



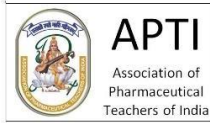
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ABSTRACTS & FULL PAPERS





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**The 12th Conference on Medicinal and Aromatic Plants
of Southeast European Countries**

CMAPSEEC-2024
PROCEEDINGS BOOK
ABSTRACTS & FULL PAPERS

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PREFACE

Dear participants and colleagues,

It is with great enthusiasm that we present the proceedings of the 12th International Congress on Medicinal and Aromatic Plants of Southeast European Countries (CMAPSEEC-2024), held on October 17-19, 2024, in the historic city of Izmir, Türkiye. Organized in cooperation with the Association of Medicinal and Aromatic Plants of Southeast European Countries (AMAPSEEC) and hosted by Dokuz Eylül University, this congress has once again brought together leading scientists, researchers, and industry experts. Besides, Gaziantep University and Lokman Hekim University partnered with the organization.

This year's conference offered a dynamic platform for the exchange of knowledge, innovation, and ideas among participants from Serbia, Bulgaria, Macedonia, Croatia, Portugal, Italy, China, Thailand, Moldova, Iran, Northern Cyprus, and Türkiye considering medicinal and aromatic plants in traditional and modern medicine, agriculture, and other fields. We were honored to see representation from both the public and private sectors, indicating the broad and interdisciplinary appeal of this field.

As we face global health, environmental, and sustainability challenges, the research and development of medicinal and aromatic plants become more significant than ever. This congress not only served as a forum for presenting the latest scientific findings but also facilitated collaborations that will inspire future advancements in the sector.

This congress has once again served as a cherished gathering where scientific knowledge flourishes amidst the warmth of friendship and mutual respect. For over the years, CMAPSEEC has been more than just a conference; it has become an annual reunion where colleagues become friends, and friends become family. Each year, as we come together to explore the latest advances in medicinal and aromatic plants, we are reminded of the deep bonds that connect our diverse community.

On behalf of the organizing committee, we extend our heartfelt thanks to all participants for making CMAPSEEC not only a leading scientific congress but also a gathering that feels like coming home. We are grateful for your dedication, your enthusiasm, and the warmth that you bring to this event.

We look forward to seeing the innovations, friendships, and collaborations that will continue to grow from the seeds planted at CMAPSEEC-2024.

Sincerely,

Prof. Dr. İlkyay Erdođan Orhan
Prof. Dr. Nazım Şekerođlu
Prof. Dr. İpek Süntar
Prof. Dr. F. Sezer Şenol Deniz
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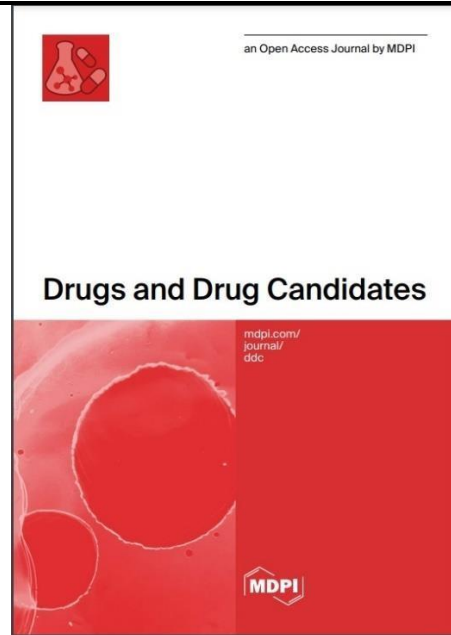
The organizing committee would like to sincerely thank the supporters and sponsors for their valuable support and contributions to the CMAPSEEC-2024. This conference has been organized by academicians and researchers from distinguished world universities, research institutions, non-governmental organizations, and agencies. The main organizers, supporters, and sponsors are;

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- Kumamoto University, Japan
- Walailak University, Thailand
- FITOTABAUM, Gaziantep University, Türkiye
- KUAD – Cosmetic Producers and Researchers Association
- APTI – Association of Pharmaceutical Teachers of India
- AMAPMED – Association of Medicinal and Aromatic Plants of Mediterranean
- GOFMAP – Global Federation of Medicinal and Aromatic Plants
- AMAPSEEC – Association for Medicinal and Aromatic Plants of Southeast European Countries
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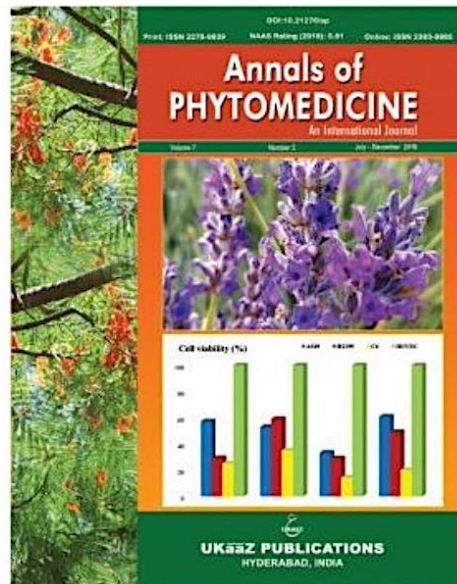


Contracted Journals

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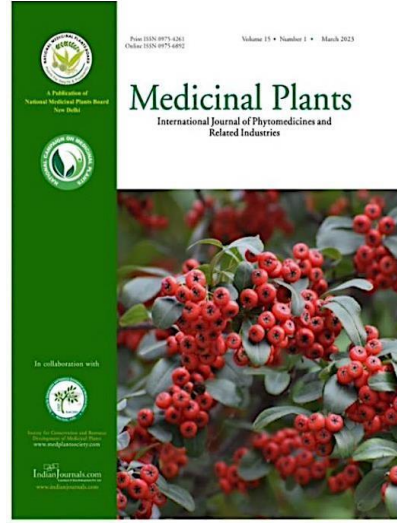
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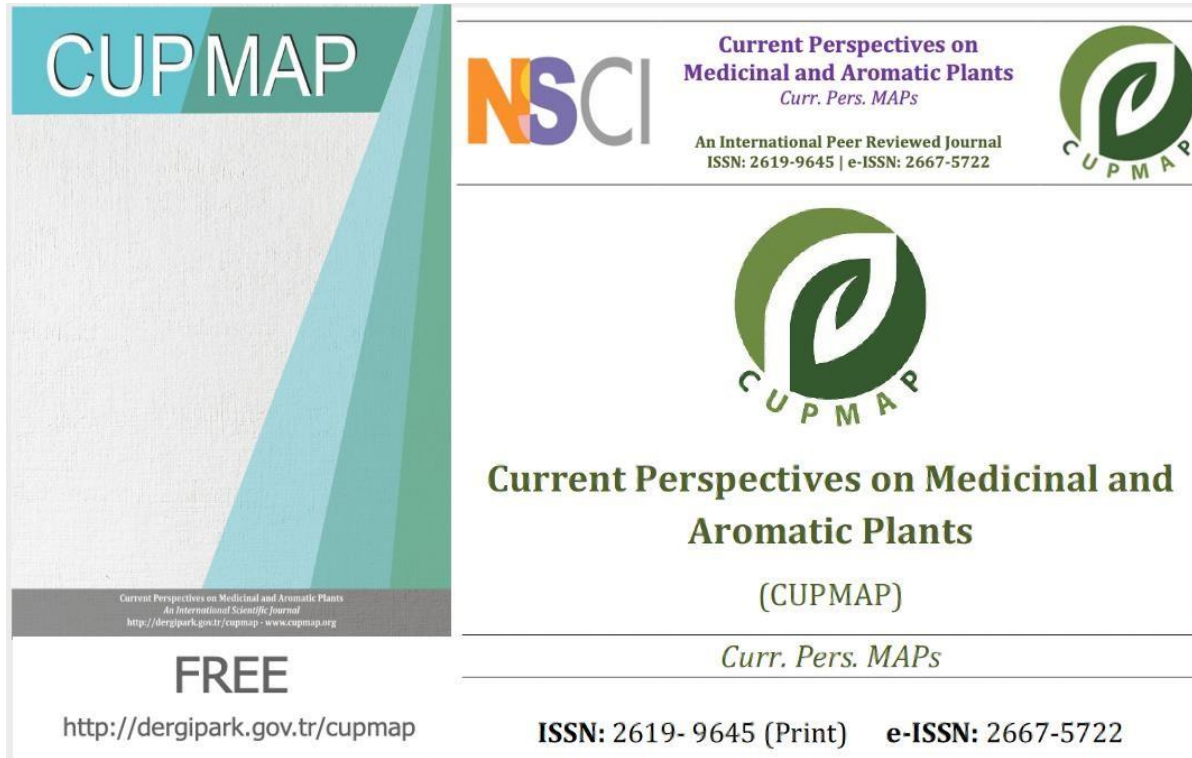
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Current Perspectives on Medicinal and Aromatic Plants
(CUPMAP)

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The image shows the cover of the journal 'Current Perspectives on Medicinal and Aromatic Plants (CUPMAP)'. The cover features the title 'CUPMAP' in large white letters on a green background. Below the title, it says 'Current Perspectives on Medicinal and Aromatic Plants' and 'An International Scientific Journal'. The URL 'http://dergipark.gov.tr/cupmap' is also present. The word 'FREE' is prominently displayed in the bottom left corner. To the right of the cover, there is a logo for NSCI (National Science Citation Index) and the journal's title in English. Below the logo, it states 'An International Peer Reviewed Journal' and provides the ISSN: 2619-9645 and e-ISSN: 2667-5722. The journal's logo, a green leaf inside a circle with 'CUPMAP' written below it, is also shown. The title 'Current Perspectives on Medicinal and Aromatic Plants (CUPMAP)' is repeated in a larger font, followed by 'Curr. Pers. MAPs' and the ISSN information.

CUPMAP is an open access, peer-reviewed, and refereed international journal published by MESMAP scientific group. The main objective of the CUPMAP is to provide an intellectual outlook on the scientific researches on Medicinal and Aromatic Plants. CUPMAP have distinguished goals to promote interdisciplinary scientific studies in which results could easily be used in industrial production on MAPs. This international scientific journal publishes research papers, applied studies, and review articles related to medicinal and aromatic plants in the fields of science and technology such as biology, molecular biology and genetics, chemistry, agriculture, biochemistry, botany, ethnobotany, environmental science, forestry, horticulture, health care & public health, nutrition and food science, pharmaceutical sciences, and so on.

Special Issues devoted to important topics in the MAPs science and technology could also be published. CUPMAP Journal is published biannually (on June and December) in both print and online versions. The publication language of the journal is English. CUPMAP welcomes article submissions and does not charge any article submission or processing charges. CUPMAP is inviting papers for Volume 7 (Issue 2), which is scheduled to be published on December, 2024.

Last date of submission: December 13, 2024.



CMAPSEEC-2024 Konferansında toplam 65 bildiri sunulmuştur, bunlardan 38'i sözlü, 27 tanesi ise poster sunum şeklinde olup; sunulan **sözlü bildirilerin %60'lık kısmı yabancı katılımcılar** tarafından sunulmuştur. Kongreye 10 ülkeden bilim insanları katılım sağlamıştır. **Katılım Sağlayan Ülkeler:** Tayland, Portekiz, Bulgaristan, Sırbistan, İtalya, Hırvatistan, Makedonya, İran, Kuzey Kıbrıs Türk Cumhuriyeti ve Türkiye. **Kongre katılımcıları ve sunum başlıkları “CMAPSEEC-2024 Abstracts & Proceedings Book” kitabının içindekiler kısmında sunulmuştur. CMAPSEEC-2024 Konferansı aşağıda yer alan YÖK Akademik Teşvik ve Yükselme kriterlerini sağlamaktadır.**

İlgili YÖK akademik teşvik yönetmeliği; 17/1/2020 tarihli ve 31011 sayılı Resmî Gazete’de yayımlanan 16/1/2020 tarihli ve 2043 sayılı Cumhurbaşkanlığı Kararı uyarınca:

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ABSTRACTS (POSTER PRESENTATIONS)

FERMENTED FOOD PRODUCTS FROM RASPBERRIES AND BLACKBERRIES - A NEW FORMULATION FOR FUNCTIONAL BEVERAGES

Sanja Kostadinović Veličkowska¹, Daniela Todevska¹, Fidanka Ilieva¹ and Zorica Temelkova²

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² Tikveš Winery AD, 8mi Septemvri, 1430 Kavadarci, North Macedonia, E-mail: zorica.lelova@yahoo.com;

The healing effect of wines and vinegars from fruits with high amount of natural antioxidants is well known and scientifically confirmed in treatments of anemia, diabetes, hypertension, arteriosclerosis and other cardio vascular and cancer diseases. However, the most powerful natural pigments such anthocyanins, proanthocyanins and condensed tannins are presented in raspberry and blackberry fruits. In addition, anthocyanins and proanthocyanidins are the most stable antioxidants in an acidic environment (pH= 2-4) such as vinegars and wines. Production of healing wines and vinegars by technology of interrupted fermentation and a maximum of 5-6% alcohol has been developed as a new technology for production of healthy functional beverages. For production of healing wines and vinegars, raspberries and blackberries were collected and pressed, separately, in order to completely squeeze the liquid from the fleshy part of the fruit. The berry liquid was separated from pomace and subjected to fermentation by yeast Lalvin ICV D80 (Lallemant, France). Yeast nutrient was added, (FERMAID E, Lallemant, France), to prevent slow fermentation. During alcoholic fermentation, the temperature was controlled and maintained between 14-18 °C. After fermentation, sedimentation and filtration, the obtained wines and vinegars had high amounts of natural antioxidants, pleasant flavor and taste. The amount of D-glucose+D-fructose was bellowing 0.5 g/L, while the amount of sucrose was less than 0.85 g/L. The level of total phenols was higher than 850 mg/L wine and vinegars, the amount of higher molecular proanthocyanidins was over 1115 mg/L, while the amount of lower proanthocyanidins was 800 mg/L. The level of total anthocyanins was over 950 mg/L expressed as cyanidin -3-O-glucoside. This new technology of interrupted fermentation is promising for production of high-valuable functional beverages due to the facts that 5% of alcohol was sufficient for extraction of all phenolic compounds and natural antioxidant presented in raspberries and blackberries.

Key Words: healing wines and vinegars, raspberry and blackberry functional drinks, polyphenols, anthocyanins, natural antioxidants, fermentation.

Acknowledgements

We are grateful to Mrs. Dragana Popovska, the manager of the company "Bioactive-Antioxidant" for supplying the high-quality samples of wines and vinegars from raspberries and blackberries from the region of North Macedonia and her support and help during the investigation and preparation of the study.



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References

- [1] Kostadinović Velickovska, S., Wilkens, A., Stefova, M., Ivanova, V., Vojnoski, B., Winterhalter P. 2012. Stilbene levels and antioxidant activity of Vranec and Merlot wines from Macedonia: Effect of variety and enological practices. *Food Chemistry* 135 (4), 3003-3009, <https://doi.org/10.1016/j.foodchem.2012.06.118>.
- [2] Cocevska, M., Jancovska Seniceva, E., Kostadinovic Velickovska, S., Naumova-Letia, G., Mirceski, V., Rocha J.M.F., Esatbeyoglu T. 2021. Electrochemical determination of antioxidant capacity of traditional homemade fruit vinegars produced with double spontaneous fermentation. *Microorganisms*. 9(9), 1946, <https://doi.org/10.3390/microorganisms9091946>
- [3] Ilieva, F., Kostadinović Veličkovska, S., Dimovska, D., Mirhosseini, H., Spasov, H. 2017. Selection of 80 newly isolated autochthonous yeast strains from the Tikveš region of Macedonia and their impact on the quality of red wines produced from Vranec and Cabernet Sauvignon grape varieties, *Food Chemistry*, 216, 309-315, <https://doi.org/10.1016/j.foodchem.2016.08.049>.
- [4] Ilieva, F., Petrov, K., Veličkovska, S.K., Gunova, N., Dimovska, V., Rocha, J.M.F., Esatbeyoglu T. 2021. Influence of autochthonous and commercial yeast Strains on fermentation and quality of wines produced from Vranec and Cabernet Sauvignon grape varieties from Tikveš wine-growing region, Republic of North Macedonia. *Applied Sciences*. 2021; 11(13):6135. <https://doi.org/10.3390/app11136135>.
- [5] Kurt-Celebi, A., Colak, N., Hayirlioglu-Ayaz, S., Kostadinović Veličkovska, S., Ilieva, F., Esatbeyoglu, T., Ayaz, F.A. 2020. Accumulation of phenolic compounds and antioxidant capacity during berry development in black 'isabel' grape (*Vitis vinifera* L. x *Vitis labrusca* L.). *Molecules*. 25(17):3845. <https://doi.org/10.3390/molecules25173845>.
- [6] Ilieva, F., Kostadinović Veličkovska, S., Dimovska, D., Spasov, S. 2016. The impact of some wine-making practices on the quality of Vranec red wines from Macedonia produced by the newly-selected local strain "F-78". *Food Chemistry*, 194, 1123-1131, <https://doi.org/10.1016/j.foodchem.2015.08.088>.
- [7] Ilieva, F., Kostadinovic Velickovska, S., Dimovska, V., Mirhosseini, H., Spasov, H. 2019. Isolation of *Saccharomyces cerevisiae* yeast strains from Macedonian "Tikveš" wine-growing region and their impact on the organoleptic characteristics of Vranec and Cabernet Sauvignon wines. *Research Journal of Biotechnology*, 14 (6). 100-110