Cholinesterase inhibitory activity of the essential oils of *Schinus areira* L.

Damián Russo, Silvana Rodriguez and Ana Paula Murray
INQUISUR – CONICET, Departamento de Química, UNS, Bahía Blanca, Pcia. Bs.As., Argentina

INTRODUCTION

Schinus areira L., commonly known as "Aguaribay" or "Molle," belongs to the Anacardiaceae family. This plant, native to the southwest of the province of Buenos Aires, Argentina, is widely used in traditional medicine and is recognized for its various important biological actions. The essential oil derived from *S. areira* has shown significant antibacterial, antioxidant, and antifungal properties, and has also been reported as an allelopathic agent.

Butyrylcholinesterase (BChE) is considered an important therapeutic target for Alzheimer's Disease (AD), and the search for new inhibitors that target both acetylcholinesterase (AChE) and BChE is crucial in finding alternative treatments for AD patients who do not respond to selective AChE inhibitors. The aim of this study was to evaluate the inhibitory effects of the essential oil of *S. areira* on cholinesterase enzymes.

MATERIAL AND METHODS

The chemical composition of the essential oil (EO) obtained from the aerial parts of the plant through hydrodistillation was determined using gas chromatography-mass spectrometry (GC-MS). Thirty-two components present in the EO were identified by comparing their retention indices (Kovats indices) with known compounds and by comparing their mass spectra with those stored in MS databases (NBS75K.L MS DATA). The results are summarized in Table 1.

Bioguided fractionation of the essential oil was conducted using silica gel column chromatography, which led to the isolation of two active compounds identified as alpha-phellandrene and beta-eudesmol. These compounds were analyzed by GC-MS and identified by comparing their ^{1}H and ^{13}C NMR data with those reported in existing literature.

The inhibition of AChE and BChE was determined spectrophotometrically by the Ellman method. The IC_{50} values for enzyme inhibition, along with their standard deviations are summarized in Table 2 - 3

RESULTS

The essential oil contains α-phellandrene, camphene, α-pinene, and β-eudesmol as its major components. The essential oil demonstrated more effective BChE inhibition (IC_{50} = 42.37 µg/mL) compared to AChE inhibition (IC_{50} = 347.3 µg/mL).

The isolated compounds β-eudesmol and α-phellandrene exhibited potent BChE inhibition, with IC_{50} values below 15 µM, whereas their inhibition of AChE was moderate.

Schinus areira L.

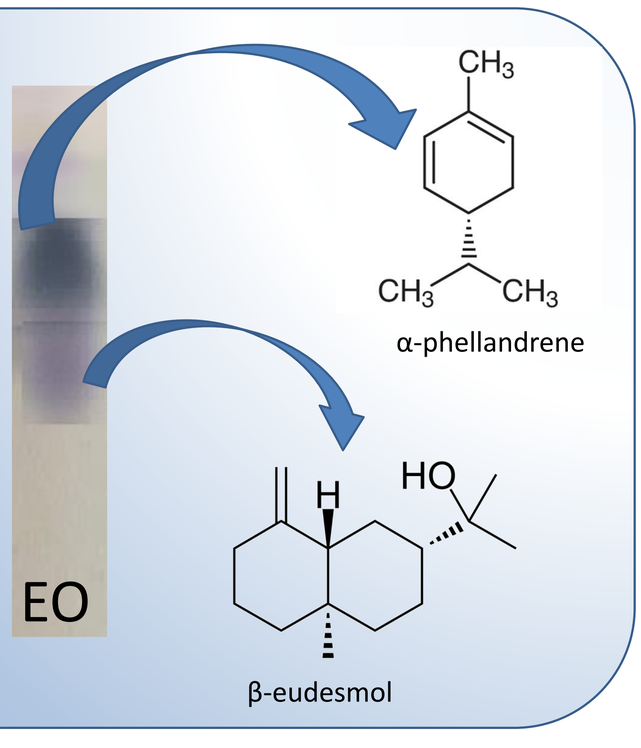

Table 1: Composition of the essential oil of *Schinus areira*

Compounds [a]	KI [b]	Percentage %	Method of identification [c]
α-pinene	939	5.243	CG-EM, RI, S
camphene	953	6.893	CG-EM, RI, S
α-phellandrene	1006	15.49	CG-EM, RI, RMN
β-phellandrene	1031	10.719	CG-EM, RI
ɣ-muurolene	1477	9.211	CG-EM, RI
germacrene D	1479	6.674	CG-EM, RI
β-eudesmol	1649	5.73	CG-EM, RI, RMN

a List of components in order of elution on DB-5 column
b Retention index (IK) on DB-5 column
c Retention index (RI) identical to literature (Adams R.P., 2007)
MS: identification based on comparison of mass spectra
S: Retention time identical to authentic compound
NMR: compound isolated and identified by NMR

Table 2: BChE and AChE inhibitory activity of *S. areira* essential oil

Essential oil	AChE IC_{50} (µg/ml ± SD)	BChE IC_{50} (µg/ml ± SD)
Schinus areira L.	60.25 ± 0.09	15.35 ± 0.22

Table 3: BChE and AChE inhibitory activity of compounds 1 and 2

Compounds.	AChE IC_{50} (µM ± SD)	BChE IC_{50} (µM ± SD)
1) α-phellandrene	6.04 ± 0.23	43.31 ± 0.35
2)β-eudesmol	14.96 ± 0.19	5.26 ± 0.28
galantamine	1.257 ± 0,0238	29.8 ± 0.24

CONCLUSION

These findings suggest that the essential oil of *S. areira* may be a valuable source of bioactive compounds that could potentially be developed into alternative treatments for Alzheimer's Disease.

REFERENCES

[1] Adams R.P., (2007). "Identification of Essential Oil Components By Gas Chromatography/Mass Spectrometry". Ed Alluredbooks. Illinois

[2] Selkoe DJ. Preventing Alzheimer's disease. Science (New York, N.Y.). 2012 Sep;337(6101):1488-1492 .

[4] Ellman GL, Courtney KD, Andres V, Featherstone RM. (1961) A new and rapid colorimetric determination of acetylcholinesterase activity. Biochemical Pharmacology, 7, 88-90

The 9th International Electronic Conference on Medicinal Chemistry
01–30 November 2023 | Online
MDPI