015). Despite this potential, systematic ethnobotanical documentation of PCOS-related plant remedies in Pakistan is lacking. Previous studies have focused primarily on general gynecological treatments, with families such as Fabaceae and Asteraceae most frequently reported (Yazbek *et al*., 2016). However, the use of medicinal plants for PCOS management in Balochistan remains unrecorded. Given the heavy reliance of rural women on indigenous medicine due to socioeconomic constraints, this gap represents a critical barrier to both conservation of modern information and the scientific validation of plant-based therapies. This research intention to document and analyze the ethnomedicinal plants used in Quetta, Baluchistan, for the treatment of PCOS. By applying ethnobotanical indices to systematically evaluate local practices, the research provides the first quantitative record of PCOS-specific herbal remedies in the region. This work establishes baseline data that may guide future phytochemical, pharmacological, and toxicological investigations, ultimately supporting the development of safe, effective, and culturally relevant plant-based alternatives for managing PCOS.

2. METHODS AND MATERIALS

Ethnomedicinal data were acquired concluded semi-structured conferences, questionnaires, open discussions, and contestant explanations. The cultural implication of respectively plant was evaluated using established quantitative indices: Use Report (UR), Use Value (UV), Frequency of Citation (FC), and Relative Frequency of Citation (RFC).

2.1. Area of Study

The present-day study was showed in District Quetta, the capital of Baluchistan province, Pakistan. Owing to its unique ecological conditions, cultural diversity and strong reliance on traditional medicine, the region provides an important setting for documenting ethnomedicinal performs related to women's health, particularly the management of polycystic ovarian syndrome (PCOS).

2.2. Geo-ethnographic Overview of District Quetta, Balochistan

Quetta, the capital of Balochistan province in southwestern Pakistan, serves as both a city and district of strategic and cultural importance. Historically known as Shāl or Shālkot derivative from the Pashto word *kwatkot*, denotation "fort" the city has a population of nearly 1.6 million, making it the seventh largest in the country. Situated at an elevation of 1,680 m, Quetta is Pakistan's highest-altitude metropolitan center, encircled by mountains and widely recognized as the "Fruit Garden of Pakistan" for its diverse orchards of fresh and parched fruits. Its location near the Bolan Pass and close to the Pakistan–Afghanistan border has long positioned it as a hub of regional trade and communication (Gazdar *et al*., 2010). The city is characterized by significant ethnic diversity, with Pashtun, Baloch, Hazara, and Punjabi communities coexisting and speaking languages such as Pashto, Balochi, Brahui, Urdu, and Hazaragi. Quetta's cold semi-arid climate is marked by hot seasons, cold winter time, and occasional snowfall, creating a distinctive ecological landscape. These geographic and socio-cultural features, combined with a continued reliance on traditional medicine, make Quetta a valuable setting for ethnobotanical research, particularly for exploring the custom of medicinal vegetation in managing women's fitness conditions such as polycystic ovarian syndrome (PCOS).

2.3. Socio-Economic Profile of the Study Area

Quetta, the capital of Baluchistan, is rich in biodiversity and traditional ethnomedicinal knowledge. The surrounding mountains and valleys host numerous therapeutic plants, including *Tagetes erecta*, *Vitex agnus-castus*, *Psidium guajava*, *Hyoscyamus niger*, *Medicago sativa*, and *Zea mays*. Rural communities, with limited access to modern healthcare, rely heavily on these species for primary treatment. The region's dry, temperate climate supports extensive agriculture, particularly orchards of grapes, apples, apricots, plums, almonds, and pomegranates, along with major crops such as wheat, barley, and maize. Quetta is also renowned for premium dry fruits like almonds, raisins, and *Pinus gerardiana* (chalghoza), which form a vital part of the local economy. Ecological reserves such as Hazar Ganji Chiltan National Park conserve valuable juniper and pistachio forests,

further sustaining biodiversity and traditional knowledge. This unique blend of ecological richness, agricultural productivity, and ethnomedicinal reliance positions Quetta as a key site for studying the role of medicinal vegetation in women's healthcare, particularly in managing PCOS.

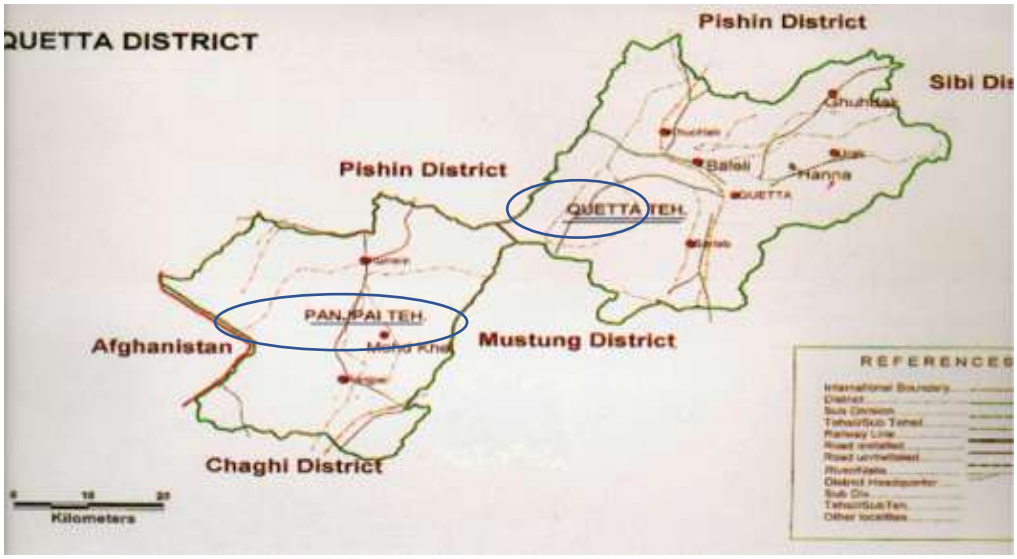

Figure 1: Geographical map of Pakistan highlighting Baluchistan province and the study site, District Quetta.

2.4. Ethnographic interviews

Ethnomedicinal data were composed through uncompromising interviews and organized surveys designed to document the traditional use of indigenous plants. A total of 197 informants participated, including 170 local residents (schoolteachers, housewives, university students, and women of varying marital status and age groups) and 12 herbal experts or traditional healers. The conferences were showed in Urdu, the widely spoken resident language, ensuring accessibility and accuracy of responses. To capture generational variation in traditional knowledge, participants were categorized into three age groups: 15–18, 19–30, and 31–47 years. Data collection was carried out across different sites within District Quetta, including Postal Colony, Samungli Road, Qambrani Girls School, Sardar Bahadur Khan Women's University, and nearby schools. This approach enabled a comprehensive understanding of ethnomedicinal practices across diverse social, educational and professional backgrounds

2.5. Collection, Botanical Authentication and Formulation of Medicinal Plants

Medicinal plants were systematically surveyed and recorded in District Quetta, Balochistan, drawing on the knowledge of indigenous communities from December 2023 to June 2024. Data on vernacular names, traditional

therapeutic applications, plant parts utilized as pharmacological agents and preparation methods were meticulously documented and are summarized in Table 1.

2.6. Quantitative Evaluation of Ethnobotanical Results

he collected data have been analysed quantitatively according to the ethnobotanical indices such as Use Value (UV), Use Reports (UR), Family Importance Value (FIV), Frequency of Citation (FC), and Relative Frequency of Citation (RFC).

2.6.1. Use value (UV)

The Use Value (UV) remained calculated following the formulation projected by Tardío and Pardo-de-Santayana (2008) and later adapted by Savikin *et al*. (2013). UV is a modified index that estimates the relative significance of a plant classes created on the number of uses reported by informants. Unlike indices that rely solely on frequency of citation (RFC), UV accounts for the diversity of uses assigned to each species, thereby providing a more comprehensive measure of ethnomedicinal relevance. The numeral of customs conveyed for each species by different informants was applied in the formula to determine its relative significance.

UV= ΣU / N

Here, 'N' represents the total quantity of informers participating in the study, while 'UV' denotes the number of medicinal applications reported for a particular plant species by each informant. The UV value approaches 1 when a species is cited for multiple uses and nears 0 when it is rarely reported. However, UV alone does not indicate whether a plant is used for a single purpose or multiple therapeutic applications.

2.6.2. Use report (UR)

The Use Report (UR) represents the total quantity of times a plant species is cited for medicinal purposes by informants. It provides an indication of both the frequency and range of applications attributed to a species. As outlined by Prance *et al*. (1987), UR is obtained by counting the number of informants who associate a species with specific use categories, combined with the overall number of uses mentioned across those categories.

2.6.3. Family Importance value (FIV)

The Family Importance Value (FIV) is used to assess the relative cultural significance of plant families within a community. It serves as an indicator for ethnobotanists to estimate the ethnomedicinal position of a particular plant taxon. The FIV was calculated using the following method:

FIV=FC (family)/ N×100

Here, *N* denotes the total number of informers surveyed, while *FC* refers to the number of informants who reported species within a given family. The Family Importance Value (FIV) indicates the cultural significance of plant relatives and is calculated as the percentage of informants mentioning each family (Vitalini *et al*., 2013).

2.6.4. Frequency citation (FC) and Relative frequency Citation

The Frequency of Citation (FC) was calculated to determine how often each plant species was reported by informants. To further quantify the equal of consensus among contributors concerning the ethnomedicinal use of local species, the Relative Frequency of Citation (RFC) was employed. RFC was calculated using the formula proposed by Vitalini *et al*. (2013), where *N* represents the total number of informants, *FC* the number of informants who mentioned a given species, and RFC the ratio of FC to N. This index reflects the relative importance of each species based on the quantity of informers citing it.

RFC=FC/ N (0 < RFC < 1)

Here *FC* refers to the number of informers who cited a detailed species, *N* represents the total number of participants in the survey, and *RFC* denotes the comparative frequency of reference. The RFC value is derived from the ratio of FC to N (RFC = FC/N) and expresses the proportion of informants who acknowledged the custom of a given species or family. This measure provides an objective indication of the relative cultural and ethnomedicinal reputation of each taxon within the study area.

3. RESULTS

A total of 197 women and traditional herbal practitioners were interviewed in Quetta, categorized into three age groups, with the majority aged 18–47 years. Only females were included in the study, as PCOS is a women-specific disorder and women demonstrated greater awareness of medicinal plants used for its treatment.

3.1. Plant Diversity and Families

The survey documented 35 medicinal plant species traditionally used for PCOS management (Table1). The most represented personal was Lamiaceae (5 species), followed by Cucurbitaceae, Fabaceae, Asteraceae, and Meliaceae (2 species respectively). This reflects the cultural and ecological prominence of Lamiaceae in the region.

3.2. Plant Parts and Preparation Methods

Leaves and roots were the most commonly used plant parts (26% each), followed by seeds (20%), flowers (16%), and fruits (13%). Decoction was the most preferred preparation method (33%), followed by powder (26%) and infusion (20%) (Fig. 1, Fig. 2). Less frequently reported methods included extraction, tincture, and direct use.

3.3. Quantitative Ethnobotanical Indices

3.3.1. Use Value (UV): The highest UV was recorded for *Salvia hispanica* L. (1.8), followed by *Moringa oleifera* Lam. (1.0), *Vitex agnus-castus* L. (0.87), and *Eleocharis dulcis* (0.85). The lowest UV was noted for *Azadirachta indica* A. Juss (0.2).

3.3.2. Use Reports (UR): *Vitex agnus-castus* L. was cited most frequently (7 reports), whereas *Delonix regia* was cited least (1 report).
3.3.3. Relative Frequency of Citation (RFC): The uppermost RFC was reported for *Azadirachta indica* A. Juss (0.05). Species such as *Salvia hispanica* L., *Allium sativum* L., *Ocimum tenuiflorum* L., *Helianthus annuus* L., *Vitex agnus-castus* L., and *Melia azedarach* L. followed with RFC values of 0.04 each. The lowest RFC (0.00) was for *Angelica sinensis*.
3.3.4. Frequency Citation (FC): *Azadirachta indica* A. Juss (10 citations) and *Salvia hispanica* L., *Curcuma longa* L. (9 citations each) ranked highest, while *Angelica sinensis* (1 citation) ranked lowest.

3.4. Key Medicinal Plants for PCOS

Several plants emerged as particularly important in PCOS management:
Salvia hispanica (chia): regulates blood sugar, aids weight management, and balances hormones.
Curcuma longa (turmeric): reduces oxidative stress and hyperandrogenism, improves insulin sensitivity.
Moringa oleifera (moringa): combats insulin resistance, reduces inflammation, and enhances folliculogenesis.
Vitex agnus-castus (chaste tree): increases progesterone levels, regulates menstruation, and reduces acne and hirsutism.
Azadirachta indica (neem): highly cited, reflecting its wide acceptance in local healthcare practices.

3.5. Indigenous Knowledge and Transmission

Traditional knowledge of medicinal plants remains widespread, particularly among rural women, who reported greater familiarity compared to their urban counterparts. Knowledge is largely preserved by elderly women and local healers, though its transmission is threatened by modernization and declining interest among younger generations.

3.6. Quantitative Analysis

Among the recognized species, Salvia hispanica L. exhibited the maximum use value (UV = 1.8), followed by Moringa oleifera Lam. (1.0), Vitex agnus-castus L. (0.87), Eleocharis dulcis (Burm.f.) Trin. ex Hensch. (0.85), Momordica charantia L. (0.83), Lepidium meyenii Walp. (0.83), Trifolium pratense L. (0.80), and Hibiscus rosa-sinensis L. (0.80). In contrast, Azadirachta indica A. Juss. recorded the lowest use value (0.2). These findings align with the therapeutic significance of chia, moringa, and chaste tree in management metabolic and reproductive disturbances associated with PCOS. However, they differ after the results of Pachiappan *et al*. (2017), who reported Lepidium meyenii as having the uppermost use value due to its prominent role in reducing PCOS-related symptoms. Such discrepancies may be attributed to regional variations in vegetation, availability, and geoclimatic conditions, which shape local knowledge and preferences in plant use. The analysis revealed that the highest number of use reports (UR) was recorded for Vitex agnus-castus L. (7), followed by Momordica charantia L., Angelica sinensis, Eleocharis dulcis (Burm.f.) Trin. ex Hensch., and Melia azedarach L. (6 each). The lowest UR was noted for Delonix regia (Bojer ex Hook.) Raf. (1). These findings contrast with those of Ahmad *et al*. (2021), who identified Teucrium stocksianum as the most frequently cited species, suggesting regional variation in ethnobotanical knowledge and plant utilization. Relative frequency of citation (RFC) values indicated that Azadirachta indica A. Juss. had the highest importance (0.05), followed closely by Salvia hispanica L., Allium sativum L., Ocimum tenuiflorum L., Helianthus annuus L., Vitex agnus-castus L., and Melia azedarach L. (0.04 each). The lowest RFC was recorded for Angelica sinensis (0.00) (Table 1). These results highlight neem, chia, garlic, basil, sunflower, and chaste tree as the most frequently recognized species by local communities. Frequency of citation (FC) further confirmed the dominance of these species, with Azadirachta indica A. Juss. (10), Salvia hispanica L., and Curcuma longa L. (9 each) receiving the highest scores, while Angelica sinensis was the least cited (1). Collectively, these results underscore the central role of neem, chia, turmeric, and other key species in local ethnomedicinal practices, particularly in addressing women's health concerns such as PCOS.

3.7. Ethnobotanical Heritage and Traditional Knowledge in District Quetta

The traditional ethnomedicinal practices of Quetta are increasingly threatened by modernization and the growing reliance on allopathic medicine. Much of this knowledge is held by elderly community members, who serve as the primary custodians of indigenous practices. However, with their passing and the younger generation's declining interest, this cultural heritage is gradually eroding. Although local herbalists retain substantial expertise, they are often reluctant to share it beyond their circles, further limiting its transmission. This study was designed to document, preserve and disseminate this indigenous knowledge, with particular emphasis on women's healthcare and PCOS management. Findings revealed that women in rural areas demonstrated greater familiarity with medicinal plants, their preparations, and applications, particularly in relation to gynecological disorders. By contrast, women in urban Quetta showed limited awareness of these traditional remedies. These observations highlight the urgency of systematic ethnobotanical documentation to ensure that valuable plant-based knowledge is not lost but instead made available for broader healthcare and scientific applications.

3.8. Ethnobotanical Perspectives on PCOS: Plant-Based Remedies for Symptom Alleviation

This study documented 60 plant species from 30 indigenous taxa traditionally used for managing PCOS. Information on family, local names, growth forms, preparation methods, and therapeutic parts was recorded. Dalchini (Cinnamomum spp.), a widely used spice and medicine with over 250 known species (Sangal, 2011), was highlighted for its antioxidant and metabolic benefits. In womanhood with PCOS, cinnamon extract

progresses insulin kindliness, reduces hyperinsulinemia, and alleviates reproductive complications (Borzoei *et al*., 2018). Several other plants were also identified with potential to regulate hormones, enhance ovarian function, reduce oxidative stress, and correct metabolic imbalances. These results emphasize the importance of traditional ethnobotanical knowledge as a matching approach for PCOS management, while also reinforcing its relevance in modern healthcare practices.

3.9. Medicinal Herbs Traditionally Used for PCOS Management

Asparagus racemosus (Asparagaceae) has long been exploited in traditional Indian and Pakistani medicine, particularly within Ayurveda and ethnobotanical practices. Its phytoestrogenic compounds (plant-based estrogens) support the normal development of ovarian follicles, regulate the menstrual cycle, and restore female reproductive health. Moreover, it helps combat hyperinsulinemia (Santosh Kumar *et al*., 2008). Beyond reproductive health, *A. racemosus* exhibits various pharmacological activities, including immunomodulatory, antioxidant, anti-inflammatory, anti-aging, neuroprotective, hepatoprotective, antiulcer, and antidiarrheal properties, as well as benefits in managing dyspepsia and tumors.

Tinospora cordifolia (Menispermaceae) is a extensively recognized therapeutic vegetable appreciated for its hypoglycemic and anti-inflammatory properties (Chandrasekaran *et al*., 2012). By alleviating chronic tissue inflammation, it helps reduce insulin resistance, restore metabolic balance, and improve ovarian health. These actions make it particularly beneficial in managing insulin imbalance and ovarian cysts associated with PCOS.

Foeniculum vulgare (Apiaceae), usually recognized as fennel, contains high levels of phytoestrogens that play a key character in reducing irritation and mitigating insulin resistance in women with PCOS. These bioactive compounds also help restore cellular balance, thereby addressing metabolic turbulences associated with the syndrome (Jungbauer *et al*., 2014). In addition, fennel has a long history of use in outdated medicine, predominantly for treating gastrointestinal disorders and related ailments (Wesam Kooti *et al*., 2015).

Ocimum tenuiflorum (Lamiaceae), normally recognized as Holy basil or Tulsi, is a traditional herbal remedy with notable anti-androgenic properties. It reduces excessive androgen production, thereby alleviating hyperandrogenism, one of the hallmark structures of PCOS. In addition, it shows potential in managing obesity and related comorbidities, alongside a wide range of other ailments.

Actaea racemosa (Ranunculaceae), or Black cohosh, has extended been recognized for its therapeutic role in women's reproductive health. It is used to address anovulation, infertility, and hormonal imbalance in PCOS and has been reported to induce ovulation in affected women (Bency Baby *et al*., 2016). Historically, it was regarded as a women's remedy for conditions such as amenorrhea, leucorrhea, dysmenorrhea, and other uterine disorders.

Lepidium meyenii (Brassicaceae), commonly known as Maca root, is traditionally used for alleviating menopausal symptoms. It functions as a natural hormonal balancer and endocrine stimulant, supporting progesterone and estrogen production to regulate the menstrual cycle. As a fertility-enhancing adaptogen, it is considered a nutritional "superfood," also contributing to the restoration of male testosterone levels.

Grifola frondosa (Meripilaceae), or Maitake mushroom, is valued for its hypoglycemic effects and potential in diabetes management. Experimental studies suggest that its extract can induce ovulation in women with PCOS (Tori Hudson ND *et al*., 2003). Its mode of action is linked to enhancing insulin sensitivity and regulating blood glucose levels.

Taraxacum officinale (Asteraceae), commonly identified as Dandelion root, is recognized for its strong liver-detoxifying and bile-stimulating properties. By supporting hepatic function, it helps regulate hormonal balance, particularly through increasing sex hormone-binding globulin (SHBG), which lowers circulating free testosterone levels. It also promotes toxin elimination, benefiting women with menstrual and reproductive disorders.

Tribulus terrestris (Zygophyllaceae), commonly recognized as Gokhru, is a widely used therapeutic plant in both traditional and modern medicine. Rich in bioactive compounds such as glycosides, flavonoids, and alkaloids, it is regarded as a fertility enhancer and ovarian tonic. This research proposes its potential in improving folliculogenesis and restoring ovarian function in womanhood with PCOS (Singh *et al*., 2019). Traditionally, it has been used to manage infertility, sexual dysfunction, and menstrual disorders, making it a promising herbal alternative for PCOS management.

Galega officinalis (Fabaceae), or Goat's rue, has historically been used for managing diabetes mellitus due to its hypoglycemic properties. The plant contains guanidine derivatives, natural precursors of the biguanide class of drugs, including metformin a standard behavior for PCOS (Babu *et al*., 2018). By reducing insulin resistance and improving glucose metabolism, *G. officinalis* holds therapeutic potential for alleviating PCOS symptoms, although further clinical research is warranted.

Areca catechu (Arecaceae), commonly known as Betel nut or Areca palm, is traditionally used to enhance female reproductive health. It promotes hormonal balance, alleviates abdominal congestion, and supports overall uterine function. Additionally, it has been applied for postpartum recovery and to strengthen reproductive capacity (Meenakshi *et al*., 2014). Its role in regulating female hormones underscores its relevance in addressing PCOS-related reproductive concerns.

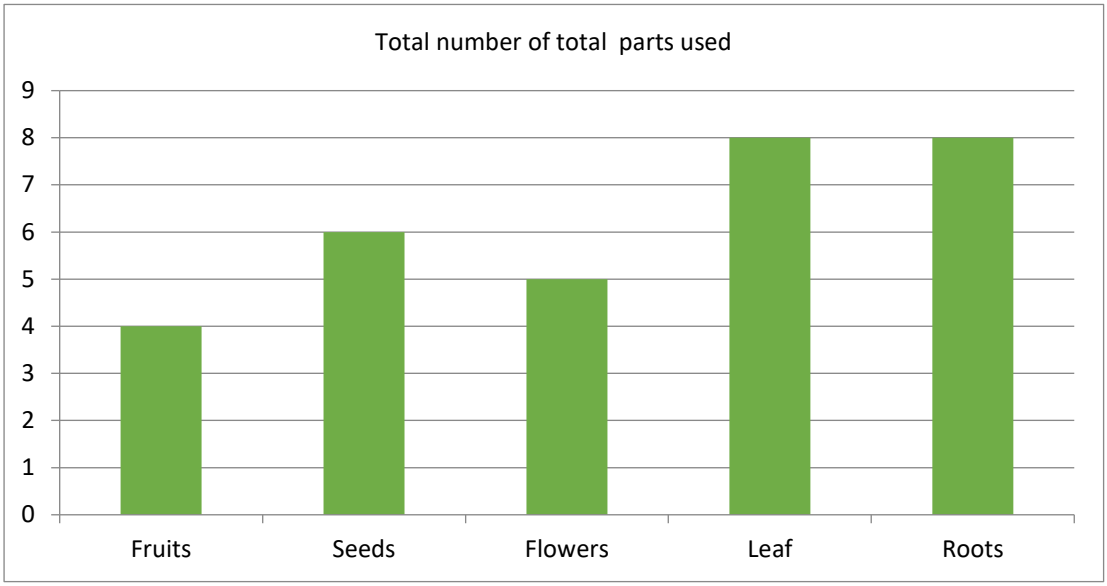

Figure 2: Plant parts utilized in ethnomedicinal practices for managing PCOS in Quetta

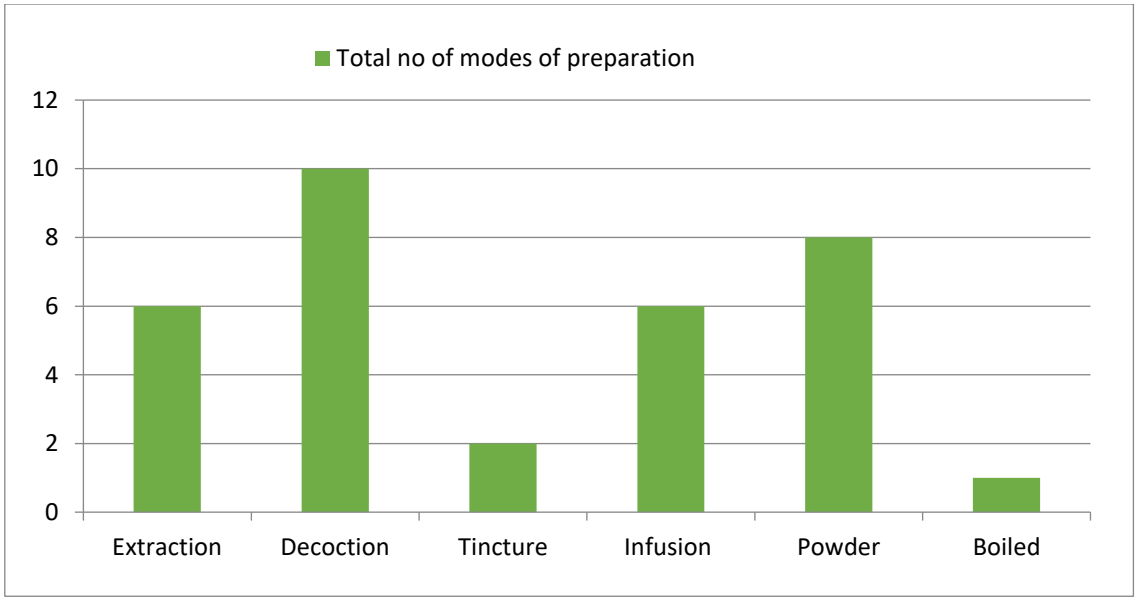

Figure 3: Ethnomedicinal preparation techniques for PCOS treatment in Quetta

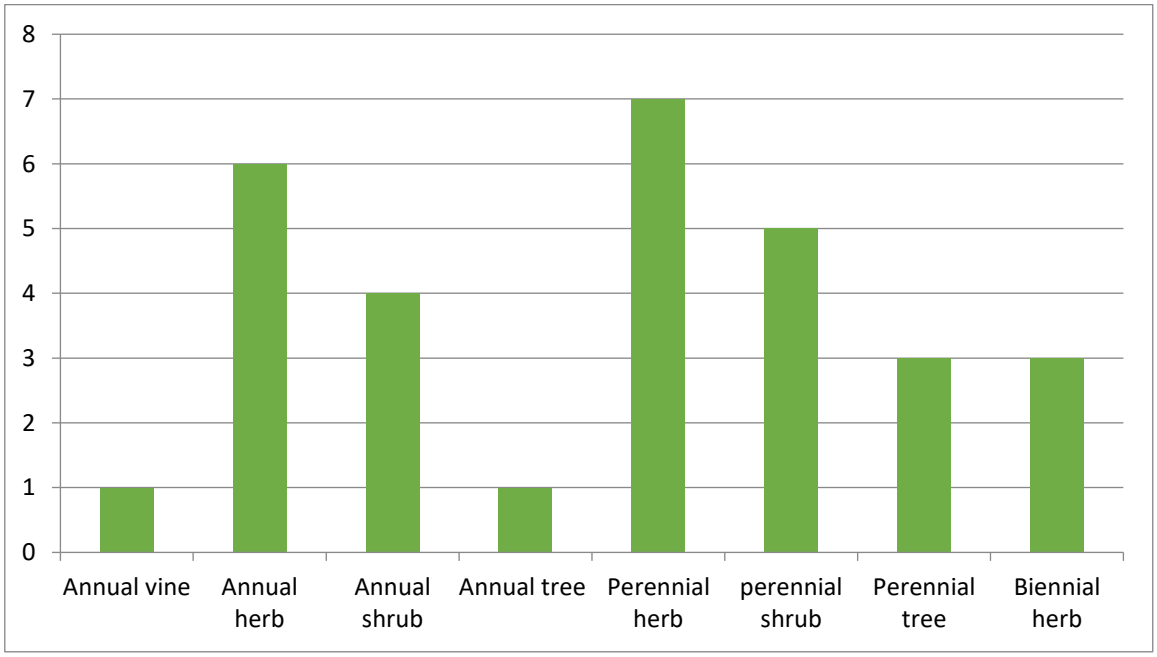

Figure 4: Plants associated with PCOS remedies in Quetta

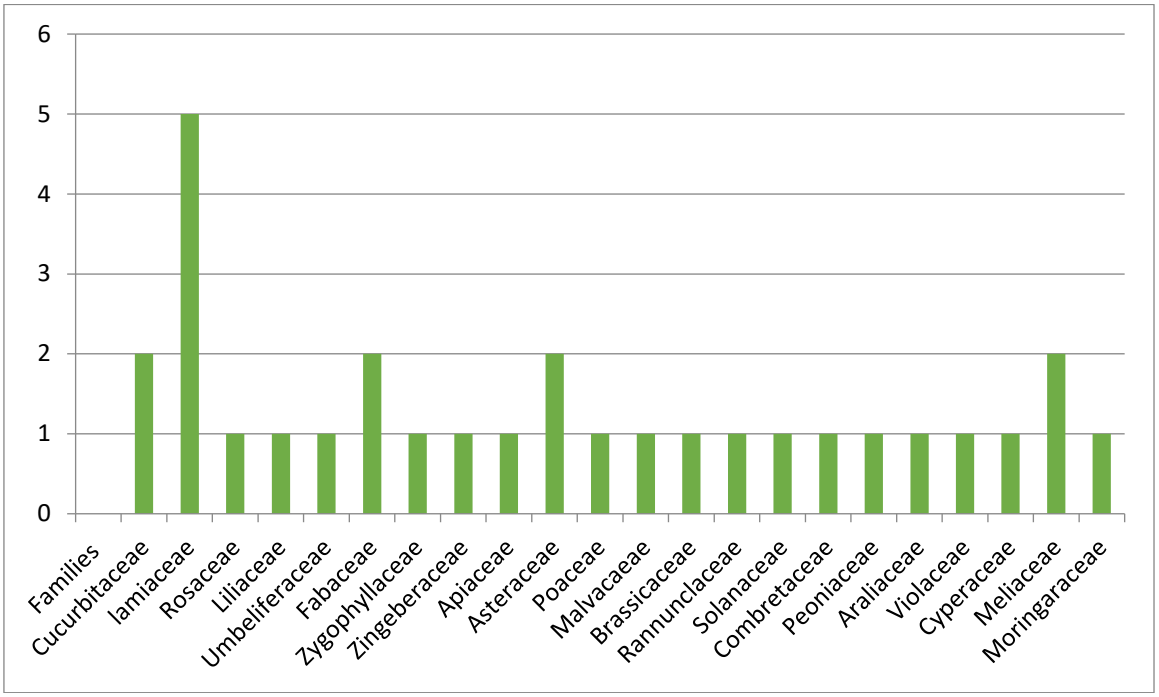

Figure 5: Prevalent species employed across groups within the study region

Table1: Medicinal plants and their respective families traditionally employed in the management of PCOS by indigenous communities of District Quetta, Balochistan, Pakistan.

S.NO	Botanical name	Vernacular name	Family name	Life form	Part used	Preparation	FC	UR	UV	RFC
1.	*Momordica charantia* L.	Bitter melon Karela	Cucurbitaceae	Annual vine	Fruit	Extraction	5	6	0.83	0.02
2.	*Salvia hispanica* L.	Chia Tukham-e-sharbati	*Lamiaceae*	Annual herb	Seed	Decoction	9	5	1.8	0.04
3.	*Rosa spp*	Rose Gulaab	Rosaceae	Perennial shrub	Flower	Extraction	6	3	0.5	0.03
4.	*Allium sativum* L.	Garlic Lehsan	Liliaceae	Annual herb	Flower buds	Decoction	8	4	0.5	0.04
5.	*Cuminum cyminum* L.	Cumin Safed zeera	Umbelifera e	Annual herb	Fruit	Extraction	4	2	0.5	0.02
6.	*Ocimum tenuiflorum* L.	Holybasil Tulsi	Lamiaceae	Perennial herb	Leaf	Extraction	8	4	0.5	0.04
7.	*Trifolium pretense* L.	Red Clove Laal laung	Fabaceae	Biennial herb	Flower	Decoction	5	4	0.8	0.02
8.	*Tribulus terrestris* L.	Puncture vine Gokharu	Zygophylla ceae	Annual herb	Root	Extract	5	3	0.6	0.02
9.	*Curcuma longa* L.	Turmeric Haldi	Zingeberac eae	Perennial herb	Root	Deccotion	9	4	0.4	0.04
10.	*Angelica sinesis*	Dong quai	Apiaceae	Biennial herb	Root	Tincture	1	6	0.16	0.00

11.	*Artemisia vulgaris* L.	Mugwort	Asteraceae	Perennial Herb	Leaves	Decoction	4	3	0.75	0.02
12.	*Avena sativa* Linn	Oat straw	Poaceae	Annual herb	Seed	Infusion	3	2	0.66	0.01
13.	*Hibiscus rosa-sinensis* L.	Chinese hibiscus Karkade	Malvaceae	Perennial shrub	Seed	Infusion	5	4	0.8	0.02
14.	*Lepidium meyenii* Walp.	Maca	Brassicaceae	Biennial herb	Root	Powder	6	5	0.83	0.03
15.	*Helianthus annus* L.	Sunflower Surajmukhi	Asteraceae	Annual shrub	Seed	Powder	8	5	0.62	0.04
16.	*Nigella sativa* L.	Black seed Kalonji	Ranunculaceae	Perennial shrub	Seeds	Infusion	7	5	0.71	0.03
17.	Withania somnifera L.	winter cherry Ashwagandha	Solanaceae	Annual shrub	Root	Infusion	6	4	0.66	0.03
18.	Terminalia bellirica (Gaertn.) Roxb.	Triphala Baheda	Combretaceae	Annual herb	Fruit	Powder	4	3	0.75	0.02
19.	*Paeonia lactiflora* Pall.	Chinese peony	Paeoniaceae	Perennial herb	Root	Tincture	5	3	0.6	0.02
20.	*Panaxginseng* C.A.Mey.	Ginseng Asian ginseng	Araliaceae	Perennial herb	Root	Powder	4	2	0.5	0.02
21.	*Vitex agnus-castus* L.	Chastetree Bana	Lamiaceae	Perennial shrub	Leaves	Infusion	8	7	0.87	0.04
22.	*Viola Odorata* L.	Sweet violet Gul e banafsha	Violaceae	Perennial herb	flower	Infusion	4	3	0.75	0.02
23.	*Cucurbita pepo* L.	Pumpkin Kadu	*Cucurbitaceae*	Annual herb	Seed	Extraction	7	4	0.57	0.03
24.	*Eleocharis dulcis (Burm.f.)* Trin. ex Hensch.	Water chestnut Singhara	Cyperaceae	Perennial herb	Fruit	Boiled Powder	7	6	0.85	0.030.
25.	*Melia azedarach* L.	Bakain Chinaberry Tree	Meliaceae	Perennial tree	Leaves	Decoction Powder	8	6	0.75	0.04
26.	*Moringa oleifera* Lam.	Moringa Suhanjana	Moringaceae	Annual Tree	Leaves	Decoction Powder	4	4	1	0.02
27.	*Azadirachta indica* A.juss.	Neem plant	Meliaceae	Perennial tree	Leaves	Decoction	10	2	0.2	0.05
28.	*Delonix regia* (bojer ex hook.) Raf.	Royal Poinciana Gulmohar tree	*Fabaceae*	Perennial tree	Leaves	Decoction Powder	2	1	0.5	0.01
29.	*Lavandula angustifolia* Mill.	True lavender Ustakudoos	Lamiaceae	Perennial shrub	Flower	Oil Extraction Decoction	5	3	0.6	0.02
30.	*Salvia rosmarinus* spenn.	Rosemary	Lamiaceae	Perennial shrub	Leaves	Decoction	3	2	0.66	0.01

4. DISCUSSION

This study highlights the enduring significance of ethnomedicinal plants in the organization of polycystic ovarian syndrome (PCOS) among womanhood in Quetta. With 35 species documented, this research not only demonstrates the diversity of locally available therapeutic flora but also underscores the reliance of rural populations on traditional plant-based remedies due to limited healthcare access. These findings support earlier observations that traditional medicine continues to provide primary healthcare solutions in developing regions (WHO, 2008; Naguib *et al*., 2011). The predominance of the domestic Lamiaceae in the training is consistent with its global recognition as one of the most diverse and pharmacologically valuable groups of plants (Sarac *et al*., 2007; Giuliani *et al*., 2008). Its members are characterized by volatile oils and bioactive compounds that are therapeutically relevant for endocrine and gynecological disorders. The prominence of Lamiaceae in Quetta can be attributed to its wide distribution, ecological adaptability, and deep-rooted cultural importance. Similar dominance of this family has been reported in other ethnomedicinal surveys across Pakistan (Ahmad *et al*., 2014; Jamila and Mostafa, 2014), reinforcing its role as a cornerstone of herbal medicine. Decoction emerged as the maximum frequently employed preparation method (33%), followed by powder and infusion. This pattern parallels findings from other ethnobotanical studies (Gurdal and Kultar, 2013; Ahmad *et al*., 2014), where boiling plant materials is considered an effective technique for extracting active compounds. The high reliance on leaves and roots (26% each) reflects both their abundance in the local ecosystem and their perceived therapeutic potency. However, unsustainable harvesting of roots and whole plants, as reported elsewhere (Qureshi, 2012), raises concerns about biodiversity conservation and highlights the need for sustainable harvesting strategies in the study area. The quantitative ethnobotanical indices provide critical insights into species importance and informant consensus. *Salvia hispanica* L. recorded the highest use value (UV = 1.8), reflecting its wide therapeutic range, particularly in regulating blood sugar, balancing hormones, and supporting digestive health. *Vitex agnus-castus* L., with the highest use reports (UR = 7), was strongly associated with managing irregular menstruation, infertility, and acne. *Azadirachta indica* A. Juss, despite a lower UV (0.2), showed the maximum frequency citation (FC = 10) and relative frequency citation (RFC = 0.05), underscoring its cultural acceptance and perceived efficacy against PCOS-related symptoms. These findings echo global reports on the versatile medicinal roles of neem and chaste tree in women's health (Pachiappan *et al*., 2017). This study also reveals disparities in knowledge distribution. Rural women demonstrated higher familiarity with ethnomedicinal practices compared to urban women, a pattern shaped by limited healthcare access and stronger cultural continuity. However, modernization and the availability of pharmaceuticals are eroding the transmission of traditional knowledge. This concern is echoed by Ahmad *et al*. (2014) and Jamila and Mostafa (2014), who note that ethnobotanical wisdom is increasingly confined to older generations and traditional healers. If this knowledge is not systematically documented and preserved, it risks being permanently lost. The reliance on ethnomedicinal plants in Quetta mirrors global trends where between 50,000 and 80,000 flowering plants are used medicinally (Naguib *et al*., 2011), and 70–80.0% of the world's inhabitants depends on herbal preparations for primary healthcare (WHO, 2008). The findings affirm that local practices are part of a broader, worldwide dependence on plant-based medicine, particularly in managing complex disorders like PCOS, where conventional therapies may be costly, inaccessible, or associated with side effects. Several species documented in this study, such as *Salvia hispanica*, *Curcuma longa*, *Moringa oleifera*, and *Vitex agnus-castus*, exhibit pharmacological properties that directly target PCOS-related pathologies, including hyperinsulinemia, hyperandrogenism, oxidative stress, and menstrual irregularities. The best part of therapeutic prospective of ethnomedicinal plants as complementary or alternative strategies for PCOS management. Moreover, the identification of locally preferred species provides a foundation for phytochemical and pharmacological validation, aligning with calls to integrate traditional knowledge into modern drug discovery (Hendawy *et al*., 2018).

5. CONCLUSION

This study highlights the rich ethnobotanical knowledge of women in Quetta, where 35 medicinal plant species are traditionally employed to manage polycystic ovarian syndrome (PCOS) and related reproductive disorders. The dominance of the Lamiaceae family, the frequent use of leaves and roots, and the preference for decoction, powder, and infusion reflect both cultural practices and ecological availability. Quantitative indices further demonstrate the significance of key species such as *Salvia hispanica*, *Vitex agnus-castus*, and *Azadirachta indica*, which were consistently reported for their diverse therapeutic roles in regulating hormones, improving insulin sensitivity, and alleviating PCOS symptoms. The findings also reveal a clear generational gap: women in rural areas retain stronger plant-based knowledge than their urban counterparts, while younger populations show less awareness due to modernization and reliance on pharmaceuticals. This underscores the crucial requirement to manuscript and preserve original knowledge before it is lost. These results establish Quetta as an important center of ethnomedicinal practices, where traditional knowledge and biodiversity intersect to provide effective, low-cost, and culturally relevant remedies for women's health. Beyond cultural preservation, these insights hold significant promise for future pharmacological validation and drug development, offering natural alternatives for managing PCOS.

REFERENCES

1. Abbas, M. W., Hussain, M., Akhtar, S., Ismail, T., Qamar, M., Shafiq, Z., and Esatbeyoglu, T. (2022). Bioactive compounds, antioxidant, anti-inflammatory, anti-cancer, and toxicity assessment of Tribulus terrestris—in vitro and in vivo studies. Antioxidants, 11(6), 1160.
2. Abbott D. H., Dumesic D. A., and Franks S. (2002a) Developmental origin of polycystic ovary syndrome: a hypothesis. J. Endocrinol. 174:1–5
3. Abbott D. H., Eisner J. R., Colman R. J., Kemnitz J. W., and Dumesic D. A. (2002b) Prenatal androgen excess programs for PCOS in female rhesus monkeys. In Chang R. J., Dunaif A., and Hiendel J. (eds.) Polycystic Ovary Syndrome, pp. 119–133. New York: Marcel Dekker
4. Abudayyak, M., Jannuzzi, A. T., Özhan, G., and Alpertunga, B. (2015). Investigation on the toxic potential of Tribulus terrestris in vitro. Pharmaceutical biology, 53(4), 469-476.
5. Afiat, M., Lor, A. A., Najafi, M. N., Ghazanfarpour, M., and Jafarabadi, M. (2022). Examining the Effect of Chamomile on Clinical Symptoms and Hormonal Parameters among Patients with Polycystic Ovarian Syndrome. Journal of Family and Reproductive Health, 16(4), 248.
6. Azziz, R., Marin, C., Hoq, L., Badamgarav, E., and Song, P. (2005). Health care-related economic burden of the polycystic ovary syndrome during the reproductive life span. The Journal of Clinical Endocrinology and Metabolism, 90(8), 4650-4658.
7. Azziz R, Nestler JE, Dewailly D. Androgen excess disorders in women: polycystic ovary syndrome and other disorders. Humana Press; 2006. p. 184.
8. Adams, J. M., Taylor, A. E., Crowley Jr, W. F., and Hall, J. E. (2005). Polycystic ovarian morphology with regular ovulatory cycles: insights into the pathophysiology of polycystic ovarian syndrome. Obstetrical and gynecological survey, 60(4), 239-240
9. Ahmad, F., Ahmed, A., Shakeel, A., Hussain, H. A., and Raza, S. A. (2024). The efficacy of Linum usitatissimum seeds to inhibit estrogen receptor as a natural therapy for PCOS: An in silico and in vitro analysis. Cell Biochemistry and Function, 42(1), e3897.
10. Akdoğan, M., Tamer, M. N., Cüre, E., Cüre, M. C., Köroğlu, B. K., and Delibaş, N. (2007). Effect of Spearmint (Mentha Spicata Labiatae) Teas on Androgen Levels in Women With Hirsutism. Phytotherapy Research: An International Journal Devoted To Pharmacological And Toxicological Evaluation Of Natural Product Derivatives, 21(5), 444-447.
11. AKENE, B. (2021). The Effects of Ethanolic Extract of Ocimum Gratissimum (Linn.) Leaves on Selected Reproductive Hormones and Insulin on Letrozole-Induced Polycystic Ovarian Syndrome in Wistar Rats.
12. Alaee, S., Bagheri, M. J., Ataabadi, M. S., and Koohpeyma, F. (2020). Capacity Of Mentha Spicata (Spearmint) Extracts In Alleviating Hormonal And Folliculogenesis Disturbances In A Polycystic Ovarian Syndrome Rat Model. World's Veterinary Journal, (3), 451-456.
13. Alahmadi, A. A., Alzahrani, A. A., Ali, S. S., Alahmadi, B. A., Arab, R. A., and El-Shitany, N. A. E. A. (2020). Both Matricaria chamomilla and metformin extract improved the function and histological structure of thyroid gland in polycystic ovary syndrome rats through antioxidant mechanism. Biomolecules, 10(1), 88.
14. Al-Snafi, A. E. (2018). Arabian Medicinal Plants Affected Female Fertility-Plant Based Review (Part 1). IOSR Journal of Pharmacy, 8(7), 46-62.
15. Alwan, S. H., and Al-Saeed, M. H. (2021). Biosynthesized silver nanoparticles (using Cinnamomum zeylanicum bark extract) improve the fertility status of rats with polycystic ovarian syndrome. Biocatalysis and Agricultural Biotechnology, 38, 102217.
16. Arentz, S., Abbott, J. A., Smith, C. A., and Bensoussan, A. (2014). Herbal medicine for the management of polycystic ovary syndrome (PCOS) and associated oligo/amenorrhoea and hyperandrogenism; a review of the laboratory evidence for effects with corroborative clinical findings. BMC complementary and alternative medicine, 14, 1-19.
17. Ataabadi, M. S., Alaee, S., Bagheri, M. J., and Bahmanpoor, S. (2017). Role Of Essential Oil Of Mentha Spicata (Spearmint) In Addressing Reverse Hormonal And Folliculogenesis Disturbances In A Polycystic Ovarian Syndrome In A Rat Model. Advanced Pharmaceutical Bulletin, 7(4), 651.
18. Awoyemi, Z. O., Adigun, A. K., Awote, O. K., Igbalaye, J. O., Soares, A. S., and Oladimeji, S. O. (2022). Ethanolic Root Extract of Urtica dioica Exhibits Pro-fertility and Antioxidant Activities in Female Albino Rats. International Journal of Biochemistry Research and Review, 31(8), 29-38.
19. Anantharaman, A., Priya, R. R., Hemachandran, H., Akella, S., Rajasekaran, C., Ganesh, J., ... and Siva, R. (2016). Toxicity study of dibutyl phthalate of R ubia cordifolia fruits: in vivo and in silico analysis. Environmental toxicology, 31(9), 1059-1067.
20. Adeyemi, A. D., Oluigbo, C. C., Esan, A. O., Bello, M. O., Oladoye, S. O., Emmanuel, C. P., and Effiong, E. (2021). Chemical Composition and Antimicrobial Activity of the Essential oils of 14 known Ficus species–A Concise. Biointerface Res. Appl. Chem, 12, 8003-8034.

21. Alonso-Esteban, J. I., Pinela, J., Barros, L., Ćirić, A., Soković, M., Calhelha, R. C., ... and Ferreira, I. C. (2019). Phenolic composition and antioxidant, antimicrobial and cytotoxic properties of hop (Humulus lupulus L.) Seeds. Industrial Crops and Products, 134, 154-159.
22. Ali, S. (2017). Phytochemical, antioxidant and cytotoxicity studies of Calendula officinalis (Pot marigold) leaves extracts. Oxidation Communications, 40(1-I), 120-130.
23. Amorim, M. M. R. and Santos, L. C. Tratamento da Vaginose Bacteriana com Gel Vaginal de Aroeira (Schinusterebinthifolius Raddi): Ensaio Clínico Randomizado. Revista Brasileira de Ginecologia e Obstetrícia, 25(2): 95-102., 2003.
24. Abbas Z, Khan SM, Alam J, Khan SW, Abbasi AM. Medicinal plants used by inhabitants of the Shigar Valley, Baltistan region of Karakorum rangePakistan. J Ethnobiol Ethnomed. 2017;13(1):53. https://doi.org/10.1186/s13002-017-0172-9.
25. Ali K, Khan N, Rahman I-U, Khan W, Ali M, Uddin N, *et al*. The ethnobotanical domain of the Swat Valley, Pakistan. J Ethnobiol Ethnomed. 2018;14(1):39. https://doi.org/10.1186/s13002-018-0237-4.
26. Ahmad, M., Shazia, S., Fazl-i-Hadi, S., Hadda, T.B., Rashid, S., Zafar, M., Khan, M.A., Khan, M.P.Z., Yaseen, G., 2014. An ethnobotanical study of medicinal plants in high mountainous region of Chail valley (District Swat-Pakistan). Journal of Ethnobiology and Ethnomedicine 10, 1–36.
27. Ahmad, K., Ahmad, M., Huber, F. K., and Weckerle, C. S. (2021). Traditional medicinal knowledge and practices among the tribal communities of Thakht-e-Sulaiman Hills, Pakistan. BMC Complementary Medicine and Therapies, 21, 1-21.
28. Azlan, N. Z., Bustaman, S. Z., and Razak, R. N. H. A. (2022). Knowledge Level on the Association Between Body Mass Index (BMI), Menstrual Cycle and Lifestyle Patterns in Contributing the Development of Polycystic Ovarian Syndrome (PCOS) Among Female University Students. International Journal of Care Scholars, 5(2), 58-74.
29. Balaji, S., Amadi, C., Prasad, S., Kasav, J. B., Upadhyay, V., Singh, A. K., ... and Joshi, A. (2015). Research Article Urban Rural Comparisons of Polycystic Ovary Syndrome Burden among Adolescent Girls in a Hospital Setting in India.
30. Bocquet, L., Sahpaz, S., Hilbert, J. L., Rambaud, C., and Riviere, C. H. L. L. (2018). Humulus lupulus L., a very popular beer ingredient and medicinal plant: Overview of its phytochemistry, its bioactivity, and its biotechnology. Phytochemistry reviews, 17(5), 1047-1090.
31. Bandariyan, E., Mogheiseh, A., and Ahmadi, A. (2021). The effect of lutein and Urtica dioica extract on in vitro production of embryo and oxidative status in polycystic ovary syndrome in a model of mice. BMC Complementary Medicine and Therapies, 21, 1-11.
32. Bawazir, A. S., Yahya, B. A., Tilwane, K. S., and Imam, S. S. S. (2023). Comparative Antimicrobial Evaluation of Socotrine Aloe and Aloe Barbadensis Miller. Journal of Pharmacognosy And Phytochemistry, 12(5), 415-421.
33. Belkhadi, A., Hediji, H., Abbes, Z., Nouairi, I., Barhoumi, Z., Zarrouk, M., and Djebali, W. (2010). Effects of exogenous salicylic acid pre-treatment on cadmium toxicity and leaf lipid content in Linum usitatissimum L. Ecotoxicology and Environmental Safety, 73(5), 1004-1011.
34. Boomsma, C. M., Eijkemans, M. J. C., Hughes, E. G., Visser, G. H. A., Fauser, B. C. J. M., and Macklon, N. S. (2006). A meta-analysis of pregnancy outcomes in women with polycystic ovary syndrome. Human reproduction update, 12(6), 673-683.
35. Biagi, P.L., Bordoni, A., Hrelia, S., Celadon, M., and Horrobin, D.F. 1991. Gamma-linolenic acid dietary supplementation can reverse the aging influence on rat liver microsome delta 6-desaturase activity. Biochim Biophys Acta, 1083(8):187-192.
36. Birch, A. E., Fenner, G. P., Watkins, R., and Boyd, L. C. (2001). Antioxidant Properties Of Evening Primrose Seed Extracts. Journal of Agricultural and Food Chemistry, 49(9), 4502-4507.
37. Borzoei, A., Rafraf, M., Niromanesh, S., Farzadi, L., Narimani, F., and Doostan, F. (2018). Effects of cinnamon supplementation on antioxidant status and serum lipids in women with polycystic ovary syndrome. Journal of traditional and complementary medicine, 8(1), 128-133.
38. Bangulzai, N., Ahmed, S. F., Kashif, M., Fatima, M., Ahmed, M., and Mushtaq, N. (2022). Antifungal activity of essential oils extracted from different plants against Penicillium digitatum causing green mold of citrus. International Journal of Agriculture and Bioscience, 11(2), 75–83. https://doi.org/10.47278/journal.ijab/ 2022.011
39. Brice-Ytsma, H., and Chidley, N. (2024). Herbal Medicine in Treating Gynaecological Conditions Volume 2: Specific Conditions and Management Through the Practical Usage of Herbs. Aeon Books.
40. BRASIL. Ministério da Saúde. Agência Nacional de Vigilância Sanitária. Resolução de Diretoria Colegiada no. 48 de 16 de março de 2004. Aprova o regulamento técnico de medicamentos fitoterápico junto ao Sistema Nacional de Vigilância Sanitária. DOU. Diário Oficial da União, Poder Executivo, DF, Brasília, 2004.
41. BRASIL. Ministério da Saúde. Secretaria de Atenção à Saúde. Departamento de Atenção Básica. Práticas integrativas e complementares: plantas medicinais e fitoterapia na Atenção Básica/Ministério da Saúde. Secretaria de Atenção à Saúde. Departamento de Atenção Básica. Brasília: Ministério da Saúde, p. 156, 2012.
42. Bibi S, Sultana J, Sultana H, Malik RN. Ethnobotanical uses of medicinal plants in the highlands of Soan Valley, salt range, Pakistan. J Ethnopharmacol. 2014; 155(1):352–61. https://doi.org/10.1016/j.jep.2014.05.031.
43. Balaji, S.; Amadi, C.; Prasad, S.; Bala Kasav, J.; Upadhyay, V.; Singh, A.K.; Surapaneni, K.M.; Joshi, A. Urban rural comparisons of polycystic ovary syndrome burden among adolescent girls in a hospital setting in India. BioMed Res. Int., 2015, 2015(158951), 158951.
44. Bonet, M.A., Parada, M., Selga, A., Valles, J., 1999. Studies on pharmaceutical ethnobotany in the regions of L'Alt Emporda´ and Les Guilleries (Catalonia, Iberian Peninsula). Journal of Ethnopharmacology 68, 145–168.

45. Barber, T.M., McCarthy, M. I., Franks, S., and Wass, J. A. (2007). Metabolic syndrome in polycystic ovary syndrome. Endokrynologia Polska, 58(1), 34-41.
46. Bruner, B., Chad, K., and Chizen, D. (2006). Effects of exercise and nutritional counseling in women with polycystic ovary syndrome. Applied physiology, nutrition, and metabolism, 31(4), 384-391.
47. Beal MW. Women's use of complementary and alternative therapies in reproductive health care*J Nurse-Midwifery*199843224-234. 4. Beal MW. Women's use of complementary and alternative therapies in reproductive health care. J Nurse-Midwifery 1998;43:224–234.
48. Britannica, T. Editors of Encyclopaedia (2024, September 17). Quetta. Encyclopedia Britannica. https://www.britannica.com/place/Quetta-Pakistan
49. Bency Baby T, Smitha Rani, Remya K, Shebina Rasheed P, Azeem AK. Polycystic ovarian syndrome: Therapeutic potential of herbal remedies- A review. International Journal of Herbal Medicine. 2016; 4(5):91-96.
50. Cameron, E., Bland, J., and Marcuson, R. (1989). Divergent effects of omega-6 and omega-3 fatty acids on mammary tumor development in C3H/Heston mice treated with DMBA. Nutrition Research, 9(4), 383-393.
51. Chandrasekaran, C. V., Srikanth, H. S., Anand, M. S., Allan, J. J., Viji, M. H., and Amit, A. (2013). Evaluation of the Mutagenic Potential and Acute Oral Toxicity of Standardized Extract Of Ocimum Sanctum (Ocibest™). Human and Experimental Toxicology, 32(9), 992-1004
52. Choudhary, K., Singh, R., Garg, A., Verma, N., Purohit, A., and Deora, D. (2019). An updated overview of polycystic ovary syndrome. Int. J. Biol. Sci, 7(3), 1-13.
53. Chen, J. T., Tominaga, K., Sato, Y., Anzai, H., and Matsuoka, R. (2010). Maitake mushroom (Grifola frondosa) extract induces ovulation in patients with polycystic ovary syndrome: a possible monotherapy and a combination therapy after failure with first-line clomiphene citrate. The Journal of Alternative and Complementary Medicine, 16(12), 1295-1299.
54. Chitra, V., and Dhivya, D. P. (2017). Role of herbals in the management of polycystic ovarian syndrome and its associated symptoms. International Journal of Herbal Medicine, 5(5), 125-131.
55. Chong, C., Wu, Y., Dong, Z., Wang, Z., Zhong, S., Chen, H., and Zhou, Y. (2021). Effect of Grifola frondosa polysaccharides (GFPS) on the improvement of clinical symptoms in letrozole-induced polycystic ovary syndrome (PCOS) rats. 한국식품영양과학회 학술대회발표집, 525-525.
56. Ćetković, G. S., Djilas, S. M., Čanadanović-Brunet, J. M., and Tumbas, V. T. (2004). Antioxidant properties of marigold extracts. Food Research International, 37(7), 643-650.
57. Chandrasekaran CV, Vijayalakshmi MA, Prakash K, Bansal VS, Meenakshi J, Amit A. Herbal Approach for Obesity Management Review Article. American Journal of Plant Sciences. 2012; 3(No.7A):1003-1014.
58. CLARKE, J. H. R.; RATES, S. M. K. and BRIDI, R. Um alerta sobre o uso de produtos de origem vegetal na gravidez. Revista Infarma,19(1/2): 41-49., 2007.
59. Datta, K., Singh, A. T., Mukherjee, A., Bhat, B., Ramesh, B., and Burman, A. C. (2009). Eclipta Alba Extract with Potential for Hair Growth Promoting Activity. Journal of Ethnopharmacology, 124(3), 450-456.
60. de Falco, B., Grauso, L., Fiore, A., Bochicchio, R., Amato, M., and Lanzotti, V. (2021). Metabolomic analysis and antioxidant activity of
61. wild type and mutant chia (Salvia hispanica L.) stem and flower grown under different irrigation regimes. Journal of the Science of Food and Agriculture, 101(14), 6010-6019
62. Dunaif, A. (1997). Insulin resistance and the polycystic ovary syndrome: mechanism and implications for pathogenesis. Endocrine reviews, 18(6), 774-800.
63. Dayani Siriwardene, S. *et al*. 2010. Clinical efficacy of Ayurveda treatment regimen on Subfertility with poly cystic ovarian syndrome (PCOS). AYU (An International Quarterly Journal of Research in Ayurveda) 31, 24. https://doi.org/10.4103/0974-8520.68203
64. Dehghan, A., Esfandiari, A., and Bigdeli, S. M. (2012). Alternative treatment of ovarian cysts with Tribulus terrestris extract: a rat model. Reproduction in domestic animals, 47(1), e12-e15.
65. Dhadhal, S. (2022). Bioprospecting *Aloe Barbadensis Mill.* As A Possible Pre-Conceptive Agent in Polycystic Ovary Syndrome (Doctoral Dissertation, Maharaja Sayajirao University Of Baroda (India)).
66. Dib, H., Seladji, M., Bencheikh, F. Z., Faradji, M., Benammar, C., and Belarbi, M. (2021). Phytochemical screening and antioxidant activity of Salvia hispanica. Journal of Pharmaceutical Research International, 33(41A), 167-174.
67. Din, Z. U., Alam, M., Ullah, H., Shi, D., Xu, B., Li, H., and Xiao, C. (2021). Nutritional, phytochemical and therapeutic potential of chia seed (Salvia hispanica L.). A mini-review. Food Hydrocolloids for Health, 1, 100010

68. Do Prado, D. M., De Almeida, A. B., De Oliveira Filho, J. G., Alves, C. C., Egea, M. B., and Lemes, A. C. (2021). Extraction of Bioactive Proteins from Seeds (Corn, Sorghum, and Sunflower) and Sunflower Byproduct: Enzymatic Hydrolysis and Antioxidant Properties. Current Nutrition and Food Science, 17(3), 310-320.
69. Das, J., Manchur, M. A., Emran, T. B., and Uddin, M. F. (2012). Antioxidant, cytotoxic and phytochemical properties of the ethanol extract of Saraca indica leaf. J Pharm Res, 5, 5530-5533.
70. Dadfar, F., Hosseini, S. E., and Bahaoddini, A. (2014). A review of phytochemical, pharmacological and physiological properties of ginger (zingiber officinale). Clinical Excellence, 3(1), 72-86.
71. Duke, J.; Duke, P.K.; Cellier, J.L. Duke Handbook of medicinal herbs, 2 nd; United States, 2002.
72. Dalal, D., Kunte, S., Oblureddy, V. T., and Anjali, A. K. (2023). Comparative evaluation of antimicrobial efficacy of german chamomile extract, tea tree oil, and chlorhexidine as root canal irrigants against e-faecalis and streptococcus mutans - An In Vitro study. International Journal of Agriculture and Biosciences 2023, 12(4), 252–256.
73. De Wet, H., and Ngubane, S. C. (2014). Traditional herbal remedies used by women in a rural community in northern Maputaland (South Africa) for the treatment of gynaecology and obstetric complaints. South African Journal of Botany, 94, 129-139.
74. Dumont, E., Cordon, M. A., Baghtchedjian, L., Zai, M. J., and Cock, I. E. (2024). Eucalyptus major (Maiden) Blakely and Melaleuca alternifolia (Maiden and Betche) Cheel Leaf Solutions Inhibit the Growth of Antibiotic-Sensitive and β-Lactam Resistant Bacterial Pathogens.
75. 10 home remedies for polycystic ovary syndrome. https://pcos.com/herbal-remedies/.
76. El Menyiy, N., Mrabti, H. N., El Omari, N., Bakili, A. E., Bakrim, S., Mekkaoui, M., and Bouyahya, A. (2022). Medicinal Uses, Phytochemistry, Pharmacology, and Toxicology of Mentha Spicata. Evidence-Based Complementary and Alternative Medicine, 2022(1), 7990508.
77. El-Baz, Y. G., Moustafa, A., Ali, M. A., El-Desoky, G. E., Wabaidur, S. M., and Faisal, M. M. (2023). An analysis of the toxicity, antioxidant, and anti-cancer activity of cinnamon silver nanoparticles in comparison with extracts and fractions of Cinnamomum cassia at normal and cancer cell levels. Nanomaterials, 13(5), 945.
78. Ehrmann, D. A. (2005). Polycystic ovary syndrome. New England Journal of Medicine, 352(12), 1223-1236.
79. FaragAllah, E. M., Algharib, S. A., Goda, N. I., El-Malkey, N. F., Mahboub, H. H., El-Fayoumi, S. H., and Aref, M. (2023). Protective effect of Salvia hispanica (chia seeds) against obesity induced ovarian disorders in rat model. Tissue and Cell, 83, 102156.
80. Farhana, A., Reddy, T. A., Bhavana, K., Mutha, S., and Bakshi, V. (2018). Assessment Of Ocimum Sanctum To Normalize The Estrous Cycle In Letrazole Induced Polycystic Ovary Syndrome In Female Wistar Rats. World J. Pharm. Res, 7(14), 907-919.
81. Fecker, R., Buda, V., Alexa, E., Avram, S., Pavel, I. Z., Muntean, D., and Danciu, C. (2020). Phytochemical and Biological Screening of Oenothera Biennis L. Hydroalcoholic Extract. Biomolecules, 10(6), 818.
82. Gautama, M. K., and Goel, R. K. (2014). Toxicological Study of Ocimum Sanctum Linn Leaves: Hematological, Biochemical, And Histopathological Studies. Journal of Toxicology, 2014(1), 135654.
83. Ghanbari, A., Akhshi, N., Nedaei, S. E., Mollica, A., Aneva, I. Y., Qi, Y., and Echeverria, J. (2021). Tribulus terrestris and female reproductive system health: A comprehensive review. Phytomedicine, 84, 153462.
84. Gonzales, G. F. (2007). Biological Effects of Lepidium Meyenii, Maca, a Plant from the Highlands of Peru. Natural Products I, 209-234.
85. Gonzales, G. F., Gonzales, C., and Gonzales-Castañeda, C. (2009). Lepidium Meyenii (Maca): A Plant from the Highlands of Peru from Tradition to Science. Forschende Komplementarmedizin (2006), 16(6), 373–380. Https://Doi.Org/10.1159/000264618
86. Güzel, S., Ülger, M., and Özay, Y. (2020). Antimicrobial and antiproliferative activities of Chia (Salvia hispanica L.) seeds. International Journal of Secondary Metabolite, 7(3), 174-180.
87. Ghavi, F., Taghizadeh, M., Taebi, M., and Abdolahian, S. (2019). Effect of Foeniculum vulgare essence on symptoms of polycystic ovarian syndrome (PCOS): A randomized double-blind, placebo-controlled trial. Journal of Herbal Medicine, 17, 100277
88. Gharanjik, F., Shojaeifard, M. B., Karbalaei, N., and Nemati, M. (2022). Research Article The Effect of Hydroalcoholic Calendula Officinalis Extract on Androgen-Induced Polycystic Ovary Syndrome Model in Female Rat.
89. Giuliani, C. And L. Maleci Bini, 2008. Insight into the structure and chemistry of glandular trichomes of Labiatae, with emphasis on subfamily Lamioideae. Plant Systematic and Evolution, 276: 199-208.
90. Gjønnaess, H. (1994). Ovarian electrocautery in the treatment of women with polycystii ovary syndrome (PCOS): Factors affecting the results. Acta obstetricia et gynecologica Scandinavica, 73(5), 407-412.
91. Gazdar, Haris; Kaker, Sobia Ahmad; Khan, Irfan (February 2010). "Buffer zone, colonial enclave or urban hub? Quetta: between four regions and two wars". *www.crisisstates.com*.
92. Gurdal, B., Kultur, S., 2013. An ethnobotanical study of medicinal plants in Marmaris (Mŭ gla, Turkey). Journal of Ethnopharmacology 146, 113–126.
93. Gonzales GF, Cordova A, Vega K, Chung A, Villena A, Gonez C *et al*. Effect of Lepidium meyenii (MACA) on sexual desire and its absent relationship with serum testosterone levels in adult healthy men. 2002; 34(6):367-72.
94. Heidary, M., Yazdanpanahi, Z., Dabbaghmanesh, M. H., Parsanezhad, M. E., Emamghoreishi, M., and Akbarzadeh, M. (2018). Effect of chamomile capsule on lipid-and hormonal-related parameters among women of reproductive age with polycystic ovary syndrome. Journal of Research in Medical Sciences, 23(1), 33.
95. Horowitz, S. (2011). Medicinal mushrooms: Research support for modern applications of traditional uses. Alternative and Complementary Therapies, 17(6), 323-329.

96. Hendawy, S.F., A.A. Ezz El-Din, E.E. Aziz and E.A.Omer, 2010. Productivity and oil quality of Thymus vulgaris L. under organic fertilization conditions. Ozean J. Appl. Sci., 3: 203-216.
97. Himaja, K., Veerapandiyan, K., and Usha, B. (2024). Aromatase inhibitors identified from Saraca asoca to treat infertility in women with polycystic ovary syndrome via in silico and in vivo studies. Journal of Biomolecular Structure and Dynamics, 1-16.
98. Iqbal H, Sher Z, Khan ZU. Medicinal plants from salt range pind dadan khan, District Jhelum, Punjab, Pakistan. J Med Plants Res. 2011;5(11):2157–68.
99. Irshad, S., Ashfaq, A., Muazzam, A., and Yasmeen, A. (2017). Antimicrobial and Anti-Prostate Cancer Activity of Turmeric (Curcuma Longa L.) And Black Pepper (*Piper Nigrum L.)* Used In Typical Pakistani Cuisine. Pakistan Journal of Zoology, 49(5).
100. IBIAPINA, W.V.; LEITÃO, B.P.; BATISTA, M.M.; PINTO, D. S. Inserção da Fitoterapia na atenção primária aos usuários do SUS. Rev. Ciência Saúde Nova Esperança. Jun, 12(1): p.58-68, 2014.
101. Ibrar, M., Hussain, F., Sultan, A., 2007. Ethnobotanical studies on plant resources of
102. Ranyal Hills, District Shangla, Pakistan. Pakistan Journal of Botany 2, 329–337.
103. Joshi, A., Muthal, A., Namdeo, A., and Shinde, V. Integrative Approaches for the Management of PCOS: A Review.
104. Joshi, B., Pandya, D., and Mankad, A. (2018). Comparative Study of Phytochemical Screening and Antibacterial Activity of Curcuma Longa (L.) And Curcuma Aromatica (Salib.). J. Med. Plants, 6, 145-148.
105. Juntachote, T., and Berghofer, E. J. F. C. (2005). Antioxidative Properties and Stability of Ethanolic Extracts of Holy Basil and Galangal. Food Chemistry, 92(2), 193-202.
106. Jarco, S., Pilawa, B., and Ramos, P. (2021). Free radical scavenging activity of infusions of
107. Ju, J., Santana de Oliveira, M., and Qiao, Y. (2023). Antiviral Activity and Mechanism of Cinnamon Essential Oil and Its Active Components. In Cinnamon: A Medicinal Plant and A Functional Food Systems (pp. 141-160). Cham: Springer International Publishing.
108. Jamila, F., Mostafa, E., 2014. Ethnobotanical survey of medicinal plants used by people in Oriental Morocco to manage various ailments. Journal of Ethnopharmacology 154, 76–87.
109. Jan, G., Khan, M.A., Farhatullah, J.F.G., Ahmad, M., Jan, M., Zafar, M., 2011.
110. Ethnobotanical studies on some useful plants of Dir Kohistan valleys KPK,
111. Pakistan. Pakistan Journal of Botany 43 (4), 1849–1852.
112. Jungbauer, Alois, Svjetlana Medjakovic. Phytoestrogens and the metabolic syndrome. The Journal of steroid biochemistry and molecular biology. 2014; 139:277-289.
113. Kovacs TG, Norman RJ. Polycystic Ovary Syndrome. Cambridge University Press; 2nd ed. 2007.
114. Kaingu, C. K., Oduma, J. A., and Kanui, T. I. (2011). Practices of traditional birth attendants in Machakos District, Kenya. Journal of ethnopharmacology, 137(1), 495-502.
115. Kapoor, R., and Huang, Y. S. (2006). Gamma linolenic acid: an antiinflammatory omega-6 fatty acid. Current pharmaceutical biotechnology, 7(6), 531–534. https://doi.org/10.2174/138920106779116874.
116. Konno, S. biological significance and medicinal properties of the maitake mushroom. Cultivation, antioxidant properties and health benefits, 1.
117. Knochenhauer ES, Key TJ, Kahsar-Miller M, Waggoner W, Boots LR, Azziz R. Prevalence of the polycystic ovary syndrome in unselected black and white women of the southeastern United States: a prospective study. J Clin Endocrinol Metab 1998; 83:3078-3082.
118. Kshama, D. N. M. R. (2024, May). FROM NATURE TO NURTURE: A REVIEW OF HERBAL APPROACHES TO POLYCYSTIC OVARY SYNDROME (PCOS). In Obstetrics and Gynaecology Forum (Vol. 34, No. 3s, Pp. 1142-1152).
119. Kumar, V., and Kumar, N. (2022). Therapeutic Effect of Herbal Medicinal Plants on Polycystic Ovarian Syndrome: A Review. Asian Journal of Pharmaceutical Research and Development, 10(6), 153-160.
120. Kamble, S. C., Humbare, R. B., Sarkar, J., and Kulkarni, A. A. (2020, November). Assessment of phytochemicals and antioxidant properties of root extracts of Rubia cordifolia L. in different solvent systems. In Biology and Life Sciences Forum (Vol. 4, No. 1, p. 100). MDPI.
121. Karimi, E., Jaafar, H. Z., and Ahmad, S. (2011). Phytochemical analysis and antimicrobial activities of methanolic extracts of leaf, stem and root from different varieties of Labisa pumila Benth. Molecules, 16(6), 4438-4450.
122. Khan MA, Khan MA, Hussain M, Ghulam GM. An ethnobotanical inventory of himalayan region poonch valley Azad Kashmir (Pakistan). Ethnobot Res Appl. 2010;8:107–23. https://doi.org/10.17348/era.8.0.107-123.
123. Kumar Santosh, Mehla RK, Dang AK. Use of shatavari (asparagus racemosus) as a galactopoietic and therapeutic herb-A review. Agric. Rev. 2008; 29(2):132- 138.
124. Lakshmi, J. N., Babu, A. N., Kiran, S. M., Nori, L. P., Hassan, N., Ashames, A., ... and Shaik, A. B. (2023). Herbs as a source for the treatment of polycystic ovarian syndrome: A systematic review. BioTech, 12(1), 4.
125. Latha, K., Rammohan, B., Sunanda, B. P. V., Maheswari, M. U., and Mohan, S. K. (2015). Evaluation of anxiolytic activity of aqueous extract of Coriandrum sativum Linn. in mice: A preliminary experimental study. Pharmacognosy research, 7(Suppl 1), S47.
126. Lakhani, K. (2005). Arterial wall mechanics in women with polycystic ovary syndrome. University of London, University College London (United Kingdom).
127. Lee, E. J., Kim, J. R., Choi, D. R., and Ahn, Y. J. (2008). Toxicity of cassia and cinnamon oil compounds and cinnamaldehyde-related compounds to Sitophilus oryzae (Coleoptera: Curculionidae). Journal of Economic Entomology, 101(6), 1960-1966.

128. Miller, L. G., and Murray, W. J. (1998). Specific toxicologic considerations of selected herbal products. Herbal Medicinals, 311.
129. Manneras, L., Cajander, S., Holmäng, A., Seleskovic, Z., Lystig, T., Lönn, M., and Stener-Victorin, E. (2007). A new rat model exhibiting both ovarian and metabolic characteristics of polycystic ovary syndrome. Endocrinology, 148(8), 3781-3791.
130. Mobeen, H., Hamid, H., Shafiq, A., Adil, M., Kashif, M., and Yousuf, N. (2016). LH/FSH, BMI and clinical profile in polycystic ovarian syndrome: A correlative study. International Journal of Biochemistry Research and Review, 9(1), 1-6.
131. Maleki, V., Faghfouri, A. H., Tabrizi, F. P. F., Moludi, J., Saleh-Ghadimi, S., Jafari-Vayghan, H., and Qaisar, S. A. (2021). Mechanistic and therapeutic insight into the effects of cinnamon in polycystic ovary syndrome: a systematic review. Journal of ovarian research, 14, 1-14.
132. Manimurugan, C., Sujatha, M., Rathnakumar, A. L., Sandhanalakshmi, M., and Zanwar, A. A. (2023). Role of flaxseed (Linum usitatissimum L.) in disease prevention and treatment. Asian Pacific Journal of Tropical Biomedicine, 13(7), 277-286.
133. Manouchehri, A., Abbaszadeh, S., Ahmadi, M., Nejad, F. K., Bahmani, M., and Dastyar, N. (2023). Polycystic ovaries and herbal remedies: A systematic review. JBRA assisted reproduction, 27(1), 85.
134. Maqbool, M. Management of Polycystic ovary syndrome using drugs of herbal origin.
135. Martínez-Cruz, O., and Paredes-López, O. (2014). Phytochemical profile and nutraceutical potential of chia seeds (Salvia hispanica L.) by ultra high performance liquid chromatography. Journal of Chromatography A, 1346, 43-48.
136. Moran LJ Noakes M Clifton PM Wittert GA Williams G Norman RJ Short-term meal replacements followed by dietary macronutrient restriction enhance weight loss in polycystic ovary syndrome, *Am J Clin Nutr*, 2006, vol. 1(pg. 77-87).
137. Moini Jazani, A., Nasimi Doost Azgomi, H., Nasimi Doost Azgomi, A., and Nasimi Doost Azgomi, R. (2019). A comprehensive review of clinical studies with herbal medicine on polycystic ovary syndrome (PCOS). DARU Journal of Pharmaceutical Sciences, 27, 863-877.
138. Mudgal, L. K., Joshi, P. K., and Sharma, R. (2012). Aloe Vera Extract Characterization and Its Protection against Fenvalerate Induced Toxicity in Heteropneustes Fossilis. Environment Conservation Journal, 13(1and2), 65-71.
139. Mueed, A., Shibli, S., Jahangir, M., Jabbar, S., and Deng, Z. (2023). A comprehensive review of flaxseed (Linum usitatissimum L.): health-affecting compounds, mechanism of toxicity, detoxification, anticancer and potential risk. Critical Reviews in Food Science and Nutrition, 63(32), 11081-11104.
140. Mukhopadhyay, M. K., and Nath, D. (2011). Phytochemical screening and toxicity study of Saraca asoca bark methanolic extract. International Journal of Phytomedicine, 3(4), 498.
141. "Mean for the period 1961 – 2009". Karachi: Climate Data Processing Centre (CDPC), Pakistan Meteorological Department. Archived from the original on 13 June 2010.
142. Nowak DA, Snyder DC. The Effect of Flaxseed Supplementation on Hormonal Levels Associated with Polycystic Ovarian Syndrome: A Case Study. Curr Top Nutraceutical Res 2007; 5(4): 177–181.
143. Najafipour, F., Rahimi, A. O., Mobaseri, M., Agamohamadzadeh, N., Nikoo, A., and Aliasgharzadeh, A. (2014). Therapeutic effects of stinging nettle (Urtica dioica) in women with Hyperandrogenism. International Journal of current research and academic review Rev, 2(7), 153-160.
144. Mannerås, L., Fazliana, M., Nazaimoon, W. W., Lönn, M., Gu, H. F., Östenson, C. G., and Stener-Victorin, E. (2010). Beneficial metabolic effects of the Malaysian herb Labisia pumila var. alata in a rat model of polycystic ovary syndrome. Journal of ethnopharmacology, 127(2), 346-351.
145. Novakovic, S., Jakovljevic, V., Jovic, N., Andric, K., Milinkovic, M., Anicic, T., ... and Joksimovic Jovic, J. (2024). Exploring the Antioxidative Effects of Ginger and Cinnamon: A Comprehensive Review of Evidence and Molecular Mechanisms Involved in Polycystic Ovary Syndrome (PCOS) and Other Oxidative Stress-Related Disorders. Antioxidants, 13(4), 392.
146. Norhaiza, M., Maziah, M., and Hakiman, M. (2009). Antioxidative properties of leaf extracts of a popular Malaysian herb, Labisia pumila. Journal of Medicinal Plants Research, 3(4), 217-223.
147. Norman R. J. and Clark A. M. (1998) Obesity and reproductive disorders: a review. Reprod. Fertil. Dev. 10:55–63.
148. Nardo LG, Gelbaya TA, Wilkinson H, Roberts SA, Yates A, Pemberton P, Laing I. Circulating basal anti-Müllerian hormone levels as predictor of ovarian response in women undergoing ovarian stimulation for in vitro fertilization, Fertil Steril, 2008.
149. Nowak DA, Snyder DC, Brown AJ, Wahnefried WD. The Effect of Flaxseed Supplementation on Hormonal Levels Associated with Polycystic Ovarian Syndrome: A Case Study. Curr Top Nutraceutical Res. 2007; 5(4):177-181.
150. Naguib, N.Y.M., 2011. Organic Vs Chemical Fertilization of Medicinal Plants: A Concise Review of Researches. Advances in Environmental Biology, 5: 394-400.
151. Nasir, E. and S.I. Ali. (Eds.). 1980-1989. Flora of Pakistan. No. 132-190. Islamabad, Karachi.
152. Neves, J.M., Matos, C., Moutinho, C., Queiroz, G., Gomes, L.R., 2009. Ethnopharmacological notes about ancient uses of medicinal plants in Tras-os-Montes
153. (northern of Portugal). Journal of Ethnopharmacology 124, 270–283.
154. Osman, N. N., Alsahfi, S. A., and Alshubaily, F. (2019). Effectiveness of Aqueous Extract of Fenugreek Seeds and Flaxseed on Polycystic .Ovarian Syndrome in Female Rats International Journal of Pharmaceutical Research and Allied Sciences, 8(4-2019), 42-54.

155. Özkol, H., Musa, D., Tuluce, Y., and Koyuncu, I. (2012). Ameliorative influence of Urtica dioica L against cisplatin-induced toxicity in mice bearing Ehrlich ascites carcinoma. Drug and chemical toxicology, 35(3), 251-257.
156. Obluchinskaya, E. D., Pozharitskaya, O. N., Zakharov, D. V., Flisyuk, E. V., Terninko, I. I., Generalova, Y. E., ... and Shikov, A. N. (2022). The Biochemical composition and antioxidant properties of Fucus vesiculosus from the Arctic region. Marine drugs, 20(3), 193.
157. Patel Anuradha Jitendra, Thakor Akanksha Pravin. (2012). Prospective use of Tephrosia Purpurea in Remedial Treatment of PCOS: Study in Wistar Rat. ISCA J. Biological Sci 1, 1-6.
158. Pasquali, R., Pelusi, C., Genghini, S., Cacciari, M., and Gambineri, A. (2003). Obesity and reproductive disorders in women. Human reproduction update, 9(4), 359-372.
159. Pachiappan, S., Matheswaran, S., Saravanan, P. P., and Muthusamy, G. (2017). Medicinal plants for polycystic ovary syndrome: A review of phytomedicine research. International journal of Herbal and Medicine, 5(2), 78-80.
160. Patel, S. M., and Nestler, J. E. (2006). Fertility in polycystic ovary syndrome. Endocrinology and Metabolism Clinics, 35(1), 137-155.
161. Pinya, S., Ferriol, P., Tejada, S., and Sureda, A. (2019). Mushrooms reishi (Ganoderma lucidum), shiitake (Lentinela edodes), maitake (Grifola frondosa). In Nonvitamin and Nonmineral Nutritional Supplements (pp. 517-526). Academic Press.
162. Prance, G. T., W. Balee, B. M. Boom, and R. L. Carneiro. 1987. "Quantitative Ethnobotany and the Case for Conservation in Amazonia." Conservation Biology 1 (4): 296–310.
163. Pachiappan, S., Arul Balasubramanian, M. G., and Ramalingam, K. Pharmacoinformatics based in silico Molecular Dynamics Simulation for Screening Phytochemicals as AMPK and INSR Modulators for Polycystic Ovarian Syndrome from Medicinal Plants. Google Scholar.
164. Plengsuriyakarn, T., Viyanant, V., Eursitthichai, V., Tesana, S., Chaijaroenkul, W., Itharat, A., and Na-Bangchang, K. (2012). Cytotoxicity, toxicity, and anticancer activity of Zingiber officinale Roscoe against cholangiocarcinoma. Asian Pacific Journal of Cancer Prevention, 13(9), 4597-4606.
165. Qureshi R, Ghufran M, Sultana K, Ashraf M, Khan A. (2007). Ethnomedicinal studies of medicinal plants of Gilgit District and surrounding areas. Ethnobot Research and Applications 2007;5:115–22. https://doi.org/10.17348/era.5.0.115-122.
166. Qureshi, R, 2012. Medicinal flora Of Hingol National Park, Baluchistan, Pakistan. Pakistan Journal of Botany 44 (2), 725–732.
167. Radha, M. H., and Laxmipriya, N. P. (2016). The Role of Aloe Barbadensis Mill as A Possible Pre-Conceptive Herb For The Management Of Polycystic Ovarian Syndrome: A Rodent Model Study. Austin Journal of Reproductive Medicine and Infertility *3*(2), 1040.
168. Rao, S. K. (2021). An insight on polycystic Ovary syndrome (PCOS) and use of herbal medicines as alternative treatment. In Treating Endocrine and Metabolic Disorders with Herbal Medicines (pp. 125-163). IGI Global.
169. Ramachandran, S., Nikitha, J., Gopi, C., Amala, M., and Dhanaraju, M. D. (2020). Effect of Prunus dulcis and Salvia hispenica in the management of polycystic ovary syndrome in Wistar rats. Journal of Taibah University Medical Sciences, 15(2), 122-128.
170. Rasheed, N., Ahmed, A., Nosheen, F., Imran, A., Islam, F., Noreen, R., and Amer Ali, Y. (2023). Effectiveness of Combined Seeds (Pumpkin, Sunflower, Sesame, Flaxseed): As Adjacent Therapy to Treat Polycystic Ovary Syndrome in Females. Food Science and Nutrition, 11(6), 3385-3393.
171. Rotterdam, E. S. H. R. E. (2004). ASRM sponsored pcos concensus workshop group. Revised 2003 consensus on diagnostic criteria and long-term health risks related to polycystic ovary syndrome. Fertility and Sterility, 81(1), 19-25. https://doi.org/10. 1016/j.fertn stert.2003.10.004
172. Reaven GM. The metabolic syndrome: requiescat in pace. Clinical Chemistry 2005;51:931– 8.
173. Rao, S. K. (2021). An insight on polycystic Ovary syndrome (PCOS) and use of herbal medicines as alternative treatment. In Treating Endocrine and Metabolic Disorders with Herbal Medicines (pp. 125-163). IGI Global.
174. Ramburrun, S. (2022). In vitro investigation of Rosa Rubiginosa (rosehip) oil and essential oil combinations for the topical treatment of acne (Doctoral dissertation, Department of Pharmacy and Pharmacology, University of the Witwatersrand, South Africa).
175. Sadeghi, Z. and Mahmood, A. Ethno-gynecological knowledge of medicinal plants used by Baluch tribes, southeast of Baluchistan, Iran. Revista Brasileira de Farmacognosia 24(6): 706-715., 2014.
176. Shantaram Gajanan Khanage, Tarkasband Yogita Subhash And Inamdar Rahat Bhaiyyasahe(2019) Herbal Drugs For The Treatment Of Polycystic Ovary Syndrome (Pcos) And Its Complications Pharmaceutical Resonance 2019 Vol.2 - Issue 1(5-9)
177. Sabir, S. M., Zeb, A., Mahmood, M., Abbas, S. R., Ahmad, Z., and Iqbal, N. (2020). Phytochemical Analysis and Biological Activities of Ethanolic Extract of Curcuma Longa Rhizome. Brazilian Journal of Biology, 81, 737-740.
178. Speroff, L., and Fritz, M. A. (Eds.). (2005). Clinical gynecologic endocrinology and infertility. lippincott Williams and wilkins
179. Saiyed, A., Jahan, N., Makbul, S. A. A., Ansari, M., Bano, H., and Habib, S. H. (2016). Effect of combination of Withania somnifera Dunal and Tribulus terrestris Linn on letrozole induced polycystic ovarian syndrome in rats. Integrative medicine research, 5(4), 293-300.

180. Sandeep, P. M., Bovee, T. F., and Sreejith, K. (2015). Anti-androgenic activity of Nardostachys jatamansi DC and Tribulus terrestris L. and their beneficial effects on polycystic ovary syndrome–Induced rat models. Metabolic syndrome and related disorders, 13(6), 248-254.
181. Shamsi, M., Ganji, A., Mosayebi, G., Amirhoseiny, E. S., Shohani, S., and Ghazavi, A. (2023). Chamomile and Urtica dioica extracts improve immunological and histological alterations associated with polycystic ovarian syndrome in DHEA-induced mice. BMC Complementary Medicine and Therapies, 23(1), 102.
182. Sharifi, M., Nourani, N., Sanaie, S., and Hamedeyazdan, S. (2024). The Effect of Oenothera Biennis (Evening Primrose) Oil on Inflammatory Diseases: A Systematic Review of ClinicalTrials. BMC Complementary Medicine and Therapies, 24(1), 89.
183. Shoorei, H., Khaki, A., Ainehchi, N., Taheri, M. M. H., Tahmasebi, M., Seyedghiasi, G., and Raza, S. H. A. (2018). Effects of Matricaria chamomilla extract on growth and maturation of isolated mouse ovarian follicles in a three-dimensional culture system. Chinese Medical Journal, 131(02), 218-225.
184. Singh, D., and Chaudhuri, P. K. (2018). A Review on Phytochemical and Pharmacological Properties of Holy Basil (Ocimum Sanctum L.). Industrial Crops and Products, 118, 367-382.
185. Sirotkin, A. V. (2023). Influence of flaxseed (Linum usitatissimum) on female reproduction. Planta Medica, 89(06), 608-615.
186. Sirotkin, A. V., and Kolesarova, A. (2021). Puncture vine (Tribulus terrestris L.) in control of health and reproduction. Physiological research, 70(Suppl 4), S657.
187. Sobha, K., Poornima, A., Harini, P., and Veeraiah, K. (2007). A Study On Biochemical Changes In The Fresh Water Fish, Catla Catla (Hamilton) Exposed To The Heavy Metal Toxicant Cadmium Chloride. Kathmandu University Journal of Science, Engineering and Technology, 3(2), 1-11
188. Šavikin, K., Zdunić, G., Menković, N., Živković, J., Ćujić, N., Tereščenko, M., and Bigović, D. (2013). Ethnobotanical study on traditional use of medicinal plants in South-Western Serbia, Zlatibor district. Journal of ethnopharmacology, 146(3), 803-810.
189. Sharma HK, Sharma RK. Evaluation of Efficacy and Safety of Evecare® Syrup in Infertility due to Polycystic Ovarian Syndrome. Indian J Clin Pract 2010; 21(2): 129- 32.
190. Shange, N. C. (2016). The efficacy of a phytotherapeutic complex (Angelica sinensis, Dioscorea villosa, Matricaria chamomilla, Viburnum opulus and Zingiber officinalis) compared with homoeopathic similimum in the treatment of primary dysmenorrhoea (Doctoral dissertation).
191. Sangal, A. (2011). Role of cinnamon as beneficial antidiabetic food adjunct: a review.
192. Singh, P.P.; Krishna, A. Anti-hyperglycaemic activity of tribulus- terrestris fruit extract restores metabolic imbalance in letrozole induced -PCOS mice. International Journal of Pharmacognosy and Phytochemistry, 2019, 11(4),
193. 304-311.
194. Sureda, A., and Tejada, S. (2022). Skin metabolic syndrome and phytonutrients. In The Role of Phytonutrients in Metabolic Disorders (pp. 373-396). Academic Press.
195. Shi, J., Yang, Y., Zhou, X., Zhao, L., Li, X., Yusuf, A., ... and Hu, X. (2022). The current status of old traditional medicine introduced from Persia to China. Frontiers in Pharmacology, 13, 953352.
196. Sengar, N., Joshi, A., Prasad, S. K., and Hemalatha, S. (2015). Anti-inflammatory, analgesic and anti-pyretic activities of standardized root extract of Jasminum sambac. Journal of ethnopharmacology, 160, 140-148.
197. Sarac, N. and A. Ugur, 2007. Antimicrobial activities and usage in folkloric medicine of some Lamiaceae species growing in Mugla, Turkey. EurAsia J. Bio. Sci., 1: 28-34.
198. Shah SMM, Ullah F, Shah SMH, Zahoor M, Sadiq A. Analysis of chemical constituents and antinociceptive potential of essential oil of Teucrium Stocksianum bioss collected from the north west of Pakistan. BMC Complement Altern Med. 2012;12(1):244. https://doi.org/10.1186/1472-6882-12-244.
199. Swayamjeet Satapathy, Namrata Das, Debapriya Bandyopadhyay, Sushil Chandra Mahapatra, Dip Sundar Sahu, Mruthyumjayarao Meda. Effect of Tulsi (Ocimum sanctum Linn.) Supplementation on Metabolic Parameters and Liver Enzymes in Young Overweight and Obese Subjects. Indian Journal of Clinical Biochemistry. 2016; DOI: 10.1007/s12291-016-0615-4.
200. Shari Lieberman. A Review of the Effectiveness of Cimicifuga racemosa (Black Cohosh) for the Symptoms of Menopause. Journal of Women's Health. 2009; 7(5):525-529.
201. Sharma Meenakshi, Sharma Gyan Prakash, Meena Mahendra Singh. Role of traditional ayurvedic herbs in gynocological disorders. A DEMAND OF 21ST CENTURY. International Journal of Applied Ayurved Research. 2014; 1(8):2347-6362.
202. Tilburt, J. C., and Kaptchuk, T. J. (2008). Herbal medicine research and global health: an ethical analysis. Bulletin of the World Health Organization, 86, 594-599.
203. TSOBOU, R., MAPONGMETSEM, P. M. and DAMME, P. Medicinal Plants Used for Treating Reproductive Health Care Problems in Cameroon, Central Africa1. Economic Botany, 70(2): 145-159., 2016.
204. Tayanloo, A., Zare, S., Karimzadeh-Bardei, L., and Hoseini, S. (2017). Effect of Urtica dioica hydroalcoholic extract on liver inflammatory factors in polycystic ovarian syndrome induced in Wistar rats by estradiol valerate. Nova Biologica Reperta, 4(2), 181-188
205. Tekin, M., Özbek, H., and Him, A. (2009). Investigation of acute toxicity, anti-inflammatory and analgesic effect of Urtica dioica L. Pharmacologyonline, 1, 1210-5.
206. Tripodi, F., Falletta, E., Leri, M., Angeloni, C., Beghelli, D., Giusti, L., and Coccetti, P. (2022). Anti-aging and neuroprotective properties of Grifola frondosa and Hericium erinaceus extracts. Nutrients, 14(20), 4368
207. Tardío, J., and Pardo-de-Santayana, M. (2008). Cultural importance indices: a comparative analysis based on the useful wild plants of Southern Cantabria (Northern Spain). Economic botany, 62, 24-39

208. Tareen, R. B., Bibi, T., Khan, M. A., Ahmad, M., Zafar, M., and Hina, S. (2010). Indigenous knowledge of folk medicine by the women of Kalat and Khuzdar regions of Balochistan, Pakistan. Pakistan Journal of Botany, 42(3), 1465-1485
209. Tori Hudson ND. Maitake Mushroom Extract and Polycystic Ovarian Syndrome. Natural Medicine Journal. 2011; 3(2):2157-6769.
210. Talpur N, Echard B, Yasmin T, Bagchi D, Preuss HG. Effects of niacin-bound chromium, Maitake mushroom fraction SX and hydroxycitric acid on the metabolic syndrome in aged diabetic Zucker fatty rats. Molecular Cell biology and Biochemistry, 2003; 252(1-2):369-377.
211. Valizadeh, A., Rezazadeh, S., Hanafi, A., Tarassoli, Z., Shamabadi, A., and Kashani, L. (2022). The therapeutic effects of cinnamon on polycystic ovary syndrome: A review. Journal of Iranian Medical Council.
212. Vishwakarma, H., Patel, S., Chouksey, S., Lodhi, S., Kurmi, R., and Nema, P. (2022). Herbal Products for Gynecological Disorders. Asian Journal of Dental and Health Sciences, 2(2), 1-8.
213. Vuksan, V., Jenkins, A. L., Brissette, C., Choleva, L., Jovanovski, E., Gibbs, A. L., and Hanna, A. (2017). Salba-chia (Salvia hispanica L.) in the treatment of overweight and obese patients with type 2 diabetes: A double-blind randomized controlled trial. Nutrition, Metabolism and Cardiovascular Diseases, 27(2), 138-146.
214. Wu, J. Y., Siu, K. C., and Geng, P. (2021). Bioactive ingredients and medicinal values of Grifola frondosa (Maitake). Foods, 10(1), 95.
215. Wu, W. H., Liu, L. Y., Chung, C. J., Jou, H. J., and Wang, T. A. (2005). Estrogenic effect of yam ingestion in healthy postmenopausal women. Journal of the American College of Nutrition, 24(4), 235-243.
216. Wang, T., Jónsdóttir, R., Liu, H., Gu, L., Kristinsson, H. G., Raghavan, S., and Ólafsdóttir, G. (2012). Antioxidant capacities of phlorotannins extracted from the brown algae Fucus vesiculosus. Journal of agricultural and food chemistry, 60(23), 5874-5883.
217. Wardle, J. (2010). Polycystic ovarian syndrome. *Clinical Naturopathy:* An evidence-based guide to practice, 383.
218. World Health Organization (WHO), 2008. "Traditional medicine" Fact sheet number: 134(December).Retrieved from: "http://www.who.int/mediacentre/factsheets/fs13 4/en/.
219. Wesam Kooti, Maryam Moradi, Sara Ali-Akbari, Naim Sharafi-Ahvazi, Majid Asadi-Samani, Damoon AshtaryLarky. Therapeutic and pharmacological potential of Foeniculum vulgare Mill: A review. Journal of HerbalMed Pharmacology, 2015; 4(1):1-9.
220. Xita, N., and Tsatsoulis, A. (2006). Fetal programming of polycystic ovary syndrome by androgen excess: evidence from experimental, clinical, and genetic association studies. The Journal of Clinical Endocrinology and Metabolism, 91(5), 1660-1666.
221. YAZBEK, P. B.; TEZOTO, J.; CASSAS, F. and RODRIGUES, E. Plants used during maternity, menstrual cycle and other women's health conditions among Brazilian cultures. Journal of Ethnopharmacology,179: 310-331., 2016.
222. Zahra A, Ayoob R. A review on role of medicinal plants in polycystic ovarian syndrome: Pathophysiology, neuroendocrine signaling, therapeutic status and future prospects. Middle East Fertility Society Journal. 2018; 23: 255–262.
223. Zand Vakili, F., Zare, S. H., Rahimi, K., and Riahi, M. (2018). The effect of evening primrose oil on changes in polycystic ovary syndrome induced by estradiol valerate in rat. Armaghane danesh, 22(6), 714-724.
224. Zangeneh, F. Z., Minaee, B., Amirzargar, A., Ahangarpour, A., and Mousavizadeh, K. (2010). Effects of chamomile extract on biochemical and clinical parameters in a rat model of polycystic ovary syndrome. Journal of reproduction and infertility, 11(3), 169.
225. Zare, S., Nabiuni, M., Tayanloo, A., Hoseini, S., and Karimzadeh Bardei, L. (2015). The effects of Urtica dioica extract on lipid profile, insulin resistance index and liver histology in polycystic ovary syndrome-induced Wistar rats. Advanced Herbal Medicine, 1(2), 23-33.
226. Zaragozá, M. C., López, D., P. Sáiz, M., Poquet, M., Pérez, J., Puig-Parellada, P., ... and Mitjavila, M. T. (2008). Toxicity and antioxidant activity in vitro and in vivo of two Fucus vesiculosus extracts. Journal of Agricultural and Food Chemistry, 56(17), 7773-7780.
227. Zakaria, A. A., Noor, M. H. M., Ahmad, H., Hassim, H. A., Mazlan, M., and Latip, M. Q. A. (2021). A review on therapeutic effects of labisia pumila on female reproductive diseases. BioMed Research International, 2021(1), 9928199.
228. Ziyyat, A., Legssyer, A., Mekhfi, H., Dassouli, A., Serhrouchni, M., Benjelloun, W., 1997. Phytotherapy of hypertension and diabetes in oriental Morocco. Journal of Ethnopharmacology 58, 45–54.