Prospects for the use of plants of the genus Melkolepestnik in medicine

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Prospects of use in medicine for Erigeron L. genus plants

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SUMMARY

This paper provides an analytical review of the literature data and the results of our own studies of plants of the genus Erigeron L. (canadian small petals, caustic petals, annual small petals) growing in the territory of Central Russia as sources for obtaining herbal medicinal products.

Key words: canadian small petals, caustic petals,annual small petals, chemical composition, use in medicine.

RESUME

An analytical review of the literature and results of our studies of the genus Erigeron L. (E. canadensis L., E. acer L., E. annuus L.) growing in Central Russia as a source for medicinal herbal remedies are provided in this paper.

Keywords: Erigeron canadensis L., Erigeron acer L., Erigeron annuus L., chemical composition, application in medicine.

Introduction

The study of medicinal plants of traditional medicine in order to create phytopreparations on their basis is an urgent problem for modern domestic pharmacy. When introducing these plants into medical practice, it is necessary to carry out a whole complex of studies aimed at identifying the relationship between the biologically active substances in the plant and their possible pharmacological activity.

The genus Erigeron L. (Small-petal) has about 200 species, common in Europe, Asia and America. Of these, about 70 species of small petals are found on the territory of the Russian Federation and the CIS countries. According to the literature, on the territory of the Central Chernozem region grow and form significant reserves of canadian small petals, caustic petals and annual petals [11, 19, 21].

The aim of this work is to systematize data on chemicalcomposition and use in medicine of the studied plants of the genus Erigeron L.

The rather limited use of the studied small petals in folk medicine and the lack of their use in official medicine testifies to the low phytochemical knowledge of the plants in question. species

The Canadian small-petal has been studied to a greater extent. The essential oil content varies from 0.29 to 1.14%. It contains: (+) - limonene, (+) - α-terpineol, linalool, matrix ester (methyl decadiene-2,8-diin-4,6-oate), lacnophyll ester (methydecene-2-diin-4, 6-oat), methyl ester of matrixaric acid, dehydromatricarial ester [32, 37]. The content of essential oil in the aerial part of the plant is in the range of 0.3–0.7%, limonene - 85%, terpineol, and aldehydes are determined in its composition [23].

The presence of acyclic compounds was established: (Z) -jasmon, 2,6-dimethyl-6-(4-methyl-3-pentynyl) bicyclo [3.1.1] hept-2-ene, (1S, 2R, 3R, 5S, 7R) methyl 7-kooyloxymethyl-2-hydroxy-3-feruloyloxy-6,8-dioxabicyclo [3.2.1] octane-5-carboxylate, (1S, 2R, 3R, 5S, 7R) -methyl-7-feruloyloxymethyl-2-hydroxy-3feruloyloxy-6,8-dioxabicyclo [3.2.1] octane-5-carboxylate [22].

Among the detected triterpenoids: 3β, 16β, 20β-trihydroxytaraxast-3-O-palmitoyl ether, 3β-hydroxyolean-12-ene-28-ovic acid, 3β-erythrodiol, Fridelin; the following triterpenoids were found in the aerial part of the canadian small petal: α-amyrin, β-amirin, epifridelinol, oleanolic acid, erigeronol [22]. Canadian small petals contain mono- and sesquiterpenoids: (4Z, 8Z) -matricaria-γ-lactone, (4E, 8Z) -matricaria-γ-lactone identified in the roots, in the aerial part of the plant found: α-pinene, β-pinene, sabinene , myrcene, (Z) -β-ocymene, (E) -β-ocymene, α-terpinolene, p-menta-1,3,8-triene, p-menta-1,5,8-triene, terpinen-4-ol , Δ_3-caren, cis-carveol, trans-carveol, (S) -carvone, β-maalien, β-cubeben, β-elemene, δ-elemene, β-patchoulene, isocomene, (E) -caryophyllene, β-caryophilene, ar-curcumen, trans-α-bergamotene, geranylacetone, α-humulene, (E) -β-farnesene, γ-muurelen, germacrene A, germacrene D, germacrene D-4-ol, bicyclohermacrene, cingiberen, α-cingiberen, (E, E) -α-farnesene, β-bisabolic, β-sesquifellandrene, 6,14-oxidoacor-4-ene, cis-sesquisabinene hydrate, (E) -nerolidol, α-cadinol, α-bisabolol, spatulenol, isospatulenol, zest-8 (15) -en-9α-ol [22]; lipids: mono- and polyunsaturated fatty acids (9,12,13-trihydroxy-10 (E) - octadecene); lactones: furanone [35]. Steroids: α-spinasterol, stigmast-7-en-3β-ol, stigmast-7,12-dien-3-one, stigmast-7-en-3-one, 3-O-β-D-glucoside β-sitosterol ... Steroids in aerial plant organs are represented by α-spinasterol, β-sitosterol, and 3-O-β-D-glucopyranoside spinasterol [22, 23]. Saponins, ascorbic acid, gallic acid, carotenoids are found in the leaves. Five sphingolipids, stigmasterol, β-sitosterol-3-o-β-D-glucopyranoside, harmine [44]. There is data on the content of rubber in the plant. In the aerial part, cumulene, phenol carboxylic acids (vanillic, caffeic, chlorogenic, p-hydroxybenzoic acid, 3,5-dihydroxybenzoic acid, 3,5-dimethoxybenzoic acid), organic acids (succinic) were found, the total sugar content is 6.37% [22, 23]. Alkaloids are found in the leaves, underground and aboveground parts of the plant, saponins - in the underground part of the plant, stems and leaves. O-benzyl benzoic acid is identified in stems and leaves. Tannins are found in stems, leaves (0.2–0.3%) and flowers (0.3%). Flavonoids: flavones - 0.83%, apigenin, syringic acid, scutellarein, scutellarin, conisoflavone, luteolin, 7-O-β-D-luteolin glucuronide, 3-O-β-D- There is data on the content of rubber in the plant. In the aerial part, cumulene, phenol carboxylic acids (vanillic, caffeic, chlorogenic, p-hydroxybenzoic acid, 3,5-dihydroxybenzoic acid, 3,5-dimethoxybenzoic acid), organic acids (succinic) were found, the total sugar content is 6.37% [22, 23]. Alkaloids are found in the leaves, underground and aboveground parts of the plant, saponins - in the underground part of the plant, stems and leaves. O-benzyl benzoic acid is identified in stems and leaves. Tannins are found in stems, leaves (0.2–0.3%) and flowers (0.3%). Flavonoids: flavones - 0.83%, apigenin, syringic acid, scutellarein, scutellarin, conisoflavone, luteolin, 7-O-β-D-luteolin glucuronide, 3-O-β-D- There is data on the content of rubber in the plant. 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quercetin glucopyranoside, in the aerial part - rutin, baicalin, quercetin, 3-O-α-L-rhamnoside of quercetin, 4'-hydroxyvogonin-7-O-β-D-glucuronic acid glucoside; flavonoids have been identified in stems and leaves [22, 23].

The chemical composition of caustic and annual small petals was studied mainly in relation to the aboveground parts of plants. Derivatives of polyphenolic and phenolic acids have been identified in the roots [36]. Flavonoids, phytosterols, di- and tri-sesquiterpenes were isolated from the aerial part of the caustic petals [34, 38, 52]; studied amino acids [14], organic acids [20], polyphenolic compounds [28] and polyenes [16, 29]. Various studies have shown the content of annual derivatives of γ-pyranone [42, 48], flavonoids [30], polysaccharides [27], phenolic acids and their derivatives [30], sesquiterpenoids [39] and cyclopentenone derivatives [39] in the aerial part of the small petals.

The first report on the volatile components of caustic petals and annual petals dates back to 1950, when N. Sorensen and K. Stavholt isolated the ether of lacnophyll from the essential oil of flowers and the rest of the aerial part of caustic petals [50]. In the essential oil obtained from different parts of the annual small petal, the presence of matrix ether and lacnophyll ether was established [51]. In a recent study, over 60 components were identified from the petals acrid herb essential oil. Most were monoterpene and sesquiterpene hydrocarbons. Polyacetylene compounds have also been identified; the content of lacnophyll ether was 0.1%, and the content of matrix ether in the amount of α-muurelene was 6.0% [45]. In essential oil obtained from various parts of the annual small petal, the presence of a total of 44 components was determined, in particular, monoterpene and sesquiterpene hydrocarbons, two polyacetylene compounds (lacnophyll ester and matrix ester) and organic acids [43]. Also, the essential oil of small petal herb has been studied in various stages of the plant's vegetation. More than 60 components have been identified (monoterpenes, sesquiterpene hydrocarbons, oxygen-containing sesquiterpenes, polyacetylene compounds). In all cases, germacrene-D was the main component [34]. In the composition of the essential oils of the roots of the caustic and small petals of the annual, 54 and 47 components were identified, respectively. The yield of essential oil for the roots of the caustic petals and the annual petals was 1.0 and 0.05% of the raw material, respectively. The predominant components of the essential oils of the roots of the canadian petal and caustic petals: matrix ether (49.4 and 45.9%, respectively), lacnophyll ether (37.2 and 27.5%, respectively). The content of the sum of polyacetylene components is 92.1% in the essential oil of the roots of the small petal caustic and 85.8% in the essential oil of the roots of the petal annual. Hydrocarbons of the monoterpene series are contained in the essential oil of the roots of small petals caustic and annual in an amount of 4.2 and 5.8%, respectively. The prevailing sesquiterpenes for small petals are tricyclic sesquiterpene hydrocarbons, for small petals - β-sesquifelandrene and β-bisabolic [40]. The content of the sum of polyacetylene components is 92.1% in the essential oil of the roots of the small petal caustic and 85.8% in the essential oil of the roots of the petal annual. Hydrocarbons of the monoterpene series are contained in the essential oil of the roots of small petals caustic and annual in an amount of 4.2 and 5.8%, respectively. The prevailing sesquiterpenes for small petals are tricyclic sesquiterpene hydrocarbons, for small petals - β-sesquifelandrene and β-bisabolic [40]. The content of the sum of polyacetylene components is 92.1% in the essential oil of the roots of the small petal caustic and 85.8% in the essential oil of the roots of the petal annual. Hydrocarbons of the monoterpene series are contained in the essential oil of the roots of small petals caustic and annual in an amount of 4.2 and 5.8%, respectively. The prevailing sesquiterpenes for small petals are tricyclic sesquiterpene hydrocarbons, for small petals - β-sesquifelandrene and β-bisabolic [40].

In the course of studying plants of the flora of Ukraine in small-petaled grass

Canadian, small-petal annual and small-petal caustic among substances of polyphenolic nature, the presence of phenol carboxylic acids has been established: protocatechuic, caffeic, chlorogenic, neochlorogenic, isochlorogenic; coumarins: umbelliferone, scopoletin; flavonoids: apigenin, luteolin, quercetin, isorhamnetin, cinaroside. The quantitative content of the sum of flavonoid compounds for canadian small petals, annual and caustic is: 2.56%, 2.45% and 2.71%, respectively; the sums of hydroxycinnamic acids: 6.01%, 9.57% and 5.72% for canadian small petals, annual and caustic, respectively. The chemical composition of the polysaccharide complex of the herb of canadian small-petal, annual and caustic was determined: D-glucose, D-galactose, L-rhamnose, L-arabinose, D-xylose, D-glucuronic acid. The quantitative content of the polysaccharide complex is: 6.86%, 4.06% and 3.81% for canadian small petals, annual and caustic, respectively. The presence of 16 amino acids in these types of small petals has been established. The quantitative content of the sum of amino acids is: 1.51%, 1.49% and 1.27% for canadian small petals, annual and caustic, respectively. The presence of β-sitosterol and 19 fatty acids in these plants was established. Macro- and microelement composition is presented: Na, K, Ca, Mg, Fe, Cu, Mn, Zn, Cd, Ni, Cr, Co. Vitamins: B respectively. The presence of β-sitosterol and 19 fatty acids in these plants was established. Macro- and microelement composition is presented: Na, K, Ca, Mg, Fe, Cu, Mn, Zn, Cd, Ni, Cr, Co. Vitamins: B respectively. The presence of β-sitosterol and 19 fatty acids in these plants was established. Macro- and microelement composition is presented: Na, K, Ca, Mg, Fe, Cu, Mn, Zn, Cd, Ni, Cr, Co. Vitamins: B_1, B_2, PP, A, P [24]. We have carried out a systematic analysis of plants of the genus small-petals: small-petals of Canada, small-petals of caustic and small-petals of the annual, growing in the Central Black Earth regions of the Russian Federation. The phytochemical study revealed the presence of substances of various structures, both primary (polysaccharides, amino acids, higher fatty acids, alcohols, alkanes) and secondary metabolism (terpenoids, sterols, carotenoids, chlorophylls, derivatives of 2-phenyl-benzo-γ-pyrone and benzo -α-pyrone, phenol carboxylic acids, tannins, various organic acids), as well as mineral elements [3, 4].

The components of the lipophilic fraction of the herb of the studied species of small petals were studied using the gas chromatography-mass spectrometric method of analysis (CMS). For the first time, the presence of 52, 31 and 37 substances, respectively: higher fatty acids, sterols, alcohols, alkanes, terpenoids, was established in the lipophilic fraction of the canadian small petals, caustic petals and annual petals [9, 10].

The presence of 22, 16 and 17 polyphenolic substances, respectively, was established by the method of high-performance liquid chromatography (HPLC) in alcohol-water extracts of canadian small petals, caustic petals and annual petals. For the first time identified for the Canadian small petals are: chicory, cinnamic, ferulic acids, hesperidin, hyperoside, dihydroquercetin (taxifolin), epigallocatechin gallate, epicatechin, catechin, dihydrocoumarin; for caustic petals: chicory, ferulic acids, taxifolin, vitexin, tannin, coumarin, dihydrocoumarin; for the annual small petals: gallic, chicory, ferulic acids, rutin, taxifolin, vitexin, tannin, coumarin, dihydrocoumarin, 3-methoxycoumarin [13]. For the first time in a water-soluble polysaccharide complex (VPSC) of the herb of small petal canadian,

annual, 27, 20 and 39 substances were identified using CMS, respectively: monosaccharides of acyclic and cyclic (pyranose, furanose) structures, uronic, inorganic and organic acids [12].

The presence of at least 15 amino acids in all studied species of small petals was established, 9 of which are irreplaceable. The content of amino acids in the herb of canadian small petals varies from 0.05% (methionine) to 0.66% (glutamic acid); in the herb of one-year-old small petals from 0.07% (valine) to 0.53% (glutamic acid); in the herb of caustic petals from 0.04% (alanine) to 0.56% (serine) [1].

The macro- and microelement composition was determined, while for the first time for the studied plants of the genus small petals the presence of the following elements was established: P, Al, Si, Pb, Ag, Mo, Ba, Sr, B, Ti, V, Zr, Ga, Be [26] ... The quantitative content in the grass of the studied species of small petals of pigments (carotenoids and chlorophylls), flavonoids, organic acids, including amino acids, tannins, VPSA and pectin substances, has been established.

The content of carotenoids in the herb of the small-petal caustic and small-petal annual was 35.65 ± 1.03; 38.22 ± 0.90 and 21.98 ± 0.62 mg / 100 g; chlorophyll content - 43.21 ± 0.82; 53.78 ± 1.67 and 39.06 ± 0.66 mg / 100 g, respectively [2, 8]. The quantitative content of the sum of flavonoids in the raw material in terms of rutin was 1.92 ± 0.03%; 2.11 ± 0.04% and 1.58 ± 0.03% for canadian small petals, caustic petals and annual petals, respectively [6]. The quantitative content of VPSA in the herb of canadian small petals, caustic petals and annual petals is: 4.91 ± 0.15%; 4.99 ± 0.23% and 6.98 ± 0.29%, respectively. The content of PV in the grass of canadian small petals, caustic petals and annual petals is 8.20 ± 0.40%; 3.63 ± 0.16% and 5.05 ± 0.18%, respectively [12]. At the moment, the studied species of small petals have not found wide application in medicine. There is evidence of the use of these plants in traditional medicine.

Small-petal Canadian shows a weakly expressed tonic effect and a more pronounced diuretic, astringent effect. The infusion is used for diarrhea, urolithiasis, diabetes, edema, childhood dysuria, painful urination and many other renal pathologies. For many years, canadian small petals have been used to treat diarrhea and cholera in children. The infusion of a fresh plant was used not only to prevent diarrhea, but also to compensate for fluid lost during exhaustive dehydration. The infusion is useful for bleeding of the esophagus, intestines, bladder and kidneys, as well as in cases of metrorrhagia, with rejection of placental fragments, passive bleeding, ulcerative colitis, can be applied hot or cold and be sweetened. Local infusion is used for leukorrhea [7]. The tonic effect of the plant on the intestinal wall is used for intestinal perforation, digestive discomfort and food allergies [49]. In Africa, canadian small petals are used to treat ringworm and eczema [49]. In Korean folk

medicine, a decoction, infusion, tincture of the roots of small-petal canadian is used as an analgesic, antipyretic, diuretic, as well as for radiculitis, arthritis, gout, neuralgia, beriberi disease, headaches, hypertension, infectious hepatitis [23]. Extracts (petroleum ether, ethanol) from the aerial part of canadian small petals exhibit pronounced anti-inflammatory activity in rats with various types of edema [41].

Essential butter small petals Canadian is an hemostatic, stimulating, carminative. Shows a strongly pronounced effect on the systems of the body during bleeding, for the prevention of which it is mainly used. Small petal canadian oil is effective for all types of bleeding, but especially for uterine bleeding. When combined with 5 or 6 parts castor oil or dope ointment, it is a good way to apply dressings and compresses [49].

Essential oil from canadian small petals also has an astringent effect and can be used topically (mixed with goose fat) for hemorrhoids, also for rheumatism, furunculosis, tumors, sore throat and tonsillitis, in acute gonorrhea - in the form of a syrup. Also, the essential oil from canadian small petals is suitable for use in the perfumery and food industries [23, 37].

In the experiment, polyphenol-polysaccharide anticoagulant complex possesses thrombolytic properties, anti-inflammatory. The extracts exhibit cytotoxic activity - against HeLa, A431, and MCF-7 cells (carcinoma), erigeronol - against B16 cells (melanoma) [22].

Biological activity determined dry aquatic extracts canadian small petals, annual small petals and caustic petals, showing antidiarrheal and antioxidant effects against the background of analgesic and anti-inflammatory activity [24]. The drug "Erikan" (granules) has been developed on the basis of a water-soluble complex obtained from the aerial part of the canadian small petals, which belongs to the group of antidiarrheal agents. The drug has cytoprotective and anti-inflammatory properties, restoring the morphofunctional state of the intestine, disturbed by diarrhea. In addition, the use of Erikan is characterized by a decrease in the motor-evacuation function of the intestine, the normalization of absorption and digestion in the small intestine [18].

As a result of pharmacological studies, it has been established that complexes of biologically active substances (BAS) of canadian small petals (alcohol-water, lipophilic extracts, VPSA) exhibit pronounced analgesic and anti-inflammatory activity. For the first time on the model of pyelonephritis it was found that the studied complexes of biologically active substances accelerate the normalization of renal excretory function, reduce the intensity of oxidative processes, and contribute to an increase in the humoral form of the immune response, which determines the possibility of further studies of biologically active substances complexes from the herb of canadian small petals in the treatment of pyelonephritis [5, 15, 17, 25]. Medicinal properties of small petals

annuals are similar to canadian small petals, and they can be interchangeable; however, the annual small petal exhibits a less diuretic and more pronounced astringent effect than the canadian small petal [33]. In Chinese folk medicine, the annual petal is used to treat indigestion, enteritis, hepatitis, and hematuria [46]. Chloroform and hexane extracts of the roots of small petal annual show a moderate antiproliferative effect on MCF7 cells [31]. Small petals caustic exhibits hemostatic properties. The aerial part of the plant is used for female diseases and as an anti-inflammatory agent. In the case of external use, caustic petal is characterized by analgesic efficacy and is recommended for tonsillitis, abscesses. The leaves of the plant are beneficial for heartburn. In Tibetan medicine, small petal flowers are used for fever [23]. In Italian folk medicine, the roots of small petal caustic are used mainly topically, for toothache, bruises and arthritis [47]. The ether and ethyl acetate extracts of the roots of small petals acrid show weak antioxidant activity [36]. The results presented substantiate the further study of the efficiency of using extracts from Canadian small petals, annual small petals and caustic petals in order to create phytopreparations on their basis.

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