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Comparative study on the inhibition of acetylcholinesterase activity by *Hyptis marrubioides*, *Hyptis pectinata* and *Hyptis suaveolens* methanolic extracts

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Background & Aim

- Hyptis spp. has been shown to possesses many bioactivities including antioxidant and neuroprotective (1);
- No studies have reported their acetylcholinesterase (AChE) inhibition activitiy;
- Flavonoids are currently considered a prominent source of anti-Alzheimer disease compounds (2);
- In this study, the methanolic extracts from Hyptis marrubioides (Hm), Hyptis pectinate (Hp) and Hyptis suaveolens (Hs) leaves were compared regarding their ability to inhibit the AChE enzyme and discussed regarding to their phenolic contents.

Materials & Methods

- AChE activity assay was based on Ellman's method with physostigmine used as positive control. The chemical basis of the colorimetric reaction can be seen in figure 1:

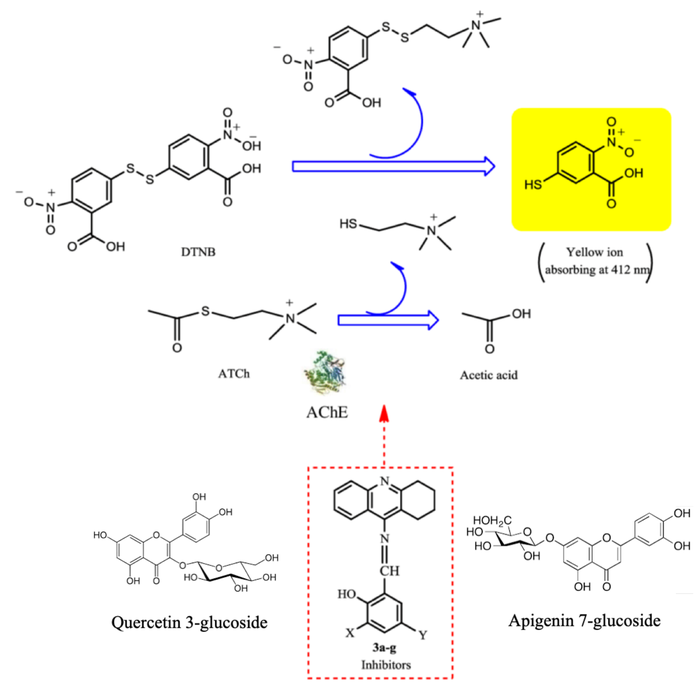
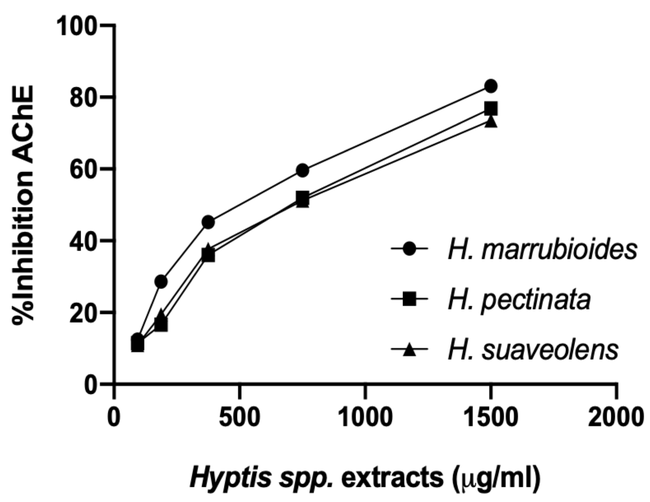


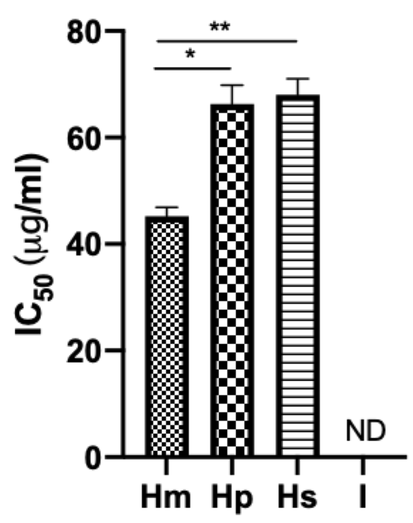
Figure 1 – Chemical principle of the Ellman´s method, adapted from (3)

Results



A

Figure 2 – Graphical curves of % AChE inhibition versus Hyptis extracts concentration (A) and IC50 values of Hyptis extracts (B). Twenty microliters of each extract in several concentrations (7,5 - 1500 µg/ml, final well concentrations) were assayed for inhibition of AChE activity. IC50 values were obtained via non-linear regression analysis (sigmoidal fitting with variable slope). Physostigmine (the reference inhibitor, I) was used as positive control. Asterisks mean significantly differences, obtained by one-way ANOVA followed by Tukey post-tests for multiple comparisons. * P≤0.05; ** P≤0.01. IC50 (physostigmine) = IC50 (physostigmine) = $6{,}480\text{x}10^{-8} \pm 7{,}586\text{x}10^{-9}$ µg/ml



B

Discussion & Conclusion

- ✓ Inhibition of AChE, the key enzyme in the breakdown of acetylcholine, may be considered as one of the treatment approaches against several neurological disorders such as Alzheimer's disease, senile dementia, ataxia, and myasthenia gravis (4);
- ✓ All Hm, Hp and Hs methanolic extracts have a moderate AChE (according to (4)) with Hm's anti-AChE activity significantly higher than Hp and Hs;
- ✓ AChE activity may be related to the flavonoids contents, since the Hm is the extract with the highest contents in flavonoids, as described (1,2);
- ✓ Since Hyptis methanolic fractions have revealed both antioxidant and anti-AChE activities, further studies are warranted, either to unveil the protective mechanism underlying these activities, or to identify the active ingredients, assess their safety and bioavailability in *in vivo* animal models;
- ✓ This study shows that Hyptis methanolic extracts can be used as a source of compounds with pharmacological properties, namely anti-AChE, which could be helpful in age-related diseases.

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References:
1. Vilasboas-Campos, D. et al. 2020. P. Neurotherapeutic effect of Hyptis spp. leaf extracts in *Caenorhabditis elegans* models of tauopathy and polyglutamine disease: role of the glutathione redox cycle. Free Rad. Biol. Med.; https://doi.org/10.1016/j.freeradbiomed.2020.10.018
2. Khan, H. *et al.* 2018. Flavonoids as acetylcholinesterase inhibitors: current therapeutic standing and future prospects. *Biomed. Pharmacother.*; doi: 10.1016/j.biopha.2018.03.007
3. Mohammed S. et al. 2014. *In-vitro* screening of acetylcholinesterase inhibitory activity of extracts from Palestinian indigenous flora in relation to the treatment of Alzheimer's disease. Funct. food health dis.; 4(9):381-400; DOI: 10.20450/mjcce.2019.1561
4. Santos R.C *et al*. 2018. Naturally Occurring Acetylcholinesterase Inhibitors and Their Potential Use for Alzheimer's Disease Therapy. Frontiers in Pharmacology 9, 1192. doi: 10.3389/fphar.2018.01192