Antioxidant Activity of *Marrubium Vulgare* Cultivated in The Region of Jijel in Algeria

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***Abstract*—**The present study, carried out on the plant *Marrubium vulgare*, harvested from the region of Jijel in Algeria, is based on the extraction of the active ingredient, from the aerial part of the plant via two solvents (50° ethanol and distilled water) by two methods: soxhlet and ultrasound respectively. Qualitative analysis of the extracts by phytochemical screening revealed the presence of several bioactive secondary metabolites, and the quantification of total phenols andflavonoids of the two plants indicates that they are very rich in these compounds.

The evaluation of the antioxidant activity opposite to DPPH• and *ABTS*• affirms that the three tested extracts of the two species have appreciable anti-free radical power.

Keywords*—Marrubium vulgare*,** ethalonic extract of *M vulgare* (E.EtOH *M vulgare*), antioxidant activity, DPPH•, *ABTS*•.

I. Introduction

For a long time, medicinal plants have been an inexhaustible source of medicines for traditional healers to treat certain often fatal pathologies [1].

Currently, of the 300 000 species of plants listed worldwide, it is estimated that only 15% of them have been studied phytochemically, including 6% for their biological activities [2].

In Algeria, there are about 3000 species of plants, 15% of which are endemic and belong to several botanical families; a major part of the latter remains very little explored and exploited on the phytochemical and pharmacological level [3].

The genus *Marrubium*, cultivated in the city of Jijel in Algeria, was chosen because of the therapeutic effects demonstrated by traditional medicine in Algeria or elsewhere and the importance of their family (the *Lamiaceae*) for its richness in secondary metabolites.

II. Method

A. Effect of DPPH radical

The DPPH radical scavenging activity was measured according to the protocol described by Blois [4]. The DPPH solution is prepared by dissolving 4 mg of DPPH in 100 mL of methanol. 400 µL of M. vulgare extract solution (the extract is dissolved in methanol) is added to 1600 µL of DPPH. The mixture is left in the dark for 30 min then the absorbance is measured at 517 nm. Under the same conditions, a negative control is prepared by adding 400 µL of methanol to 1.6 mL of DPPH. Also, the same test was performed with a standard antioxidant used as a positive control: ascorbic acid (water-soluble vitamin C). All tests are performed in triplets [4].

The anti-free radical power (AFR) was calculated according to the following equation:

$$\%(AFR) = \frac{Abs_{control} - Abs_{sample}}{Abs_{control}} x100 \qquad (1)$$

Or:

%(AFR): Anti-radical power.

Abs$_{control}$: Absorbance of the negative control (DPPH in methanol).

Abs$_{sample}$: Absorbance of sample or ethanolic or aqueous extract standard.

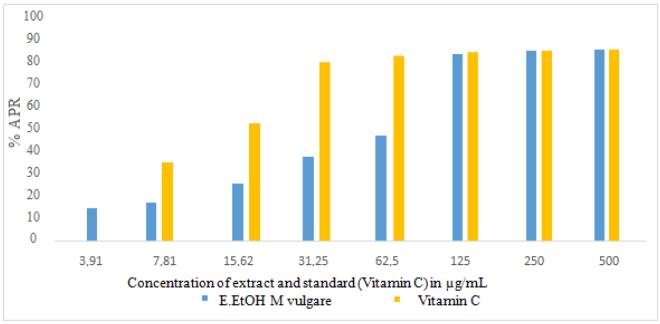

Fig. 1 Anti-free radical power (scavenging of the radical *DPPH*•) of the standard (vitamin C) and *Marrubium vulgare* extract

The concentration of sample necessary to inhibit 50% of the radical DPPH• (IC 50) was calculated from a linear regression line representing the percentages of inhibition calculated according to the different concentrations of the extracts prepared.

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TABLE I
THE IC50S OF THE EXTRACTS OF *M. VULGARE* AND OF THE STANDARD (TRAPPING OF THE RADICAL *DPPH*•).

Extract	E.EtOH *M vulgare*	Vitamin C
IC 50 µg/mL	58,25 ± 1,78	28,98 ± 0,68

Our results show that the ethanolic extract M vulgare, as well as the standard exert a concentration-dependent antioxidant activity (Fig. 1). This is interpreted by the fact that the more the concentration of the antioxidant increases, the more it oxidizes, giving protons to reduce DPPH• to DPPH-H and therefore greater anti-free radical activity.

The percentage inhibition (%I) of the ethanolic extract of M. vulgare, which is 87.56 ± 0.13%, is very close to the %I of the standard (86.60 ± 0.24%) at a concentration of 500 µg/mL. At 250 µg/mL, the ethanolic extract of M. vulgare has a high %I which is similar to that of vitamin C (86.03 ± 0.37%).

According to the 50% inhibitory concentration (IC50) (Table 1), which is inversely proportional to the antioxidant activity [5], the extract of *M vulgare* (E.EtOH *M vulgare*) has a significant anti-free radical power after comparison with the standard antioxidant.

Overall, our results reveal that E.EtOH from M. vulgare exhibits remarkable activity (IC50 of 58.25 ± 1.78 µg/mL). This is probably due to the complexity of the raw extracts in polyphenolic substances including tannins and flavonoids and the synergy between them for better antioxidant activity [6].

According to studies made by Ghedadba on the species M. vulgare, this antioxidant activity is probably due to phenylpropanoid glycosides which are considered by several researchers to be powerful antioxidants [7]. Similarly, Zaabat et al. were able to isolate these compounds from the polar extracts of M. deserti, which testifies to the effect of the E.EtOH of this plant in this anti-radical activity [8].

*B. Effect of the radical **ABTS**•*

C. The ABTS• radical scavenging power is determined by the discoloration of the solution and is expressed as percentage inhibition (I%) at 734 nm (Fig. 2).

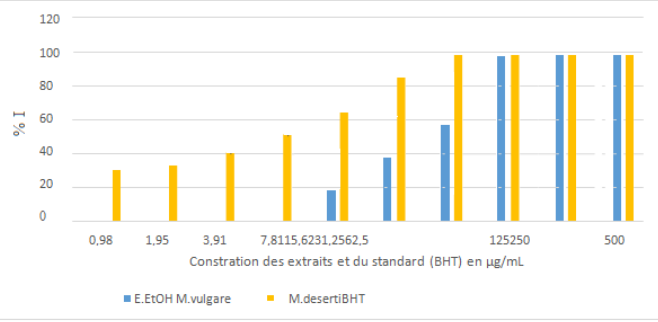

Fig. 2 Anti-radical potency (scavenging of radical *ABTS*•) of standard (BHT) and M. vulgare extract

According to the histogram of the anti-free radical power (Fig. 2), the extract of M vulgare showed significant activity at high concentrations (500 µg/mL, 250 µg/mL and 125 µg/mL) with percentages trapping of the ABTS• radical situated between 97.7% and 99.8% and which is similar to that observed with the BHT (Butylated hydroxytoluene) standard (98.8% - 99.6%).

TABLE II
THE IC50S OF THE M. VULGARE EXTRACTS AND THE STANDARD (TRAPPING OF THE RADICAL *ABTS*•).

Extract	E.EtOH *M vulgare*	BHT
IC 50 µg/mL	53,83± 0,07	7,94 ± 0,30

The IC 50 results show that the antioxidant capacity of E.EtOH of M. vulgare (53.8322 ± 0.07 µg/mL) is 7 times lower than that of BHT.

III. CONCLUSION

Whatever the test carried out, we note that the extracts of M. vulgare, cultivated in the region of Jijel, in Algeria, have an antioxidant activity in the broad sense of the term (anti-radical proven by the DPPH• and ABTS• tests).

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