BIODIVERSITY AND HEALING ACTIVITIES OF MEDICINAL PLANTS IN THE AREA OF KAMCHIA NATURE COMPLEX

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ABSTRACT

INTRODUCTION: Kamchia Nature Complex is part of the wetlands of importance in Bulgaria and has a global significance for preserving Europe's unique freshwater swamp forests also known as flooded (floodplain) forests (Bulgarian, Turkish: longoz).

AIM: The study aims to bring up to date the list of medicinal plants in the area of Kamchia Nature Complex and to create a present-day database of their ecological and biological characteristics, floral elements, conservation significance and status. In addition, this study is designed to collect data available on the healing properties, usable parts, and the groups of diseases these medicinal plants are applicable for.

MATERIALS AND METHODS: Field surveys were conducted during the 2013–2015 vegetation seasons applying enroute survey methods.

Floristic analysis was performed by the Tolmachev's method (1974).

Species were determined by "Flora of the Republic of Bulgaria" and "Identification. Guide to Higher Plants in Bulgaria".

RESULTS AND DISCUSSION: We have identified 183 species of medicinal plants out of 435 species of higher plants. The established medicinal plants refer to 60 families and 150 genera. The prevailing biology type is the herbaceous perennial plants—102 species (56%). The mesophyte plants occupy dominant position in terms of moisture and humidity as a factor—91 species (50%).

Floristic analysis reveals Eurasian geo-elements as being predominant—34 (19%), with 60 (33%) species of different types of Mediterranean distribution.

Species of conservation significance represent 20% of medicinal plants.

The established medicinal plants have more than 30 species of healing activities, one third of which is used primarily for treatment of gastrointestinal and respiratory diseases. Species in which the above ground portion of the plant is collected for its plant substance constitute half of the established medicinal plants.

CONCLUSION: Survey results reveal a considerable variety of medicinal plants in Kamchia Natural Complex area. They feature a variety of healing properties and are applicable for a wide range of diseases.

Keywords: *wetlands, medicinal plants, Kamchia Nature Complex*

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Received: November 7, 2020
Accepted: December 15, 2020

INTRODUCTION

Kamchia Nature Complex is part of the wetlands of importance in Bulgaria and has a global significance for preserving Europe's unique freshwater swamp forests also known as flooded (floodplain) forests (Bulgarian, Turkish: longoz) (1). Kamchia river floodplain around the river's estuary and its downstream are in the Red List critically endangered category wetlands in Bulgaria with Identification No. 0985; Kamchia River estuary and Maznia Azmak flooded area are in the vulnerable wetlands category with Identification No. 9010 and No. 0758 (2).

Intensive floristic studies of Kamchia Nature Complex area were carried out within the 1992–1994 period as part of the North Wetlands Coastal Area project of the Bulgarian-Swiss Biodiversity Conservation Programme (BSBCP) (3). However, there is limited evidence and few publications on the biological diversity of medicinal plants in the area (3,4,5).

AIM

The present study is part of a larger survey of the biological diversity of medicinal plants of the Northern Black Sea wetlands in Bulgaria and aims to supplement the available research data on medicinal plants in the Kamchia Nature Complex. We take aim to create an up-to-date database of their ecological and biological characteristics, floral elements, conservation significance and status. Along with it we collected data on the healing activities and usable parts of the established medicinal plants, together with data on the diseases they are applicable for.

MATERIALS AND METHODS

The surveyed territory is located approx. 20–25 km south of Varna and stretches east of the Varna–Burgess route to the village of Staro Oryahovo. It includes floodplain forests known as "Bulgarian Longoz, extensive areas of sandy dunes and a beach strip, shrub and grasslands, freshwater marshes and marine aquaria, as well as adjacent fishponds" (3).

Field surveys were conducted during the 2013–2015 vegetation seasons applying enroute survey methods.

Floristic analysis was performed by the Tolmachev's method (1974) (6).

Species were determined by "Flora of the Republic of Bulgaria" (7,8,9,10,11) and "Identification. Guide to Higher Plants in Bulgaria" (12).

Florigenic analysis of the species was done according to the classification of Asyov and Petrova (2006) (13).

Status of medicinal plants was determined by the Medicinal Plants Act (2000, 2014) (14) and the National Strategy for Biodiversity Conservation (15).

The conservation status of species was defined at national level according to the "Red Data Book of Bulgaria" (16), the Biological Diversity Act (2002, 2007) (17), Order RD-83 of 03.02.2014 (18), and at an international level as defined in Lucas (1983) (19), the IUCN Red List (2014) (20), Appendix 1 to the Convention on the Conservation of European Wildlife and Natural Habitats (21) and the Appendices to the Convention on International Trade in Endangered Species of Wild Fauna and Flora (22). Endemism was presented at the level of Balkan and Bulgarian endemics according to "Balkan Endemics in the Bulgarian Flora" (23) and "List of Bulgarian Endemic Plants" (24).

Phytotherapeutic properties of the plants were described as per Petkov (1982) (25), Asenov (1988) (26), and Nikolov (2006) (27); the applications in traditional medicine were according to Petkov (1982) (25).

RESULTS AND DISCUSSION

We identified 435 species of higher plants in the Kamchia Nature Complex area. We determined 183 species or 42% of the flora as medicinal plants. Of these, 173 (40%) were medicinal plants as per the Medicinal Plants Act (2000, 2014) and 84 species (19%) were classified as medicinal plants according to the National Strategy for Biodiversity (14, 15, Hardalova et al. 1994). They accounted for 42% of the area's higher flora community and 24% of the wild plants in Bulgaria.

The medicinal plants established for the area belonged to 60 families and 150 genera. Families with the greatest number of species were: Asteraceae—21 (11%), Lamiaceae—13 (7%), Fabaceae—12 (7%), Rosaceae—11 (6%), Apiaceae—10 (5%), Ranunculaceae—7 (4%), Scrophulariaceae—7 (4%), and Polygonaceae—6 (3%), accounting for 47% of the established species. There were 9 less represented families

with 4 species each, 4 families with 3 species each, 10 families with 2 species, and 28 families were represented by 1 species each. Apart for Poaceae, Ranunculaceae, and Polygonaceae, the rest of the families were duly represented with regards to the number of species in the flora of surveyed area (3).

Herbaceous perennial type plants were the predominant plant biology type—102 species (56%), followed by the annual ones—28 species (15%), and the shrubs—19 species (10%). Biennial plants were represented by 13 species (7%), the typical tree species were 11 (6%), annuals to biennials accounted for 6 species (3%), while biennials to perennials and shrubs to trees had 2 species (1%) to account for.

Analysis displayed that distribution of the established for the area medicinal plants by biological type followed the described flora species distribution. Herbaceous perennial plants were prevalent (241 species or 54%), followed by the annuals (92 species—21%) and the shrubs (24 species or 6%) (3).

Considering moisture and humidity as a factor, Mesophyte plants were the dominant medicinal plants—91 species (50%), followed by Hygrophytes—46 species (25%), and Xerophytes—41 species (22%). Hydrophytes were represented by 5 species (3%) only. The flora of Kamchia Nature Complex had similar ecological structure with Mesophytes (225 species or 52%) being the predominant type, followed by Hygrophites (109 species or 24%) and xerophytes (89 species or 21%). Hydrophytes were represented by 12 species or 3% (3) only.

Primary florigenic analysis revealed prevalence of Eurasian geo-elements—34 (19%). They were dominant in the flora of the surveyed area as well—119 species (26%) (3). Euro-Mediterranean came next—28 (15%), followed by Euro-Siberian—23 (13%), European—17 (9%), Cosmopolitans—16 (9%), sub-Mediterranean—16 (9%), boreal—13 (7%), subboreal—13 (7%), and others. Generally, there were 60 species with different types of Mediterranean distribution, thus accounting for 33% of the total number of medicinal species. Percentage representation of Mediterranean species—33%, was similar for Kamchia Natural Complex.

Analyses suggested that 20% of the 183 established medicinal plants belonged to different conservation categories.

The European Red List for endangered species lists 18 species under the category of near threatened: *Alisma plantago-aquatica* L, *Leucojum aestivum L.*, *Angelica sylvestris* L., *Bidens tripartita* L, *Carpinus betulus* L., *Pulmonaria officinalis* L., *Myriophyllum spicatum* L., *Iris pseudacorus* L., *Lycopus europaeus* L., *Mentha aquatica* L., *Lemna minor* L., *Colchicum autumnale* L., *Lythrum salicaria* L., *Nymphaea alba* L., *Rumex hydrolapathum* Huds., *Lysimachia nummularia* L., *Samolus valerandi* L., *Caltha palustris* L.

The Bulgarian Red Data Book for endangered species includes three species as endangered: *Eryngium maritimum* L., *Nuphar lutea* (L.) S. et .S., *Nymphaea alba* L. Protected plants are *Eryngium maritimum* L., *Nuphar lutea* (L.) S. et .S., *Nymphaea alba* L., *Anacamptis pyramidalis* (L.) Rich. and *Himantoglossum hircinum* (L.) *Spreng*, according to Bulgarian Biological Diversity Act, Appendix 3, Article 37. Conservation measures and regulated use is required for *Leucojum aestivum* L. and *Orchis purpurea Huds* as per the Bulgarian Biological Diversity Act, Appendix 4, Art. 41 (1). There are seven species prohibited for collection from their natural habitats pursuant to Order No. RD-83 (03.02.14) of the Minister of Environment and Water issued on the grounds of the Medicinal Plants Act, Art. 10 (1, 2, 3): *Althea officinalis* L., *Artemisia santonicum* L. *subsp. patens* (Neibr.) K. Pers., *Glaucium flavum Crantz*, *Inula helenium* L., *Orchis purpurea* Huds., *Ruscus aculeatus* L. and *Valeriana officinalis* L.

There is one medicinal plant under special protection and use regulations—*Betonica officinalis* L, for which maximum quantities for collection from its natural habitat are annually set. The above restriction is set by Order No. RD-83 of 03.02.2014 of the Minister for the Environment and Water issued on the basis of the Medicinal Plants Act, Article 10 (1,2,3).

We grouped the established for Kamchia Nature Complex medicinal plants according to the diseases they are applicable for in Table 1.

Analysis suggests more than 30 different types of healing activities of the established medicinal plants. Most of them act as diuretics (18 species). This number does not exceed significantly the number of other groups with different healing activities. The predominant part of species (59), representing one

Table 1. Groups of diseases, healing activities and plant substance

Species	Healing Action	Plant Substance
Plants Used for Treatment of Cardiovascular Diseases		
Allium rotundum L.	atherosclerosis, antimicrobial	Bulbus Allii
Crataegus monogyna Jacq.	cardiovascular, decreasing blood pressure, sedative	Folium et flos Crataegi cum foliis
Geranium robertianum L.	hypotensive, sedative	Rhizoma, folim et flos Geranii
Lycopus europaeus L.	cardiovascular	Herba Lycopi
Nymphaea alba L.	cardioactive agent	Rhizoma Nymphaeae albae
Pastinaca sativa L.	cardiovascular, spasmolytic, hypotensive	Radix et fructus Pastinacae
Periploca graeca L.	cardioactiv agent	Cortex seu stipites Periplocae graecae
Thalictrum flavum L.	hypotensive, antitumor action	Herba Thalictri
Viscum album L.	hypotensive, cardiotonic agent, vasodilating	Herba Visci
Plants Used for Treatment of Gastrointestinal Diseases		
Alnus glutinosa (L.) Gaertn.	antidiarrheal agent, astringent	Fructus, folium et cortex Alni
Artemisia vulgaris L.	appetite exciting, sedative, haemostatic action	Herba et radix Artemisiae
Arum maculatum L.	anti-inflammatory	Tubura Ari
Ballota nigra L.	spasmolytic, anti-inflammatory, pain reliever	Herba Ballotae
Betonica officinalis L.	spasmolytic, stimulates the appetite	Rizoma, radix et herba Betonicae
Carpinus betulus L.	antimicrobial, antidiarrheal agent	Folium, flos et cortex Carpini
Centaurea cyanus L.	appetite exciting, stimulates the release of bile, diuretic	Flores Centaureae
Chamomilla recutita (L.) Rausch	anti-inflammatory, antiseptic, spasmolytic	Flores Chamomillae
Chelidonium majus L.	spasmolytic, stimulates the release of bile	Herba Chelidonii
Convolvulus arvensis L.	laxative, diuretic, epithelium tonic	Herba Convolvuli
Cornus mas L.	astringent	Fructus Corni
Cuscuta europaea L.	purgative, diuretic, pain reliever	Herba Cuscutae
Datura stramonium L.	spasmolytic	Folium Stramonii
Frangula alnus Mill.	laxative, antidiarrheal agent	Cortex Frangulae
Fraxinus ornus L.	astringent	Cortex Fraxini
Fraxinus oxycarpa Wild.	astringent	Cortex Fraxini

Fumaria officinalis L.	spasmolytic, stimulates the release of bile	Herba Fumariae
Geum urbanum L.	anti-inflammatory, antidiarrheal agent, antimicrobial	Rhizoma et radix Gei urbani
Heracleum sibiricum L.	spasmolytic, hypotensive	Radix et fructus Heraclei sibirici
Lotus corniculatus L.	spasmolytic, analgesic	Herba Loti corniculati
Malus sylvestris Mill.	astringent, hypotensive,	Fructus Mali sylvestris
Malva sylvestris L.	spasmolytic, expectorant, expectorant,sedative	Flos et folium Malvae sylvestris
Nuphar lutea (L.) S. et .S.	anti-inflammatory	Rhizoma Nupharis lutei
Prunus spinosa L.	astringent, anti-inflammatory	Flos et fructus Pruni spinosae
Pulicaria dysentherica (L.) Bernh.	laxative, against insects	Herba et radux Pulicariae
Rubus caesius L.	astringent, antidiarrheal agent, anti-inflammatory	Radix folium et fructus Rubus fruticosi
Solanum nigrum L.	spasmolytic, sedative, anesthetic	Herba Solani nigri
Teucrium polium L.	constipative, haemostatic action, disinfecting	Herba Teucrii
Teucrium chamaedrys L.	anti-inflammatory, anesthetic, astringent, antidiarrheal agent	Herba Teucrii
Ulmus minor Mill.	astringent, antidiarrheal agent, anti-inflammatory	Cortex Ulmi
Plants Used for Treatment of the Liver and Biliary Tract		
Cichorium inthybus L.	appetite exciting, diuretic, stimulates the release of bile	Radix Cichorii
Mentha aquatica L.	spasmolytic, carminative, antiseptic	Folium Menthae aquaticae
Mentha pulegium L.	spasmolytic, carminative, antiseptic	Folium Menthae pulegiumae
Rumex crispus L.	stimulates the release of bile, laxative,	Radix et folium Rumicis crispis
Rumex acetosella L.	stimulates the release of bile, laxative	Radix et folium Rumicis acetosellis
Rumex hydrolapathum Huds.	stimulates the release of bile, laxative	Radix et folium Rumicis hydropalathumis
Taraxacum officinalis Veb.	stimulates the release of bile, diuretic	Herba et Radix Taraxaci
Plants Used for Treatment of Respiratory Diseases		
Althea officinalis L.	expectorant, anti-inflammatory	Radix Althaeae
Anacamptis pyramidalis (L.) Rich.	expectorant, anti-inflammatory	Tuber Salep
Angelica sylvestris L.	expectorant, stimulates sweating, spasmolytic, diuretic	Rhizoma et radix Angelicae sylvestris
Glaucium flavum Crantz	cough suppressant	Herba Glauci flavi

Hedera helix L.	anti-inflammatory, expectorant, broncholytic	Folium Hedere helicis
Himantoglossum hircinum (L.) Spreng.	expectorant, anti-inflammatory	Tuber Salep
Inula helenium L.	anti-inflammatory, expectorant, anthelmintic	Radix Inulae helenii
Iris pseudacorus L.	expectorant, anti-inflammatory, analgetic	Rizoma Iridis
Iris pumila L.	anti-inflammatory	Rhizoma Iridis
Lysimachia nummularia L.	expectorant, diuretic	Radix et flos Primulae
Orchis purpurea Huds.	expectorant, anti-inflammatory	Tuber Salep
Paliurus spina-christi Mill.	expectorant, anti-inflammatory, spasmolytic	Fructus Paliuri
Papaver rhoeas L.	expectorant	Flos Rhoeados
Platanthera bifolia Rich.	expectorant, anti-inflammatory	Tuber Salep
Primula acaulis (L.) Grubb.	expectorant, diuretic, sedative	Radix et flos Primulae
Pulmonaria officinalis L.	expectorant, anti-inflammatory	Herba Pulmonariae
Saponaria officinalis L.	expectorant, diuretic, stimulation of sweat	Radix Saponariae rubrae
Senecio jacobaea L.	spasmolytic, antiasthmatic	Rhizoma et Herba
Siderites montana L.	expectorant	Herba Sideritis montanae
Sisymbrium officinale (L.) Scop.	expectorant, diuretic,	Herba Sisymbrili
Trifolium arvense L.	expectorant, haemostatic action, diuretic, anti-inflammatory	Herba et flos Trifolii arvensis
Trifolium pratense L.	expectorant, haemostatic action, diuretic, anti-inflammatory	Herba et flos Trifolii pratensis
Verbascum phlomoides L.	expectorant, anti-inflammatory	Flos Verbasci
Verbascum phoeniceum L.	expectorant, expectorant, anti-inflammatory	Flos Verbasci
Veronica anagalis-aquatica L.	broncholytic, expectorant, anti-inflammatory	Herba Veronicae
Veronica arvensis L.	expectorant, anti-inflammatory	Herba Veronicae
Veronica austriaca L.*subsp. jacquinii* (Baumg.) Maly	broncholytic, expectorant, anti-inflammatory	Herba Veronicae
Veronica beccabunga L.	broncholytic, expectorant, anti-inflammatory	Herba Veronicae
Viola odorata L.	expectorant, diuretic	Radix, rhizoma, herba et flos Violae
Plants Used for Treatment of Kidney and Urinary Tract Diseases		
Alisma plantago-aquatica L.	diuretic	Rhizoma Plantaginis aquaticae

Anagalis arvensis L.	diuretic, expectorant, anti-inflammatory	Herba Anagallidis
Arctium lappa L.	diuretic, anti-ulcer	Radix Bardanae
Arctium tomentosum Mill.	diuretic, anti-ulcer	Radix Bardanae
Asperula odorata L.	diuretic, stimulation of sweat, expectorant	Herba Asperulae
Astragalus glycyphyllos L.	diuretic, anti-inflammatory, antihypertensive	Herba Astragali glucyphylli
Cynodon dactylon L.	diuretic, laxative	Rhizoma Graminis italici
Eryngium campestre L.	diuretic, spasmolytic	Radix Eringii
Eryngium maritimum L.	diuretic, spasmolytic	Radix Eringii
Fragaria vesca L.	diuretic, anti-inflammatory, anti atherosclerosis activity	Fructus et folium Fragariae
Galium palustre L.	astringent, anti-inflammatory, antimicrobial, laxative	Herba Galii palustri
Galium aparine L.	diuretic, laxative, pain reliever	Herba Galii aparinis
Oenanthe aquatica (L.) Poir.	diuretic, spasmolytic, expectorant	Fructus Phellandrii
Ononis spinosa L.	diuretic, anti-inflammatory	Radix Ononidis
Physalis alkekengii L.	diuretic, anti-inflammatory	Fructus Alkekengi
Polygonum aviculare L.	diuretic, astringent, haemostatic action	Herba Polygoni avicularis
Populus tremula L.	diuretic, antiseptic	Gemma Populi
Populus nigra L.	diuretic, antiseptic	Gemma Populi
Prunella vulgaris L.	pain reliever, diuretic	Herba Prunellae vulgaris
Ruscus aculeatus L.	diuretic, astringent, antihemorrhoid	Rhizoma et radix Rusci
Sambucus ebulus L.	diuretic, antiseptic, expectorant	Radix,fructus et flos Ebuli
Plants Used for Treatment of Rheumatic Diseases and Colds		
Colchicum autumnale L.	antitumor action, pain reliever	Bulbo-tuber Colchici
Filipendula vulgaris Moench	anti-rheumatic, diuretic	Herba Filipendulae
Phytolaca americana L.	anti-inflammatory, anti-rheumatic, laxative	Radix et folium Phytolaccae
Salix alba L.	antipyretic, anti-rheumatic	Cortex Salicis
Sambucus nigra L.	stimulation of sweat, diuretic	Flores et fructus Sambuci
Sambucus racemosa L.	anti-inflammatory, antioxidant action	Radix et Fructus Sambuci
Sinapis arvensis L.	skin-warming action	Semen Sinapis arvensae
Smilax excelsa L.	influenza, antipyretic	Herba Smilax exelsi
Solanum dulcamara L.	stimulation of sweat, anti-inflammatory, diuretic, laxative	Herba Dulcamarae
Sorbus torminalis (L.) Crantz	anti-rheumatic, astringent, diuretic	Fructus Sorbi torminalae

Verbena officinalis L.	stimulation of sweat, antipyretic, sedative	Herba Verbenae
Xanthium spinosum L.	anti-rheumatic, anti-inflammatory	Herba et fructus Xanthii spinosi
Xanthium strumarium L.	anti-rheumatic, anti-inflammatory	Herba et fructus Xanthii strumarii
Plants Used for Treatment of Metabolic and Endocrine Diseases		
Galega officinalis L.	hypoglycaemic, diuretic	Herba Galegae
Lemna minor L.	antipyretic, anti-inflammatory, stimulates the release of bile,	Herba Lemnae
Lepidium ruderale L.	antidiabetic, stimulation of sweat, diuretic, sedative	Herba Lepidii
Xeranthemum annuum L.	antiviral action, antibacterial, antimycotic, strengthens the immune system	Herba Xeranthemii
Plants Used for Treatment of Parasitic Diseases		
Artemisia campestris L.	anthelmintic	Herba Artemisiae
Artemisia santonicum L. subsp. patens (Neibr.) K.Pers.	anthelmintic	Herba et radix Artemisiae
Daucus carota L.	anthelmintic, source of vitamin A	Radix et semen Dauci
Pteridium aquilinum (L.) Kuhn.	anthelmintic	Rhizoma et folium Aquilinae
Tanacetum vulgare L.	anthelmintic, antiseptic, spasmolytic	Herba Tanaceti vulgare
Plants That Affect the Central Nervous System		
Conium maculatum L.	pain reliever	Fructus et Herba Conii
Consolida regalis S. F. Gray	curare-like action	Herba et semen Consolidae
Humulus lupulus L.	sedative	Strobuli Lupuli
Leucojum aestivum L.	improves neuromuscular conduction, curare-like action	Herba Leucoji aestivi
Melilotus alba Med.	sedative	Herba Meliloti
Melilotus officinalis (L.) Pall.	sedative	Herba Meliloti
Scutellaria altissima L.	spasmolytic, astringent, diuretic, sedative	Herba Scutelarii
Valeriana officinalis L.	sedative, spasmolytic, hypotensive	Radix et rhizoma Valerianae
Plants with a Predominantly Haemostatic Action		
Acer tataricum L.	astringent, anti-inflammatory	Folium Aceri tatarici
Bidens tripartita L.	astringent, diuretic, stimulation of sweat, expectorant	Herba Bidentis
Capsella bursa-pastoris (L.) Medicus.	haemostatic action	Herba Bursae – pastoris
Erodium cicutarium (L.) L Her.	haemostatic action	Herba Erodii cicutarii
Loranthus europaeus L.	antihemorrhoidal	Herba Loranthi

Lythrum salicaria L.	astringent, haemostatic action, antiseptic, antidiarrheal agent	Herba Salicariae
Lythrum virgatum L.	astringent, haemostatic action, antiseptic, antidiarrheal agent	Herba Salicariae
Persicaria hydropiper (L.) Opiz.	haemostatic action	Herba Polygoni hydropiperis
Persicaria maculata (Raf.) S.F.Gray	haemostatic action,	Herba Poligonii hydropiperis
Quercus cerris L.	astringent, haemostatic action, anti-inflammatory	Cortex et fructus Quercus
Quercus frainetto Ten.	astringent, haemostatic action, anti-inflammatory	Cortex et fructus Quercus
Sangusorba minor Scop.	haemostatic action, astringent, anti-inflammatory, constipative	Rhizona et radix Sanguisorbe
Sanquisorba officinalis L.	haemostatic action, astringent, anti-inflammatory, constipative	Rhizona et radix Sanguisorbe
Urtica dioica L.	haemostatic action, diuretic	Folium Urticae
Viburnum opulus L.	haemostatic action, sedative	Cortex et extractum Viburni fluidum
Aristolochia clematitis L.	wound healing	Radix, rizoma et herba Aristolochiae clematitis
Caltha palustris L.	anti-inflammatory, anesthetic	Herba Calthae palustris
Hypericum perforatum L.	anti-inflammatory, astringent, anti-ulcer, haemostatic action, sedative, wound healing	Herba Hyperici
Plantago major L.	anti-inflammatory, expectorant, laxative, anti-ulcer, diuretic	Folium et herba Plantaginis majoris
Plantago arenaria W. et K.	anti-inflammatory, expectorant, anti-ulcer,	Folium et herba Plantaginis arenariae
Plantago lanceolata L.	anti-inflammatory, expectorant, anti-ulcer	Folium et herba Plantaginis lanceolatae
Stachys recta L.	regenerative, antispastic	Herba Stachi rectae
Symphytum officinale L.	wound healing, anti-ulcer	Radix Symphyti
Plants Used in Skin Diseases		
Bellis perennis L.	wound healing, expectorant,	Flores Bellidis perennis
Clematis vitalba L.	anti-inflammatory, antimicrobial, wound healing	Radix folium et flos Clematidis vitalbae
Euphorbia amygdaloides L.	keratolytic	Succus Euphorbiae
Euphorbia myrsinites L.	keratolytic	Succus Euphorbiae
Fagus orientalis Lipsky	antiseptic, antimycotic	Pix, Fructus et folium
Plants with Other Types of Actions		
Anthemis tinctoria L.	hair bleaching	Fructus, folium et cortex Anthemis tinctorii
Butomus umbellatum L.	nutrient	Rizoma Butomi

Equisetum palustre L.	-	Herba Equiseti
Lamium purpureum L.	nutrient, nectariferous	Herba Lamii
Lathyrus niger (L.) Bernh.	fodder, nectariferous	Herba Lathyri nigri
Lathyrus pratensis L.	fodder, nectariferous	Herba Lathiri pratensi
Ranunculus ficaria L.	antibacterial action	Herba et Rhizoma Ficarii
Ranunculus repens L.	pain reliever	Herba et Rhizoma Ranunculi repensis
Rosa corymbifera Borkh.	rich in vitamins, preventing scorching, astringent, diuretic	Fructus Rosae
Trifolium repens L.	fodder	Herba Trifolii repensis
Vicia grandiflora Scop.	fodder	Herba Vicii

fifth of the featured medicinal plants, are used mainly for treatment of gastrointestinal diseases and respiratory diseases.

Different morphological and generative parts of the established medicinal plants are used as plant substances. The species in which the above ground portion of the plant is collected for its plant substance dominate the rest and constitute half of the established for the area medicinal plants. One third of the species can be collected and used for different plant parts.

CONCLUSION

Survey results reveal a considerable variety of medicinal plants in Kamchia Natural Complex area. They represent an integral part of the country's resource of medicinal plants. Their presence enhances and highlights floodplain forest's significance, manifests the uniqueness of coastal sands and dunes as habitats with priority conservation status. The established medicinal plants feature a variety of healing activities and are applicable for a wide range of diseases. Findings suggest further resource-based research in view of their protection and rational use.

REFERENCES

1. Michev T. Etat general des zones humides en Bulgarie. In: Michev T, editor. Plan National d'actions prioritaires de conservation des zones humides les plus importantes de Bulgarie. Ministere de l'environment de Bulgarie et Bureau de la Convention de Ramsar. Sofie: 1993. pp. 9-10.
2. Michev T, Stoyneva M. Conservation of Bulgarian non-lotic wetlands. In: Michev, T, Stoyneva M, editors. Inventory of Bulgarian Wetlands and their Biodiversity. Sofia: 2007.
3. Ivanov D, Filipova-Marinova M, Dimitrov D. Flora and vegetation of the nature complex „Kamchia". Proceedings of the National Museum, Varna. 2002; 32–33(47–48): 314–40. (In Bulgarian).
4. Ivanov D, Filipova-Marinova M. Medicinal plants of wetlands along the Northern Black Sea coast. Hist Med Coll; 2008; 4-5:50-7. (In Bulgarian).
5. Zahariev D, Boycheva P, Kosev K. Review on the medicinal plants of the north black sea coast (Bulgaria). Annual of Sofia University, Faculty of Biology. 2016; 99(2):100-14.
6. Tolmachev AI. Introduction to plant geography. Publishing house of the Leningrad University; 1974. (In Russian).
7. Jordanov D, editor. Florae Reipublicae Popularis Bulgaricae. Vol. I-IX. Serdicae: Aedibus Acad. Sci. Bulgaricae; 1963-1989. (In Bulgarian).
8. Velchev V, editor. Florae Reipublicae Popularis Bulgaricae. Vol. 8. Serdicae: Aedibus Acad. Sci. Bulgaricae; 1982. p. 518. (In Bulgarian).
9. Velchev V, editor. Florae Reipublicae Popularis Bulgaricae. Vol. 9. Serdicae: Aedibus Acad. Sci. Bulgaricae; 1989. p. 539. (In Bulgarian).
10. Kozhuharov S, editor. Flora of the Republic of Bulgaria. Vol. X-XI. Sofia: Prof. M. Drinov Acad. Publ; 1995. p. 428. (In Bulgarian).
11. Peev D, editor. 2013. Flora of the Republic of Bulgaria. Vol. XI, Sofia: Prof. M. Drinov Acad. Publ; 2013. p. 523. (In Bulgarian).
12. Kozhuharov S, editor, Andreev N, Anchev M, Kozhuharov S, Markova M, Peev D, et al. Determi-

nant of the vascular plants in Bulgaria. Sofia: Science and Art; 1992.

13. Assyov B, Petrova A, Dimitrov D, Vassilev R. Conspectus of the Bulgarian vascular flora. Distribution maps and floristic elements. Sofia: Bulgarian Biodiversity Foundation; 2006. p. 452. (In Bulgarian).

14. Medicinal Plants Act of the Republic of Bulgaria. Annex. State Gazette. 2000;29:9-29. Last amended in: State Gazette. 2014; 98. (In Bulgarian).

15. Hardalova R, Evstatieva L, Gusev C. Characteristics of the resource from the wonderfully healing plants in Bulgaria and the provision for sustainable development. In: National strategy behind bio-diversity denomination. 1994; 2:41-72. (In Bulgarian).

16. Peev D, editor. Red Data Book of the Republic of Bulgaria. Vol. 1. Plants and fungi. Available at: http://e-ecodb.bas.bg/rdb/bg/voll/Lycinund=html (accessed on 01.08.2013).

17. Law on Biodiversity of the Republic of Bulgaria. Annex. State Gazette. 2002;77. Last amended in State Gazette. 2017; 76. (In Bulgarian).

18. Order NoRD-83 from 3 February 2014 for special arrangements for the conservation and use of medicinal plants. State Gazette. 2014; 14. (In Bulgarian).

19. Lukas G. List of rare threatened and endemic plants in Europe. Strasbourg: Council of Europe; 1983.

20. The IUCN Red List of threatened species. 2014.3.

21. Bern Convention, 1979: Convention on the Conservation of European Wildlife and Natural Habitats. Appendix I (enforced in Bulgaria on 01.05.1991)

22. CITES, 1975: Convention on International Trade in Endangered Species of Wild Fauna and Flora.

23. Petrova A, Vladimirov V. Balkan endemics in the Bulgarian flora. Sofia: Phytologia Balcanica. 2010; 16(2):293–311.

24. Petrova A, Velchev V. List of Bulgarian endemic species. In: Petrova A, editor. Atlas of Bulgarian Endemic Plants. Sofia: Gea–Libris Ltd.; 2006; p. 399.

25. Petkov V, editor. Contemporary phytotherapy. Sofia: Medicine and Physical Education; 1982. (In Bulgarian).

26. Asenov I, Nikolov S. Pharmacognosy. Sofia: Medicine and Physical Education; 1988. (In Bulgarian).

27. Nikolov S, editor. Specialized encyclopedia of medicinal plants in Bulgaria. Sofia: Trud; 2006. p. 566. (In Bulgarian).