



## AN INVESTIGATION OF ALGERIAN *CRATAEGUS* (HAWTHORN): THEIR PHYSICO-CHEMICAL PROPERTIES, ANTIOXIDANT CAPACITIES AND CHEMICAL PROFILE USING THE HPLC ANALYSIS

GOUDJIL Sabrina<sup>1\*</sup>, BOUSSEKINE Samira<sup>2</sup>, BELKHALFA Hakim<sup>3</sup>, GOUDJIL Sarra<sup>4</sup>,  
<sup>1</sup>Laboratory of Bioactive Molecules and Applications, Larbi Tébessi University, Tebessa, 12. 000,  
Algeria.

<sup>2</sup>Laboratory of Bioactive Molecules and Applications, Larbi Tébessi University, Tebessa, 12. 000,  
Algeria.

<sup>3</sup> Scientific and Technical Research Center in Physico-Chemical Analysis (CRAPC) ouargla. Algeria

<sup>4</sup>Higher normal school (ENS) Faculty of chemistry. Constantine. Algeria.

Code CCP 34

Email\*: [Sabrina.goudjil@univ-tebessa.dz](mailto:Sabrina.goudjil@univ-tebessa.dz)

### Introduction & Objectives:

Many phenolic compounds in plants possess antioxidant activity and may help protect cells against the oxidative damage caused by free radicals. In addition, some flavonoids and proanthocyanidins are employed to treat several kinds of heart disease or mild and moderate depression. Some secondary metabolites synthesized in *Crataegus* (hawthorn) species have recently received more attention. This study investigated some physico-chemical, biochemical characteristics and content of bioactive compounds using colorimetric methods and chemical profile using a high-performance liquid chromatography (HPLC) analysis of Algerian *crataegus* (hawthorn).

### Methodology (Material and methods):

#### 1- Determination of antioxidant activity:

**DPPH free radical - scavenging assay:** The antioxidant activity of flowers and leaves of *Crataegus* was evaluated following Blois (1958) method using the free radical DPPH (2,2 - diphenyl - 1 - picrylhydrazyl).

**ABTS cation radical assay :** The ABTS scavenging activity was determined according to the method described earlier (Re et al., 1999).

**GOR scavenging assay:** The Galvinoxyl radical (GOR) scavenging assay activity was determined according to Shi et al. (2001) method.

#### 2- Enzymatic inhibitory assay:

**The  $\alpha$  - amylase inhibitory assay:** The  $\alpha$  - amylase inhibitor activity was investigated using the method described elsewhere (Behvar et al., 2018). Acarbose was used as a standard to compare our results ( Taslimi et al., 2017 ; Taslimi and Gulçin, 2017 ; Gulçin et al., 2018 ; Taslimi et al., 2018 ).

**Anti - Alzheimer activities:** Butyrylcholinesterase inhibitory of the *crataegus* was evaluated using the spectrophotometric method developed by Ellman et al. (1961)

#### 1- Method of chemical compounds analyzed by HPLC technique.

17 Standards analyzed : acétylsalicylique Acide.lcd , ascorpique Acide.lcd , caféique Acide.lcd, chlorogénique Acide.lcd, gallique Acide.lcd , para comarique Acide.lcd ,Caféine.lcd ,Catéchine.lcd ,Hipi catichine.lcd ,pyrogallol.lcd ,quercétine.lcd, Rutine.lcd, Vitamine B1.lcd, Vitamine B6.lcd, Vitamine D3.lcd, vanilline.lcd

**Results and discussion:** The butanolic fraction of *crataegus* (leaves with flowers) was quantified and identified by HPLC analysis. The results were revealed the presence of 8 bioactive



compounds (acetyl-salicylic acid, ascorbic acid, caffeic acid, chlorogenic acid, Gallic acid, paracomaric acid, quercetin, vitamin D<sub>3</sub>). In terms of biological activities, the antioxidant,  $\alpha$ -amylase inhibitory and anti cholinesterase were determined. The butanolic extract showed antioxidant activity in DPPH and ABTS (IC<sub>50</sub>: 16, 43  $\pm$  0, 46 and 16, 13  $\pm$  0, 35  $\mu$ g/ mL) very closer with standards tested and activity with Galvinoxyl radical (GOR) (IC<sub>50</sub>: 583, 95  $\pm$  2, 20  $\mu$ g/ mL), The extract was found to exhibit the inhibitory effect against BChE (IC<sub>50</sub>: 165,54  $\pm$  3,49  $\mu$ g/ mL). A significant  $\alpha$ -amylase inhibitory activity was displayed (IC<sub>50</sub> ;83.81  $\pm$  1.74  $\mu$ g/ mL) more the standard used.

### Conclusion:

Based on these results, it is right to conclude that *crataegus* is important source of the natural anti-diabetic, antioxidants and anti - Alzheimer's disease. There is a growing interest to incorporate the *crataegus* (hawthorn) extracts in to food products to replace food additives such as BHA and BHT in order to avoid their side effects. Therefore, the anti - diabetic potential of *crataegus* (hawthorn) suggest this species as an attractive substitute for diabetic's management as recommended in the literature. The isolated bioactive molecules from *crataegus* (hawthorn) extracts may provide more information necessary for desirable pharmacological.

**Keywords:** *Crataegus*, HPLC, chemical compounds, Biological activity.

### References

1. Blois , M. S. , 1958 . Antioxidant determinations by the use of a stable free radical . Nature 181 , 1199 – 1200 .
2. Re , R. , Pellegrini , N. , Proteggente , A. , Pannala , A. , Yang , M. , Rice - Evans , C. , 1999 . Antioxidant activity applying an improved ABTS radical cation decolorization assay . Free Radic. Biol. Med. 26 , 1231 – 1237 .
3. Shi , H. , Noguchi , N. , Niki , E. , 2001 . Galvinoxyl method for standardizing electron and proton donation activity . Methods Enzymol. 335 , 157 – 166 .
4. Behvar , A. , Gokhan , Z. , Mir , B. , Mahdi , A. , Leila , D. , 2018 . Amylase, glucosidase, tyrosinase, and cholinesterases inhibitory, antioxidant effects, and GC - MS analysis of wild mint (*Mentha longifolia* var. *calliantha*) essential oil: a natural remedy . Er. J. Integr. Med. 22 , 44 – 49 .
5. Taslimi , P. , Gulçin , I. , 2017 . Antidiabetic potential: in vitro inhibition effects of some natural phenolic compounds on  $\alpha$  - glycosidase and  $\alpha$  - amylase enzymes . J. Biochem. Mol. Toxicol. 31 , e21956 .
6. Taslimi , P. , Gulçin , I. , 2018 . Antioxidant and anticholinergic properties of olivetol . J. Food Biochem. 42 , e12516 .
7. Taslimi , P. , Akıncioğlu , H. , Gülçin , I. , 2017 . Synephrine and phenylephrine act as  $\alpha$  - amylase,  $\alpha$  - glycosidase, acetylcholinesterase, butyrylcholinesterase and Carbonic anhydrase enzymes inhibitors . J. Biochem. Mol. Toxicol. 31 , e21973 .
8. Gulçin , I. , Taslimi , P. , Aygün , A. , Sadeghian , N. , Bastem , E. , Kufrevioglu , O. I. , Turkan , F. , Şen , F. , 2018 . Antidiabetic and antiparasitic potentials: inhibition effects of some natural antioxidant compounds on  $\alpha$  - glycosidase,  $\alpha$  - amylase and human glutathione S - transferase enzymes . Int. J. Biol. Macromol. 119 , 741 – 746 .
9. Taslimi , P. , Aslan , H. E. , Demir , Y. , Oztaskin , N. , Maraş , A. , Gulçin , I. , Beydemir , S. , Goksu , S. , 2018 . Diarylmethanon, bromophenol and diarylmethane compounds: discovery of potent aldose reductase,  $\alpha$  - amylase and  $\alpha$  - glycosidase inhibitors as new therapeutic approach in diabetes and functional hyperglycemia . Int. J. Biol. Macromol. 119 , 857 – 863 .
10. Ellman , G. L. , Courtney , K. D. , Andres , Jr. , V. , Featherstone , R. M. , 1961 . A new and rapid colorimetric determination of acetylcholinesterase activity . Biochem. Pharmacol. 7 , 88 – 95 .
11. Cakmak , K. C. , Gülçin , I. , 2019 . Anticholinergic and antioxidant activities of usnic acid - An activity - structure insight . Toxicol. Rep. 6 , 1273 – 1280 .
12. Taslimi , P. , Turhan , K. , Türkan , F. , Karaman , H. S. , Turgut , Z. , Gulcin , I. , 2020b . Cholinesterases,  $\alpha$  - glycosidase, and carbonic anhydrase inhibition properties of 1H - pyrazolo [1, 2 - b] phthalazine - 5, 10 - dione derivatives: synthetic analogues for the treatment of Alzheimer's disease and diabetes mellitus . Bioorg. Chem. 97 , 103647 .

