CZU: 582.998.1:581.4 **https://doi.org/10.59295/sum1(191)2026_41**

CONTRIBUTIONS TO THE STUDY OF SOME MEDICINAL SPECIES FROM THE *ACHILLEA* L. GENUS

Nina CIOCÂRLAN,
Moldova State University

The paper describes ten species of the genus *Achillea* L. (*A. ageratum* L. *A. clypeolata* Sibth. et Sm., *A. coarctata* Poir., *A. colina* L., *A. filipendulina* Lam., *A. grandifolia* Friv., *A. millefolium* L., *A. nobilis* L., *A. ochroleuca* Ehrh., *A. odorata* L.) introduced and studied in the "Al. Ciubotaru" National Botanical Garden (Institute) of the Moldova State University. The morphological characteristics of the plants, distribution area, the content of bioactive compounds and the therapeutic importance are presented. A brief analysis of the growth and development peculiarities of the plants under *ex situ* conditions is given. Allochthonous *Achillea* species have demonstrated a high adaptive potential to the pedoclimatic conditions of the Republic of Moldova. The plants consecutively perform all the phenological phases of the seasonal rhythm of development, including the vegetative period, budding, flowering and full seed maturation. They have a stable phenotype, and are long-growing plants, characterized by a long flowering period.

Keywords: *Asteraceae, Achillea, medicinal uses, biology, ex situ conservation.*

CONTRIBUȚII LA STUDIUL UNOR SPECII MEDICINALE DIN GENUL *ACHILLEA* L.

Lucrarea se referă la zece specii din genul *Achillea* L. (*A. ageratum* L., *A. clypeolata* Sibth. et Sm*., A. coarctata* Poir., *A. colina* L., *A. filipendulina* Lam., *A. grandifolia* Friv., *A. millefolium* L., *A. nobilis* L., *A. ochroleuca* Ehrh., *A. odorata* L.) introduse și cercetate în Grădina Botanică Națională (Institut) "Al. Ciubotaru" a USM. Sunt prezentate caracteristicile morfologice ale plantelor, arealul de răspândire, compușii bioactivi și importanța terapeutică. Este prezentată o scurtă analiză a particularităților de creștere și dezvoltare ale plantelor în condiții *ex situ.* Speciile alohtone de *Achillea* au demonstrat un potențial adaptiv înalt la condițiile pedoclimatice ale Republicii Moldova. Plantele realizează consecutiv toate fazele fenologice ale ritmului sezonier de dezvoltare, inclusiv stadiul pre-generativ, butonizare, înflorire și maturizarea deplină a semințelor. Sunt plante cu fenotip stabil, cu perioadă lungă de vegetație și faza de înflorire îndelungată.

Cuvinte-cheie: *Asteraceae, Achillea, utilizări medicinale, biologie, conservare ex situ.*

Introduction

One of the main areas of activity of the "Al. Ciubotaru" National Botanical Garden (Institute) (GBNI) is the introduction of new plant species, including those with economic value, and their maintenance in *ex situ* collections. The preservation of valuable medicinal and aromatic plants (MAPs) in the collections of the botanical gardens make possible their scientific research and, if necessary, supplementing natural sources of raw materials with those from culture, which contributes to reducing anthropogenic pressure on natural populations. Of scientific and practical interest, which has increased especially in the last decades, is the study of the biological peculiarities of growth and development of new allochthonous MAPs for the purpose of their introduction into culture. The large number of promising medicinal plants for the economic sector also includes *Achillea* species, being of great interest as natural sources of bioactive compounds.

The genus *Achillea* L. (family Asteraceae) includes about 150 species, widespread mainly in extratropical countries in the Northern Hemisphere, the Mediterranean region and Southwest Asia [8, 21]. In the spontaneous flora of Bessarabia, the genus *Achillea* L. is represented by 13 species [8]. *Achillea* species (Yarrow) are perennial herbaceous plants, 10-150 cm high. Stem erect or ascending. Leaves alternate, with the lamina usually pinnately divided. Anthodia 3-8(10) cm long, gathered in corymbiform inflorescences. Marginal flowers ligulate, female, white, yellow, rarely pink. Central flowers bisexual, actinomorphic; tubular ligules yellow or whitish. Fruit – compressed achene, cuneate-elongated, with two prominent whitish lateral ribs.

The genus *Achillea* L. includes important medicinal species, used for various therapeutic purposes such as antispasmodic, haemostatic, antioxidant and anti-inflammatory agents [22, 23]. Many *Achillea* species have a long history in traditional medicine, primarily used for wound healing, haemorrhages, and treating gastrointestinal issues, inflammation, fever, and menstrual disorders [1]. Even nowadays, many *Achillea* species are used in cosmetic applications, to treat wounds, acne, inflammation, and digestive problems. Although spontaneous populations of *Achillea* L. are widely distributed in the world, some of these species are becoming rare or threatened with extinction due to the pressure of excessive collections and the destruction of natural habitats. Of the five studied *Achillea* species, the pale-yellow yarrow (*A. ochroleuca*) is a rare species, included in the Red Book of the Republic of Moldova (3rd edition), with the status of a critically endangered species [12]. Compressed yarrow (*A. coarctata)* is also rare. In the Republic of Moldova is protected by the state [13, 16]. In this context, conservation through cultivation is one of the effective methods of protecting the genetic resources of rare medicinal plants.

This paper describes ten taxa of the genus *Achillea* L. introduced and studied in the Collection of Medicinal Plants of GBNI, the bio-morphological characteristics under *ex situ* conditions and their importance for the economic sector.

Material and methods

The research was conducted in 2020-2025. Ten medicinal species of the genus *Achillea* L. (*A. ageratum* L., *A. clypeolata* Sibth. et Sm., *A. coarctata* Poir., *A. colina* L., *A. filipendulina* Lam., *A. grandifolia* Friv., *A. millefolium* L., *A. nobilis* L., *A. ochroleuca* Ehrh., *A. odorata* L.) grown in the Collection of Medicinal Plants were selected as study objects. Mobilization of plant genetic resources of the genus *Achillea* L. was achieved through international seed exchange (*Index Seminum*) and from spontaneous flora (Table 1).

Table 1. Origin of germplasm sources of *Achillea* L. species

Scientific name	Origin of germplasm sources institution/year	
A. clypeolata	Botanical Garden Duisburg, Germany	2003
A. filipendulina	Botanical Garden of the University of Padua, Italy	2003
A. grandifolia	Botanical Garden of the University of Medicine and Pharmacy, Târgu-Mureș, Romania	2021
A. odorata	Munich Botanical Garden, Germany	2019
A. colina, A. nobilis, A. ochroleuca, A. millefolium	Spontaneous flora	2016
A. coarctata	Sector of rare plants within the National Botanical Garden	2025

The experiments into the acclimatization and introduction of new taxa were performed in the Experimental Sector of the Collection of Medicinal Plants (Laboratory of Plant Resources) within the GBNI. The establishment of the experimental plots (area of 10 m^2), the study of biological characteristics of plants under *ex situ* conditions were carried out according to the methodology accepted in the field [26]. During the growing season, agrotechnical procedures necessary to ensure normal plant development were carried out. Plant propagation through seedlings grown in heated greenhouses and by fragmentation of perennial plants in late autumn was performed. The nomenclature of taxa is given according to floristic works [8, 17] and international data networks [7, 21, 30].

Results and discussion

Long-term research into the introduction of medicinal plants within the Laboratory of Plant Resources of GBNI has led to the creation of plant generic complexes for comparative, complex and interdisciplinary studies in order to highlight promising species for the economic sector. Thus, over the last decades, the genera *Echinacea, Artemisia, Thymus, Teucrium, Digitalis, Scutellaria, Potentilla,* ***Achillea,*** *Mentha, Origanum, Salvia, Tanacetum, Vitex,* etc. have been enriched with new taxa of scientific and economic value [4, 5].

In the Medicinal Plant Collection, the genus *Achillea* L. is represented by 10 taxa: 5 allochthonous species (*A. ageratum*, *A. clypeolata, A. filipendulina*, *A. grandifolia, A. odorata*) obtained by the international seed exchange and 5 autochthonous species (*A. coarctata*, *A. colina*, *A. millefolium*, *A. nobilis*, *A. ochroleuca*) originating from the spontaneous flora.

Achillea ageratum

Achillea clypeolata

Achillea filipendulina

Achillea odorata

Achillea grandifolia

Fig. 1. The appearance of non-native species of Achillea in the Medicinal Plants Collection

Allochthonous species of *Achillea* introduced into the Medicinal Plant Collection

***Achillea ageratum* L.** (Sweet Yarrow). Perennial, herbaceous plant native to Europe [21]. Stems ascending, simple or branched, pubescent, woody at the base, 10-60 cm high. Leaves glabrouse or shortly hirsute, strongly glandular-punctate; the lower ones oblong-obovate, pinnatifid, lobes toothed; the upper ones sessile, oblong, obtuse at the apex, serrated. Corymbs with 15 or more capitula. Flowers yellow. The aerial part or inflorescences are used for medicinal purposes. In the conditions of the Botanical Garden it blooms in June-July (Figure 1).

***Achillea clypeolata* Sibth. et Sm.** (Balkan Yarrow) is an endemic to the Balkan Peninsula [21], widely cultivated in France and Czech Republic. It is a perennial, herbaceous plant, finely tomentose, 30-60 cm high. Stem simple, leafy. Leaves alternate, pinnatisect, smooth, densely tomentose, oblong linear; the basal ones petiolate, serrate pinnatifid; stem ones spaced, about 2 times longer than the internodes, the upper ones 1-2 cm long, sessile. Numerous anthodia, collected in corymbose inflorescences. Marginal flowers with golden-yellow ligules. Fruit – oblong-cuneiform achene. The aerial part (*Herba Achilleae clypeolatae*) or anthodia (*Flos Achilleae clypeolatae*) are used for medicinal purposes. In the conditions of the Botanical Garden it blooms in May-June.

***Achillea filipendulina* Lam.** (Fern-Leaf Yarrow) is a perennial, herbaceous plant, 40-70(120) cm high. Leaves linear, pinnate, lobed and serrated, hairy and rough. Tubular, trilobed, yellow flowers, grouped in corymb-type inflorescences. Fruit – elongated achene. It is native to Central and Southwest Asia; naturalized in Europe and North America [21]. The aerial part or inflorescences are used for pharmacological purposes. In the Botanical Garden conditions it blooms in June-July (Figure 1). The plants prefer sunny places with well-drained soil. It reproduces by seeds and vegetatively, by root fragmentation, in early spring or late autumn.

***Achillea grandifolia* Friv.** (Large-leaved Yarrow) is a robust herbaceous, perennial plant reaching 40–125 cm in height. Stem grey-green, woody at the base. Leaves aromatic, grey-green, deeply pinnatifid to pinnatisect. Inflorescences large, dense, flat corymbs, 5-20 cm across, contain 50-250 small flower heads. Each flower head has 4-5 white ray florets with a central yellowish disc. It is native to the Balkan Peninsula and Asiatic Turkey [21]. The aerial part or inflorescences are used for pharmacological purposes. Under ex situ conditions the plants bloom in June-July.

***Achillea odorata* L.** (Cream-flowered Sneezewort) is a perennial herbaceous plant, 12-30 cm high, pubescent. Stems few or numerous, erect or ascending, simple or, rarely, branched towards the top. Basal and lower stem leaves petiolate, oblong-elliptic, bi-pinnatisect; other sessile, pinnatisect, with equal lobules, dense, linear, entire, apex acute. Numerous anthodia, grouped in corymbose inflorescences. Marginal flowers are yellowish with shortened ligules. The distribution area includes France, Spain, Morocco, and Algeria [21]. In the conditions of the Botanical Garden it blooms in June-July (Figure 1). The leaves and flowers are used for medicinal purposes. Plants are easily propagated by seeds and in a vegetative way.

The chemical composition, therapeutic effects and medicinal uses of *Achillea* L. species introduced into the GBNI are presented in Table 2. The data presented reveal a significant therapeutic importance of *Achillea* species, so much so that in recent decades they have become the subject of many scientific studies.

Table 2. Medicinal importance of *Achillea* L. species.

Scientific name	Bioactive substances	Therapeutic effects	Medicinal applications
Achillea ageratum	flavonoids, essential oil [9]	analgesic, antipyretic anti-inflammatory	wounds, bleeding, digestive disorders (flatulence, dyspepsia), headaches
Achillea clypeolata	diterpenes, coumarins, phenolic compounds, flavonoids, volatile oil [29]	antibacterial, antimicrobial, antioxidant [25]	In folk medicine, it is used to treat haemorrhoids, wounds, gastrointestinal atony, urinary incontinence, kidney inflammation, amenorrhea, and liver diseases [29]
Achillea coarctata	essential oil, flavonoids, phenolic acids, sesquiter-pene lactones [1, 14]	anti-inflammatory cytotoxic and antimicrobial [11,14, 23]	gastrointestinal disorders, hypertension, menstrual effects [1]
Achillea colina	phenolic compounds	digestive, anti-inflammatory, analgesic, antipyretic and wound healing, cytoprotective, antioxi-dant [10, 23]	diuresis and urinary stone secretion, blood purification, skin condition, injuries, psoriasis, purulent ulcers, liver ailments, regulation of menstruation, bronchitis, asthma and throat ache [1]
Achillea filipendulina	volatile oil, bitter substances, tannins, flavonoids, phenolic acids, camphor, vitamins, and minerals [1, 31]	anti-inflammatory, antispasmodic, wound healing, antiseptic, antibacterial, antiviral, antifungal [31]	haemorrhoids, headache, cardiovascular illnesses [21], wound healing, gastrointestinal and gynaecological conditions, menopause, menstrual cramps, gout, hypoglycaemia, arthritis, eczema, and varicose veins [1]

Achillea grandifolia	essential oil, flavonoids, phenolic acids [1, 19, 28]	antioxidant, anti-inflammatory, antimicrobial, antiradical [6, 28]	wounds, abdominal pain, diarrhoea, flatulence, and menstrual disorders, often prepared as infusions or essential oils [28]
Achillea millefolium	volatile oil, flavonoids, terpenes, phenolic acids, sterols, saponins, amino acids, resins, bitter substances [31]	antispasmodic, anti-inflammatory, stomachic, bitter-tonic, haemostatic, astringent, estrogenic, carminative, antioxidant [20, 24]	hyperacid gastritis, enterocolitis, gastric ulcer, biliary dyskinesia, flatulence, diarrhoea, gynaecological and urinary diseases, urinary incontinence, bronchitis, haemorrhoids. Externally - eczema, purulent wounds, leucorrhoea, varicose ulcers [20, 31]
Achillea nobilis	flavonoids, tannins, vitamins, essential oil, phenolic compounds, flavone glycosides, phytoncides, organic acids [18, 27]	galactagogue, restorative, antibacterial, antifungal, antitumor. antispasmodic [15, 18, 23]	reproductive and cardiovascular system disorders, metrorrhagia, haemorrhoids, diarrhoea, abdominal pain, diabetes, eczema, wounds, dental illnesses [31]; animal parasites, skin wounds and infections [1]
Achillea odorata	phenolic compounds, flavonoids, essential oil [2]	wound healing, diuretic, carminative, antioxidant, cytotoxic, analgesic, anti-inflammatory [3]	rheumatism, skin inflammation, allergic rhinitis, wound healing and improvement of high blood pressure, gastrointestinal tract diseases, diarrhoea, abdominal pain and stomach-ache [2, 3]
Achillea ochroleuca	Insufficiently studied from the perspective of the content of biologically active substances and medicinal uses; phytochemical studies are necessary to highlight the chemical and therapeutic profile.		

***Achillea* species from spontaneous flora**

***Achillea coarctata* Poir.** (Compressed Yarrow) is a perennial, herbaceous plant, native to South-eastern and Eastern Europe to Turkey [21]. Plants 25-40 (70) cm high, densely pubescent tomentose. Rhizome vertical, long, many-headed with numerous roots. Stems solitary or several, erect, round, simple or branched. Basal and the lower cauline leaves petiolate, linear, those median linear or linear-lanceolate sessile, pinnatisect. Capitula many on a dense-pubescent peduncle, gathered in dense and strongly convex corymbose inflorescences, often semiglobular. Marginal floret ligules yellow, reniform. Fruit – achene cuneate-elongate. In the conditions of the Botanical Garden it blooms from late May to July. It is an aromatic and medicinal plant.

***Achillea collina* J. Becker ex Rchb.** (Mountain Yarrow) is an herbaceous plant, 25-60 cm high with creeping, multi-headed rhizome. Stems erect or slightly ascending from the base, simple or branched, often reddish. Leaves tri- pinnatisect, dark-green; the basal ones petiolate, linear or narrow-lanceolate. Middle and upper leaves sessile, linear, with sterile axillary shoots. Anthodia numerous, collected in corymbiform inflorescences. Marginal flowers with white or pale pink ligules. Fruit – achene elongate-wedge. The distribution area includes Central and Eastern Europe, the Mediterranean region [21]. The leaves and inflorescences are used for medicinal purposes. It blooms in June-September.

***Achillea millefolium* L.** (Common Yarrow) is an herbaceous, perennial plant native to Europe, Northern Asia to the Himalayas and North America [21]. Stem solitary or 3-5, erect or ascending from the base, simple or, rarely, branched at the top. Leaves are oblong-lanceolate, tri- pinnatisect, the upper ones bi-pinnatisect. Basal and lower cauline leaves petiolate; middle leaves sessile, often with sterile axillary shoots. Anthodia numerous, grouped in corymbiform inflorescences. Marginal flowers with white ligules, rarely pink, oval. Fruit – elongated achene. In the conditions of the Botanical Garden it blooms in June-July.

The aerial part (*Herba Millefolii*) or inflorescences (*Flores Millefolii*) are used for pharmacological purposes. The medicinal properties of the plant are worldwide recognized and it is included in the Pharmacopoeias of several European countries.

***Achillea nobilis* L.** (Noble Yarrow) is a perennial, herbaceous plant, 20-70 cm high, densely woolly, sometimes glabrescent. Solitary stem or 3-6 are erect or slightly ascending, simple or branched towards the top. Basal leaves and lower stem leaves petiolate, broad-ovate, ovate or oblong-elliptic, tri-penate-sectate; the others, pinnatisect, sessile. Numerous anthodia are grouped in convex corymbose inflorescences. Fruit – obovoid achene. The distribution area includes Europe up to Siberia and the Caucasus [21]. It is an aromatic, medicinal, spicy and ornamental plant. The aerial part and inflorescences are used for medicinal purposes. In the conditions of the Botanical Garden it blooms in June-July.

***Achillea ochroleuca* Ehrh.** (Pale-Yellow Yarrow) is a perennial, herbaceous plant, native to Central and Eastern Europe and the Balkan Peninsula [21]. Generative stems with spaced leaves, the lower ones petiolate, the others sessile, auriculate. Sterile stems with petiolate leaves. Leaves fine-pubescent or almost glabrous, linear, pectinate, segments linear or subulate-linear. Anthodia numerous, gathered in corymbiform, dense, convex inflorescences. Marginal flowers with pale-yellow ligules, elongated-round. Fruit – achene obovoid or almost oval. In the conditions of the Botanical Garden it blooms in May-June. It is a critically endangered species, included in the Red Book of the Republic of Moldova. The plant is insufficiently studied from the perspective of the content of biologically active substances and medicinal uses, requiring further biological and phytochemical studies to highlight the chemical and therapeutic profile.

Achillea plants can be propagated in several ways: by seeds, cuttings, or by dividing the plants. Yarrow seeds are sown in spring (for seedlings) and in autumn (directly into open ground). Spring sowing of yarrow begins around the end of February. In about 2 weeks the seedlings appear. At the stage of 2-3 true leaves, the plants are transplanted into individual pots. Yarrow seedlings are planted in open ground at the mid-May. Autumn sowing of yarrow is carried out in late autumn, shortly before the arrival of frost. Yarrow is very easily propagated by cuttings. The green cuttings (5-10 cm) with 2-4 developed buds are taken in the summer from mature plants. Once roots appear, the cutting can be immediately planted in its permanent location outdoors. It is recommended to divide yarrow every 3-5 years. The mature plant is divided into several sections and planted in a new location. The plants grow well in full sun and well-drained, nutrient-poor soil, requiring little water once established. *Achillea* species are drought and frost-resistant plants.

The field observations during several vegetation periods revealed the adaptive potential of non-native *Achillea* plants to local climatic conditions. Yarrow plants go through all stages of development, flowering and setting seeds annually. They have a stable phenotype, and are long-growing plants, characterized by a long flowering period (about 1.5 months). Based on the success of the introduction, yarrows have proven themselves to be highly hardy to the local climate. The high capacity for vegetative propagation ensures their classification in the group of resistant and very resistant in culture. Allochthonous species (*A. ageratum*, *A. clypeolata A. filipendulina*, *A. grandifolia, A. odorata*) under *ex situ* conditions achieve all phenological phases of the seasonal rhythm of development (vegetative stage, budding, flowering, seed maturation). The generative period culminates with abundant fruiting and the development of viable seeds, which demonstrates high adaptability to local pedoclimatic conditions. Propagation methods by seedlings grown in greenhouses and by dividing perennial plants in autumn and early spring are productive and allow the expansion of the crop. In the cultivated populations (in the case of all investigated species), the plants were not affected by diseases or pests. It must be mentioned that all studied *Achillea* species are distinguished by special decorativeness, abundant and long-lasting flowering, being also recommended for landscaping.

Conclusion

The literature survey revealed the high medicinal properties of the *Achillea* L. species introduced and studied in the National Botanical Garden. The results obtained during several vegetation periods showed the adaptive potential of allochthonous *Achillea* species to local pedoclimatic conditions. It has also been established that all ten species have a long growing season, with flowering occurring in mid-summer and

lasting for about 30–45 days. The spontaneous species have also grown well under cultivation conditions, as demonstrated by the improvement of some plant characteristics, such as a longer flowering period and higher morphological parameters than in natural populations. Due to a wide spectrum of pharmacological properties, the *Achillea* L. taxa introduced into the NBGI collections represent valuable sources of raw material with therapeutic importance, while representing, at the same time, important objects for further investigations, with particular attention to the conservation of natural resources in the case of rare species (*A. coarctata* and *A. ochroleuca*).

Bibliography:

1. BARDA, C., GRAFAKOU, M.E., TOMOU, E.M. SKALTSA, H. (2021). Phytochemistry and Evidence-Based Traditional Uses of the Genus *Achillea* L.: An Update (2011–2021). In: *Scientia Pharmaceutica*. 2021. 89(4), p. 50. https://doi.org/10.3390/scipharm89040050
2. BOUTENNOUN, H., BOUSSOUF, L., KEBIECHE, M. et al. *In vivo* analgesic, anti-inflammatory and antioxidant potentials of *Achillea odorata* from north Algeria. In: *South African Journal of Botany*. 2017. 112, p. 307-313. https://doi.org/10.1016/j.sajb.2017.06.004.
3. BOUTENNOUN, H., BOUSSOUF, L., RAWASHDEH, A. et al. *In vitro* cytotoxic and antioxidant activities of phenolic components of Algerian *Achillea odorata* leaves. In: *Arabian Journal of Chemistry*. 2017. 10(3), p. 403-409. https://doi.org/10.1007/S13596-017-0278-6
4. CIOCARLAN, N. Asteracee medicinale alohtone introduse și cercetate în Grădina Botanică Națională (Institut) “Al. Ciubotaru”. In: *Studia Universitatis Moldaviae (Seria Ştiinţe Reale şi ale Naturii)*. 2024, 1(171), p. 56-64. https://doi.org/10.59295/sum1(171)2024_07
5. CIOCARLAN, N. Diversitatea taxonomică a colecției de plante medicinale din Grădina Botanică Națională (Institut) “Al. Ciubotaru”. In: *Studia Universitatis Moldaviae (Seria Ştiinţe Reale şi ale Naturii)*. 2023, 1(171), p. 29-36. https://doi.org/10.59295/sum1(171)2023_04
6. DROBAC, M.M., KUKIĆ-MARKOVIĆ, J.M., MILENKOVIĆ, M.T. et al. The chemical composition, antimicrobial and antiradical properties of the essential oil of *Achillea grandifolia* aerial parts from Serbia. In: *Botanica Serbica.* 2021. 45, p. 233-240.
7. *Euro+Med PlantBase – the information resource for Euro-Mediterranean plant diversity*. Disponible: http://www.europlusmed.org [Accessed: 06.02.2026]
8. *Flora Basarabiei: (Plantele superioare spontane)*. A. Negru, Valentina Cantemir, V. Ghendov et al.; sub red. Andrei Negru. Chișinău: Universul. 2022. 5, p. 232-253.
9. GARSIA, M.D., PUERTA, R., MARTINEZ, S., SAENZ, M. Analgesic, antipyretic and anti-inflammatory effects of *Achillea ageratum.* In: *Phytotherapy Research.*1998. 11(5), p. 376-379.
10. GIORGI, A., BOMBELLI, R., LUINI, A. et al. Antioxidant and cytoprotective properties of infusions from leaves and inflorescences of *Achillea collina* Becker ex Rchb. In: *Phytotherapy Research*. 2009, 23(4), p. 540-5. https://doi.org/10.1002/ptr.2679
11. HEGAZY, M-E.F., ABDEL-LATEFF, A., GAMAL-ELDEEN, A.M. et al. Anti-inflammatory activity of new guaiane acid derivatives from *Achillea coarctata*, In: *Natural Product Compounds*. 2008. 3, p. 851-856. https://doi.org/10.1177/1934578X0800300604
12. IZVERSCAIA, T., GHENDOV, V., CIOCÂRLAN, N. *Achillea ochroleuca* Ehrh. In: Red Book of the Republic of Moldova. Plants and Animals, 3rd Edition, Chisinau: Știința, 2015, p. 21.
13. IZVERSCAIA, T., GHENDOV, V., CIOCARLAN, N., BARANCEAN, C. Synopsis on genus *Achillea* L. (Asteraceae Dumort.) in the flora of Dniester-Prut River region. In: *Journal of Botany*. 2020. 1(20), p. 36-52. DOI: https://doi.org/10.5281/zenodo.4095778
14. KARAALP, C., YURTMAN, A.N., YAVASOGLU, U.K. Evaluation of antimicrobial properties of *Achillea* L. flower head extracts. In: *Pharmaceutical Biology*. 2009. 47(1), p. 86-91. https://doi.org/10.1080/13880200802448682
15. KARAMENDERES, C., APAYDIN, S. Antispasmodic effect of *Achillea nobilis* L. subsp. *sypulea* (O. Schwarz) Bassler on the rat isolated duodenum. In: *Journal of Ethnopharmacology*. 2003. 84(2-3), p. 175-179. https://doi.org/10.1016/s0378-8741(02)00296-9

16. *Legislația ecologică a Republicii Moldova* (1996-1998). Chișinău: Societatea Ecologică «BIOTICA», 1999, 233 p.
17. NEGRU, A. *Determinator de plante din flora Republicii Moldova*. Chișinău: Universul. 2007. p. 248.
18. OZDEMIR, F.A. Potential Effects of Essential Oil Compositions on Antibacterial Activities of *Achillea nobilis* L. subsp. *neilreichii*. In: *Journal of Essential Oil-bearing Plants*, 2019. 22(2), p. 574-580. https://doi.org/10.1080/0972060X.2019.1623722
19. OZEK, G. Phytochemical Characterization of *Achillea grandifolia* Friv. Essential oil and its potent against oxidative damage, acetylcholinesterase and α-amylase. In: *Applied Sciences and Engineering*. 2018. 19(3), p. 671-684. https://doi.org/10.18038/aubtda.392366
20. *PFAF. Plants for a Future Database* (2010-2025). Disponible: https://pfaf.org/user/plantsearch.aspx [Accessed: 06.02.2026]
21. *POWO (Plants of the World Online)* 2025. The Royal Botanic Gardens, Kew. Disponible: https://powo.science.kew.org/ [Accessed: 06.02.2026]
22. RAHIMMALEK, M., SAYED TABATABAEI, B.E., ETEMADI, N. et al. Essential oil variation among and within six *Achillea* species transferred from different ecological regions in Iran to the field conditions. In: *Industrial Crops Production*. 2009. 29, p. 348-355. https://doi.org/10.1016/j.indcrop.2008.07.001
23. SAEIDNIA, S., GOHARI, A., MOKHBER-DEZFULI, N., &KIUCHI, F. A review on phytochemistry and medicinal properties of the genus *Achillea.* In: *Journal of Faculty of Pharmacy, Tehran University of Medical Sciences*. 2011. 19(3), p. 173–186.
24. SCARLAT, M. A., TOHANEANU, M. *Bazele fitoterapiei*. Ploiesti, World Galaxy, 2009, 643 p.
25. SIMIC, N., PALIC, R., RANDJELOVIC, V. Composition and antibacterial activity of *Achillea clypeolata* essential oil. In: *Flavour and Fragrance Journal*. 2005. 20(2), p. 127-130. https://doi.org/10.1002/ffj.1391
26. SPARKS, T.H.; MENZEL, A.; STENSETH, N.C. European Cooperation in Plant Phenology. *Climate Research*. 2009. 39, 12 p.
27. TASKIN, D., TASKIN, T. Phenolic composition and biological properties of *Achillea nobilis* L. subsp. *neireichii* (Kerner) Formanek. In: *Industrial Crops and Products*. 2018. 111, p. 555-562. https://doi.org/10.1016/j.indcrop.2017.11.022
28. TSIFTSOGLOU, O.S., ATSKAKANI, M.E., KRIGAS, N. et al. Exploring the medicinal potential of *Achillea grandifolia* in Greek wild-growing populations: Characterization of volatile compounds, anti-inflammatory and antioxidant activities of leaves and inflorescences. In: *Plants*. 2023. 12(3), p. 613. https://doi.org/10.3390/plants12030613
29. WERNER, I., MUCAJI, P., PRESSER, A., GLASL, S. Sesquiterpenes and phenolic compounds from *Achillea clypeolata*. In: Zeitschrift für Naturforsch., 2007. 62b, p. 267-271. http://www.znaturforsch.com/ab/v62b/62b0267.pdf
30. WFO (2026): *Achillea* L. Disponible: http://www.worldfloraonline.org/taxon/wfo-4000000214. [Accessed: 06.02.2026]
31. *Дикорастущие полезные растения России*/Отв. ред. Буданцев А. Л., Лесиовская Е. Е. СПб.: Издательство СПХФА. 2001, стр. 66-68. ISBN 5-8085-0124-5.

N. B: *The research was carried out within the framework of Subprogram 010101 "Research and ex situ and in situ conservation of plant diversity in the Republic of Moldova"*

Data about author:
Nina CIOCÂRLAN, PhD, coordinating scientific researcher, National Botanical Garden (Institute) "Al. Ciubotaru", Moldova State University.
ORCID: 0000-0002-9477-5848
E-mail: nina.g.ciocarlan@gmail.com

Presented: 11.02.2026
Reviewed: 18.03.2026
Accepted for publication: 20.05.2026