



Phenolic profile and antioxidant activity of peppermint (*Mentha piperita* L.) agro-industrial waste



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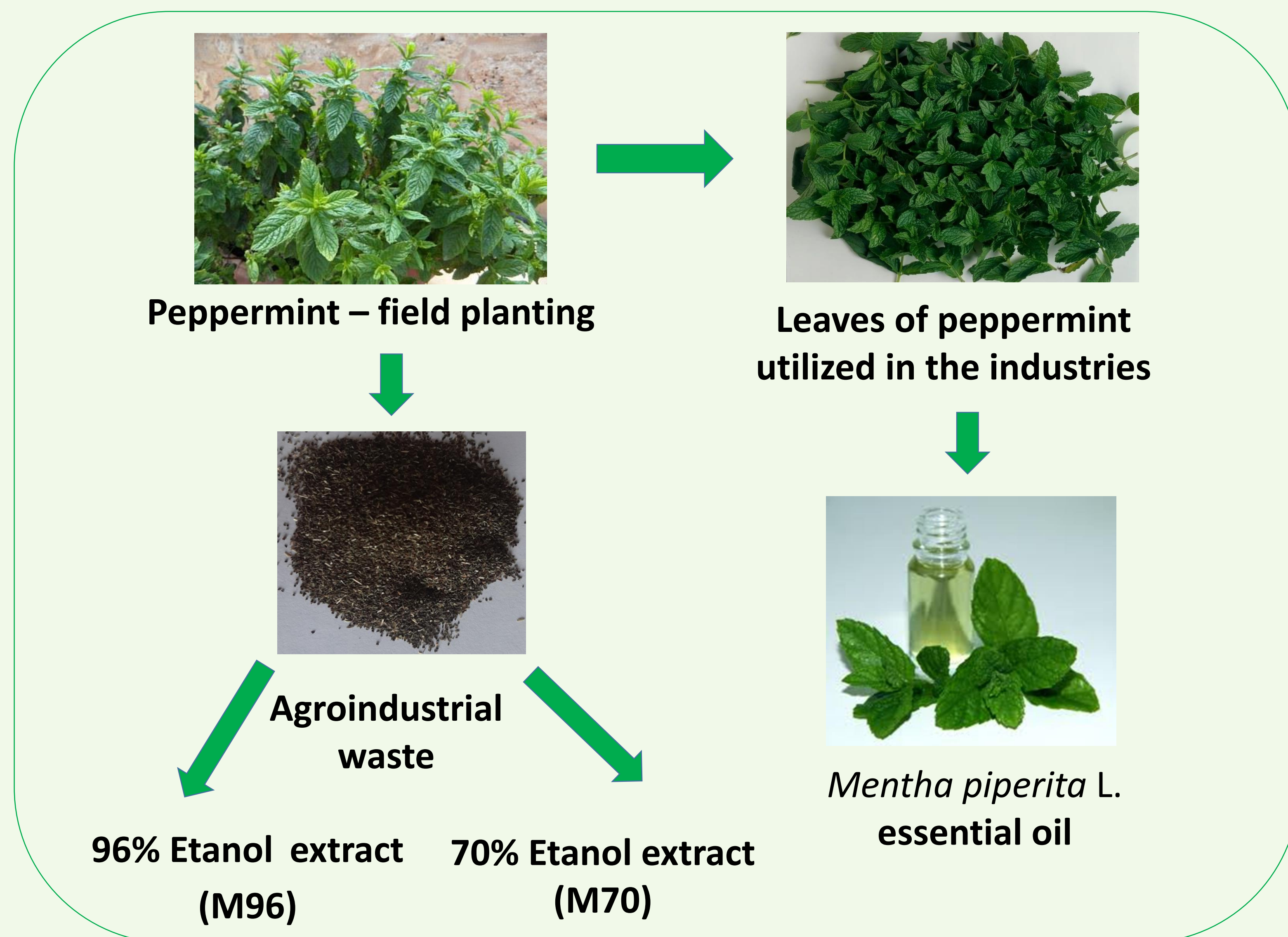
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INTRODUCTION

Nowadays, the management of herbal waste represents both an economic and environmental issue on a global level. However, the herbal waste and by-products contain some valuable compounds such as phenolic compounds, which are possible to be recovered sufficiently to find positive results regarding their potential use in terms of content, market, and suitability. Among medicinal and aromatic plants, peppermint (*Mentha piperita* L.) is one of the most cultivated in the Balkan region, commonly utilized in both food and pharmaceuticals industries. The active parts of this plant are the stems, leaves, and flowers. However, some parts of plant, mostly seeds, are excluded at the field as agro-industrial waste.

MATERIAL AND METHOD

This study explored the polyphenol profiles and antioxidant activities of ethanol extracts of peppermint's agro-industrial waste from the field. Ethanol-water mixtures in the concentrations of 96 % (v/v) and 70 % (v/v) were used to obtain extracts from dried plant (*M. piperita* L.) waste material. For the separation and quantification of phenolic compounds, ultra-high performance liquid chromatography with a mass spectrometer was used (1). In addition, total phenol content (TPC) was evaluated in ethanolic extracts by Folin-Ciocalteu method (2), while antioxidant activity was evaluated by DPPH (3) and FRAP methods (4).



RESULTS AND DISCUSSION

In total, twelve phenolic compounds were quantified in both samples, including four phenolic acids and eight flavonoids. Chlorogenic acid was the most abundant phenolic compound in both samples prepared with the ethanol-water mixture (M70; 1.77 mg/L) and with ethanol (M96; 0.56 mg/L), followed by caffeic acid with 0.99 and 0.33 mg/L, respectively. Among flavonoids, the most abundant was rutin with amounts 2.93 (M70) and 2.09 (M96) mg/L, while other flavonoids were quantified in small amounts.

Table 1. The phenolic profiles of etanolic extracts (M96 and M70) produced from agroindustrial waste of *Mentha piperita* L

mg/L	M70	M96	mg/L	M70	M96
Galic_acid	n.d.	n.d.	Ferulic_acid	n.d.	n.d.
Protocatechuic acid	n.d.	n.d.	Naringin	n.d.	n.d.
5-O-Caffeoylquinic acid	1.77	0.56	Quercetin 3-O-rhamnoside	n.d.	n.d.
p-Hydroxybenzoic_acid	0.10	0.04	Isorhamnetin_3-O-glucoside	0.13	0.06
Catechin	n.d.	n.d.	Luteolin	0.11	0.06
Caffeic_acid	0.99	0.32	Quercetin	0.07	0.03
Rutin	2.93	2.09	Naringenin	0.09	0.08
p-Coumaric_acid	0.02	0.01	Apigenin	0.34	0.15
Quercetin_3-O-glucoside	0.48	0.35	Kaempferol	0.10	0.05

CONCLUSION

The ethanolic extracts of peppermint's agro-industrial waste exhibited noteworthy antioxidant activity. Considering the presented results, this high-value and low-cost material should be more extensively studied and encouraged for further exploitation in the food industry sector, thus contributing to waste reduction and building more sustainable future.

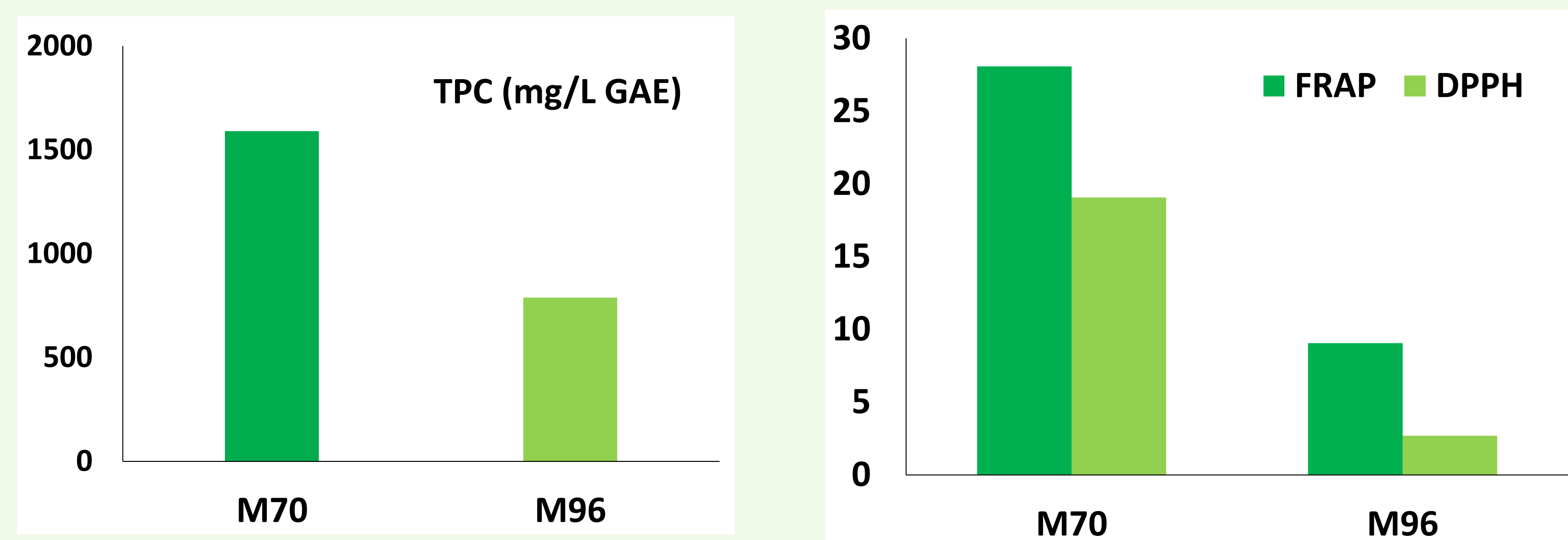


Figure 1. (a) The total phenol content and (b) antioxidant capacity of peppermint's waste extracts

TPC of M70 and M90 samples were 1587.71 and 786.86 mg/L gallic acid equivalents. The antioxidant activity was 28.70 (M70) and 19.07 (M96) mM Trolox equivalents (TE) according to FRAP method; while 9.05 and 2.69 mM TE according to DPPH method, respectively.

Reference

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