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**Comparative Study of Chemical Composition and the biological effect of essential oils for two plants;** *Lavandula Stoechas et Laurus Nobilis.*

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**Abstract:**

For both plants, the aerial parts used of *Lavandula Stoechas (LS)* and *Laurus Nobilis (LN)* are leaves harvested during the flowering period. They give respectively (0.12%; 0.45%) and (0.326% 0.623%) by hydrodistillation essence. The constituents of the chemical composition have been identified by gas chromatography coupled to mass spectrometry (GC-MS). The essential oils leaves of LN and LN for two areas, ***"Zinat"*** and ***"Hallila"*** are very rich in oxygenated monoterpenes. Moreover, the biological effect, for essential oils of *LS* and *LN* possess an antibacterial activity against a bacteria *Bacillus subtilis*, except for *LN* has also the effect against Escherichia coli K12 and other bacteria don’t have the effect against *Porteus sp*, *Staphylococcus aureus* and *Escherichia coli K12 LS* of our species.

**Keywords:** *Lavandula Stoechas*; *Laurus Nobilis*; Hydrodistillation; Essential oils; Antibacterial activity.

**1. Introduction**

Aromatic and Medicinal Plants [1; 2] have an important place in medicine and perfumery [3], In this recent study showed that essential oils and their components have significant potential at the microbiology in many industrial and medical fields [4]. The *Lavandula Stoechas* plant [5] has antiseptic properties [6], bactericidal [7], disinfectant, calming [8; 9], antispasmodics [10], and carminative [11], and for the *Laurus Nobilis* plant [12] provides antiseptic properties, bactericidal [13], soothe pain associated with angina, participates in the treatment of flu symptoms (cough, bronchitis, sinus blocked, etc), quiet rheumatism and joint pain. The extraction by hydrodistillation of these species gave a larger quantity of essential oils.

In this article, we have respectively studied the composition of essential oils extracted for leaves of the two aromatic plants *<Lavandula Stoechas (LS);Laurus Nobilis(LN)>*, which are found in the region of Tetouan and their biological effect.

**2. Materials and methods**

The aerial parts for the studied plants were harvested in two different areas. They were identified by Professor IBN MANSOUR Laboratory of Applied Organic Chemistry, Department of Chemistry, Faculty of Science, University Abdelmalek Essaadi, Morocco.

**2.1 Experimental sites**

The both plants LS and LN are earlier, they are harvested from March to May in the wild case but they are rarely used. In our case in north of Morocco we took two different sites in the Tetouan harvest region ***« Hallila ; Zinat »***. The harvest was made in May, during the flowering period.

**2.2 Production of the essential oil**

The hydrodistillation mounting [16] is very special chemistry. It allows to achieve a decoction of leaves,, and channel the vapors formed during the heating, also it condense before to recover essential oil. There are some mountains of distillation plant for aromatherapy, the amounts are very limited.

**2.3 Test Methods**

The gas chromatography coupled to mass spectrometry is a technique used to identify constituents of essential oils studied.

**2.4 Experimental method for biological activity of essential oils**

The study of antibacterial activity of essential oils for *LS* and *L.N* were tested on four strains: *Escherichia coli*, *Staphylococcus aureus*, *Bacillus subtilis* and *Porteus sp*

**3. Results and discussion**

**3.1 Outputs obtained**

The quantitative results obtained by hydrodistillation of leaves the *LS* and *LN* plants for two areas are summarized in Table 1 following the comparison:

***Table 1: Quantity of essential oils and Outputs of leaves the LS and LN for two zones « Zinat ; Hallila»***

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| ***Zone*** | ***ZINAT*** | | ***HALLILA*** | |
| **Part used** | **Leaves** | | **Leaves** | |
| **Studied plant** | ***L.S*** | ***L.N*** | ***L.S*** | ***L.N*** |
| **Mass of E.O In (g)** | **0.63** | **3.26** | **7.56** | **13.31** |
| **Output of E.O In (%)** | **0.12** | **0.326** | **0.45** | **0.623** |

According to Table1, we observed that the leaves of plants tested for ***«Hallila»*** are richer in essential oil than « ***Zinat»***.

**3.2 Chemical composition of essential oils the *LS* and *LN* for *« Hallila ; Zinat»*.**

We note that the pure essential oils of leaves for *LS; LN* plants of two areas ***«Zinat»*** and ***«Hallila»*** are very rich in oxygenated monoterpenes and some sesquiterpenes.

This experimental comparative can be reduced between two plants studied by percentage of some components exist in table below:

***Table2: Chemical composition and percentages of pure essential oils of leaves for LS and LN «Hallila;Zinat».***

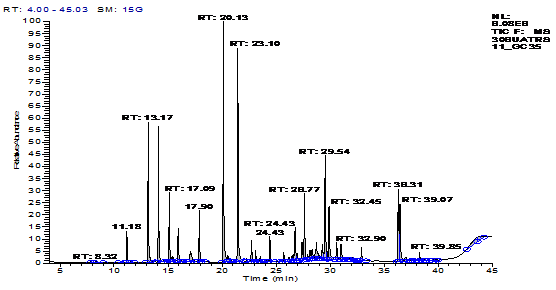
|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Components for the  *L.S* plant | *ZINAT* | | *HALLILA* | | Components for the LN plant |
| ***(%) Of E.O For Leaves*** | | ***(%) Of E.O For Leaves*** | |
| ***L.S*** | ***L.N*** | ***L.S*** | ***L.N*** |
| D-Fenchol | **6.62** | **36.11** | **37.15** | **42.60** | **1.8-cineol** |
| α-Fenchone | **6.94** | **21.63** | **12.52** | **9.63** | **Acetate de α-Terpinyle** |
| 6-Isopropenyl-4,8a-Dimethyl-1,2,3,5,6,7,8,8a-Octahydronaphthalene-2,3-diol | **4.56** | **19.98** | **0.54** | **7.58** | **Linalool** |
| 2-Methyl-9-(prop-1-en-3-ol-2-yl)-Bicyclo[4.4.0] dec-2-en-4-ol | **4.50** | **6.55** | **0.29** | **8.82** | **Sabinene** |
| β-Himachalène | **0.78** | **2.00** | **0.34** | **5.09** | **α-Pinene** |
| 1,8-Cineole | **1.62** | **0.57** | **7.32** | **0.41** | **∆3-Carene** |
| Veridiflorol | **6.10** | **0.24** | **1.53** | **0.26** | **α-terpène** |
| Camphor | **3.47** | **0.13** | **1.45** | **0.31** | **α-Thujene** |
| Borneol | **1.85** | **0.16** | **2.43** | **0.19** | **Trans-sabinene hydrate** |
| Dehydroaromadendrène | **1.81** | **0.52** | **0.78** | **0.52** | **γ -Terpinene** |
| Camphene | **0.16** | **0.15** | **1.08** | **1.22** | **9-Isopropyl-1-methyl-2-methylene-5-oxatricyclo[5.4.0.0(3,8)]undecane** |
| α-Pinene | **0.08** | **0.14** | **2.54** | **0.10** | **β -Ocimene** |
| Caryophyllène | **1.08** | **0.62** | **0.21** | **0.45** | **β-Guaiene** |
| Cubenol | **2.55** | **0.29** | **0.61** | **0.95** | **Camphene** |
| Germacrène-D | **0.39** | **0.87** | **0.33** | **1.08** | **Germacrene-B** |
| Tau.-Cadinol | **1.25** | **0.21** | **0.35** | **072** | **Borneol** |
| Verbenone | **0.23** | **1.13** | **0.30** | **0.73** | **4-Terpineol** |
| α-Guaiene | **0.44** | **1.32** | **0.27** | **0.73** | **α -Fenchol** |
| Selina-3,7(11)-diène | **0.72** | **0.11** | **0.43** | **0.56** | **α-Hmulene** |
| Acétate d’Isopulegol | **0.18** | **0.58** | **0.56** | **0.09** | **Acetateendobornyle** |
| α-Cyclogeraniol | **0.19** | **0.56** | **0.23** | **0.49** | **Acetate de linalyle** |
| Myrtenol | **1.49** | **0.19** | **0.80** | **052** | **-Cadinene** |
| Trans-Caryophyllène | **1.42** | **2.10** | **0.36** | **1.40** | **Trans-Caryophyllene** |
| Acétate of fenchyle | **2.53** | **0.49** | **5.93** | **0.36** | ** -Cadinene** |
| Acétate of Myrtenyle | **11.54** | **0.29** | **2.00** | **0.46** | **α –Guaiene** |
| Acétate of Bornyle | **8.86** | **0.39** | **3.12** | **0.51** | **Epoxide d’aromadendrene** |

According to table2, we maintain the following notes:

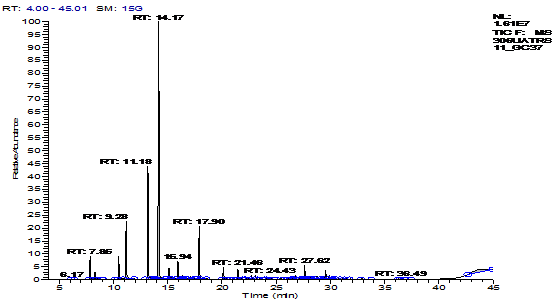
* The majority of components exist in the first *L.S* plant are totally different compared the second *LN* plant.
* The major product for *Lavandula Stoechas (LS)* is absolutely different than the major product for *Laurus Nobilis (LN).*
* There are components supported in two plants tested with the different percentages.
* The most constituents of the essential oils which existed in each plant for two areas with percentages are comparable.
* The pure essential oils of leaves for *L.S* in the region of ***«Hallila»***: D-fenchol (37.15%) is the major compound, which is more abundant than the region ***«Zinat»*** (6.26%). We can conclude that D-fenchol is chemotype in the presence of essential oils. However, the essential oil of leaves for the same plant is the richest in acetate of bornyl.
* The pure essential oils of leaves for L N regions ***«Zinat»*** and ***«Hallila»*** are rich in 1,8-cineole which is the major product. It is most abundant in oil ***«Hallila»*** (42.60%) than as in that of ***«Zinat»*** (37.15%). However, that oil of ***«Zinat»*** is richer the linalool than ***«Hallila»***. There is also the α-pinene and sabinene are more abundant than in that of ***«Hallila»*** respectively.

**3.3 Chromatograms of the pure essential oils of leaves for *LS* and *LN***

**3.3.1 Chromatograms for *LS***

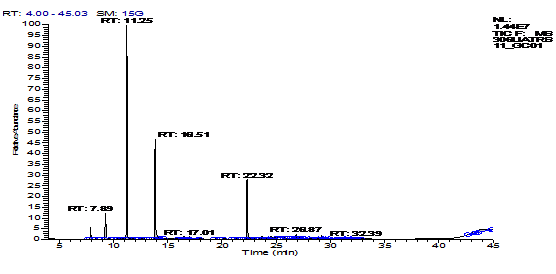
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***Fig 1: Chromatogram of the pure essential oils of leaves of Lavandula Stoechas "Zinat"***

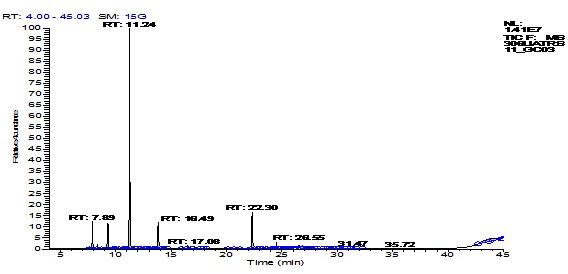


***Fig 2: Chromatogram of the pure essential oils of leaves of Lavandula Stoechas "Hallila"***

**3.2 Chromatograms for *L.N***

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***Fig 3: Chromatogram of the pure essential oils of leaves of Laurus Nobilis "Zinat"***

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***Fig 4: Chromatogram of the pure essential oils of leaves of Laurus Nobilis "Hallila"***

**3.3 Evaluation of biological effect for essential oils of LS and LN**

* The pure essential oils of leaves LS for the two regions has an antibacterial activity against Bacillus subtilis strain, but this activity is' absent for the other three strains.
* ***Three tests for the region "Zinat"***



***Fig5: Inhibition Zone for the bacterium Bacillus subtilis***

* ***Three tests for the region "Hallila"***



***Fig6: Inhibition Zone for the bacterium Bacillus subtilis***

* For *Laurus N*, the aromatogram corresponding the pure essential oils of ***«Hallila»*** shows the appearance a clear zone of inhibition against the bacterial strains *Bacillus subtilis* and *Escherichia coli K12*, and for the both strains remained, there is an absence of inhibition zone in the region ***«Zinat»***, and the same observation appears on aromatogram for pure essential oils of ***«Hallila».***
* ***Region of «Zinat »***
* ******

***Fig7: Inhibition Zone for the bacteria Escherichia coli K12 and Bacillus subtilis***

* ***Region of «Hallila»***



***Fig8: Inhibition Zone for the bacteria Escherichia coli K12 and Bacillus subtilis***

***Table3: Antibacterial activity of the pure essential oils of LS and LN leaves for two regions « Hallila ; Zinat»* *determined by the well diffusion technique.***

|  |  |  |  |
| --- | --- | --- | --- |
|  | ***Bacterial strains*** | **Zone Inhibition Diameter for *L.S* In (mm).** | **Zone Inhibition Diameter for *L.N* In (mm).** |
| **Pure E.O for la Region  «  Zinat »**  **30μl** | Bacillus subtilis | **2.33** | **3** |
| Escherichia coli K12 | **-** | **7,33** |
| Stapylococcus aureus | **-** | **-** |
| Porteussp | **-** | **-** |
| **Pure E.O for la Region  *« Hallila »***  ***30μl*** | Bacillus subtilis | **3** | **3** |
| Escherichia coli K12 | **-** | **6,33** |
| Stapylococcus aureus | **-** | **-** |
| Porteussp | **-** | **-** |

According to these results for the four strains tested and especially for both bacterial strains carry the diameters of the inhibition zones are generally low and similar for both pure essential oils ***"Hallila; Zinat"***. We conclude that the pure essential oils of both regions don’t have a significant effect against bacterial strains.

**4. Conclusion**

We can conclude that the essential oils of leaves for two plants *LS* and *LN* were recovered by distillation have the low outputs and that the pure essential oils of leaves for *Lavandula Stoechas* and *Laurus Nobilis* of two areas ***"Hallila; Zinat*** " are very rich in oxygenated monoterpenes and some sesquiterpenes.

The pure essential oils of leaves for the LS of ***"Hallila"*** that the fenchol compound is the major product, then we was found that the product 1,8-cineole is the major component. It is more abundant in oil "Halila" than that of ***"Zinat"*** However, oil ***"Zinat"*** is richer by linalool than ***"Hallila".***

Finally, the components and the percentages of the essential oil of species studied ***Lavandula Stoechas*** and ***Laurus Nobilis*** for two regions are different, this can be explained by the two plants are not the same family then the vegetable nature meaning the life mechanisms for each vegetable cell of plant to another the geographic, climatic, technical extractions, time of harvest and the drying time.

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