ISSN: 0975-833X

*Available online at http://www.journalcra.com*

**INTERNATIONAL JOURNAL OF CURRENT RESEARCH**

*International Journal of Current Research*
*Vol. 13, Issue, 12, pp.19794-19797, December, 2021*
*DOI: https://doi.org/10.24941/ijcr.42655.12.2021*

**RESEARCH ARTICLE**

# EFFECT OF SOIL COMPOSITION ELEMENTS ON ESSENTIAL OILS CONTENT OF *JUNIPERUS COMMUNIS* L. BERRIES IN NORTH POPULATIONS IN ALBANIA

**Agastra Arlinda, Najada Kadiasi and Ibraliu Alban**

Department of Agronomic Sciences, Agricultural University of Tirana, Tirana, Albania

**ARTICLE INFO**

***Article History:***
Received 25th September, 2021
Received in revised form
19th October, 2021
Accepted 20th November, 2021
Published online 29th December, 2021

***Keywords***
Albania, Juniperuscommunis, essential oils, soil composition.

****Corresponding author:***
***Agastra Arlinda***

**ABSTRACT**

Common Juniper (*Juniperus communis* L.) is a coniferous scrub belonging to the Cupressaceae family and it is widely spread throughout the territory of Albania, exportation of berries plays an important role on the economic aspect of the population especially the North part of Albania. Environmental factors and soil composition elements have a significant influence in essential oils content. Five native populations of *Juniperus communis* L. growing wild are taken in consideration divided in main regions at North of Albania. The Juniper berries are collected manually for two years (2017-2018). Hydro distillationis held on dried berries in a Clevenger apparatusfor 4 h at a distillation rate of 3 mL.min−1.Essential oils content varied at a range of 1.6-2.6 % on the first year based on the dry weight (v/w) and during the second year the essential oils content varied at a range 1.4-2.6%. After EO analysis eleven main elements belonging mainly to monoterpenes class (α-pinene, myrcene, β-pinene, sabinene, limonene, terpinene-4-ol,germacrene D) are identified. The dominant component was α-pinene belonging to monoterpenes. Results assumed that in populations of *Juniperus communis* L. growing on five sites in North part of Albania, composition of EO was a significantly correlated with soil composition elements, concluding that soil types and composition had affected on chemical constitutions of essential oil in the investigated populations.



***Citation: Agastra Arlinda, Najada Kadiasi and Ibraliu Alban.*** *"*Effect of soil composition elements on essential oils content of *juniperus communis* l. berries in north populations in albania*", 2021. International Journal of Current Research, 13, (12), 19794-19797.*

# INTRODUCTION

*Juniperus communis* L. is an evergreen gymnosperm scrub (Thomas et al.2007) with a wide broad amplitude adapted to various ecologicalconditions. This genus includes around 68 species. Common Juniper (*Juniperus communis* L.) is the only Juniperus species found in both hemispheres (Adams and Pandey 2003) ,and it can be found up to 3000m above to sea level (Lim 2012). Juniper habitats are scattered to concentrate along with other light-requiring species of plants, mostly shrubs that occur within communities of grass lands and scrubland vegetation. Referring to the country's geographic position as well as geological, relief, and climatic factors, juniper is present almost the entire territory of Albania.Juniper`s berries are collected by the local population especially in the North of Albania for lots of families it is the basic economic source.Albania has a long tradition in collecting juniper berries either for individual usage as flavouring agents in food and alcoholic beverages from mainly import for juniper's berries come from Albania.Environmental factors and soil composition elements have a significant influence in essential oils content. In this article we have analyzed five populations in the North part of Albania for two years (2017- 2018) taking in consideration most important pedoclimatic factors : soil elements (PH , Humus ) altitude, to proof the correlation between these factors and EO composition main investigated elements changes.

# MATERIALS AND METHODS

The berriesof *Juniperus communis* L. were collected from November to December 2017 and 2018 in the North partof Albania. Sampling is collected using information of Albanian GenBank for distribution of natural population of *Juniperus communis* L. and based in protocols forcollection of plant genetic material. The study was conducted in the main natural

growing areas of common juniper (*Juniperus communis L.)* populations in Albania. Between the localities it is considered a large distance for the purpose of having diversity. Regarding the locations for considering as a reference matter also the altitude (Figure 1). Voucher specimens were deposited in Genetics and Plant Breeding Laboratory Department of Agriculture Sciences, Agricultural University of Tirana. Berries were cleaned from impurities and naturally dried at room temperature.

**Collection of plant material:** Scrubs were selected to each locality mentioned and their positions were recorded by GPS. 100g of Juniper berries from each scrub were collected manually into linen bags for each year (2017-2018) stored in room temperature after cleaned and dried.

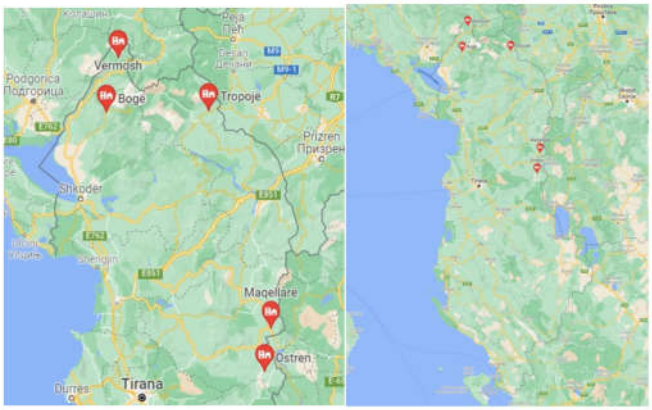



**Figure 1**. ***Map of Juniperus communis collected in the North part of Albania***

Soil samples were collected in all 5 localities around 1 m diameter each scrub from which the berries werecollected. The upper layer of ground was removed and then the soil samples were collected with the soil drill from 0-15 cm layer and then delivered to the laboratory of in Albanian Transfer Technology Center of Fushe-Kruja.

**Isolation of the Essential Oil:** *Juniperus communis* L. berries were submitted to hydro distillation (100 g berries in 0.4 liters of water contained in a 1-liter flask) in a Clevenger apparatusfor 4 h at a distillation rate of 3 mL.min−1 according to Pharmacopoeia European (2004). The content of EO is determined as weight percentage.

**GC/MC analysis:** Analysis of the composition of the essential oil of *Juniperus communis* L berries was carried out with PC-PA-014-17J19 method by FAST GC-FID (in French). Identifications are validated by GC-MC in February 2019 approved by "LaboratoriePhyto Chemia".

# RESULTS AND DISCUSSION

**EO analysis:** The EO yield depended on the years and the locations (Table 1). Essential oils content varied at a range of 1.6-2.8 % on the first year based on the dry weight (v/w) and during the second year the essential oils content varied at a range 1.4-2.6 %. The highest yield in year 2017 was 2.8% corresponding in Diber. The highest yield percentage corresponds in Tropoje with 1.6 %. Referring to the second year 2018 , the highest percentage of EO yield is 2.6 % corresponding in Diber and the lowest percentage is found in Tropoja, 1.4%.

**Components found in EO analysis:** After EO analysis is performed, eleven typically elements belonging mainly to monoterpenes class are identified. The dominant component was α-pinene belonging to monoterpenes class.In the first year the ranges for α-pinene varied between 21.78 % - 27.12 %. In the second year the values varied from 25.08 % - 29.72 %.

**Evaluation of soil components**

**Humus:** Humus content is one of the most important factors analyzed in correlation with EO content. In sites taken in consideration for the study the humus content ranged from 8.65% in Boge to 1.66 % in Tropoje . A significant correlation ($p<0,05$) was found between the humus content and EO yield.In Boge where the humus content is 8.65 % the range of EO content was 2.6 % and the lowest range of humus content (Tropoje–1.66) corresponds with the lowest EO content1.6 % . Based to this fact , the low amount of humus is related to the low production of EO yield. It is possible that the lower amount of humus in the soil content may not only be related to its low production but also in greater mineralization (Jozef Fejér, Daniela Gruľová, Adriana Eliašová; 2018 ) this may reflect positively in the accumulation of EO.

**Analysis of Variance**

**Ph content related to EO yield:** The soil Ph values in five localities ranged from7.9–8.4 which means that the soil is typically alkaline. The two-factorial analysis of variance in five populations in the North of Albania for the Ph value and EO yield content resulted that for these two elements there is no correlation proven statistically since $p>0.05$.

**Main components in EO**

**α-Pinene:** Different ranges in percentage of α-Pinene was evaluated in five different localities for two years taken in study. The highest percentage in 2017was registered in Maqellare(27.8 %) and the lowest percentage was registered in Boge (21.78%). In 2018 The highest percentage was registered in Boge (29.72 %), and the lowest percentage was registered in Maqellare (21.78%).When we compare the two years,we evaluate an increasement of the percentage of α-Pinene in 2018 comparing the year 2017.

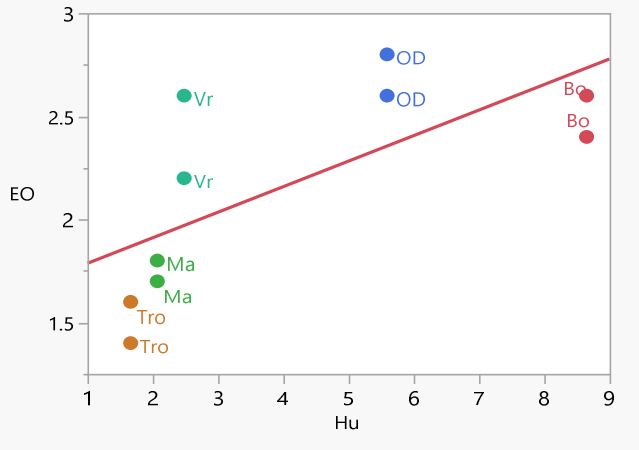
**Myrcene:** Different ranges in percentage of Myrcene was evaluated in five different localities for two years taken in study. The highest percentage in 2017 was registered in Ostren(25.6 %) and the lowest percentage was registered in Tropoje (6.77%). In 2018 The highest percentage was registered in Ostren (21.6 %) and the lowest percentage was registered in Vermosh (6.57%). When we compare the two years, we evaluate andecrease of the percentage of Myrcene in 2017 comparing the year 2018.

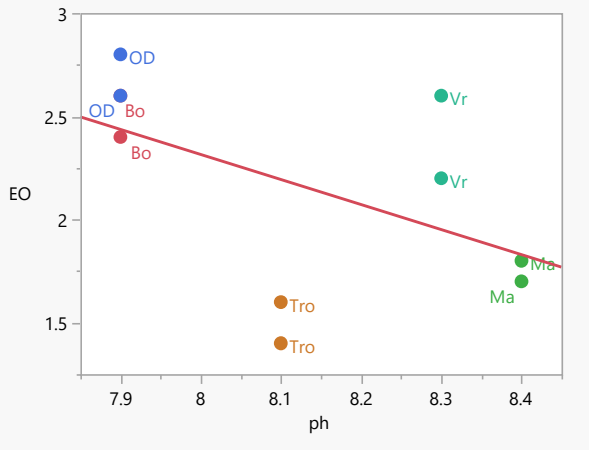
**Sabinene:** Different ranges in percentage of Sabinene was evaluated in five different localities for two years taken in study. The highest percentage in 2017 was registered in Boge (17.40 %) and the lowest percentage was registered in Ostren (9.19%). In 2018 The highest percentage was registered in Boge (13.89 %) and the lowest percentage was registered in Vermosh (9.51%). When we compare the two years, we evaluate a decrease of the percentage of Myrcene in 2017 comparing the year 2018.

| Sites | Alt (m) | | Hu % | | ph -log(H+) | | EO % | |
|---|---|---|---|---|---|---|---|---|
| | Year | | Year | | Year | | Year | |
| | 2017 | 2018 | 2017 | 2018 | 2017 | 2018 | 2017 | 2018 |
| Vermosh | 1046 | 1046 | 2.48 | 2.48 | 8.3 | 8.3 | 2.6 | 2.2 |
| Boge | 899 | 899 | 8.65 | 8.65 | 7.9 | 7.9 | 2.6 | 2.4 |
| Maqellare | 796 | 796 | 2.07 | 2.07 | 8.4 | 8.4 | 1.8 | 1.7 |
| Ostren | 1048 | 1048 | 5.59 | 5.59 | 7.9 | 7.9 | 2.8 | 2.6 |
| Tropoje | 1255 | 1255 | 1.66 | 1.66 | 8.1 | 8.1 | 1.6 | 1.4 |

| Source | DF | Sum of Squares | Mean Square | F Ratio |
|---|---|---|---|---|
| Model | 1 | 1.0899658 | 1.08997 | 7.3211 |
| Error | 8 | 1.1910342 | 0.14888 | Prob > F |
| C. Total | 9 | 2.2810000 | | 0.0268* |

| Source | DF | Sum of Squares | Mean Square | F Ratio |
|---|---|---|---|---|
| Model | 1 | 0.6106154 | 0.610615 | 2.9244 |
| Error | 8 | 1.6703846 | 0.208798 | Prob > F |
| C. Total | 9 | 2.2810000 | | 0.1256 |




# DISCUSSION AND CONCLUSION

*Juniperus communis* L. has a wide ecological amplitude found on different geographical sites. This diversity leads to species adaption that can lead to various ecotypes and chemotypes (JozefFejér, Daniela Gruľová, Adriana Eliašová, Ivan Kron & Vincenzo De Feo ; 2018 ). The environmental conditions of five locations taken in consideration for this study, in North part of Albania are very heterogeneous. The most important factors that affected the accumulation of EO are pH and humus content among soil properties and altitude among topographic factors (JozefFejér, Daniela Gruľová, Adriana Eliašová, Ivan Kron & Vincenzo De Feo ; 2018).

The results represented in this study showed the impact of soil elements Humus and Phon the EO yield and on its composition. Significant differences are found in EO yield between localities for two years. The most significant factors impacting EO yield appear to be Ph of the soil and especially humus content. Statistically significant differences are evaluated. Regardingthe EO components α-Pinene was evaluated to be the main component in the highest percentage in all samples followed by Myrcene and Sabinene. Analyzed components showed differences in percentage during the two years. The two-factorial analysis of variance in five populations in the North of Albania for the EO yield content also for the Humus value in soil content resulted there is significant correlation proven statistically ($p<0.05$).

# REFERENCES

Vilčinskas R, Vilkaitytė A, Zybartaitė L, Paulauskas A, Kupčinskienė E. 2013 ; Genetic characteristics of *Juniperus communis* L. from diferent ecotypes. Biologija. 59(1): 129–134.

JozefFejér, Daniela Gruľová, Adriana Eliašová, Ivan Kron & Vincenzo De Feo ; 2018 ; The most important factors that affected the accumulation of EO were pH and humus content among soil properties and altitude among topographic factors

Šalamon, I. and Petruska, P. (2017) Quality of Juniper Essential Oil (Oleum Juniperi) in the South Slovakia and it's Curative and Industrial Utilization. Indian Journal of Pharmaceutical Education and Research | Vol 51 | Issue 3 | Jul-Sep, 2017 (Special Issue)

Barrett 1998. Catling & Brownell 1998; Daubenmire 1978; Decker et al. 1991; Dietz & Nagy 1976; Dittberner& Olson 1983; EMEA 1999; EuropeanCommunity 1992; Gardner et al. 1998; Gastler et al. 1951; Janknecht 1986; McBride & Borders Forest Trust 1998; Mundinger 1978; Mundinger 1979; Novak 1959; Pase& Hurd 1958; Philips 1910; U.S. Department of Agriculture 1937

Leung, A.Y. and S. FOSTER, 1996. Encyclopedia of Common Natural Ingredients Used in Food, Drugs, and Cosmetics. 2nd Edn., Wiley, New York, ISBN-10: 0471508268, pp: 649.

Koukos, K.P. and K.I. Papadopoulou, 1997; Essential oil of *Juniperus communis L. grown in north Greece:* Variation of fruit oil yield and composition. Essential Oil Res., 9: 35-38. DOI: 10.1080/10412905.1997.9700711

Gixhari, B. - Ismaili, H. - Vrapi, H - Elezi, F - Dias, S - Sulovari, H., 2012; *Geographic distribution and diversity of fruit tree species in Albania*.International Journal of Ecosystems and Ecology Sciences (IJEES), Vol. 2 (4): 355-360.

Hyso, M. - Shehu, A. - Çobaj, P. 2005; *Collection and assessment of germplasm of aromatic and medicinal Plants for Genetic diversity.* Agricultural Services Project 2003-2005. Ministry of Agriculture and Food, Tirana, 2005.

Ibraliu, A., Faslia, N., Mullaj A. and Xuefei MI; Status of Medicinal PlantResearch in Albania. Current Trends in Medicinal Botany. I.K. International PublishingHouse Pvt. Ltd. ISSN 978-93-82332-50-3 page 61-76.

Haziri, A - Faiku, F - Mehmeti, A - GOVORI, S - Abazi, S - Daci, M and Mele, A; Antimicrobial properties of the essential oil of *Juniperus communis (L.),* growing wild in east part of Kosovo 2013.

Papadhopulli, G. 1976. *Bimet Mjekesoredhe Aromatikete Shqiperise* (Medicinal Plants of Albania). Shtepiabotuese "8 Nentori", Tirana, Albania (in Albanian), 203p.

*******