

NEMATICIDAL POTENTIAL OF *Mentha x rotundifolia* HYDROLATE BY-PRODUCT

M. Fe Andrés^a, Carmen E. Díaz^b, Juliana Rocha^c and Azucena Gonzalez-Coloma^a

^a Instituto de Ciencias Agrarias (ICA), CSIC, Calle Serrano 115-ápda, 28006 Madrid, Spain

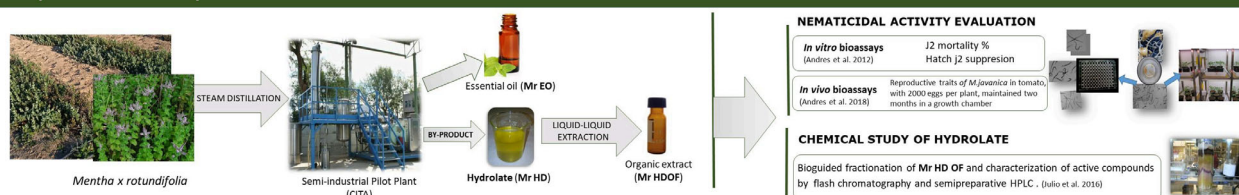
^b Instituto de Productos Naturales y Agrobiología (IPNA), CSIC, Avda. Astrofísico F. Sánchez 3, 38206 La Laguna, Tenerife, Spain

^c Centro de Investigación y Tecnología Agroalimentaria de Aragón (CITA), Avda. Montañana 930, 50059 Zaragoza, Spain.

Background

Mentha x rotundifolia, also known as apple mint, is an aromatic and medicinal plant of ethnopharmacological interest and several studies have demonstrated the antioxidant, antimicrobial, antifungal, insecticide, and nematocidal activity of its essential oil. Following a process of crop domestication, a chemically stable population of *M. x rotundifolia* has been developed for further valorization. The *in vitro* nematocidal effects of Spanish *M. x rotundifolia* EO, with piperitone oxide as the main component, have been previously demonstrated. In this work, we have studied the *in vitro* and *in vivo* nematocidal activity of *M. x rotundifolia* hydrolate by-product, obtained from the semi-industrial vapor-pressure essential oil extraction, against the root-knot nematode *Meloidogyne javanica*.

Experimental procedures

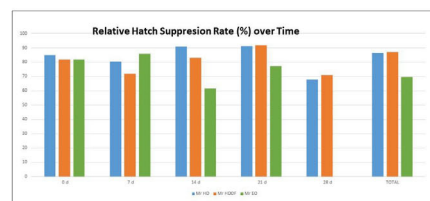


Results

In vitro Nematicidal Activity

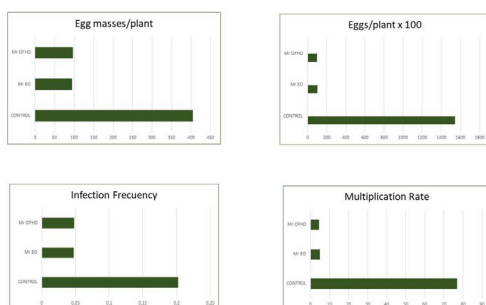
	<i>M. javanica</i> (J2) Mortality %				
	24h	48h	72h	LC ₅₀ (95 % CI)	LC ₉₅ (95 % CI)
Mr HD	100	100	100		
Mr HD OF	94.36 ± 2.64	100	100	0.253 (0.242-0.264)	0.393 (0.384-0.405)
Mr EO	100	100	100	0.204 (0.196-0.213)	0.320 (0.308-0.334)

Mr HD OF and Mr EO concentration: 1mg/ml; Mr HD: undiluted. Values are means of four replicates, corrected according to Scheider-Orrell's formula. Five concentrations were used to obtain LC₅₀ and LC₉₅.



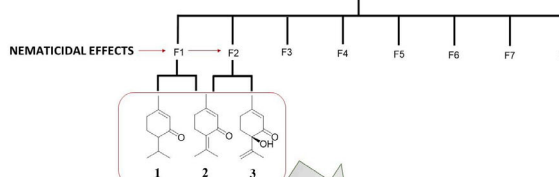
0 d: Five days of incubation. Subsequent times: number of days of immersion in water after time 0.

In vivo Nematicidal Activity



Organic EXTRACT

BIOGUIDED FRACTIONATION



ACTIVE COMPOUNDS
1: Carvacrol
2: Piperitone
3: (-)-(4R)-4-hydroxyisopiperitone

Conclusions

- The *Mentha x rotundifolia* hydrolate and its organic fraction (OF) were very effective *in vitro*, inducing strong lethal effects in *M. javanica* J2 and powerful egg hatching suppression effects. All this indicates that the active components of the hydrolate are present in the OF.
- The bio-guided fractionation of the hydrolate organic extract afforded two active fractions in which the nematocidal compounds: Carvacrol (1), piperitone (2) and (-)-(4R)-4-hydroxyisopiperitone (3) were identified.
- The hydrolate OF-treated soils significantly reduced the reproductive traits of the *M. javanica* population with similar effects to those demonstrated by the essential oil treatment.
- The present work highlights the nematocidal potential of *Mentha x rotundifolia* hydrolate, a by-product obtained from the extraction of essential oil by industrial steam distillation. The extraction of the organic fraction of the hydrolate allows quantifying the nematocidal activity as well as to standardize and characterize (chemical marker, chemical fingerprint) different batches of this active by-product.

References

- Andrés MF, González-Coloma A, Sanz J, Burillo J, Sainz P (2012) Nematicidal activity of essential oils: a review. *Phytochem Rev* 11:371–390
- Andrés MF, González-Coloma A, Muñoz R, De la Peña F, Julio LF, Burillo J (2018). Nematicidal potential of hydrolates from the semi industrial vapor-pressure extraction of Spanish aromatic plants. *Environ Sci Pollut Res Int.* 2018 Oct;25(30):29834-29840. doi: 10.1007/s11356-017-9429-z. Epub 2017 Jun 22. PMID: 28639024.
- Julio, L.F. Barrero, A.F. Herrador Del Pino, M.M. Arteaga, J.F. Burillo, J. Andres, M.F. Díaz, C.E. González-Coloma, A. (2016). Phytotoxic and Nematicidal Components of *Lavandula luisieri*. *Journal of Natural Products*, Vol. 79, Núm. 2, pp. 261-266.