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RESEARCH ARTICLE

GAS CHROMATOGRAPHY-MASS SPECTROMETRY (GC-MS) ANALYSIS OF BIOACTIVE COMPOUNDS OF AJARA AND AJARA-LAZICA ENDEMIC SPECIES

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ABSTRACT

The article deals with the results of the study of 21 endemic plant species in Ajara and Ajara-Lazica on the content of biologically active compounds applying tandem chromate mass spectrometry (GC-MS/MS) method. Basically, the content of biologically active compounds containing nitrogen was confirmed in 11 species: *Erysimumcontractum Somm. et Levier.*, *Seselifoliosum (Somm. et Lev.) Mand.*, *Astragalussommieri Freyn.*, *Quercuspetra var. dshorochensis c. Koch.*, *Rubusadzharicus Sanadze – Rosaceae Juss., Rhynchosporacaucasica Vahl.*, *Amaracusrotundifolius (Boiss.) Briq.*, *Rhododendron smirnovii Trautv., Rhododendron ungernii Trautv., CentaureaadzharicaSosn.*, *Astragalusadzharicus M.Pop.* The research on the above stated endemic species is a novelty and a primary one, therefore, proceeding from the results, it requires further through study for the purpose of application in medicine.

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INTRODUCTION

A malignant tumor is one of the widely spread diseases in the world today. Lethal outcomes caused by it acquire unprecedented size day by day. Alongside with surgical, beam, chemical, hormone and combined therapies article significance is granted to the anti-tumor compounds obtained from plants and the nano-particles prepared on their basis which selectively penetrate into tumor cells. The majority of anti-malignant tumor preparations of vegetable origin (Colchicine, Colchamine, Vincristine, Vinblastine, Taxol, etc.) are the biologically active, alkaloid-containing medications. Therefore, the search for new resources of alkaloid-containing medicinal plants for the purpose of producing medications against a malignant tumor is one of the topical issues for modern medicine. For today thousands of plants of different countries have been studied on biologically active content. Great is the contribution of Georgian scientists as well (Vachnadze V., Bakuridze A, Vachnadze D., Berashvili D., etc.) in the chemical and pharmacological study of plants (Chelidoniummajus, Catharantusroseus, Colchicum speciozum, Taxusbaccata, etc.) for the purpose of their application in medical practice (1; 6) Ajara or the same as south Colchis floristic region takes one of the distinguished places in terms of vegetation diversity, high share of endemism and uniqueness of forest ecosystems. Vegetation in Ajarais distinguished by particular diversity and originality that is stipulated by ancient plant groupings, endemics and relicts formed as early as the tertiary (Palaeogene) period. The research in this aspect acquired special attention since the opening of borders with the neighboring Turkish republic owing to which Georgia, including Ajara, became a linking corridor between Europe and Asia. Many insuperable natural the so called geographical barriers of plants became easily attainable. Hence, the study of Ajara-Lazica endemics acquires special interest (2; 5). The endemic plants of Ajara and Ajara-Lazica (except for *Galanthuskrasnovii, Galanthusrizechensis* and *Cyclamen adzharicum*) have not been studied on biologically active content and their cytotoxic action so far. The research acquires particular interest and topicality by the fact that construction of roads, bridges and power stations put endemic species under great danger and some of them are threatened to extinction. Therefore, their timely study first and foremost in terms of preservation, elaboration of corresponding

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measures and further study on biologically active substances content is one of the urgent issues for botanists, biologists and pharmacognosists.

MATERIALS AND METHODS

For the purpose of the study of the content of biologically active substances, 21 herbaceous as well as woody endemic plant species have been selected, spread in Georgia, namely Ajara and Ajara-Lazica.

Plant species under study, endemic to Ajara:

*Angelica adzharica M.Pop. (Umbellifereae Juss. (=*Apiaceae Lindl.)); *Centaureaadzharica Sosn. (Asteraceae Dumort. (=Compositae Giseke); Erysimumcontractum Somm. et Levier.* (Crucifereae Juss. (=Brassicaceae Burnett.)); *Psoraleaacaulis var. adzharica (FabaceaeLindl.); Rubusadzharicus Sanadze* (Rosaceae Jus.). Plant species under study, endemic to Ajara-Lazica: *Amaracusrotundifolius (Boiss.) Briq. (=Origanumrotundifolium) (Lamiaceae Juss. (=Labiaceae)*); *Astragalusadzharicus M.Pop. (FabaceaeLindl.); Astragalussommieri Freyn. (FabaceaeLindl.); Cyclamen adzharicum Pobed. (=C.adjaricum var. ibericum) (Primulaceae Vent.)*; *Hypericumnordmanni Khokhr. (Hypericaceae Juss.); Hypericumptarmicifoliumvar. Adzharicum (Hypericaceae Juss.); LinariaadzharicaKem.-Nath. (=L.syspirensis C. Koch.) (ScrophulariaceaeJuss.); Osmanthusdecorus Boiss. et Bal. (Oleaceae Hoffm. et Link.); Primula megasaefoliaboiss. Et Bal. (Primulaceae Vent.); Quercuspetra var. dshorochensis c. Koch. (FabaceaeLindl.); Rhododendron smirnovii Trautv. (Ericaceae DC.); Rhododendron ungernii Trautv. (Ericaceae DC.); Rhynchosporacaucasica Vahl. (Cyperaceae Juss.); Scrophulariachloranta Ky et Boiss. (Scrophulariaceae Juss.); Scutellariapontica C. Koch. (Labiateae L.); Seselifoliosum (Somm. et Lev.) Mand.* (*Umbelliferae Juss., (= Apiaceae Lindl.)*.

It should be noted that the great part of the given plants is under a strong impact of anthropogenic factors. Some of them are under threat of extinction. Almost majority of them represent the species included into the Red List (5) and vulnerable species under threat (2). Therefore, their timely study is important for conservation and preservation purposes as well. Materials for analysis were taken in 2014-2015, early spring and late summer periods when plants are in the active growing and flowering phases. For the purpose of identification of biologically active substances the study was conducted with tandem chromate mass spectrometry GC/MS/MS method at the Toxicology and Chemical Expertise laboratory of LevanSamkharauli Court Expertise National Bureau (Georgia). As raw material, we took grass and roots for analysis, dried them and crushed the obtained sample in accordance with the requirements of tenth edition of state pharmacopeia. Afterwards, 25 ml methanol was added to 5 grams of crushed raw material. After evaporation of the organic solvent, 55-50 mkl*BSTFA/EtAc* (40:10) were separately added to the dry remains and heated to 70^0C temperature for 20 minutes. After cooling, 1-1 mkl was studied with tandem chromate-mass spectrometry – device: *Agilent Technologies 7000 GC/MS/MS Triple Quad;* column- *Elite 5-MS; 30MX250 µm X 0,25 µm*; furnace temperature: 60^0C-310^0C (program regime); injector temperature - 250^0C; transfer line temperature -310^0; airborne - helium 1ml/m; ionization source *El-70 ev;* scanning regime *TIC.* For the purpose of identification of the target substance in the object under study, mass spectrums of the peaks existing on chromatographs were compared with the mass spectrums of the substances existing in the database (NIST 2011).

RESULTS AND DISCUSSION

Out of 21 plant species endemics to Ajara and Ajara-Lazica, we have obtained numerous plants containing biologically active substances with the tandem chromate mass spectrometry. At this stage of the research we offer 11 species, clearly shown on 1-11 chromatograms.

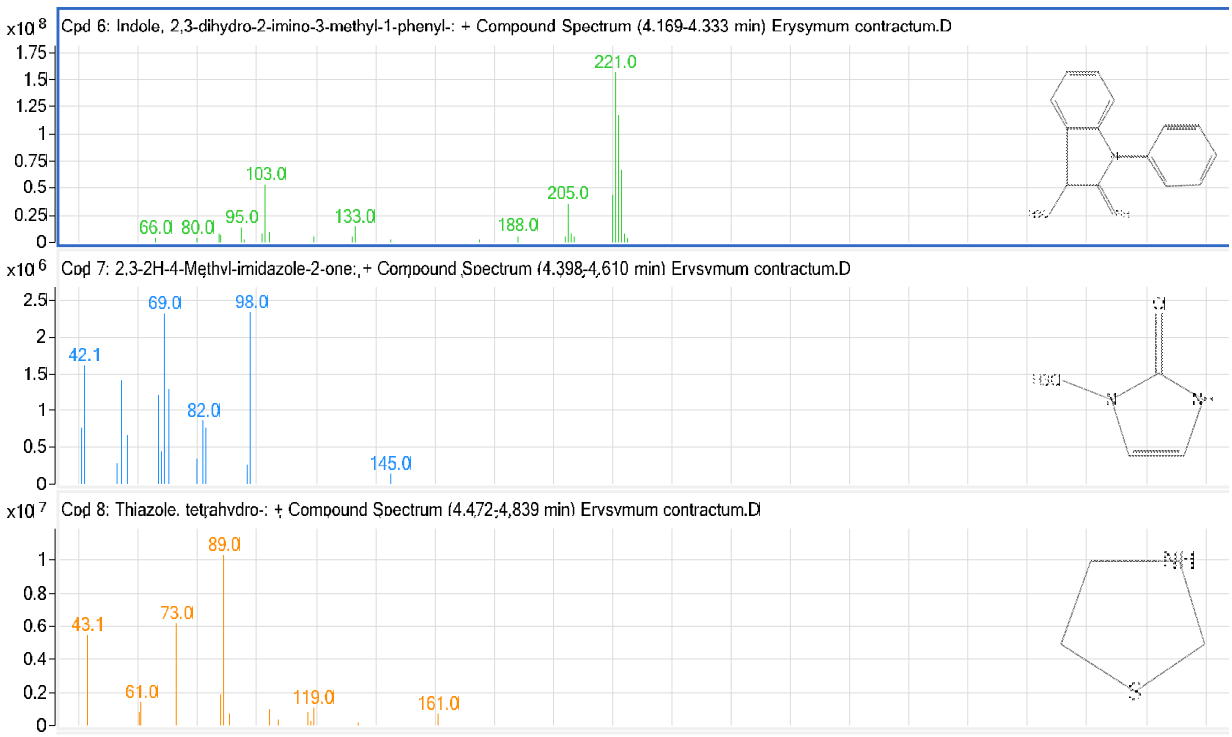


Diagram 1. Erysimumcontractum Somm. et Levier. - Indole,2,3-dihydro-2-imino-3-methyl-1-phenyl GC MS/MS

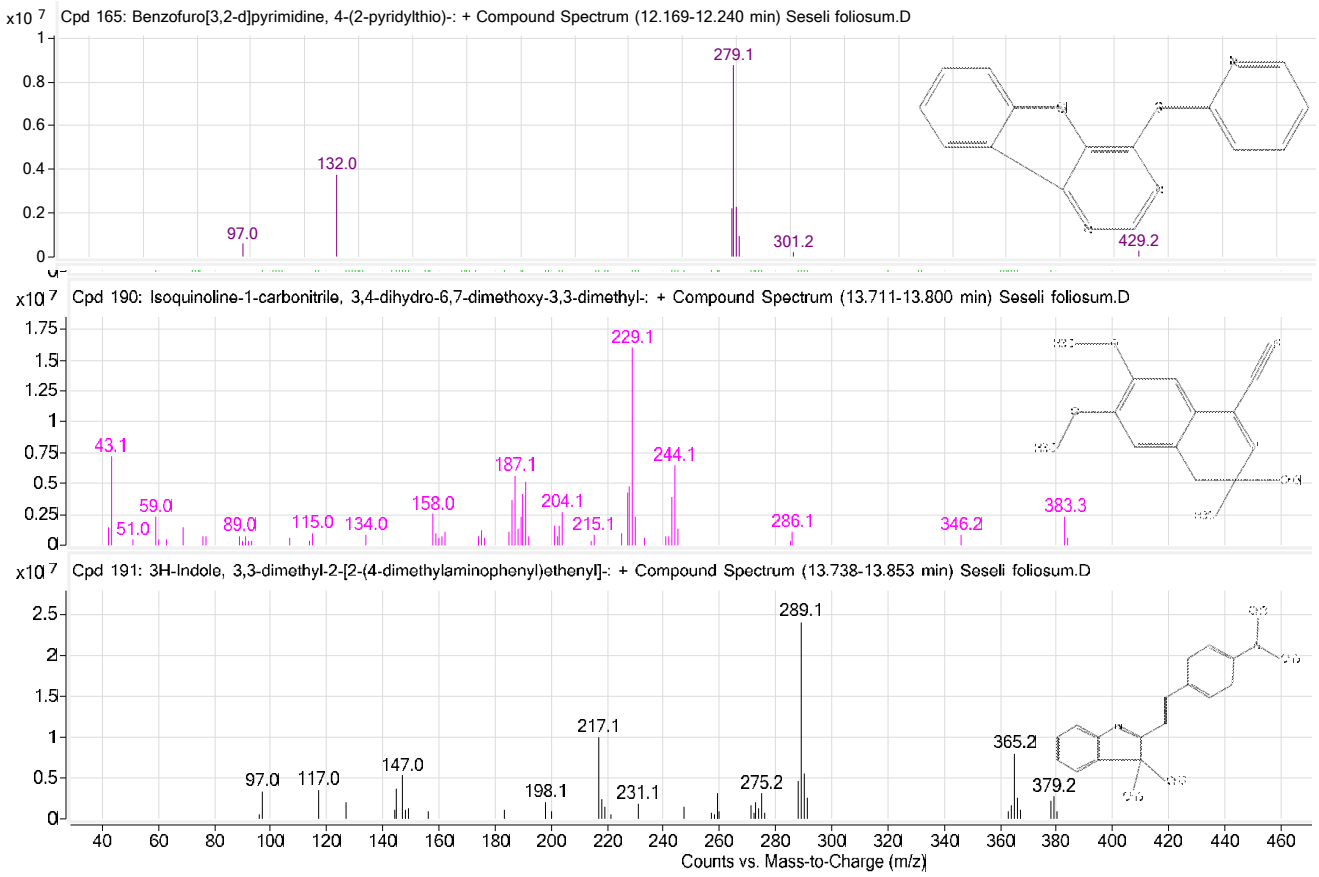


Diagram 2. Seselifoliosum (Somm. et Lev.) Mand. GC MS/MS Benzofuro[3,2-d]pyrimidine, 4-(2-pyridylthio). Isoquinoline-1-carbonitrile, 3,4-dihydro-6,7-dimethoxy-3,3-dimethyl. 3H-Indole,3,3-dimethyl-2[2-(-4-dimethylaminophenyl)ethenyl]

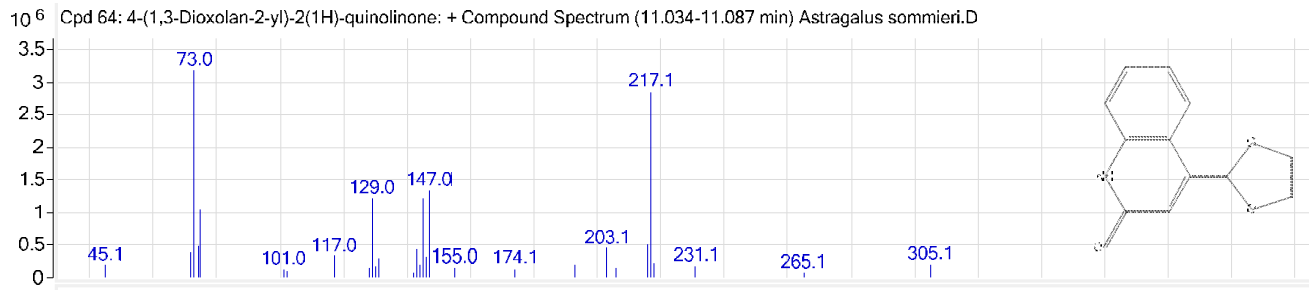
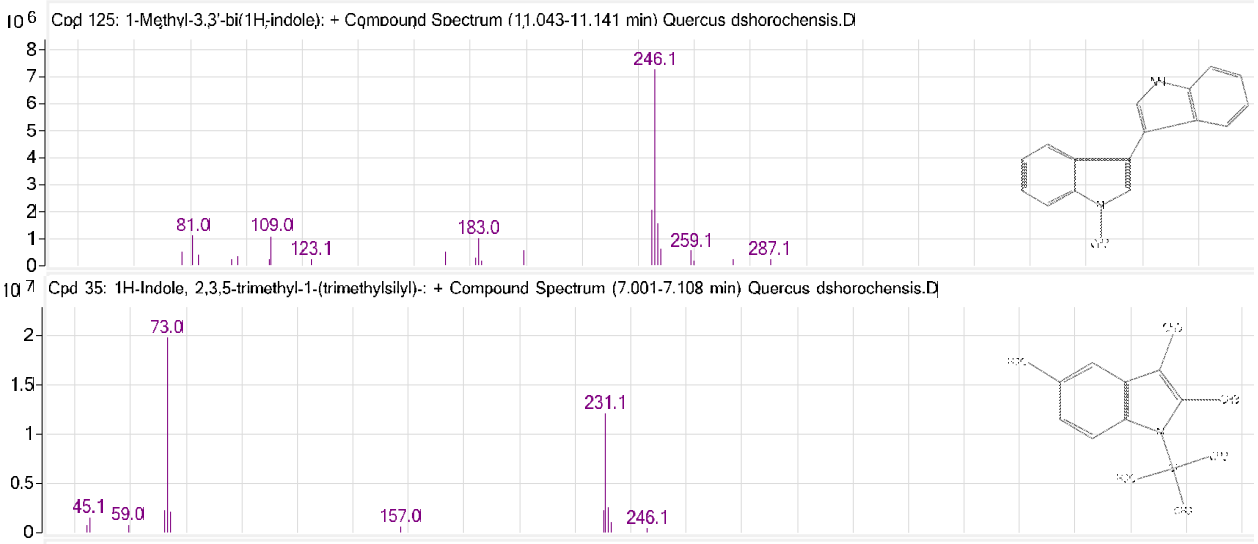


Diagram 3. Astragalussommieri Freyn. 4–(1,3–Dioxolan-2-yl)-2(1H)-quinolinone



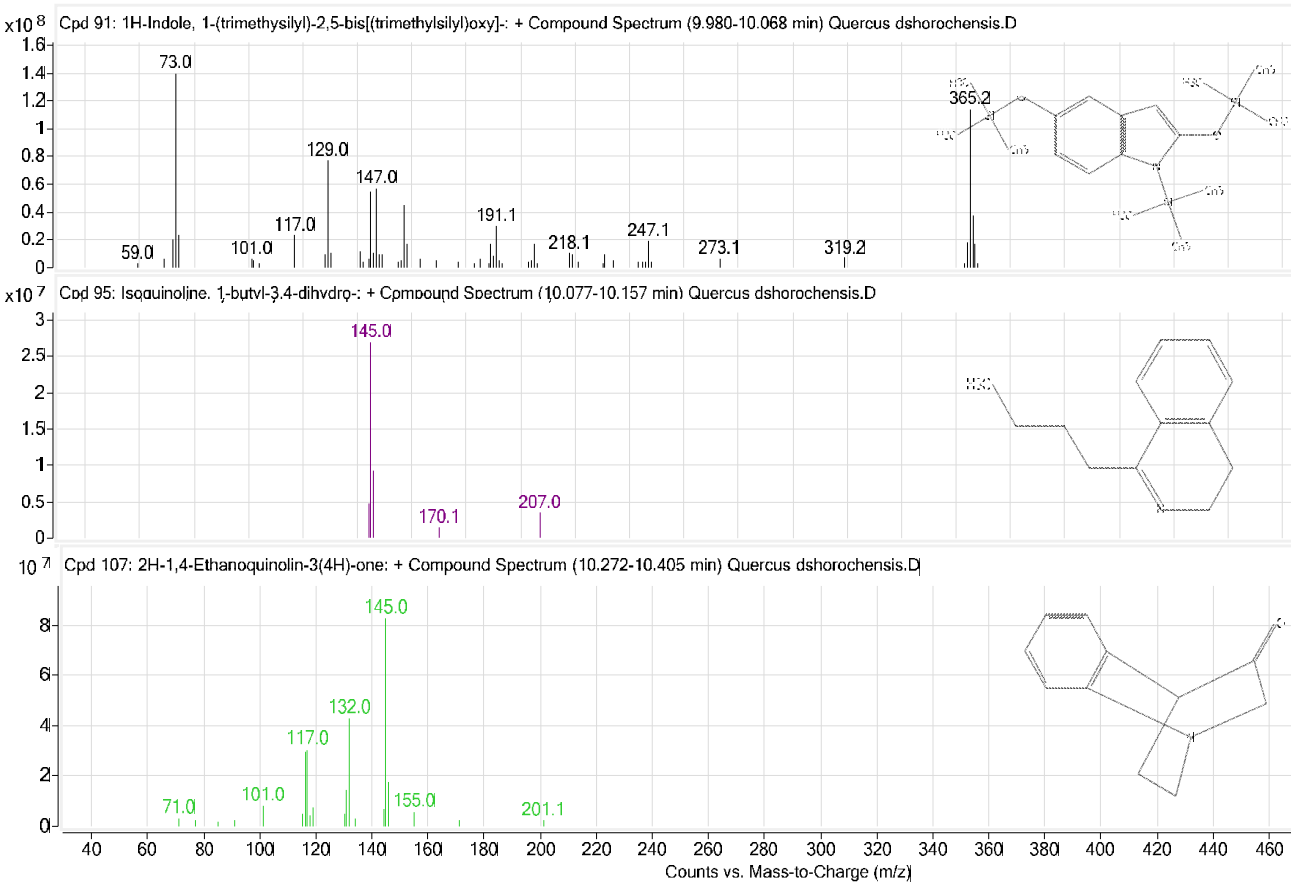


Diagram 4. Quercuspetra var. dshorochensis c. Koch. 1-Methyl-3,3-bi(1H-indole). 1-H-indole, 2,3,5-trimethyl-1(trimethylsilyl) 1H-Indole, 1-(trimethysilyl)-2,5-bis[(trimethysily)oxy] Isoquinoline, 1-butyl-3,4-dihydro 2H-1,4-Ethanoquinolin-3(4H)-one.

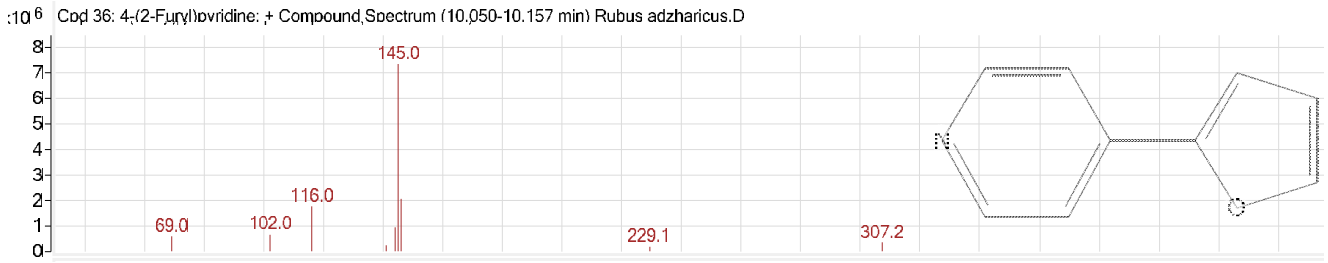


Diagram 5. Rubusadzharicus Sanadze 4–(2–Furyl)pyridine

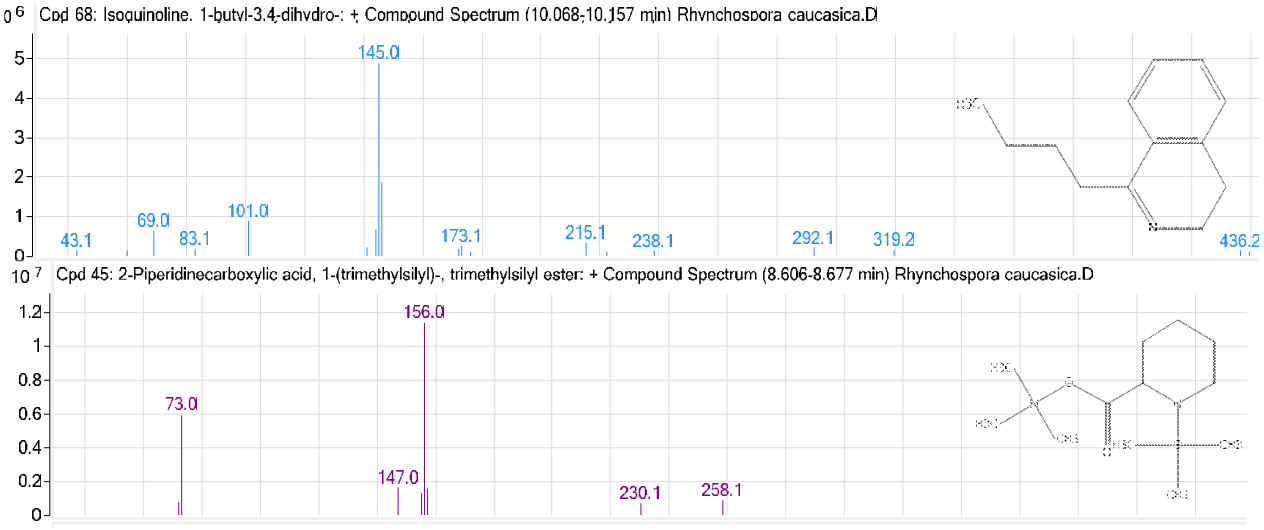


Diagram 6. RhynchosporacaucasicaVahl. Isoquinolin, 1-butyl-3,4-dihydro. Piperidinecarboxylic acid, 1-(trimethylsilyl)-trimethylsilyl ester

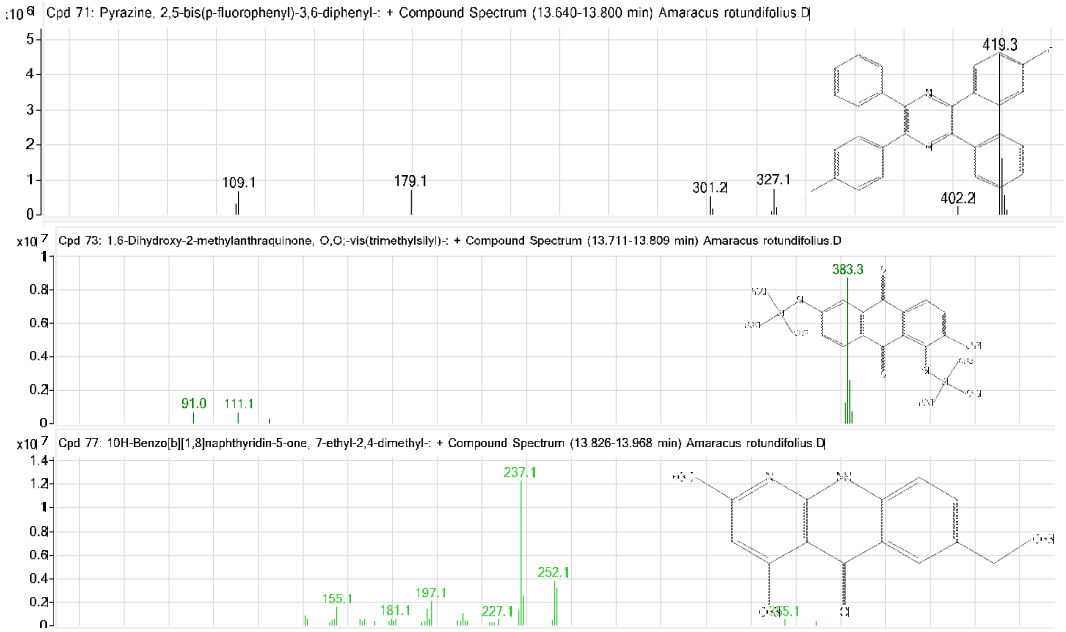


Diagram 7. Amaracusrotundifolius(Boiss.)Briq. (=Origanumrotundifolium Pyrazine, 2,5-bis(p-fluoropenyl)-3,6-diphenyl. 10H-Benzo[b][1,8]naphthyridin-5-one, 7-ethyl-2,4-dimethyl. 1,6-Dihydroxy-2-methylanthraquinone

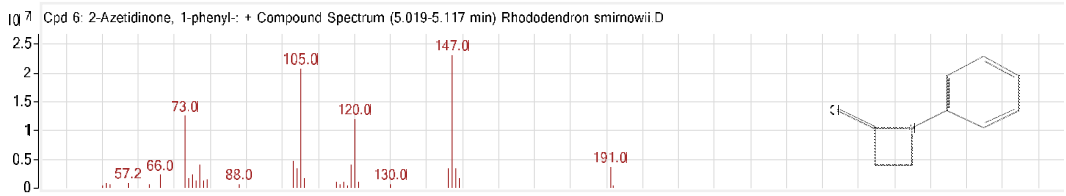


Diagram 8. Rhododendron smirnovii Trautv.-Ericaceae DC; 2-Azetidinone, 1-phenyl[.?]

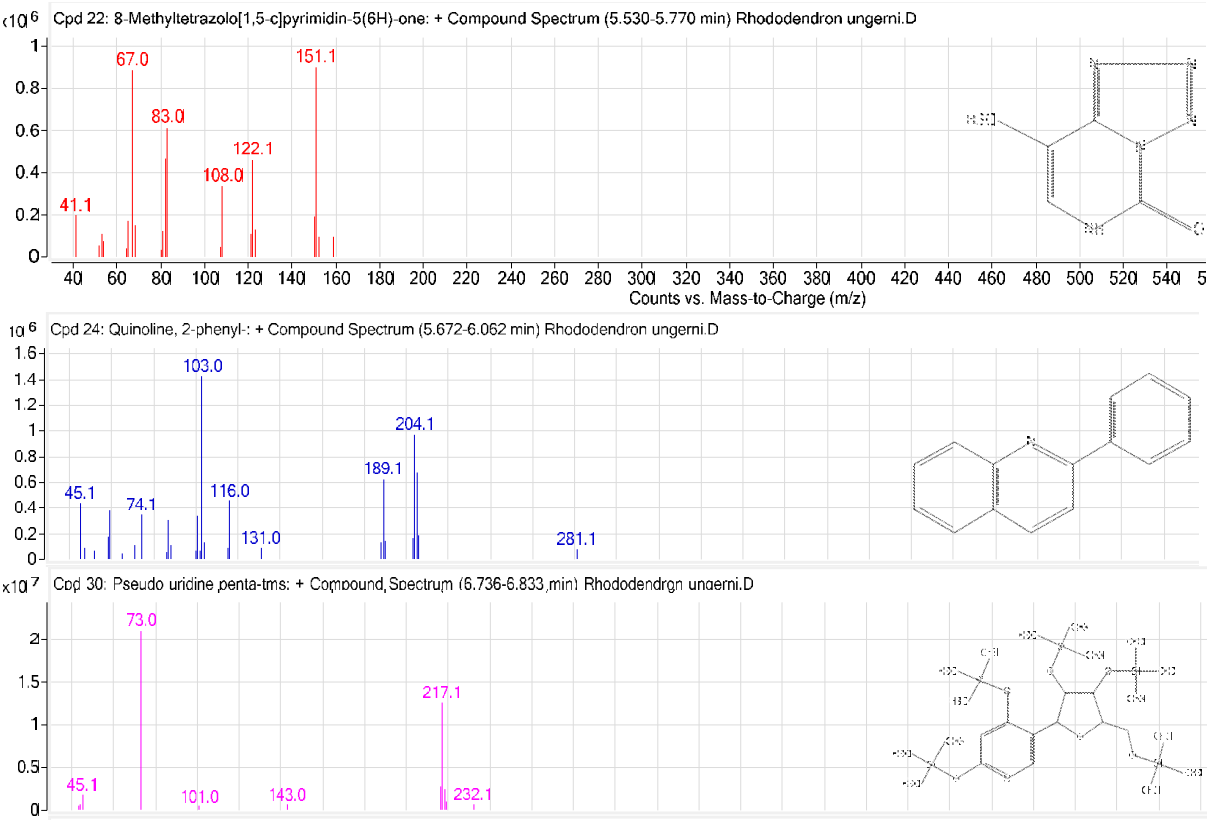


Diagram 9. Rhododendron ungernii Trautv. 8-Methyltetrazolo[1,5-c]pirimidin-5(6H)-ONE. Quinoline, 2-phenyl. Pseudo uridinepenta-tms

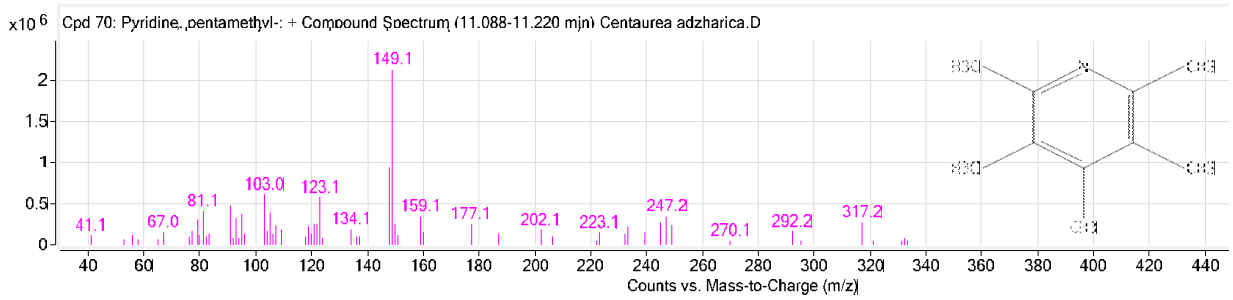


Diagram 10. Centaureaadzharica Sosn. Asteraceae Dumort

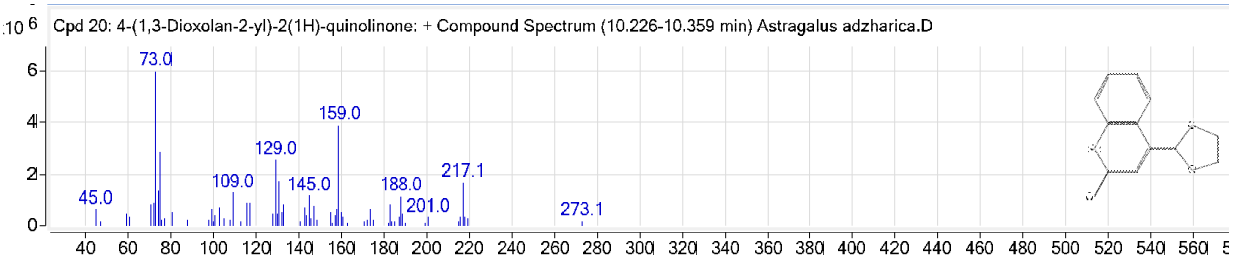


Diagram 11. Astragalusadzharicus M.Pop

Conclusion

Thus, as a result of the analysis of 21 plant species endemics to Ajara and Ajara-Lazica with the tandem chromate mass spectrometry (GC-MS/MS) method, the following 11 species have been identified containing biologically active substances: *Erysimumcontractum Somm. et Levier.*, *Seselifoliosum Somm. et Lev.) Mand., Astragalussommieri Freyn.*, *Quercuspetra var. dshorochensis C. Koch., Rubusadzharicus Sanadze*, *Rhynchosporacaucasica Vahl.*, *Amaracusrotundifolius (Boiss.) Briq. (=Origanumrotundifolium)*, *Rhododendron smirnovii Trautv.*, *Rhododendronungernii Trautv.*, *Centaureaadzharica Sosn., Astragalusadzharicus M.Pop.* The research is a novelty and will continue in future as wellCytotoxic effect.

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