

Floristic and ecological aspects of medical and aromatic plant on Lumbardh valley of Prizren in Kosovo

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Abstract

Biodiversity and its study has been and remains an important research field, not only for the ecological importance that it presents, but also for raising the scale of recognition as well as for identifying human impacts on it. The diversity of environments has created a high ecosystem diversity that has enabled the creation of a rich flora, especially in the valleys in high mountainous areas. The phytocenosis of these environments is quite rich in floral elements, where a special place occupies the medicinal and aromatic herbs. The floristic studies and analysis in these areas enables the identification of this part of the spontaneous flora. They bring important ecological information for the identification of types of medicinal and aromatic herbs, where some of which result as unknown or unheard in their environment. Deepening of recognitions for botanical features and extending habitats shows interest not only in the botanical and ecological aspect but also in economical aspect, because they constitute an important natural resource especially for local communities, thanks to their many-use features in many areas. There are about 300 species of medicinal and aromatic herbs in the territory of Kosovo, where about 250 species are found in the Sharri Mountains area, part of which is the Lumbardh Valley of Prizren, which is the subject of this study. The Lumbardh Valley of Prizren, even though it has a relatively small extension, presents a high floral diversity and a great variety of herbs. This study aimed the identification of the spontaneous flora of medicinal and aromatic herbs for the recognition, distribution, human impact and their condition in this territory. Knowing the floristic wealth of the medicinal and aromatic herbs of this valley is a valuable contribution to the identification of the ecological and economic values that they present, as well as their preservation and better management.

Keywords: biodiversity; spontaneous flora; species richness; medical plants; aromatic plants.

1. Introduction

The currently biodiversity richness of our planet is the result of over 3.5 billion years of evolution, during this period it has been continuously enriched with plant and animal species. Its importance stands in the fact that the biodiversity performs a big number of basic functions for the sustainability of the biosphere system such as availability of elements and resources, climate stabilization and water and nutrients recycling, a natural filter against the spread of pathogenic agents. Biodiversity enhances community sustainability to catastrophic events, enhances the ability of ecosystems to face the climate change and retains a richness of valuable resources for human being [21]. Human population is closely dependent on the environment for resources such as water, for goods as raw materials, food and many other good things and services [7]. For its role it has in maintaining functional ecosystems, and consequently of the entire biosphere, it has already become the focus of attention and it presents a special interest to the international scientific community, especially for its conservation [2]. Special importance in this regard is floristic diversity (fitodiversity), where it study should be done for each individual ecological zone. Phyto-diversity is defined as a set of plant species in a specific territory [24] and the taxonomic unit for study is the species.

Kosovo's territory is part of the Mediterranean region, where the heterogeneity of the environment has influences in a large variety of habitats that are abundant in a large number of species. In the Mediterranean regions there are areas with a high concentration of biodiversity and high density of endemic species called 'hot spots' [17]. Kosovo's paramount and mountainous phyto-diversity is very rich in species where a considerable number are

wellknown and studied, but many other unrecognized species remain, which are not only botanical, but also ecological ones. The geographical characteristics of the area, climatic, terrestrial and hydrological conditions have a significant impact on the distribution of plant and animal species. Kosovo is particularly rich in plant species, although it is relatively small territory of the Balkans, which accounting about 25% of the Balkan peninsula flora or around 18% of Europe's flora. According to the data, there are about 1,800 species of vascular plants that have been collected, but the botany experts believe that there are around 2500 species [25]. Important parts of the Kosovo flora there are also the medical and aromatic types. Floristic research in Kosovo was carried out time ago, starting with activities dating back to the first half of the 19th century. A. Boue (1836), researched in the suburban areas of Peja, Prizren and Pristina where he collected floral material [12]. Studies on the Sharri Mountains flora and in general flora of Kosovo have also been carried out by several botanists [11,12,19,20,22,26] A great contribution to the study of the flora of this region has also given by Rexhepi (1986) with the study "Flora of the High Mountains of Kosovo", describing some species in the upstream of Lumbardh of Prizren river. The Lumbardh of Prizren River Valley is part of the National Park of Sharri Mountains and it is very rich in medicinal and aromatic plants which are the subject of this study.

2. Material and Methods

The study was done in Prizren municipality, which is located in the South of Kosovo and represents 5.94% of the Kosovo's territory (Figure 1). The study area lies in the flow of Lumbardh of Prizren River from its spring to its outpouring into the White Drini River, which is located in the Sharri Mountains in Kosovo at the altitude of its spring of 2360 m up to 280 m in the Drini i Bardhë outpouring. The study was carried out over the years 2015-2016, during which numerous field surveys have been carried out specially during the spring season, mainly during vegetation seasons in spring, summer and fall, to determine plant and aromatic plant species in the study area. Field surveys have been carried out through floral expeditions realized during the spring, summer and fall vegetation seasons, in order to capture as much of the phenophases and as many medical and aromatic plants as possible. In the laboratory has been definitions and classifications according to families, sexes for plant species found and herbaceous. Determination and classification was performed using analytical key like Hayek (1927-1933); [9]; "Flora of Albania" (Mitrushi, 1966; Papparisto et al., 1988-2000); "Albania's Flora Escape" [6]; "Albania's Flourite Field Leader" [27]; "Flora of the High Mountains of Kosovo" [25]. After the classification of the medicinal and aromatic herbal types, florist lists have been compiled.

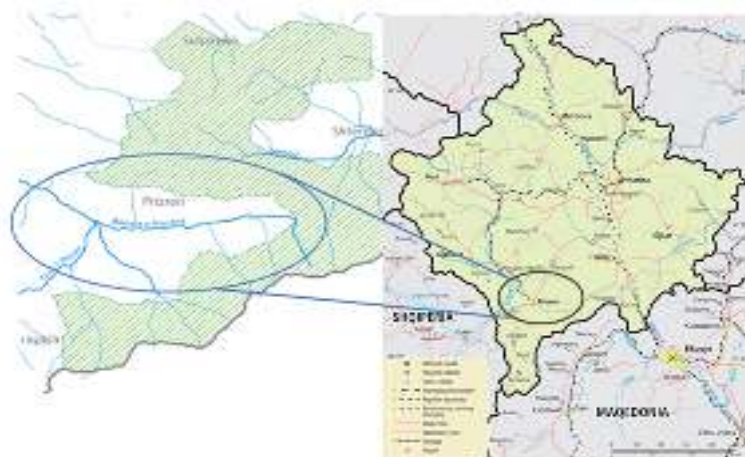


Figure 1. Area of study

3. Results and Discussion

The valley of Lumbardh of Prizren River is characterized by a rich geomorphology of the terrain which has allowed the development of the morphological diversity with different herbal, herbaceous, shrub and woody forms, different forms of medicinal and aromatic plants. From the study on the identification of natural flora species in the valley of Lumbardh of Prizren river results that have been found and determined 59 families, 128

genera and 155 species representing, medicinal and aromatic plants (Figure 2). From the analysis of life forms, based on the classification of the Danish botanist Raunkier (1934) dominate the species from H-Hemicryptophyta 61 species, Ph- Phanerophyta 45 species, T- Terophyta 23 species, G-Geophyta 13 species, Ch-Chamaephyta 12 species, Linaceae 1 species.



Figure 2. The floristic biodiversity of medicinal and aromatic plants in the Lumbardh valley

In Kosovo the number of medicinal and aromatic plants is around 300 species. The Sharri Mountains are also rich in medicinal and aromatic plants with about 250 different varieties of plants that represent a national resource and therefore they should be preserved and valued [20]. In the study of this research in this area are evidenced 155 medicinal and aromatic plants. After the year 2000, in Kosovo the harvesting of aromatic herbs is spontaneous and unorganized and uncontrolled by the relevant state institutions. This has influenced to have serious damage to the medical plant's reduction fund. Some species are about to disappear as *Gentiana lutea* L., which are also presented in the Red Book of Kosovo [19]. For this, many species of medicinal herbs have degraded or are towards extinction. Some habitats and medical and aromatic plant types which are part of them are still threatened or endangered by extinction from such factors such as the use of environments along the valley for livestock grazings, the improper collection of medicinal herbs, forest cuttings, constructions without any criteria in the protected area, intentional fires by unconscious persons, presence of refractive fountains in this area. The research of medicinal and aromatic plants in this area is based on literature sources such as: Albanian medicinal and aromatic plants [10], Medicinal plants [26]; Atlas of medicinal herbs [20]; Medicinal plants [18]; Inverting of medicinal herbs in Kosovo [19]; Albania's aromatic herbs [4]: 109 medicinal plants. School book, Pristina; [5]: Medical herbs for every illness, Ilar, Tirana.

Table 1. Medical and aromatic plants on the studied area

| No. | Scientific name | Family |
|-----|--|------------------------|
| 1. | <i>Abies alba</i> Mill. | <i>Pinaceae</i> |
| 2. | <i>Acanthus balcanicus</i> Heywod et I.B.K. Richardson | <i>Acanthaceae</i> |
| 3. | <i>Achillea millefolium</i> | <i>Asteraceae</i> |
| 4. | <i>Aesculus hippocastanum</i> L. | <i>Hipocastanaceae</i> |
| 5. | <i>Agrimonia eupatoria</i> L. | <i>Poaceae</i> |
| 6. | <i>Agrostema githago</i> L. | <i>Caryophyllaceae</i> |
| 7. | <i>Ajuga reptans</i> L. | <i>Lamiaceae</i> |
| 8. | <i>Alnus glutinosa</i> (L.) Geartn. | <i>Betulaceae</i> |
| 9. | <i>Althaea officinalis</i> L. | <i>Malvaceae</i> |
| 10. | <i>Althaea rosea</i> L. | <i>Malvaceae</i> |
| 11. | <i>Alliaria petiolata</i> (Bieb.) Cav et Grand | <i>Brassicaceae</i> |
| 12. | <i>Allium ursinum</i> L. | <i>Liliaceae</i> |
| 13. | <i>Allium cepa</i> L. | <i>Liliaceae</i> |

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| 14. | <i>Anuchusa officinalis L.</i> | <i>Boraginaceae</i> |
| 15. | <i>Arcticum lappa L.</i> | <i>Asteraceae</i> |
| 16. | <i>Arctostaphylos uva-ursi (L.)</i> | <i>Ericaceae</i> |
| 17. | <i>Artemisia vulgaris L.</i> | <i>Asteraceae</i> |
| 18. | <i>Asperula odorata (L.)</i> | <i>Rubiaceae</i> |
| 19. | <i>Atropa belladonna L.</i> | <i>Solanaceae</i> |
| 20. | <i>Barbarea vulgaris R.Br.</i> | <i>Brassicaceae</i> |
| 21. | <i>Bellis perennis L.</i> | <i>Asteraceae</i> |
| 22. | <i>Betulla pendula Roth.</i> | <i>Betulaceae</i> |
| 23. | <i>Brasica oleraceae L.</i> | <i>Brassicaceae</i> |
| 24. | <i>Buxus sempervirens L.</i> | <i>Buxaceae</i> |
| 25. | <i>Capsella bursa-pastoris L.</i> | <i>Brassicaceae</i> |
| 26. | <i>Cardemine pratensis L.</i> | <i>Brassicaceae</i> |
| 27. | <i>Carolina acanthifolia All.</i> | <i>Asteraceae</i> |
| 28. | <i>Carolina acualis L.</i> | <i>Asteraceae</i> |
| 29. | <i>Castanea sativa Miller.</i> | <i>Fagaceae</i> |
| 30. | <i>Centarium erythraea Rafn.</i> | <i>Gentianaceae</i> |
| 31. | <i>Centaurea cyanus L.</i> | <i>Asteraceae</i> |
| 32. | <i>Clemetis vitalba L.</i> | <i>Ranunculaceae</i> |
| 33. | <i>Cornus mas L.</i> | <i>Cornaceae</i> |
| 34. | <i>Cichorium intybus L.</i> | <i>Asteraceae</i> |
| 35. | <i>Coronilla varia L.</i> | <i>Fabaceae</i> |
| 36. | <i>Coryllus avellana L.</i> | <i>Corylaceae</i> |
| 37. | <i>Crategus monogyna Jasq.</i> | <i>Rosaceae</i> |
| 38. | <i>Cydonia oblonga Mill.</i> | <i>Rosaceae</i> |
| 39. | <i>Chelidonium majus L.</i> | <i>Papaveraceae</i> |
| 40. | <i>Datura stramonium</i> | <i>Solanaceae</i> |
| 41. | <i>Daucus carrota</i> | <i>Apiaceae</i> |
| 42. | <i>Dryopterix flix-mas</i> | <i>Aspidaceae</i> |
| 43. | <i>Dictamnus albus L.</i> | <i>Rutaceae</i> |
| 44. | <i>Epilobium angustifolium L.</i> | <i>Onagraceae</i> |
| 45. | <i>Equisetum arvense L.</i> | <i>Equisetaceae</i> |
| 46. | <i>Euphorbia cyparissias L.</i> | <i>Euphorbiaceae</i> |
| 47. | <i>Ficus carica L.</i> | <i>Moraceae</i> |
| 48. | <i>Foeniculum vulgare Mill.</i> | <i>Apiaceae</i> |
| 49. | <i>Fragaria vesca L.</i> | <i>Rosaceae</i> |
| 50. | <i>Frangula alnus Miller.</i> | <i>Rhamanaceae</i> |
| 51. | <i>Fraxinus ornus L.</i> | <i>Oleaceae</i> |
| 52. | <i>Fumaria officinalis L.</i> | <i>Papaveraceae</i> |
| 53. | <i>Galium verum L.</i> | <i>Rubiaceae</i> |
| 54. | <i>Galega officinalis L.</i> | <i>Fabaceae</i> |

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| 55. | <i>Gentiana lutea L.</i> | <i>Gentianaceae</i> |
| 56. | <i>Geranium robertianum L.</i> | <i>Geraniaiceae</i> |
| 57. | <i>Geum urbanum L.</i> | <i>Rosaceae</i> |
| 58. | <i>Glechoma hederaceae L.</i> | <i>Lamiaceae</i> |
| 59. | <i>Hedera helix L.</i> | <i>Araliaceae</i> |
| 60. | <i>Helianthus annuus L.</i> | <i>Asteraceae</i> |
| 61. | <i>Humulus lupulus L.</i> | <i>Canabanaceae</i> |
| 62. | <i>Hypericum perforatum L.</i> | <i>Hypericaceae</i> |
| 63. | <i>Juglans regia L.</i> | <i>Juglanaceae</i> |
| 64. | <i>Juniperus communis L.</i> | <i>Cupressaceae</i> |
| 66. | <i>Juniperus comunis subsp. nana (Willd.)</i> | <i>Cupressaceae</i> |
| 67. | <i>Juniperus oxycedrus L.</i> | <i>Cupressaceae</i> |
| 68. | <i>Lepidium campestre (L.)R.Br.</i> | <i>Brasicaceae</i> |
| 69. | <i>Leucanthemum vulgare(Vaill.) Lam</i> | <i>Asteraceae</i> |
| 70. | <i>Lingustrum vulgare L.</i> | <i>Oleaceae</i> |
| 71. | <i>Lonicera caprifolium L.</i> | <i>Caprifoliaceae</i> |
| 72. | <i>Malva sylvestris Mill.</i> | <i>Malvaceae</i> |
| 73. | <i>Malus domestica L.</i> | <i>Rosaceae</i> |
| 74. | <i>Malus sylvestris Mill.</i> | <i>Rosaceae</i> |
| 75. | <i>Matricaria chamomilla L.</i> | <i>Asteraceae</i> |
| 76. | <i>Meticago sativa L.</i> | <i>Fabaceae</i> |
| 77. | <i>Melilotus officinalis (L.) Pallas.</i> | <i>Fabaceae</i> |
| 78. | <i>Melisa Officinalis L.</i> | <i>Lamiaceae</i> |
| 79. | <i>Mentha pulegium L.</i> | <i>Lamiaceae</i> |
| 80. | <i>Morus alba l.</i> | <i>Moraceae</i> |
| 81. | <i>Morus nigra L.</i> | <i>Moraceae</i> |
| 82. | <i>Nasturtium officinale R.Br.</i> | <i>Brasicaceae</i> |
| 83. | <i>Nigella arvensis L.</i> | <i>Ranunculaceae</i> |
| 84. | <i>Nigella damasceana L.</i> | <i>Ranunculaceae</i> |
| 85. | <i>Ononis spinosa L.</i> | <i>Fabaceae</i> |
| 86. | <i>Orchis morio L.</i> | <i>Orchidaceae</i> |
| 87. | <i>Oraginum vulgare L.</i> | <i>Lamiaceae</i> |
| 88. | <i>Papaver rhoeas L.</i> | <i>Papaveraceae</i> |
| 89. | <i>Parietaria officinalis L.</i> | <i>Urticaceae</i> |
| 90. | <i>Parnassia palustris L.</i> | <i>Parnassiaceae</i> |
| 91. | <i>Petasites albus L.</i> | <i>Asteraceae</i> |
| 92. | <i>Petasites hybridus (L.) P. Geartn.</i> | <i>Asteraceae</i> |
| 93. | <i>Physalis alkekengi L.</i> | <i>Solanaceae</i> |
| 94. | <i>Pinus nigra Arn.</i> | <i>Pinaceae</i> |
| 95. | <i>Pinus sylvestris L.</i> | <i>Pinaceae</i> |
| 96. | <i>Plantago lanceolata L.</i> | <i>Plantaginaceae</i> |

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| 97. | <i>Plantago media L.</i> | <i>Plantaginaceae</i> |
| 98. | <i>Plantanus orientalis</i> | <i>Plantanaceae</i> |
| 99. | <i>Polygala vulgaris L.</i> | <i>Polygalaceae</i> |
| 100. | <i>Polygonum bistorta L.</i> | <i>Polygonaceae</i> |
| 101. | <i>Poligonum persicaria L.</i> | <i>Polygonaceae</i> |
| 102. | <i>Primula acualis L.</i> | <i>Primulaceae</i> |
| 103. | <i>Primula elatior (L.) GRUFB.</i> | <i>Primulaceae</i> |
| 104. | <i>Primula verris L.</i> | <i>Primulaceae</i> |
| 104. | <i>Prunus cerasus L.</i> | <i>Rosaceae</i> |
| 105. | <i>Prunus domostica L.</i> | <i>Rosaceae</i> |
| 106. | <i>Prunus avium L</i> | <i>Rosaceae</i> |
| 107. | <i>Prunus spinosa L.</i> | <i>Rosaceae</i> |
| 108. | <i>Pyrus amigdaliformis Will.</i> | <i>Rosaceae</i> |
| 109. | <i>Pyrus pyraaster Burgsd.</i> | <i>Rosaceae</i> |
| 110. | <i>Pteridium aquilinum Kuhn.</i> | <i>Rosaceae</i> |
| 111. | <i>Pulmonaria officinalis L.</i> | <i>Boraginaceae</i> |
| 112. | <i>Ranunculus acris L.</i> | <i>Ranunculaceae</i> |
| 113. | <i>Ranunculus bulbosus L.</i> | <i>Ranunculaceae</i> |
| 114. | <i>Ranunculus repans L.</i> | <i>Ranunculaceae</i> |
| 115. | <i>Raphanus raphanistrum L.</i> | <i>Ranunculaceae</i> |
| 116. | <i>Robinia pseudoacacia L.</i> | <i>Fabaceae</i> |
| 117. | <i>Rosa canina L.</i> | <i>Rosaceae</i> |
| 118. | <i>Rosa tomentosa L.</i> | <i>Rosaceae</i> |
| 119. | <i>Rosa pendulina L.</i> | <i>Rosaceae</i> |
| 120. | <i>Rubus ideaus L.</i> | <i>Rosaceae</i> |
| 121. | <i>Rumex crispus L.</i> | <i>Polygonaceae</i> |
| 122. | <i>Ruscus acuelatus L.</i> | <i>Liliaceae</i> |
| 123. | <i>Ruta graveolens (Griseb.)</i> | <i>Rutaceae</i> |
| 124. | <i>Salix alba L.</i> | <i>Salicaceae</i> |
| 125. | <i>Sambucus ebulus L.</i> | <i>Caprifoliaceae</i> |
| 126. | <i>Sambucus racemosa L.</i> | <i>Caprifoliaceae</i> |
| 127. | <i>Sambucus nigra L</i> | <i>Caprifoliaceae</i> |
| 128. | <i>Sanicula europaea L.</i> | <i>Apiaceae</i> |
| 129. | <i>Saponaria officinalis L.</i> | <i>Caryophyllaceae</i> |
| 130. | <i>Satureja montana L.</i> | <i>Lamiaceae</i> |
| 131. | <i>Sedum acre L.</i> | <i>Crasulaceae</i> |
| 132. | <i>Silene vulgaris (Moench.) Gracke</i> | <i>Caryophyllaceae</i> |
| 133. | <i>Sinapsis arvensis L.</i> | <i>Brassicaceae</i> |
| 134. | <i>Stachys officinalis (L.) Trev.</i> | <i>Lamiaceae</i> |
| 135. | <i>Sisymbrium officinalis (L.) Scop</i> | <i>Brassicaceae</i> |
| 136. | <i>Symphytun officinale L.</i> | <i>Boraginaceae</i> |

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| 137. | <i>Tanacetum vulgare L</i> | <i>Asteraceae</i> |
| 138. | <i>Taraxacum officinale Weber.</i> | <i>Asteraceae</i> |
| 139. | <i>Teucrium chamaedrys Web.</i> | <i>Lamiaceae</i> |
| 140. | <i>Teucrium montanum L.</i> | <i>Lamiaceae</i> |
| 141. | <i>Tilia cordata Mill.</i> | <i>Tiliaceae</i> |
| 142. | <i>Trifolium pratense L.</i> | <i>Poaceae</i> |
| 143. | <i>Tusilago farfara L.</i> | <i>Asteraceae</i> |
| 144. | <i>Thymus pulegoides L.</i> | <i>Lamiaceae</i> |
| 145. | <i>Ulmus minor Miller.</i> | <i>Ulmaceae</i> |
| 146. | <i>Urtica dioica L.</i> | <i>Urticaceae</i> |
| 147. | <i>Vaccinium myrtillus L.</i> | <i>Ericaceae</i> |
| 148. | <i>Valerina officinalis L.</i> | <i>Valerinaceae</i> |
| 149. | <i>Veratrum album L.</i> | <i>Liliaceae</i> |
| 150. | <i>Veronica officinalis L.</i> | <i>Scrophulariaceae</i> |
| 151. | <i>Vinca minor L.</i> | <i>Apocynaceae</i> |
| 152. | <i>Viola odorata L.</i> | <i>Violaceae</i> |
| 153. | <i>Viola tricolor L.</i> | <i>Violaceae</i> |
| 154. | <i>Vitis sylvestris Gmel.</i> | <i>Vitaceae</i> |
| 155. | <i>Zea mays L</i> | <i>Poaceae</i> |

4. Conclusions

The geographic characteristics of the valley as the geographic position, geomorphology, climatic, hydrological and terrestrial conditions, has allowed the development of diversity morphological of different plant, herbaceous, shrub and woody forms.

The presence of Lumbardh's flowing waters along the valley has favored the development of many plant forms that perform numerous ecological roles.

From the study on the identification of natural flora species in the valley of Lumbardh of Prizren river, it results that have been found and determined 59 families, 128 genera and 155 species that represent, medicinal and aromatic plants.

Some habitates and medical and aromatic plants which are inside them remain threatened by different factors such as the use of different areas for grazing along the valley, improper collection of medicinal herbs, forest cuttings, hunting, uncriteria constructions in the protected area, fires and presence of refractive fountains in this area.

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