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# FLORA AND VEGETATION OF THE NATURAL FORMATION THE „KOMATINSKI ROCKS"– VLAHINA MOUNTAIN

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## Abstract

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A research of the flora and vegetation of the natural phenomenon the Komatinski rocks has been conducted. The rocks are located in the floristic area of the Western Frontier Mountains – Vlahina Mountain in particular, situated North-west above the village of Brestovo, Simitli district. The reason for this research is the Simitli's municipality's decision to mutilate the natural rocky formation through chiseling into the rocks bas-reliefs of three former Bulgarian presidents. After the publication of the research results, we intend to make a proposal to the ministry of environment and water for the rocks to become a nature's protected area.

*Key words*: Balkan endemics, plant community, local flora, species list

## Introduction

In order for the geological and biological diversity in this part of Vlahina Mountain to be protected, we would like to make a proposition to the ministry of natural environment and water that this area be declared as protected. Such a floral research in the area hadn't been conducted before. The aim of the research is the study and inventory of the natural phenomenon's flora and vegetation. After the research was performed, the following results were established. Two hundred and seven species of vascular plants were found. The plants refer to 145 genera and 44 families. The hemicryptophytes are the predominant life-form (108 species), followed by the therophyte (54), fanerophytes (21 species), therophites-hemicrriptophites (12 species), and geophytes (8 species) (Table 1).

## Material and Methods

The climate of the region is sub-continental with mountainous characteristics. The average annual rainfall is 780 mm, with a maximum amount of rainfall in June and a minimum amount of rain in August. The lowest temperature is in January and the highest in July. The area's altitude is 1167 m. The total area of the Komatinski rocks is about 62 hectares. The type of soil is a brown-forest one. The geologist Sinyovski (2008, 2011) studied the formation and reached to the conclusion that the Komatinski rocks must be preserved. He estimated the age of the rocks to be Trias-Paleogenic. According to him, the rocks were described for the first time in the forties of the 20$^{th}$ century as polygenic conglomerates at the bottom of "a massive congregation of conglomerates and thick sandstones" that dated back to the Priabonian age. Later on the rocky formation was named "Komatinski conglomerates" after the name of the local area – "Komatinitsa", near the village of Brestovo.

Routing and transsectional methods were applied. The herbal materials were determined according to Jordanov (1963-1982), Velchev (1982-1989*),* Kozuharov and Kuzmanov (1995), and Peev (2012). The vegetation on the North Slope of the Komatinski rocks was examined using testing areas. The testing areas for the forest vegetation were the size of 100 m$^2$and for the grass communities – 20 m$^2$, using the Braun-Blanquet (1964) analytical method. The tests were performed within the vegetation periods from 2009 to 2013. The analysis of the flora elements was done according the one of Assyov and Petrova (2012). The climate of the region is sub-continental.

## Results

The established 207 vascular plants refer to 145 genera and 44 families (Table 1). The comparison between the local plant diversity and the overall plant diversity in Bulgaria,

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**Table 1**
**Taxonomic composition and flora of the examined area**

| Division/subdivision | Families | Genera | Species |
|---|---|---|---|
| *Polypodiophyta* | 4 | 5 | 7 |
| *Pinophyta Magnoliophyta* | 2 | 2 | 2 |
| *Monocotyledonae* | 5 | 24 | 31 |
| *Dicotyledonae* | 33 | 114 | 167 |
| Total | 44 | 145 | 207 |

shows that 5.3% of the species, 16% of the genera and 20.7% of the families from the Bulgarian flora are could be found in the area. One of these plants has a conservational status – *Huetia cynapioides* (Guss.) P. Ball and falls in the category of vulnerable species VU B2ab(i,ii,iv) (Meshinev 2009). There are 4 Balkan endemics: *Scabiosa triniifolia* Friv. *Micromeria dalmatica* Benth., *Cerastium petricola* Pancic, and *Armeria rumelica* Boiss. The new-found taxa for this area are 8: *Galium spurium* L., *Potentilla detommasii* Ten. var. *detommasii*, *Euphorbia taurinensis* All., *Silene italica* (L.) Pers. var. *achtarovii* D. Jord et P. Pan., *Leontodon cichoraceus* (Ten.) Sanguin., *Centaurea biebersteinii* DC. subsp. *rhodopaea* (Hayek & Wagner) Dostal, *Anthemis auriculata* Boiss., *Cystopteris fragilis* (L.) Bernh.f. *dentata* Hook. (Table 1).

The floristic analysis shows that there are predominantly 40 sub-Med species. What follows next are Eur-Med 36, Eur-As 33, sub Boreal 13, Eur-Sib 13, Med 8, Eur 7, Boreal 6, Pont-Med 6, Kos 6, Pont 5, Bal 4, Eur 4, Eur-subMed 4, Ap-Bal 3, sPont 3, Bal-Anat 2, Bul 2.

The floral elements with one species go as follows: Eur-Med-CAs, Alp-Med, Carp-Bal, Euro sMed, Med-As, sEux, subBal, Eur-Pont, sMed-CAs, Med-CAs, Bal-Dac è sMed-As.

The correlation between Dicotyledonae and Monocotiledonae is 5.38.

The families containing the most species of the flora of the Komatinski rocks are: *Poaceae* 24, *Asteraceae* 21, *Fabaceae* 20, *Lamiaceae* 14, *Brassicaceae* 13, *Caryophyllaceae* 13, *Rosaceae* 13, *Scrophulariaceae* 9, *Rubiaceae* 8, *Apiaceae* 4, *Boraginaceae*4, *Aspleniaceae* 4, *Violaceae* 4, *Euphorbiaceae* 3, *Fagaceae* 3, *Hypericaceae* 3, *Aceraceae* 2, *Betulaceae*2, *Campanulaceae* 2, *Cistaceae* 2, *Santalaceae* 2, *Saxifragaceae* 2, *Cyperaceae* 2, *Juncaceae* 2 and *Liliaceae* 2. The families with one species are: *Aspidiaceae*, *Athyriaceae*, *Hypolepidiaceae*, *Cupressaceae*, *Pinaceae*, *Araliaceae*, *Convolvulaceae*, *Oleaceae*, *Papaveraceae*, *Plantaginaceae*, *Plumbaginaceae*, *Polygonaceae*, *Ulmaceae* and *Orchidaceae*.

The families with the most genera are: *Poaceae* 19, *Asteraceae* 18, *Brassicaceae* 11, *Fabaceae* 10, *Rosaceae* 10, *Caryophyllaceae* 10, *Lamiaceae* 10, *Scrophulariaceae*, etc.

The genera with the most species are: *Trifolium* 7 species, *Galium* 5, *Geranium* 4, *Sedum* 4, *Veronica* 4, *Viola* 4, *Alyssum* 3, *Asplenium* 3, *Euphorbia* 3, etc.

The forest communities are represented almost entirely by a beech forest belongs to the Ostryo-Carpinion alliance HT.1954. The wood layer is dominated with *Fagus sylvatica* 4 and little presence of *Carpinus orientalis* 2, *Ostrya carpinifolia* 2 and Manna-ash *Fraxinus ornus* 1. The undergrowth beneath the forest trees is comprised of wheat species: *Ìåla uniflora* 3, *Festuca heterophylla* 2, *Dactylis glomerata* 1, *Poa nemoralis* 2, *Brachypodium sylvaticum* 1, and *Carex spicata* 2. Other species include *Cyclamen hederifolium* 3, *Galium spurium* 1, *Primula veris* 1, *Stellaria holostea* 3, *Cystopteris fragilis* 2, *Symphitum tuberosum* 1, *Geum urbanum* 2, *Aremonia agrimonoides* 2, *Mycelis muralis* 2, and *Huetia cynapioides*r.

The area of the grass community is 0.02 km$^2$ with a slope of 30 degrees. This grass community relates to the class Festuco-Brometea Br.-Bl. ex Tx. ex Soo 1947 and Alliance Festucion valesiacae Klika. 1931. Within the grass community on the North Slope the following species are found: *Poa bulbosa* 2, *Festuca nigrescens* 3, *Trifolium incarnatum* 2, *Phleum phleoides* 1, *Veronica austriaca* subsp. *jacquinii* 1, *Luzula campestris* 1, *Potentilla neglecta* 1, *Saxifraga graeca* +, *Rumex acetosella* 1, *Verbascum phoeniceum* +.

The comparison between the flora and vegetation of the supported reserve “Gabra” (also situated in the Eastern part of Vlahina mountain and having an area of 89.9 hectares) and the ones of the Komatinski rocks, shows that in the bigger territory of “Gabra”, 241 taxa vascular plants (from 181 and 54 families) are found (Gussev et al., 2005). Such a comparison proves that the smaller area of the Komatincki rocks has a biodiversity as rich as the one of “Gabra” reserve. After the study was concluded, 40 medicinal species (10.9% of the whole Komatinski rocks flora) were found.

The existence of the conservational species *Huetia cynapioides* (Guss.) P. W. Ball gave us the reason to request that this natural rocky formation be protected by the law.

## Conclusions

Two hundred and seven vascular species were found in the territory of the Komatinsky rocks. To conclude with – all that biodiversity, as well as the particular landscape and geological structure of the area, must be preserved for the upcoming generations.

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## Appendix 1. List of the plant species found in the protected area

***Polypodiophyta***

I. *Aspleniaceae*

1. *Asplenium adianthum-nigrum* L.
2. *Asplenium septentrionale* (L.) Hoffm.
3. *Asplenium trichomanes* L.
4. *Ceterach officinarum* DC.

II. *Aspidiaceae*

5. *Dryopteris filix-mas* (L.) Schott

III. *Athyriaceae*

6. *Cystopteris fragilis* (L.) Bernh. f. *dentata* Hook

IV. *Hypolepidaceae*

7. *Pteridium aquilinum* (L.) Kuhn

***Pinophyta***

V. *Cupressaceae*

8. *Juniperus communis* L.

VI. *Pinaceae*

9. *Pinus nigra* Arnold

***Magnoliophyta***

***Dicotyledonae***

VII. *Aceraceae*

10. *Acer campestre* L.
11. *Acer pseudoplatanus* L.

VIII. Apiaceae

12. *Eryngium campestre* L.
13. *Huetia cynapioides* (Guss.) P. W. Ball
14. *Orlaya daucoides* (L.) Greuter
15. *Seseli rigidum* Waldst. & Kit.

IX. *Araliaceae*

16. *Hedera helix* L.

X. *Asteraceae*

17. *Achillea millefolium* L.
18. *Anthemis auriculata* Boiss.
19. *Carduus nutans* L.
20. *Carlina acanthifolia* All.
21. *Carlina vulgaris* L.
22. *Centaurea biebersteinii* DC. subsp. *rhodopaea* (Hayek & Wagner) Dostal
23. *Chondrilla junceae* L.
24. *Cichorium inthybus* L.
25. *Cirsium ligulare* Boiss.
26. *Crepis sancta* (L.) Babc.
27. *Doronicum columnae* Ten.
28. *Filago vulgaris* Lam.
29. *Hieracium leithneri* (Heldr. & Sart. ex Boiss.) Zahn
30. *Hieracium pilosella* L.
31. *Hypochaeris glabra* L.
32. *Inula oculus-christi* L.
33. *Lactuca quercina* L.
34. *Lapsana communis* L.
35. *Leontodon cichoraceus* (Ten.) Sanguin.
36. *Leontodon hispidus* L.
37. *Mycelis muralis* (L.) Dumort.

XI. *Betulaceae*
38. *Carpinus orientalis* Mill.
39. *Ostrya carpinifolia* Scop.
XII. *Boraginaceae*
40. *Myosotis ramosissima* Rochel
41. *Myosotis sylvatica* Ehrh. ex Hoffm.
42. *Onosma heterophylla* Griseb.
43. *Symphytum tuberosum* subsp. *nodosum* (Schur) Soo
XIII. *Brassicaceae*
44. *Aethionema saxatile* (L.) R.Br.
45. *Alliaria petiolata* (M.Bieb.) Cavara &Grande
46. *Alyssum minutum* Schltdl. ex DC.
47. *Alyssum turkestanicum* Regel & Schmalh.
48. *Alyssum strigosum* Bank & Sol.
49. *Arabis sagittata* (Bertol.) DC
50. *Aurinia saxatilis* (L.) Desv.
51. *Berteroa incana* (L.) DC
52. *Cardamine hirsuta* L.
53. *Draba muralis* L.
54. *Erophila verna* (L.) Chevall.
55. *Rorippa sylvestris* (L.) Besser
56. *Thlaspi perfoliatum* L.
XIV. *Campanulaceae*
57. *Campanula persicifolia* L.
58. *Campanula rapunculus* L.
XV. *Caryophyllaceae*
59. *Arenaria serpyllifolia* L. var. *viscida* DC.
60. *Cerastium bulgaricum* Uecht.
61. *Cerastium petricola* Pancic
62. *Gypsophila muralis* L.
63. *Herniaria glabra* L.
64. *Minuartia hirsuta* (M.Bieb.) Hand.-Mazz.
65. *Moenchia mantica* (L.) Barcl.
66. *Petrorhagia illyrica* (Ard.) P.W.Ball & Heywood
67. *Petrorhagia prolifera* (L.) P. W. Ball & Heywood
68. *Scleranthus annuus* L.
69. *Scleranthus perennis* L.
70. *Silene italica* (L.) Pers. var. *achtarovii* D. Jord. et P. Pan.
71. *Viscaria vulgaris* Rohl. subsp. *atropurpurea* (Griseb.) Stoj.
XVI. *Cistaceae*
72. *Helianthemum nummularium* (L.) Mill.
73. *Rhodax canus* (L.) Fuss
XVII. *Convolvolaceae*
74. *Convolvulus cantabrica* L.
XVIII. *Crassulaceae*
75. *Jovibarba heuffelii* (Schott) A. & D. Love
76. *Sedum album* L.
77. *Sedum caespitosum* (Cav.) DC.
78. *Sedum cepaea* L.
79. *Sedum hispanicum* L.
XIX. *Dipsacaceae*
80. *Scabiosa triniifolia* Friv.
XX. *Euphorbiaceae*
81. *Euphorbia amygdaloides* L.
82. *Euphorbia cyparissias* L.
83. *Euphorbia taurinensis* All.
XXI. *Fabaceae*
84. *Astragalus onobrychis* L.
85. *Chamaecytisus austriacus* (L.) Link
86. *Coronilla varia* L.
87. *Genista depressa* M. Bieb. subsp. *frivaldszkyi* (Bois) Hayek
88. *Lathyrus laxiflorus* (Desf.) Kuntze
89. *Lathyrus nissolia* L.
90. *Lathyrus sphaericus* Retz.
91. *Lotus corniculatus* L.
92. *Medicago minima* (L.) Bartal.
93. *Medicago rigidula* (L.) All. var. *glandulosa* (Podp.) Koz.
94. *Trifolium alpestre* L.
95. *Trifolium arvense* L.
96. *Trifolium aureum* Pollich
97. *Trifolium hirtum* All.
98. *Trifolium incarnatum* L.
99. *Trifolium medium*. L. subsp. *balcanicum* Velen.
100. *Trifolium scabrum* L. subsp. *scabrum*
101. *Trigonella monspeliaca* L.
102. *Vicia hirsuta* (L.) Gray var. *hirsuta*
103. *Vicia lathyroides* L.
XXII. *Fagaceae*
104. *Fagus sylvatica* L. subsp. *moesiaca* (K. Maly) Hjelmquist
105. *Quercus cerris* L.
106. *Quercus polycarpa* Schur
XXIII. *Geraniaceae*
107. *Erodium cicutarium* (L.) L. Her.
108. *Geranium lucidum* L.
109. *Geranium pyrenaicum* Burm. f.
110. *Geranium rotundifolium* L.
111. *Geranium robertianum* L.
XXIV. *Hypericaceae*
112. *Hypericum barbatum* Jacq. subsp. *barbatum*
113. *Hypericum perforatum* L.
114. *Hypericum rumeliacum* Boiss.
XXV. *Lamiaceae*
115. *Acinos suaveolens* ( Sm.) Don
116. *Ajuga genevensis* L.
117. *Ajuga reptans* L.
118. *Clinopodium vulgare* L.
119. *Lamium amplexicaule* L.
120. *Lamium garganicum* L.
121. *Lamium purpureum* L.
122. *Micromeria dalmatica* Benth.
123. *Nepeta nuda* L.
124. *Stachys recta* L.
125. *Sideritis montana* L.
126. *Teucrium chamaedriys* L.
127. *Teucrium polium* L.
128. *Thymus glabrescens* Willd.

XXVII. *Oleaceae*
129. *Fraxinus ornus* L.
XXVIII. *Papaveraceae*
130. *Corydalis bulbosa* (L.) DC.
XXIX. *Plantaginaceae*
131. *Plantago lanceolata* L.
XXX. *Plumbaginaceae*
132. *Armeria rumelica* Boiss.
XXXI. *Polygonaceae*
133. *Rumex acetosella* L.
XXXII. *Primulaceae*
134. *Cyclamen hederifolium* Aiton
135. *Primula veris* L.
XXXIII. *Ranunculaceae*
136. *Clematis vitalba* L.
137. *Ranunculus sprunerianus* Boiss.
XXXIV. *Rosaceae*
138. *Aremonia agrimonoides* (L.) DC.
139. *Crataegus monogyna* Jacq.
140. *Filipendula vulgaris* Moench
141. *Fragaria moschata* Duchesne
142. *Fragaria vesca* L.
143. *Geum urbanum* L.
144. *Potentilla detommasii* Ten. var. *detommasii*
145. *Potentilla neglecta* Baumg.
146. *Prunus cerasifera* Ehrh.
147. *Prunus spinosa* L.
148. *Pyrus elaeagifolia* Pall. subsp. *elaeagrifolia*
149. *Rosa canina* L.
150. *Sanguisorba minor* Scop.
XXXV. *Rubiaceae*
151. *Asperula cynanchica* L.
152. *Asperula purpurea* (L.) Ehrend.
153. *Cruciata laevipes* Opiz
154. *Galium aparine* L.
155. *Galium lucidum* All.
156. *Galium odoratum* (L.) Scop.
157. *Galium spurium* L.
158. *Galium verum* L.
XXXVI. *Santalacea*
159. *Thesium arvense* Horv.
160. *Thesium dollineri* Murb.
XXXVII. *Saxifragaceae*
161. *Saxifraga graeca* Boiss.
162. *Saxifraga rotundifolia* L.
XXXVIII. *Scrophulariaceae*
163. *Euphrasia pectinata* Ten.
164. *Linaria pelisseriana* (L.) Mill.
165. *Rhinanthus rumelicus* Velen.
166. *Verbascum phoeniceum* L.
167. *Verbascum longifolium* Ten.
168. *Veronica austriaca* L. subsp. *jaquinii* (Baumg.) Maly
169. *Veronica hederifolia* L.
170. *Veronica polita* Fries
171. *Veronica verna* L. subsp. *verna*
XXXIX. *Ulmaceae*
172. *Ulmus minor* Mill.
XL. Violaceae
173. *Viola arvensis* Murr.
174. *Viola kitaibeliana* Schult.
175. *Viola reichenbachiana* Jiord. ex Boreau
176. *Viola tricolor* L.

***Monocotyledonae***
XLI. *Cyperaceae*
177. *Carex caryophyllea* Latourr.
178. *Carex spicata* Huds. var. *spicata*
XLII. *Juncaceae*
179. *Luzula campestris* (L.) Lam. & DC. subsp. *campestris*
180. *Luzula luzuloides* (Lam.) Dandy
XLIII. *Liliaceae*
181. *Muscari armeniacum* Leichtlin ex Baker
182. *Ornithogalum montanum* Cyr.
XLIV. *Orchidaceae*
183. *Orchis morio* L.
XLV. *Poaceae*
184. *Aegilops neglecta* Req. ex Bertol.
185. *Agrostis capillaris* L.
186. *Aira elegantissima* Schur
187. *Anthoxanthum odoratum* L.
188. *Arrhenatherum elatius* (L.) P.Beauv. ex J. & C.Presl.
189. *Avenula compressa* (Heuffel) Sauer & Chmelitschek
190. *Brachypodium sylvaticum* (Huds.) P. Beauv.
191. *Bromus squarrosus* L.
192. *Bromus tectorum* L.
193. *Cynosurus echinatus* L.
194. *Dactylis glomerata* L.
195. *Dichanthium ischaemum* (L.) Roberty
196. *Festuca nigrescens* Lam.
197. *Festuca heterophylla* Lam.
198. *Festuca valesiaca* Schleich. ex Gaudin
199. *Koeleria nitidula* Velen.
200. *Melica ciliata* L.
201. *Melica uniflora* Retz.
202. *Phleum phleoides* (L.) Karst.
203. *Poa bulbosa* L. var *vivipara* Koel
204. *Poa pratensis* L.
205. *Psilurus incurvus* (Gouan) Schinz & Thell.
206. *Stipa capillata* L.
207. *Vulpia myurus (*L) C.C. Gmel.

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