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Chemical composition, antioxidant and antibacterial activities of *Pistacia lentiscus* and *Rosmarinus officinalis* essentials oils

Composition chimique, activités antioxydantes et antibactériennes des huiles essentielles de *Pistacia lentiscus* et *Rosmarinus officinalis*

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Abstract - Tunisia is characterized by a climate that allows the proliferation of many plants rich in active substances with multiple biological activities and can replace the use of antioxidants and synthetic antibiotics.For this reason, the essential oils of *Rosmarinus officinalis* and *Pistacia lentiscus* were extracted with the technique of steam distillation, the chemical composition of the essential oils was analyzed by gas chromatography, and the antioxidant capacity was evaluated by the DPPH test and the antibacterial activity by the well method. Our results showed a significant difference ($p < 0.05$) in the yield of essential oils. Indeed, we recorded a yield of 0.7% for *R.officinalis* against 0.07% for *P. lentiscus*. Both species have an important ability to trap free radicals but the essential oil of *Pistacia lentiscus* has an antioxidant capacity superior to that of *Rosmarinus officinalis* oil. Likewise, for the antibacterial activity, the essential oils of *Pistacia lentiscus* were the most active against the bacterial strains tested except the Salmonella strain was more sensitive with *Rosmarinus officinalis* essential oil than *Pistacia lentiscus* essential oil. The results of the GC analysis -DM essential oils showed a complex and highly variability of chemical and aromatic composition for each species, the main components of the essential oil of *P.lentiscus* were monoterpenes: α-pinene (21,86- 17.87%), limonene (16.98-12.02%), whereas for *R.officinalis* essential oil were 1.8-cineole (28.58-38.12%) and camphor (12.81-9.65%).To conclude, the antioxidant power and the antibacterial activity are strongly correlated with the chemical composition of the essential oils.

Keywords: Essential oils, Chemical Composition, Antioxidant activities, Antibacterial activities, *Rosmarinus officinalis*, *Pistacia lentiscus.*

1. Introduction

Essential oils are used in the food industry for the manufacture of a wide variety of products, ranging from margarines to chocolate or used directly as salad and cooking oils (Trabelsi et al, 2012). Secondary metabolites constitute biologically and chemically interesting group of substances extracted from the plant kingdom. Essential oil of plants shows many biological activities in addition to their use in food, flavor, perfumery, cosmetic and pharmaceutical industries as natural antioxidants (Wei et Shibamoto, 2010; Mothana et al, 2012). Essential oil has been used since ancient times for medicinal purposes and known for its anti-rheumatic, anti-inflammatory and antispasmodic properties (Benincá et al, 2011 ; Zaouali et al, 2013). It has demonstrated powerful antimutagenic, antibacterial and chemo preventiveproperties (Okoh et al,2010). The secondary metabolites grouped as essential oil impart the much needed curative properties to them (Derwich et al, 2010). Different studies made on the essential oil show influence of the area of culture, of variety and harvest season on the chemical composition(Rohloff et al, 2005 ;Flamini et al, 2007). The presence of phenolic compounds in herbs and spices, along with the essential oils, is gaining increasing attention because of their various functions, such as antioxidant activity and flavoring properties (Gardeli et al, 2008). Indeed, natural bioactive compounds like phenols and flavonoids are the important secondary metabolites in plants having intrinsic properties that affect appearance, taste, odor and oxidative stability of plant basedfood (Singh

et al, 2012). Secondary metabolites from plants have important biological and pharmacological activities, such as anti-oxidative, anti-allergic, antibiotic, hypoglycemic and ant carcinogenic (Stankovic, 2011).

Essential oils and fatty acids, the leaves of *Pistacia lentiscus* and *Rosmarinus officinal s*have a high content of phenolic compounds and a good antioxidant activity. Polyphenols are important natural antioxidants play a major role in the prevention various pathological conditions. However, non-phenolic substances can be responsible for the antioxidant activity of *Pistacia lentiscus* and *Rosmarinus officinalis*. Therefore, further studies are needed to identify which phenolic compounds are responsible for the antioxidant activity of the species, and assess the way in which the phenolic substances contribute to this activity. Indeed, our study is interested in evaluating the chemical composition, the anti-bacterial and antioxidant activity of the tow essentials oils *Pistacia lentiscus* and *Rosmarinus officinalis.*

1. Materials and methods

1.1. Study area

The Study was carried out in Tabarka at the north-west of Tunisia. This covers an area of 3000 ha, belonging to the humid bioclimatic stage characterized by a very cold winter and a very hot summer. The rainfall is at the average of 1000 -1200mm. The study area is characterized by latitude of 36°55/ N. longitude 8°48/ N and an altitude of 108 m. The soils of the study series are permeable and devoid of limestone, characterized by their leaching and hydromorphy.

1.2. Plant materials

Two species of aromatic and medicinal plants *(Pistacia lentiscus* and *Rosmarinus officinalis)* were collected in February 2018, Stem and leaves were separated by hand and air dried at the Sylvo-Pastoral Resources Laboratory in Tabarka.

1.3. Essential oil extraction

The extraction of essential oils was realized by steam distillation, this method consists in placing the plant material on a grid located a few centimeters from the bottom of the extractor filled with water. The heated water produces steam, after passing through the plant material this vapor is enriched with volatile constituents. Then it is condensed under the effect of a cooling system. The floral water is collected in à glass balloon and the separated essential oil is collected in an opaque glass bottle. The extraction was carried out for four hours at a temperature of 100 ° C.

1.4. Essential oil gas chromatography analysis

Gas chromatography analyses were done with Shimadzu HRGC-2010 gas chromatograph (Shimadzu Co, Kyoto, Japan) equipped with flame ionization detector (FID), Auto-injector AOC-20i and auto-sampler AOC-20s. Apolar column Rtx-1 (30 m x 0.25 mm, 0.32 µm film thickness) was used. The oven temperature was held at 50°C for 10 min then programmed at 2°C/min to 190°C then held isothermal for 10 min. The injector and detector temperature were programmed at 230°C. The flow of the carrier gas (N2) was 1.6 ml/min and the split ration was 1:20. Injection volume for all samples was 0.5µl of diluted oils in n-pentane (LabScan Dublin, Ireland). The volatile compounds were identified by comparison of their retention indices (RI) relative to (C7–C20) n-alkenes with those of literature and/or with those of authentic compounds available. Relative percentage amounts of the identified compounds were obtained from the electronic integration of the FID peak areas.

1.5. Determination of total phenolic contents

The determination of the total polyphenols is carried out according to (Singleton et al, 1999). 500 µl of Folin–Ciocalteu (10%) and 1 ml of an aqueous solution of sodium carbonate Na2CO3(7.5%) are added to 500 µl of diluted extract. After shaking, the mixture was incubated for 1 hour at room temperature in dark. The absorbance of solution was then measured at 760 nm using a UV/Vis Jenway ¬6300 spectrophotometer (Jenway Ltd., United Kingdom). The total phenolics content was expressed as mg of gallic acid equivalents per gram of dry matter (mg GAE/g DM) through the calibration curve of gallic acid. All measurements were performed in triplicate.

1.6. Determination of total flavonoid contents

The flavonoid content was determined according to the method of (Yi et al, 2007),1 ml of the diluted aqueous extract was added to 1 ml of a methanol solution of aluminum chloride AlCl3 2%. After incubation at room temperature for 15 min, the absorbance was measured at 430 nm using a UV/Vis Jenway ¬6300 spectrophotometer (Jenway Ltd., United Kingdom). The total flavonoid content were calculated on the basis of the calibration curve of quercetin, and were expressed as mg quercetin equivalents per g dry matter (mg EQ/g DM). All samples were analyzed in three replications.

1.7. Determination of total tannins contents

Evaluation of the total content of condensed tannin was determined using a method described by (Sun et al, 1998). 50 µl of the suitably diluted aqueous sample, 3 ml of Vanillin solution (4% in methanol) and 1.5 mL of concentrated H2SO4 are mixed. The mixture was left in the dark for 15 minutes and the absorbance was measured at 500 nm using a UV/Vis Jenway ¬6300 spectrophotometer (Jenway Ltd., United Kingdom). The total tannins content was calculated on the basis of the calibration curve of catechin, and were expressed as mg catechin equivalents per g dry matter (mg CE/g DM). All samples were analyzed in three replications.

1.8. 1, 1-Diphenyl-2-picrylhydrazyl radical (DPPH) scavenging

The antioxidant capacity of *Rosmarinus officinalis* and *Pistacia lentiscus* essential oils was evaluated according to the method described by (Grzegorczyk et al, 2007). The essential oils were diluted in dimethyl sulphoxide (DMSO) in order to prepare different concentrations of each essential oil (10, 20, 50, 75, 100, 150,200 and 300 µg/ml) and added to 1 mL of 0.1mM DPPH in ethanol the resulting mixture was then shaken. After 30 min in the dark at room temperature, the absorbances of the different concentrations already prepared of essential oils of each species were measured at 517nm against the corresponding blank. The radical-scavenging activities, expressed as percentage inhibition of DPPH, were calculated according to the following equation: I(%) =[(A0-A1)/A0] x 100

Where I was DPPH inhibition (%), A0 was the absorbance of the control, and A1 was the absorbance of the extract/standard.

The concentration of sample required for 50% inhibition was determined and represented as IC50 for each of test solution which is expressed as µg/ml. All measurements were performed in triplicate.

1.9. Antibacterial activity

The antibacterial activities of *Rosmarinus officinalis* and *Pistacia lentiscus* against two Gram-positive bacteria strains (Listeria, Bacillus) and two Gram-negative (Escherichia coli, salmonella) were measured by means of the agar-well diffusion assay described by(Güven et al,2006). Twenty milliliters of mixture molten agar and Nutrim Broth (NB) were poured into sterile Petri dishes. A suspension (100ml) of bacteria was spread on the plates of nutrient agar, and then the plates must be dried aseptically at room temperature during 2 hours. After that, 6 mm wells were bored using a sterile cork borer. 60µl of essential oil were placed into the wells, then the Petri dishes were incubated at + 4°C for 3 to 4 hours in order to allow the diffusion of the essentials oils present into the wells. Finally, they were incubated at 37°C for 48h and the antibacterial activity was evaluated by measuring zone of inhibition. The tests were carried out in triplicate.

1.10. Statistical analysis

All data were subjected to statistical analysis by the variance according to the GLM procedure of the software (SAS , 1989)and compared by Duncan multiple rank tests. The model used was: Yij = µ + Ai + Eijk.

Where; Yij: dependent variable. µ: overall of Y; Ai: effect of the ith essential oil; Eijk: residual error.

2. Results and discussion

2.1. Volatile oil yield

The yields of essential oilsfrom the leaves of *Pistacia lentiscus* and *Rosmarinus officinalis* are shown in Figure 1. Theyvaryfrom 0.07% for *Pistacia lentiscus* to 0.7% for *Rosmarinus officinalis*. This corroborates the results of (Dob et al, 2006) and that obtainedby (Amhamdi et al,2009), so they are high compared to whatwasfound by (Bouali et al, 2017). This variationin yield of essential oils may be due to the characteristics of each plant, the type and drying time before extraction (Bencheikh et al,2015).

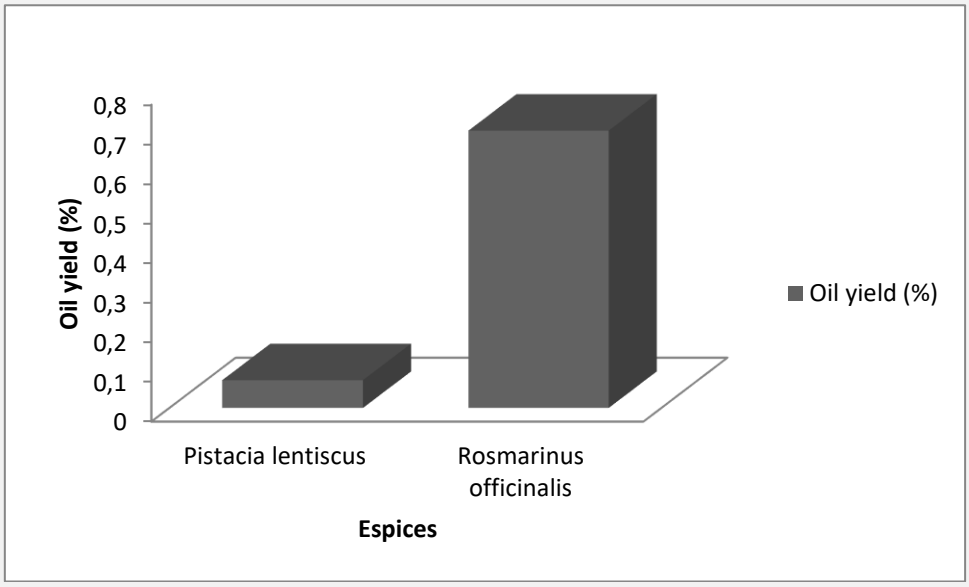


Figure 1. Oil yield of *Pistacia lentiscus* and *Rosmarinus officinalis*Essentials oils

According to our results, the observed yield of essential oils increases significantly from *Pistacia lentiscus* (Figure 1). In fact, the highest level is observed for the *Rosmarinus officinalis* with a mean value of 0.7%. However, variation in oil yield can be attributed to some factors like conditions of plant growth, environmental and region. The oil yield during plant growth is particularly susceptible to environmental conditions such as light, nutrient availability, day length and daily temperature (Skoula et al, 2000 ;Msaada et al, 2009).

2.2. Total Polyphenol, flavonoid and Tannin content

Total phenolic values of *Pistacia lentiscus* and *Rosmarinus officinalis* leaves are given in Table 1. The total phenolic content varied widely and ranged from 66.72±4.40 to 161.18±6.11mg GAE/g DM. High levels (161.18±6,11mg GAE/g DM) were found in extracts of *Pistacia lentiscus*. Low levels (66.72±4.40mg GAE/g DM) were found in extracts of *Rosmarinus officinalis*. The differences in total phenolic content between Species were statistically significant ($P < 0.05$).

The total tannin content of *Pistacia lentiscus*and *Rosmarinus officinalis* leaves was shown in Table1. The total tannin content (mg/g) in aqueous extracts, expressed in catechin equivalent (CE), varied between 36.01±4.51 and52.17±5.16 mg EC/g DM. The highest tannin concentration was registered in *Pistacia lentiscus* leaves extract (52.17±5.16 mg EC/g DM).In fact, as seen from Table1, tannin contents varied significantly ($P<0.05$) between the species.

However, there is no significant difference between the two species for total flavonoids contentsas shown in table 1 the concentration of *Pistacia lentiscus* and *Rosmarinus officinalis* in flavonoidsare respectively15.55±0.5 mg QE/g DM and 15.97±0.63mg QE/g DM.

Table 1. Total Polyphenols, Flavonoids and tannin content of *Pistacia lentiscus* and *Rosmarinus officinalis*

Species	Total Polyphenols (mg GAE/g DM)	Total Flavonoids (mg QE/g DM)	Total tannin (mg CE/g DM)
Pistacia lentiscus	161.18^{a}±6.11	15.55^{a}±0.5	52.17^{a}±10.95
Rosmarinus officinalis	66.72^{b}±4.40	15.97^{a}±0.63	36.01^{b} ±4.51
Pr>F	Et 0.0001	0.6547	0.03

The variations in the distribution of the total phenolic can be partially due to genotypic factors that control accumulation of these compounds in the plant, origins of plant and conditions for plant growth (Hashempour et al, 2010 ;Schmidt et al, 2010).The meteorological conditions, season and post-harvest conditions have been recently reported as additional source of variance in the total flavonoids content (Dziri et al, 2012). Moreover, other studies suggested that the biotic conditions (organ and physiological stage) and abiotic stresses (edaphic factors, salinity) can play an important role in the production and accumulation of phenolic compounds (Msaada et al., 2009 ;Andarwulan et al, 2010). Phenols are very important plant constituents because of their scavenging ability on free radicals due to their hydroxyl groups. Therefore, the phenolic content of plants may contribute directly to their antioxidant action and

it is likely that the activity of the extracts is due to these compounds(Wei et Shibamoto, 2010; Besombes, 2008). Flavonoids are class of secondary plant metabolites found in leguminous, fruits, flowers and leaves having several biological activities (Harborne et Williams, 2000;Karioti et al, 2010).

2.3. Antioxidant activity

Based on the IC_{50} values of the essential oils of 2 species (*Pistacia lentiscus*, and *Rosmarinus officinalis*) expressed in Table 2, the DPPH radical scavenging activity of these oils measured by the DPPH test shows a significant difference between species ($p < 0.0057$). Indeed, the essential oils of *Pistacia lentiscus* have an antioxidant activity more important than that expressed by the essential oil of *Rosmarinus officinalis* which is characterized by the highest IC_{50} (74.29 µg / ml). In fact, the IC_{50} is inversely related to the antioxidant capacity of a compound because it expresses the amount of antioxidant required to decrease the free radical concentration by 50%, the lower the IC_{50} value, the lower the activity antioxidant of a compound is great.The antioxidant capacity of the two essentials oils remain inferior to ascorbic acid used as reference antioxidant (IC_{50} = 61.3 µg / ml). Our results are close to those found by (Lardry et Haberkorn, 2007; Flamini et al, 2007).

Table 2. IC_{50} of DPPH radical scavengingactivity of essential oils

species	IC_{50}(µg/ml)
Pistacia lentiscus	70.88^{b}±1.25
Rosmarinus officinalis	74.29^{a}±0.83
Ascorbicacid	61.3^{c}±1
P>F	<0.0001

A number of methods are available for the determination of free radical scavenging activity but the assay employing the DPPH has received the maximum attention owing to its ease of use and its convenience (Rout et al, 2011).

This variation in antioxidant activity can be related to the nature and proportion of the active compounds present in the different oils studied (Bouyahya et al,2017). In fact, various phytochemical components, especially polyphenols, are known to be responsible for the free radical scavenging and antioxidant activities of plants(Atoui et al, 2005 ;Asadujjaman et al, 2013).

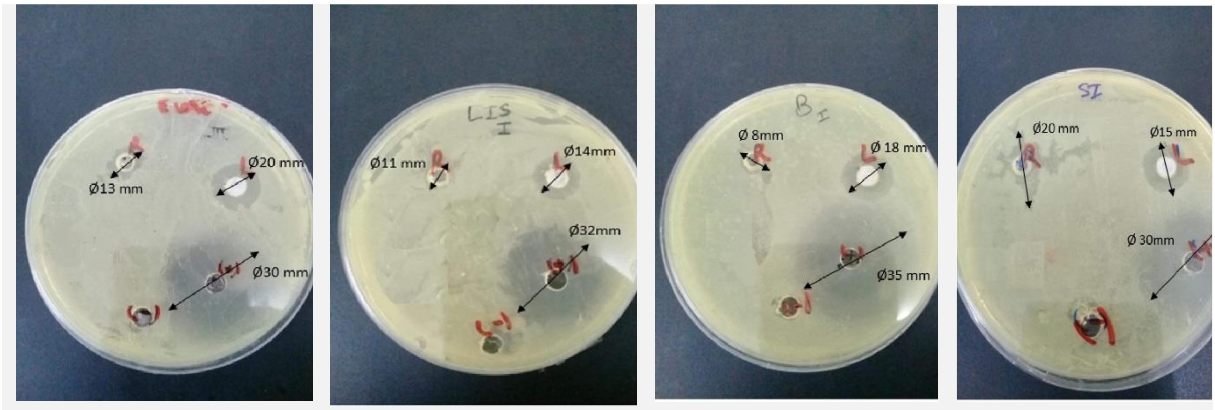
2.4. Antibacterial activity

The results recorded in Table 3 show that the essential oils of both species have antibacterial activity which varies significantly against the 4 bacterial strains tested. This activity depends on the essential oil ($P < 0.05$) and does not depend on the strain nature ($P > 0.05$). Indeed, *Pistacia lentiscus* essential oil appears the most active against the bacteria tested with zones of inhibition which varies according to the strains from 16.3 mm to 20mm and *Rosmarinus officinalis* essential oilwas less active whose zones of inhibition varies between 6mm and 12mm.

As it isnotedin table 3 thethree Bacillus, Listeria and Escherichia coli strains have an extremesensitivity to *Pistacia lentiscus* essential oil (17.33±0.57mm;14.33±1.52mm and 20mm) and alowersensitivity to *Rosmarinus officinalis* essential oil (13.33±3.78mm; 9±1.73mm and 10.33±2.51mm). However, the Salmonella strain expresses sensitivity more important with essential oils of *Rosmarinus officinalis* (21.1±1mm) than the essential oil of *Pistacia lentiscus* (16.33±1.52mm)

Table 3. Antibacterial Activities of essential oil

species	Bacteria	IZ (mm)
Pistacia lentiscus	*Salmonella*	16.33^{b}±1.52
	Bacillus	17.33^{b}±0.57
	Listeria	14.33^{b}±1.52
	Escherichia coli	20^{b}±0
Rosmarinus officinalis	*Salmonella*	21.1^{c}±1
	Bacillus	13.33^{c}±3.78
	Listeria	9^{c}±1.73
	Escherichia coli	10.33^{c}±2.51
Antibiotic	*Salmonella*	33.66^{a}±3.21
	Bacillus	33.5^{a}±3
	Listeria	33^{a}±2.64
	Escherichia coli	34.66^{a}±2.3
P>F	Effectspecies	<0.0001
	EffectBacteria	0.4684



Escherichia collie ***Listeria*** ***Bacillus*** ***Salmonella***

R = rosemary
L = lentisc
(+) = positive test:antibiotic (Gentamicin)
(-) = negative test: ethanol

2.5. Chemical composition of essential oils

The analysis of the essential oilidentified 45 terpene compounds accounting for approximately 52.94 to 90.12% of the total chemical composition in *P. lentiscus*oils, with 49 compounds accounting for 63.81 to 81.92% in *R. officinalis* (Table 4). The proportion and nature of the major compounds varyfrom one species to another.

The results of the *P. lentiscus* EO analysisshowedthat the main components of leafHEweremonoterpenes: α-pinene (21.86-17.87%), limonene (16.98-12, 02%), β-pinene (7.01-3.35%), terpinen-4-ol (7.02-3.98%) and p-cymene (4.11-3.31%).We also note the presence, to a lesserextent, of germacrene D (1.21-3.11%), α-terpinene (2.68-1.91%), α-cadinol (2.10-0.67 %), α-terpineol (2.22-1.16%), α-phellandrene (1.56-1.28%), camphene (2.23-1.01%) and sabinene (1.56-1 , 13%), γ-terpinene (2.95-0.14%), trans-caryophyllene (2.15-0.12%) and α-thujene (1.33-0.09%). alsopresent but at low proportions.

The results of the *R. officinalis* HE test show that the major constituents of thisoilare: 1,8-cineole (28,58-38,12%), camphor (12,81-9,65%)), terminalol (10.87-6.08%), α-pinene (10.01-7.14%), α-terpineol (5.03-2.60%) and β-pinene (4.53- 1.60%). Other compounds are presentwithsignificantlevelsnamely camphene (3.21-1.81%), terpinen-4-ol (3.12-1.37%), β-myrcene (2. 16-2.02%) and β-caryophyllene (2.98-0.18%) (Table 3). The results of the GC-MS analysis of leaf essential oils, twospeciesstudiedshowed a complex and highly variable chemical and aromatic composition for eachspecies. The variability of the essential oilsobserved can beexplained by the influence of variousfactors. In fact, it has been shown for the majority of plant speciesthatsecondarymetabolisms are stronglyinfluenced by plant physiology, the harvestperiod. Thesetwofactorsinduce qualitative and quantitative changes in the chemical composition(Msaada et al, 2009 ; Hosni et al,2011 ; Jemâa, 2014).The composition of essential oils cans beinfluencednimbly by otherfactors (genetics, plant environment, geographical origin, age of the plant, extraction method). Genetic heritagerelated to the species, subspecies, type of clone, plant parts used (Besombes, 2008 ;Burt, 2004 ;Neffati et al, 2009 ;Smitha et al, 2005)

The environment of the plant;related to geographic sources, climatic and meteorological conditions, nature of the soil, harvest time during the day, sunshine, harvesting seasons, neighboring plant populations may influence the chemical composition of the plant(Besombes, 2008 ;Lamendin et al, 2004 ;Lardry et Haberkorn, 2007 ;Delamare et al, 2007 ; Neffati et al, 2009 ; Smitha et al, 2005).In fact, seasonal variations in the distribution betweenhydrocarbonmonoterpenes and oxygenatedmonoterpenes for the essential oils of lentiscus (*Pistacia lentiscus* L.) have been observed by(Gardeli et al, 2008). Otherstudies have highlighted the influence of the geographical origin of the raw material(Bakkali et al, 2008 ; Oliveira et al, 2013). This is particularly the case of rosemary, whosebiochemical specificities and propertiesvaryaccording to itsoriginwhether from North Africa, Corsica or mainland France(Lamendin et al, 2004).Theage of the plant; the degree of maturity of the plant concerned also affects the composition of the essential oils(Besombes, 2008 ;Burt, 2004). Thus (Neffati et al, 2009) reported that the essential oils of the young aerial parts of Pituranthoschloranthus have higherlevels of

hydrocarbonmonoterpenes, whereas the oils of the adultaerial parts are rich in oxygenatedmonoterpenes. The influence of environmentalfactors in the chemical composition of essential oils has also been reported in A. absinthium(Bailen et al, 2013).Extraction methods, drying techniques or storage of rawmaterials affect the chemical composition of essential oils(Besombes, 2008 ; Burt, 2004 ; Smitha et al, 2005).

Table 4. Chemical composition of essential oil

Composés (%)	IR	*Pistacia lentiscus*	*Rosmarinus officinalis*
(Z)-Hex-3-ene-1-ol	823	-	-
Hexanol	831	-	-
Tricyclene	913	0.32	-
α-Thujene	922	1.33	1.4
α-Pinene	926	21.86	10.01
Camphene	930	2.23	3.21
Sabinene	967	1.56	0.23
β-Pinene	975	7.01	4.53
β-Myrcene	980	0.2	2.02
δ-2-carene	999	-	-
α-Phellandrene	1000	1.56	0.21
Δ-3-carene	1003	0.3	0.16
δ-3-carène	1005	2.68	-
α-Terpinene	1006	-	0.54
Undecane	1099	-	-
p-Cymene	1015	2.68	1.98
(Z)-β-Ocimène	1018	-	-
(E)-β-Ocimène	1021	-	-
Limonene	1027	16.98	-
γ-Terpinene	1031	2.95	1.42
α-Terpinolene	1037	0.89	0.24
Methyl 3-hydroxyhexanoate	1050	0.13	-
Para-Cyménène	1067	4.11	-
cis-Menth-2-en-1-ol	1071	0.3	-
α-Campholenal	1083	0.36	-
trans-Pinocarveol	1089	0.24	-
cis-β-Terpineol	1098	0.32	-
α-Limonene	1100	-	0.16
Borneol	1105	0.15	10.87
cis-para-Menth-2-ene-1-ol	1106	0.12	-
p-Mentha-1,5-dien-8-ol	1119	-	-
trans-para-Menth-2-ene-1-ol	1122	-	-
Terpinen-4-ol	1124	7.02	3.12
Camphre	1125	-	12.81
Lavandulylacetate	1272	-	-
α-Terpineol	1137	2.22	5.03
Neryl oxide	1138	-	-
Verbenone	1143	0.18	-
Isobornéol	1144	-	-
Lavandulol	1145	-	-
Linalylacetate	1150	Tr	-
Bornylacetate	1163	0.2	0.37
α-Cubebene	1176	0.11	-
Linalool	1178	-	0.53
Copaene	1179	0.33	-
β-Cubebene	1182	0.12	0.10
trans-Piperitol	1188	-	-
1,8-Cineole	1197	-	38.12
cis-Piperitol	1199	-	-
Acétate de fenchyle	1201	-	-
(−)-β-Elemene	1203	0.28	-
trans-Caryophyllene	1205	2.15	-

Nerol	1209	-	-
Pulegone	1214	-	-
α-Humulene	1215	0.62	0.18
Thymylmethyl oxide	1218	-	-
Carvotanacetone	1220	-	-
Carvacryl méthyl oxide	1223	-	-
trans-Cadina-1(6),4-diene	1224	0.17	-
γ-Muurolene	1226	0.39	0.13
Carvacrol méthyl ether	1228	-	-
β-Caryophyllene	1238	-	2.98
Germacrene D	1240	3.11	-
α-Muurolene	1245	-	-
γ-Muurolene	1251	-	-
γ-Cadinene	1253	-	-
Δ-Cadinene	1257	-	0.16
δ-Cadinene	1267	-	-
α-Amorphene	1272	-	0.11
Carvacrol	1279	-	-
α-Muurolene	1296	0.26	-
Tridecane	1298	-	-
Caryophyllene oxide	1328	-	-
Humuleneepoxide II	1340	0.23	-
1-Epi-cubenol	1402	0.42	-
Bornylisobutyrate	1404	-	-
β-Isocomene	1405	-	-
Lavandulylisobutyrate	1409	-	-
(E)-β-Caryophyllene	1418	-	-
Epi-α-cadinol	1420	0.71	-
Neryl propionate	1427	-	-
Cadinolisomer	1431	0.23	-
α-Cadinol	1434	2.01	-
trans-α-Bergamotene	1436	-	-
Aromadendrene	1438	-	-
Neryltiglate	1444	0.31	-
2-Phenyl 2-methlbutyrate	1460	-	-
β-Ionone	1462	-	-
Nerylisobutyrate	1469	-	-
Caryophylla-4.8-diene-5-ol	1474	-	0.21
T-Cadinol	1480	-	0.14
Lavandulyle 2-methylbutyrate	1487	-	-
Cubebol	1487	-	-
Ledene	1493	-	-
β-Bisabolene	1499	-	-
4-epi-Cubebol	1505	-	-
γ-Cadinène	1507	0.48	-
Calamenene	1511	-	-
δ-Cadinene	1517	1.52	-
Elemol	1532	-	-
Nerolidol E	1542	-	-
Thymyl 2-methylbutyrate	1549	-	-
Maaliol	1559	-	-
Spathulenol	1565	-	-
β-Germacrenol	1574	-	-
Caryophyllene oxide	1575	1.45	0.81
Viridiflorol	1581	-	-
Ledol	1587	-	-
Copaborneol	1592	-	-
Humulene 6,7-epoxide	1594	-	-
epi-Cubenol	1613	-	-
γ-Eudesmol	1616	-	-
8,9-Dehydrothymyl tiglate	1629	-	-

Thymyltiglate	1635	-	-
α-Bisabolol	1668	-	-
Classes chimiques			
Hydrocarbures monoterpéniques		63.98	73.46
Monoterpènes oxygénés		11.01	3.37
Hydrocarbures sesquiterpéniques		8.75	1.16
Sesquiterpènes oxygénés		5.84	5.93
Autres		0.54	-
Total identifié		90.12	83.92

3. Conclusion

The present work has shown that the essential oils the two species *Pistacia lentiscus* and *Rosmarinus officinalis* collected from northwestern of Tunisia are doubted of considerable antioxidant and antibacterial activities, hence the possibility of using them as antioxidants and natural antibiotics. This biological activity is strongly linked to the chemical composition of the essential oils and to the concentration of these two aromatic and medicinal plants on secondary metabolites.
Research on these two essential oils should be continued to better estimate other potential of these essential oils such as anti-inflammatory, antidiabetic and antifungal activity, even use them as supplements in the field of animal feeding.

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