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Review article

A Pharmacognostic Review on *Artemisia. spp* Growing in Libya

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ABSTRACT

Worldwide, scientists are gaining more interest in safe, cheaper and more effective plant-based medicine. Artemisia has been used in folk medicine by numerous cultures since long times. This review aims to compile the information available in literature about Artemisia spp., which grows in Libya. A state of knowledge of the taxonomy, as well as, morphological character, phytochemistery, uses in traditional medicine, and its pharmacological action as antimicrobial, anti-inflammatory and its effect on fertility are referred under perspective of its potential industrial use. The present research was conducted using several electronic database including Science Direct, PubMed, Web of Science, Google Scholar and Scopus. The present review comprises up to date information of traditional uses, phytochemistry and pharmacology of Artemisia spp growing in Libya. The Artemisia is a rich source of chemically novel compounds and needs elaborate screening strategies to dwell into the pharmacological effects of its phytoconstituents at the molecular level. This review article provides preliminary information and gives a direction for the basic and clinical research on Artemisia spp. The information congregated in this review will help researchers and industry persons to work in line to reconnoiter the potential of this plant and utilize it for the benefit of the society. Artemisia spp., is indexed in critically endangered category, so consistent efforts should be made to protect this plant species to become extinct.

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INTRODUCTION

Since thousands of years, plants have been used as medicines and believed to be Providing People with Nutritional Powers [1]. Worldwide, scientists are gaining more interest in safe, cheaper and more effective plant-based medicine, pharmaceuticals, food supplements, health products, cosmetics, and nutraceuticals. [2]. According to WHO, more than 21,000 plant species have the potential for being exercised as medicinal plants [3,4]. Various scientific research proved the richness of medicinal plants in bioactive compounds that are responsible for their benefits and biological properties [5,6].

Asteraceae is one of the largest plant families have a huge number of species (1,620 genera and 23,600 species) which are spread mostly all over the world [7,8]. *Artemisia* belongs to the family Asteraceae being one of the most common in the Northern and southern Hemisphere [8,9]. There are 500 species of the genus *Artemisia* worldwide. Several species of *Artemisia* have been reported to contain numerous phytochemicals such as polyphenols, phenolic acids, flavonoids, acetylenes and triterpene (10-11-12-13-14). In the past decade *Artemisia* species have been used traditionally in varies populations, thus; A. keiskeana Miq has been used for the treatment of gynaecepathy, amenerrhea, bruise and rheumatic disease [15]. A. vestita has been utilized for the treatment of fungal infections such

as tinea, tympanitis, and thrush [16]. Other *Artemisia* species have been used for the treatment of hepatitis, cancer, inflammation and infections by bacteria, and viruses [17].
In Libya, the genus *Artemisia* is represented by six species. They are *A. Vulgaris* [18], *A. arborescens, A. judaica, A. campestris, A. monosperma* and *A. herba-alba* [19,20].
Artemisia has been used in folk medicine by numerous cultures since long times, in Moroccan folk medicine used to treat diabetes and arterial hypertension [21,22]. Moreover, leaves from this species are traditionally used to induce Abortion [23] and as analgesic, anti-bacterial [24], anti-malarial [25] and anticancer activities [26]. due to lack of a comprehensive review on the pharmacology of Artemisia *spp* prompted us to compile a review on the traditional use and pharmacology of *Artemisia spp* which grows in Libya.

Geographical distribution
Artemisia grows wildly on nitrofilous and gypsum-rich substrata [23]. In Libya, the variety is abundant, with the highest population density in the Northeast, especially in the Green Mountains (Al- Jaba Al-Akhder), in southwest libya, southern Tripolitania and Saharo-Arabian element [27]. *A. herba-alba* and *A. arborescens* obtainable in Zintan [28] and in the Green Mountain (Al- Jabal Al-Akhder) [29]. On the other hand, *A. campestris* has been reported in Zawia [30] and southern Libya [31]. while. *A. monosperma* has reported in Tobruk in northeast of Libya [32] and in Gasar Gharian, Ghat area (El Barkat and Wadi Iseien) [26]. Moreover, *A. Vulgaris* have been recorded by Abuhadra et al., 2017., in Khallet Alforjan about 18 km south of Tripoli [18] and *A. judaica* was collected in Western Hamada in northwest of Libya [28].

Morphological characters
General morphological features of the genus *Artemisia* are defined as alternate leaves, capitula small, usually racemouse, paniculate or capitate, rarely solitary [33]. *A. monosperma* is a green glabrous shrub let; the flowering season extends from September to December in most areas. Its height is up to 50-70 cm, with ascending or diffuse stems ending in many flowered panicles; capitula are small (1mm in diameter) with 10-12 tubular florets [20]. While *A. Vulgaris* described as perennial herb without overwintering rosettes. Stems erect, simple or compound 60 – 120 (-210) cm, sparsely pubescent, often glabrescent, usually red or purplish. Leaves 1 – 10 cm wide, with the upper surface being slightly hairy and the lower surface covered with silvery-white wooly hairs [18]. *A. herba alba* is a low, evergreen, herbaceous perennial, 20-40 cm in height. Its physiology and root morphology allow it to adapt in the arid regions and enjoy maximum soil moisture. The reduced blade size reduces the welding surface. Stems are slender, erect and stiff, flowering begins in late summer [34]. Moreover, *A. judaica* is Perennial subshrub, sometimes herbaceous in appearance, densely branched, 50 to 80 cm in high. The leaves are small, alternate, sessile and split, densely covered with fine white hairs that give the plant its silvery appearance. Flowers are grouped in pale yellow, disc-shaped, hemispherical, inflorescences 5 to 10 mm in diameter, surrounded by cottony bracts, with 10 to 20 flowers. Fruits are small achenes not larger than 5 mm. in size [35,36]. Furthermore, *A. arborescens* is aromatic perennial; stems 50-100 cm long, is a fast-growing shrub 6 feet tall and 8 feet wide. The soft, silvery foliage contrasts nicely with the dull yellow flowers that appear in spring. It tolerates a wide range of climate and soil conditions, but it tolerates temperatures as low as 25 degrees Fahrenheit. Upper leaves 1 to 2 pinnate or sometimes simple, stalked; flaps 5-25 x 1-2 mm, obtuse. The inflorescence is 6-7 mm in diameter. Sheath 3.5-4mm; bracts ovate, tomentose, margin broad, glabrous, rhombic [37]. The morphological description of *A. campestris* is a biennial or short-lived perennial. The first year, the basal leaves form rosettes. The leaves toward the base of the plant are densely packed, up to 6 inches long, deeply divided into 3 or more long, narrow lobes, sometimes hairy, and often wilted (deciduous) at flowering. The upper leaves are sparser, smaller, and possibly undivided. Stems furrowed, green or dark red; one or several stems may grow from base, usually branched in upper plant, branches erect to ascending [35].

Phytochemistry
Despite numerous publications on *Artemisia* plants, the relevant studies of Chemical composition and biological evaluation of wild species in Libya were scanty an exhaustive literature review on phytochemical reports of the *Artemisia spp*. which growing in Libya reveals that the *Artemisia* species comprise mainly sterols, terpenoids, coumarins, caffeoylquinic acids, flavonoids and acetylenes [11,12]. Amongst various species of *Artemisia* in libya, *A,herba alba, A. compestris* and *A . monosperma* are especially rich in Alkaloids, Saponins and Flavonoids [31, 32,38] while *A monosperma* and *A, herba alba* rich in phenolic compounds and Coumarins [32,38] and it is absent in *A. compestris* [31]. Moreover. Volatile oils and terpenoids most commonly found in *A, herba alba*, and *A. compestris* while the Anthraquinone is not present in both [31,39].

Traditional uses of folk remedies

plant *Artemisia* is widely used in traditional medicine to treat human and animal diseases. For example, it used in traditional medicine to treat respiratory ailments, including coughs and Mucus. Also, it used as an analgesic, insect repellant, diaphoretic and diuretic and in wound healing, high blood pressure and allergies [40]. Furthermore, some mugwort plants are traditionally used to treat seizures [41,42]. *A. herba alba* in the north east of Libya wildly grows and used traditionally as oral anthelmintic agents and also used via nasal inhalation as a prophylactic to prevent wound infection after surgeries [35,43]. People take it usually to treat coughs, stomach and intestinal pain. Also for parasitic infections such as roundworms, pinworms, tapeworms, and trematodes [44]. *A. Campestris* has many medicinal properties, including: Antidote, Anticancer, anthelmintic, antibacterial, antifungal, antidiabetic and antihypertensive [45-47]. It has been used to treat a variety of conditions, including digestive, respiratory, skin and genital disorders [48-50]. As mentioned in some studies *A. monosperma* have anthelmintic, antispasmodic and antihypertensive properties [51]. In Jordan, its leaves are traditionally used to induce abortion [23]. *A. Vulgaris* used traditionally in Libya as enhance uterine contractility, skin ulcers, kidney stones [52]. exist in Europe, tinctures of the plant are used as tonics, digestive aids and Antipyretic and anthelmintic drugs [53]. *A. Vulgaris* is also used in epilepsy, gastropathy, spleen, enlarged urinary tract disease and wound healing [54,55]. Spent all the flowers stomach troubles and as an anthelmintic. In addition, in Libya, we don't have sufficient information about *A. judaica* popular use, either in Egypt *A. judaica* has antispasmodic and anthelmintic properties [56]. The infusion of Huafeng can relieve gastrointestinal cramps and also has a stomachic effect. inhale leaves provide relief from cold buildup. It is also used as fuel and insect repellant. The snake is driven away by the smoke from the burning flames branches [56,57].

Pharmacological actions

Antimicrobial Activity

Different antibacterial ingredients are utilized aromatic plant sources or potentially soaked carbon compounds. These aromatic compounds are acquired by ethanol or methanol extraction [58]. Various studies confirmed that the methanolic and ethanolic extracts of *Artemisia* species are the best antimicrobial agents [59,60,61,62,63,64]. *A. herba alba* plant growing in Tunisia has a positive effect at the Staphylococcus aureus (*S. aureus*) and Escherichia coli (*E. coli*) [65]. Moreover, Moroccan publication of this plant has antimicrobial activity for *S. aureus*, Klebsiella pneumonia (*K, pneumonia*), and *E. coli* but not effect Pseudomonas aeruginosa (*P. aeruginosa*) [66]. Libyan studies on *A. herba alba* reported antimicrobial activity of his methanol extract on E. coli, *P aeruginosa*, and *S. aureus* [67]. On contrast, ethanolic extract of *A. herba alba* showed the least antibacterial activity against *K. pneumonia, E. coli* and *P. aeruginosa* and high activity against *S, aureus* at the lower concentration [0.25mg/ml]. Meanwhile, the same extract possessed the highest activity against both *K, pneumonia* and *Salmonilla typhi* (*S, typhi*) (at 0.5 mg/ ml) with the lowest activity against *Bacillus subtilus* (*B, subtilus*) [39]. In addition, Bogdadi et .,al 2007 reported that the ethanol and methanol extracts of *A. herba-alba* exhibited promising antibacterial effect on *B. subtilis*, Enterococcus faecalis (*E, faecalis*), *S. aureus*, Staphylococcus epidermidis (*S, epidermidis*), *E. coli*, and *P. aeruginosa* [68]. On the other hand, The Libyan Essential oil of *A. herb alba* inhibited the growth of both tested standard and clinical isolates of *P. aeruginosa* [43] and both tested standard and clinical *S. aureus* bacteria [67]. On the contrary, other results shows that the essential oil of *A. herba alba* of Libyan population is not suitable for use as antimicrobial because it should be used in high doses [69]. The Essential oils of *A. herba-alba* and *A. judaica* growing in the Libyan pastures showed high antibacterial activity against *S. aureus*, Bacillus cereus *(B.cereus)* ,Listeria monocytogenes *(L. monocytogenes). and* Staphylococcus typhimurium *(S. typhimurium*) in comparative to ampicillin contrariwise the essential oil of *A. arborescens*. The essential oil of *A. judaica* showed higher antibacterial activity against Micrococcus flavus than ampicillin and streptomycin. The oils of *A. herba-alba, A. arborescens* and *A. judaica* possessed lower antibacterial capacity than both antibiotics against Gram (-) bacteria *P. aeruginosa, E. coli* and Enterobacter cloacae *(E, cloacae*) [28]. The essential oil of *A. judaica*, exhibited higher antifungal potential against Aspergillus versicolor (*A. versicolor*), Aspergillus ochraceus (*A. ochraceus*), Aspergillus niger (*A. niger*) and Penicillium species comparative to bifonazole. The essential oils of *A. herba-alba* and *A. arborescens* showed almost the same or a little lower antifungal activity than bifonazole [28]. Some studies on antimicrobial activity of essential oil and ethanol extract of *A. monosperma* grows in Libya exhibited moderate to remarkable growth inhibitory potential against *S. aureus, S. epidermidis*, Neisseria gonorrhoeae (*N, gonorrhoeae*), *K. pneumonia, S, flexneri* and *E. coli*. with best efficiency as antifungal, especially on Aspergillus fumigatus (*A, fumigatus*), Candida albicans (*C albicans*) and Geotricum candidum (*G, candidum*) [32,70]. The methanolic and aqueous extracts of A. compestris growing in Libya showed moderate antibacterial activities especially against Gram positive bacteria *S. aureus, B. subtilis*. In contrast they had weak antibacterial activities on *Salmonella* species and *E. coli* [71]. Another researchers observed Antibacterial activities of *A. campestins* methanolic extract as a maximum zone of inhibition against *S. aureus ,Streptococcus spp, E, coli* and

K, pneumonia [30].

Anti-inflammatory Activity

Regarding the anti-inflammatory activity of *Artemisia* species growing in Libya, we only obtained two references during our review. The studies that we obtained reported only the Anti-inflammatory Activity of ethanol extract and essential oil of *A. monosperma*. The ethanol extract and essential oil of this species exhibited a significantly high potency as anti-inflammatory agents. This remarkable effect of the ethanol extract of *A. monosperma* could be correlated to its relatively high terpenoid content anti-inflammatory activity [70]. The highest anti-inflammatory activity of essential oils of samples collected before flowering, and at the beginning and end of the flowering stage of *A. monosperma*, could be correlated to its relatively high monoterpenoid content viz., β-Pinene, Sabinene , β-trans-Ocimene and β-cis-Ocimene [32].

Effects of artamisia spp of fertility

From the results obtained in present review, the herbal extract of *A. herba alba* in the low dose had a beneficial effect on all parameters, with the exclusion of sperm morphology in rats [72] and another study in male rabbits found that an aqueous extract of *A. herba alba* candidum boosted sperm reproduction, significantly improving sperm speed, movement, and concentration. This is due to the action of the hormone testosterone, which stimulates and increase the number of divisions, thereby increasing the concentration of sperm [72]. These studies suggest that the traditional use of these herbs has an impact on male reproductive health. These studies also warn against overconsumption of *Artemisia*. Because it increases the activity of reproductive system cells, especially the parietal cells, thereby improving the quality of sperm and the concentration of testosterone hormone in plasma. The over activity of the cells of the reproductive system in turn leads to defective and severe testicular function. As the cells enlarge and develop into cancerous tumors.

CONCLUSION

Libya has broad and important plant wealth that needs to intensify research efforts. *Artemisia* is an important genus with a large variety of biological activities. Species of this genus possess an extensive range of pharmacological activities in addition immense potential for researchers and exploring it will lead to isolation and identification of new compounds which could be used in numerous medical applications. Exploring new species of *Artemisia* in Libya and study Their chemical components is essential. As the clinical efficacy of the previously discovered *Artemisia* species should be tested to obtain Better results against deadly diseases. It should also be taken into consideration to study the toxic effects of these plant.

Disclaimer

The article has not been previously presented or published, and is not part of a thesis project.

Conflict of Interest

There are no financial, personal, or professional conflicts of interest to declare.

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نظرا علي Artemisia sppالتي تنمو في ليبيا

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المستخلص

في جميع أنحاء العالم ، يكتسب العلماء اهتمامًا أكبر بالطب النباتي الآمن والأرخص والأكثر فعالية. تم استخدام Artemisiaفي الطب الشعبي من قبل العديد من الثقافات منذ أوقات طويلة. تهدف هذه المراجعة إلى تجميع المعلومات المتوفرة في الأدبيات حول .Artemisia spp ، التي تنمو في ليبيا. يشار إلى حالة المعرفة بالتصنيف ، وكذلك الطابع المورفولوجي ، والكيمياء النباتية ، والاستخدامات في الطب التقليدي ، وعمله الدوائي كمضادات للميكروبات ومضادات الالتهابات وتأثيره على الخصوبة من منظور الاستخدام الصناعي المحتمل. تم إجراء البحث الحالي باستخدام العديد من قواعد البيانات الإلكترونية بما في ذلك Science Direct و PubMed و Web of Science و Google Scholar و Scopus. تتضمن المراجعة الحالية معلومات محدثة عن الاستخدامات التقليدية ، والكيمياء النباتية ، وعلم العقاقير لنبات Artemisia sppالذي ينمو في ليبيا. يعتبر Artemisia مصدرًا غنيًا للمركبات الجديدة كيميائيًا ويحتاج إلى استراتيجيات فحص تفصيلية للتعمق في التأثيرات الدوائية لمكوناته النباتية على المستوى الجزيئي. توفر مقالة المراجعة هذه معلومات أولية وتعطي توجيهًا للبحوث الأساسية والسريرية على.Artemisia spp . ستساعد المعلومات المجمعة في هذه المراجعة الباحثين ورجال الصناعة على العمل في خط لاستكشاف إمكانات هذا المصنع والاستفادة منه لصالح المجتمع .Artemisia spp ، مصنفة في فئة مهددة بالانقراض بشكل خطير ، لذلك يجب بذل جهود متسقة لحماية هذه الأنواع النباتية من الانقراض.

الكلمات الدالة .Artemisia spp .ليبيا. الاستخدام التقليدي. علم العقاقير.