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Identification and characterization of Common Sage in the wilaya of Tlemcen

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Abstract

As part of the study of the biodiversity of plant genetic resources, in general and medicinal plants, in particular, we are interested in the study of an aromatic plant of Mediterranean origin, the Salvia officinalis known under the name of Mramiya , plant used in traditional medicine. Due to the absence of ethnic data and studies of racial characterizations of this species in Algeria, it is useful to contribute to the morphometric study of the sage population in the Tlemcen region. A collection of 100 plants, spread over five localities in this wilaya, is the subject of this investigation. Twenty-three measurements and 16 phenotypic characters were selected for this study. The effect of the region was studied; this factor was found to have a significant effect on the studied traits. A principal component analysis (PCA) and multiple correspondences analysis (MCA) was performed on the phenotypic characteristics, which revealed inertias corresponding to 18. 93% and 14.439% , 14.02% and 11.59% respectively for the first two principal components. This analysis made it possible to establish remarkable phenotypic differences, which have implications to be considered in the characterization program of this plant. An extraction of essential oils was performed to get an idea of the yield potential of two regions. The hydrodistillation of the aerial part of the Officinal Sage in the two regions Marsa Ben M'hidi and Ghazaouet gives a yield of 16.42% and 14.36%, respectively.

Key words: Officinal Sage, Tlemcen, morphometric characterizations, essential oils.

Introduction

For self-care, humans have long used traditional herbal remedies (herbal teas, powders, decoctions), administered by inhalations, poultices, massages or even orally (Azzi, 2013). The plant kingdom therefore constitutes an inexhaustible source of new molecules which can be used directly as active principles or which can serve as guide molecules for the development of new therapeutic agents. The Algerian flora abounds in several species of plants that have not yet been studied or have been studied but endowed with real pharmacological properties. These species are mostly spontaneous with a significant number (15%) of endemic species (Bouhamed & Zidane, 2019). Today, numerous studies carried out in the field of ethno-pharmacology show that the plants used in traditional medicine and which have been tested are often plants that are effective in different pharmacological models and are almost devoid of toxicity (Bouzid et al., 2017). Herbal remedies are an important source for pharmacological research and drug development, not only when their constituents are used directly as therapeutic agents, but also as raw materials for the synthesis of drugs (Neche, Z. 2019). The Officinal Sage is an aromatic plant of Mediterranean origin (Djerroumi & Nacef, 2004) from the lamiaceae family (Lakušić et al., 2013). It is a plant well known in the world for its important therapeutic properties in traditional medicine. Even today, various diseases are treated only by natural therapies that use not only aromatic plants, but also their essential oils, generally obtained by hydrodistillation. Many essential oils are known around the world, and several thousand of them have been identified. However, only a small proportion is of commercial interest, due to the chemical composition of these oils, the different possible uses and their production cost (Boudedja, 2017). For this, we were interested in extracting essential oils from the endemic plant Salvia officinalis, which is used in

traditional medicine in certain regions of Algeria. As well as its identification and morphometric characterization at the level of the wilaya of Tlemcen

Material and methods

The work presented here was carried out at the wilaya of Tlemcen in municipalities (Maghnia, Ghazaouet, Marsa Ben M'hidi and Msirda el fouaga on two stations Bider and Ouled Ben Yahia) in the Sage species in 2019/2020.

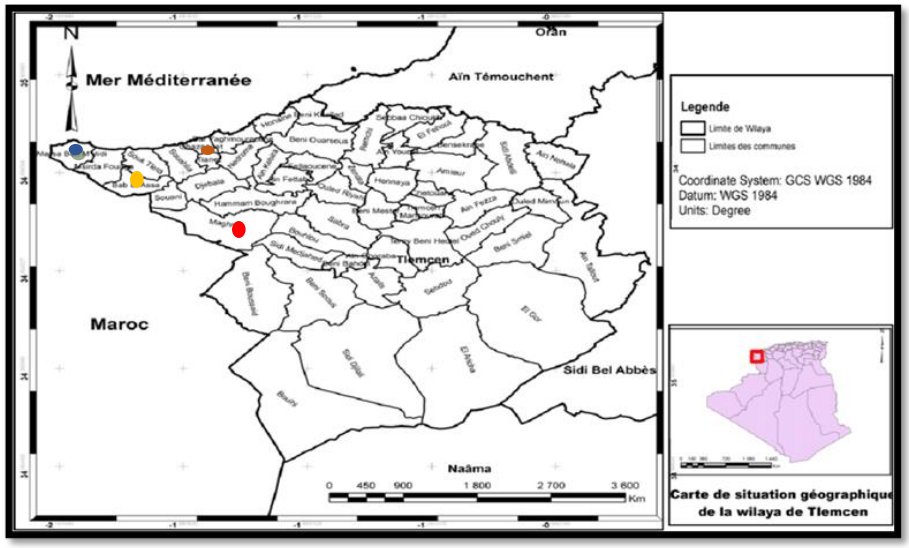

Figure 1. The geographical map shows the study areas

Climate

Table 01. Climate of each study area (Climate-Data.org)

Region	Climate
Ghazaouet	The climate of Ghazaouet is hot in summer, The Köppen-Geiger classification is Csa type. The mean annual temperature is 17.0 ° C and the mean annual precipitation is 374 mm
Marsa Ben M'hidi	Marsa Ben M'hidi is characterized by a steppe climate at all times of the year. The Köppen-Geiger classification is of type BSh. The average annual temperature is 18.1 ° C and the average annual precipitation is 336 mm
Maghnia	Maghnia and characterized by a Steppe climate, according to the Köppen-Geiger classification the climate of maghnia is BSk type. The average annual temperature is 17.1 ° C and the average annual precipitation is 365 mm
Msirda Fouaga	Msirda Fouaga and characterized by a steppe climate at all times of the year. The Köppen-Geiger classification is of type BSh. The average annual temperature is 18.1 ° C and the average annual precipitation is 336 mm.

Our study is based on the oil extraction, the identification and the morphometric characterization for the *Officinal Sage* (Figure. 2).

Figure 2. Original photo of *Officinal Sage***.**

Preparation of the extract from the leaves, flowers and stems of Officinal Sage:

The plant material used during this study is the aerial part of the *Salvia officinalis*: leaves, flowers and stem, which were harvested in the Marsa ben M'hidi and Ghazaouet wilaya of Tlemcen region from February to March 2020 These samples were dried at room temperature and protected from light in the laboratory for a few weeks (Figure. 3).

Figure 3. Dried leaves, flowers and stems from the two stations Ghazaouet and Marsa Ben M'hidi.

Figure 4. Weight of Common sage used

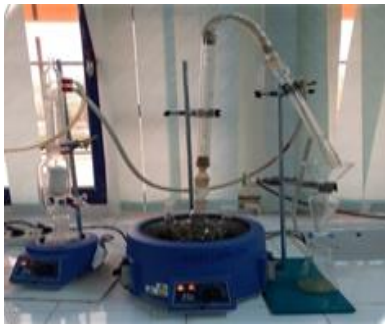

Figure 5. Hydrodistilation assembly used for the extraction of essential oil.

Process for extracting essential oils

Essential oils are extracted by the hydrodistillation method. 85g of the dried sage leaves (Figure 4) were introduced into a 500 ml flask. Impregnated with distilled water, the whole is brought to a boil from 2 to 3 hours. The vapors loaded with volatile substances pass through the condenser and then they are collected in a separating funnel. The water and the H.E then separate by density difference (Figure 5).

The extracted H.Es are stored at a temperature of 6 ° C, in opaque glass bottles, hermetically closed to protect them from air, light and temperature variations which are the main agents of degradation. Altered oil loses its biological activity (Bouzaoui, N & Haridi, Z., 2013).

Yield calculation

The yield is the ratio of the quantity of essential oil recovered to the quantity of the plant which has been treated by hydro-distillation; it is expressed as a percentage (%) and calculated by the following formula:

$$R = Pb / Pa X\ 100$$

R: essential oil yield.
Pb : amount of essential oil recovered in grams.
Pa: quantity of the plant used in grams (Hallel, 2011**).**

The following table lists the data needed to calculate the essential oil yield for each station;

Table 01. The data needed to calculate the essential oil yield for each station.

Station	**Pb**	**Pa**	**R**
Ghazaouet	0.1221	85	**R1**
Marsa Ben M'hidi	0.1314	80	**R2**

Morphometric characterization

Table 02: The studied quantitative and qualitative parameters.

	Abbreviation	**Measurements**
Quantitative characters	LFp	Length of small leaves
	lfp	Small leaf width
	LFm	Average leaf length
	lfm	Medium leaf width
	LFg	Length of large leaves
	lfg	Large leaf width
	Hp	The height of the plant
	LP	Petiole length
	LI	Inflorescence length
	LCA	Chalice length
	LCO	Corolla length
	LTC	Length of corolla tube
	Hc	The height of the corolla
	LLI	Length of the lower lip
	LLS	Upper lip length
	NFB	Number of leaves per branch
	NT	Number of tabs
	NRT	Number of branches at each stem
	NF	Number of flowers
	NE	Number of stamens
	NPI	Number of pistils
	NS	Number of sepals
	NPE	Number of petals
Qualitative characters	CF	Leaf color (small, medium and large)
	Taf	The size of the leaves (small, medium and large)
	FOA	The shape of the leaves (angle of the top)
	FOL	The shape of the leaf tip length
	FOB	The shape of the lamina base
	FOI	The shape of the edge incision at the level of the limbus
	CA	Anthers color
	CFI	net color
	CST	stigma color
	CS	style color
	CSE	sepal color
	CT	rod color
	POL	Position of the widest part at the level of the leaf blade
	TF	Leaf type
	RCS	Distribution of secondary color on the leaf blade
	RL	Roughness on the limbus

The characterized plant material comes from a field prospection during the year 2019-2020 at the wilaya of Tlemcen. The measurements were carried out on 20 different plants (per city) taken randomly in the field. These plants were collected from five (05) localities belonging to different sites in the study region.

Studied variables

The study was carried out on 23 quantitative parameters and 16 qualitative parameters. Table 02.

The phenotypic descriptors or variables were analyzed by two methods which are: SPSS Statistical Analysis Software (version 25): The effect of region was compared by the one-way ANOVA test. A principal component analysis (PCA) was carried out in order to group together the homogeneous individuals who carry the same characteristics based on quantitative measurements to differentiate the plants according to these criteria, define a classification of plants and build a typology which consists of identifying individuals who are quite similar to each other. Finally, to obtain the optimal number of groups, an ascending hierarchical classification (CHA) was used.

Results and discussion

Quantitative characters

Descriptive analysis

The total Officinal Sage population studied has an average height of (67.85 ± 15.96) cm; a medium, small and medium-large leaf length of (3.005 ± 0.507), (4.816 ± 0.441) and (6.926 ± 0.861) cm; a small, medium and large leaf width of (1.111 ± 0.231), (1.572 ± 0.215) and (2.210 ± 0.324) cm; a length of petiole (2.580 ± 0.716) cm; length of inflorescence (20.657 ± 5.435) cm, length of calyx (0.906 ± 0.0992) cm; corolla length (2.0945 ± 0.199) cm, corolla tube length (1.5939 ± 0.188) cm; height of corolla (1.8106 ± 0.175) cm and length of lower and upper lip of (0.848 ± 0.213) and (0.64 ± 0.117) cm on average. The other measures: number of tabs, number of branches on each stem, number of leaves per branch and number of flowers are shown the following variations: (4.01 ± 1.418), (73.21 ± 30.443) (135.89 ± 46.265) and (14.24 ± 3.435) respectively (Table 03).

Table 03: Global descriptive analysis of the measurements of the Officinal Sage studied.

	N	Min	Max	Average	Standard error	Standard deviation	Variance
LFp	100	1,80	3,90	3,005	0,0507	0,507	0,257
lfp	100	0,60	1,60	1,111	0,0231	0,231	0,054
LFm	100	4	5,50	4,816	0,0441	0,441	0,194
lfm	100	1,10	2	1,572	0,0215	0,215	0,046
LFg	100	5,60	8,60	6,926	0,0861	0,861	0,742
lfg	100	1,30	3,10	2,210	0,0324	0,324	0,105
Hp	100	32	95	67,85	1,597	15,966	254,917
LP	100	0,88	4,64	2,5804	0,0716	0,716	0,513
LI	100	9	33,50	20,657	0,5435	5,435	29,544
LCA	100	0,601	1,227	0,9066	0,0099	0,0992	0,010
LCO	100	1,467	2,695	2,0945	0,0199	0,199	0,040
LTC	100	1,231	2	1,5939	0,0188	0,188	0,036
Hc	100	1,392	2,197	1,8106	0,0175	0,175	0,031
LLI	100	0,338	1.380	0.848	0.213	0.213	0.046
LLS	100	0,326	0,891	0,64	0,0117	0,117	0,014
NFB	100	26	224	135,89	4,626	46,265	2140,442
NT	100	2	9	4,01	0,142	1,418	2,010
NRT	100	11	133	73,21	3,044	30,443	926,794
NF	100	7	22	14,24	0,344	3,435	11,800
NE	100	2	2	2	0	0	0
NPI	100	1	1	1	0	0	0
NS	100	5	5	5	0	0	0
NPE	100	3	3	3	0	0	0

Variation of individuals by region

Very highly significant differences ($p < 0.05$) were found for width of small and medium leaves, length of large leaves, length of calyx, length of corolla, length of corolla tube, height of corolla , length of the lower and upper lip, number of leaves per branch) in body measurements We can conclude that there is a difference in the morphological characteristics between individuals of Officinal Sage at the level of the regions studied (these characters are influenced by the environment).

Table 4: Results of the univariate analysis of variance according to the regions.

The settings	Marsa Ben M'hidi	Maghnia	Ghazaouet	Ouled Ben Yahia	Bider	sig
Length of small leaves	3,155±0,498	2,960±0.553	2,935±0.508	3,010±0.519	2,970±,4736	***
Small sheet width	1,235±0,225	0,905±0.187	1,005±0.201	1,145±0.179	1,265±0.149	***
Average leaf length	4,875±0,447	4,780±0.422	4,895±0.454	4,855±0.441	4,675±0.445	**ns**
Medium leaf width	1,70±,2384	1,440±0.178	1,510±0.174	1,665±0.213	1,545±0.163	***
Length of large leaves	7±,771	7.275±0.886	6.455±0.644	7.105±1.06	6.80±0.723	***
Large leaf width	2 ,26±,311	2,145±0.266	2,135±0.306	2,350±0.366	2,16±0.340	**ns**
The height of the plant	65,85±18,55	65,65±14.125	69,80±14.813	65,75±17.210	72,20±15.192	**ns**
Petiole length	2,87±,778	2,584±0.626	2,519±0.729	2,425±0.719	2,502±0.708	**ns**
Inflorescence Length	20,605±6,39	19,725±5.168	22,255±4.322	20,615±5.421	20,09±5.854	**ns**
Chalice length	0,940±,151	0,950±0.073	0,899±0.068	0,847±0.079	0,894±0.071	***
Corolla length	2,225±,200	2,138±0.13	2,109±0.155	1,909±0.181	2,089±0.191	***
Corolla tube length	1,711±,220	1,691±0.123	1,530±0.147	1,428±0.110	1,608±0.173	***
The height of the corolla	1,931±,116	1,968±0.123	1,816±0.111	1,652±0.122	1,684±0.137	***
Length of the lower lip	1,090±,148	0,842±0.150	0,869±0.165	0,578±0.101	0,678±0.201	**ns**
Upper lip length	,679±,108	,685±0.073	,722±0.111	,516±0.090	,638±0.082	***
Number of leaves per branch	158±55,01	122,05±36.46	125,50±42.24	146,85±49.81	127,05±38.60	***
Number of tabs	4,95±1,731	3,20±0,523	3,20±0,410	4,95±1,731	3,75±0,851	***
Number of branches at each stem	83,90±35,52	65,30±24.39	77,40±24.461	77,65±32.035	61,80±31.383	**ns**
Number of flowers	15,05±3,456	13,80±3.002	13,60±3.545	13,90±4.051	14,85±3.117	**ns**

For the other parameters: length of small and medium leaves, width of large leaves, length of the petiole, length of the inflorescence, length of the lower lip, number of branches on each stem, number of flowers and the height of the plant, we note that the Pvalue> 0.05 so we accept H0 is therefore for these characters there is no difference compared to the regions (these characters are not where can be influenced by the environment).

The variations (mean ± standard deviation) of the parameters studied in the region of Marsa Ben M'hidi present leaves (small and medium) longer linear (3.155 ± 0.498) and (4.875 ± 0.447) cm, medium leaves and large larger (1.70 ± 0.2384) and (2.26 ±, 311) cm; a length of the petiole (2.87 ±, 778) cm and a fairly long corolla and corolla tube (2.225 ± 0.20) and (1.711 ±, 220) cm; a length of the lower lip (1.090 ±, 148) cm.

The other measures: number of leaves per branch, number of tabs, number of branches on each stem and number of flowers has very high variance values, which explains variability in the population, probably due to significant genetic variability.

The Maghnia region shows strong values for the length of the large leaves, length of the calyx and the height of the corolla with the following variations: (7.275 ± 0.886), (0.950 ± 0.073) and (1.968 ± 0.123) cm. The region of Ghazaouet and Ouled Ben Yahia presents strong values for the length of the upper lip and length of the inflorescence with variations (0.722 ± 0.111) and (20.615 ± 5.421) cm respectively. Finally, the region of Bider presents strong values for the width of the small leaves and the height of the plant (1.265 ± 0.149) and (72.20 ± 15.192) cm; respectively. These four regions have balanced values for the other measures and smaller those reported for the region of Marsa Ben M'hidi.

We can conclude that there is a difference in the morphological characteristics between the individuals of the common Sage at the level of the regions studied.

Analysis of variables

A principal component analysis (PCA) was used by retaining the following variables: HC, LLI, LLS, LCO, LTC, LCa, LP, LFp, LFm, LFg, Lap, Lam, Lag, NFB, NRT, H, NF and NT. The cumulative share of information returned in this case is 67.408% Table 05.

Table 05. Initial eigenvalues.

Component	Sums extracted from the load square		
	Total	**% of variance**	**% cumulative**
1	3,597	18,933	18,933
2	2,743	14,439	33,371
3	2,098	11,044	44,415
4	1,696	8,928	53,344
5	1,475	7,762	61,106
6	1,197	6,302	67,408

The analysis of the parameters studied shows that the two axes have respectively 18.933% and 14.439% of the total inertia.

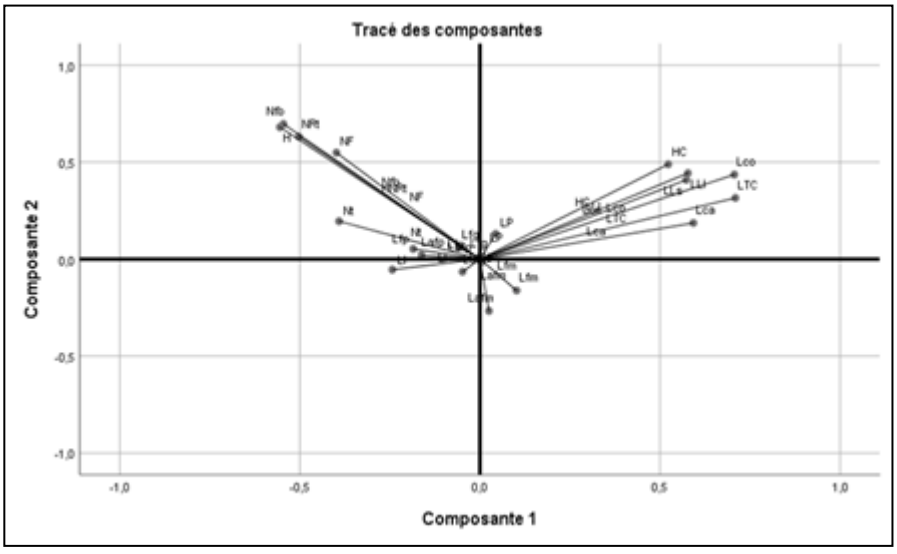

Figure 6. Presentation of the variables by PCA in the Officinal Sage population studied.

We note at the PCA level of Figure 06 that the characteristics studied in Officinal Sage are similar in their majorities to the circle, which reflects a significant level of significance statistically. This is not true for the characters: LP, LFp, LFm, LFg, lfp, lfm, lfg which excludes their interpretation.

We distinguish the formation of four groups of characters. This reflects a positive correlation between these parameters at the level of each group. The first group includes ″ the height of the corolla, length

of the lower lip, length of the upper lip, length of the corolla, length of the tube of the corolla, length of the calyx″. These characters have a strong positive correlation between them. The second group includes ″ number of leaves per branch, number of branches on each stem, height of the plant, number of flowers ″, these characters also have a strong positive correlation between them. The third group includes ″number of stems″, and finally, the fourth group includes parameters ″ length and width of small, medium and large leaves, length of petiole″ poorly represented on the chosen plane (factor 1 and 2).

- The correlation between the Gr1 group and the Gr2: zero correlation.
- The correlation between the Gr1 group and the Gr3: there is no correlation.
- The correlation between Gr2 and Gr3: strong positive correlation.
- The correlation between Gr2 and Gr4: there is no correlation.

Analysis of individuals

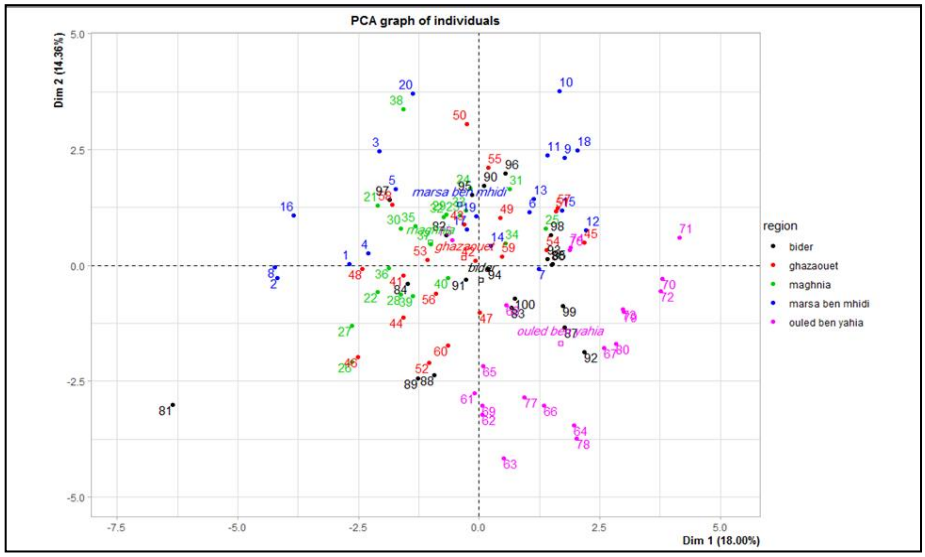

Figure 7. Graph of the distribution of individuals at the PCA level.

After the superposition of the graph of individuals of figure 07 on the graph of the parameters of figure 06 we note that:

The population of Marsa Ben M'hidi shows high value for the characters of Gr1 and Gr2 and balanced values for the characters of Gr3 and Gr4 ideal populations. Furthermore, the Maghnia population shows high values for the Gr1 traits and balanced values for the Gr2, Gr3 and Gr4 traits. Also, the population of Ghazaouet presents high value for the characters Gr3 and Gr4 and low values for the characters of Gr1 and Gr2. Howver, the population of Ouled Ben Yahia and Bider are populations with dispersed values, which makes them the populations with the most (genetic) variability. This result may be due to less selective pressure on these last two populations compared to the other populations.

Ascending hierarchical classification (AHC).

The dendrogram resulting from this analysis make it possible to evidence three groups, which are:

G1 contains the region of Marsa Ben M'hidi., G2 contains the region of Ghazaouet and Magnia and G3 contains the region Ouled Ben Yahia and Bider.

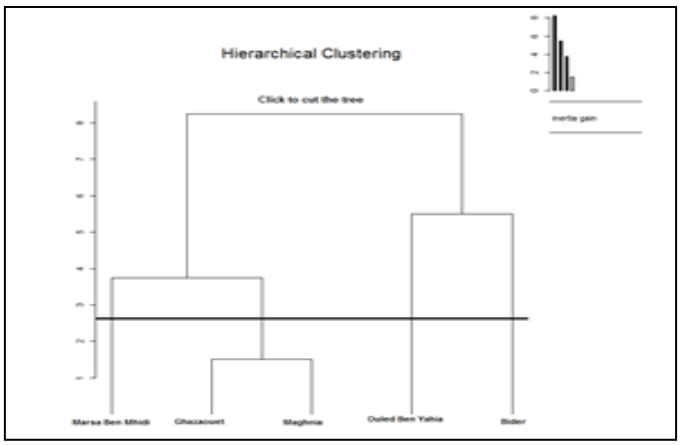

Figure 08. Ascending hierarchical classification (AHC).

Qualitative characteristics

Descriptive statistics

Table 6: Descriptive analysis of the qualitative characteristics in the population (Officinal Sage) studied.

Qualitative characters		Effective	Percentage
color of small leaves	whitish green	90	90
	Gray green	10	10
medium leaf color	whitish green	92	92
	Gray green	08	08
color of large leaves	whitish green	92	92
	Gray green	08	08
leaf shape	narrow elliptical	84	84
	large oval	16	16
shape of vertex angles	sharp	70	70
	right	30	30
tip length shape	short	60	60
	average	24	24
	long	16	16
shape of blade base	obtuse	64	64
	sharp	22	22
	rounded	14	14
shape of the edge incision in the limbus	low	65	65
	absent or very weak	35	35
position of the widest part in the limbus	moderately towards the base	53	53
	between	33	33
	strongly towards the base	14	14
distribution of secondary color on the leaf blade	all over	68	68
	marginal zone	32	32
types of roughness on the leaf blade	absent or very weak	52	52
	low	19	19
	average	29	29
The inflorescence	semi-erect	100	100
net color	clear white	100	100
anthers color	violet	100	100
style color	violet	100	100
stigma color	clear white	100	100
Leaf type	compound	100	100

MCA

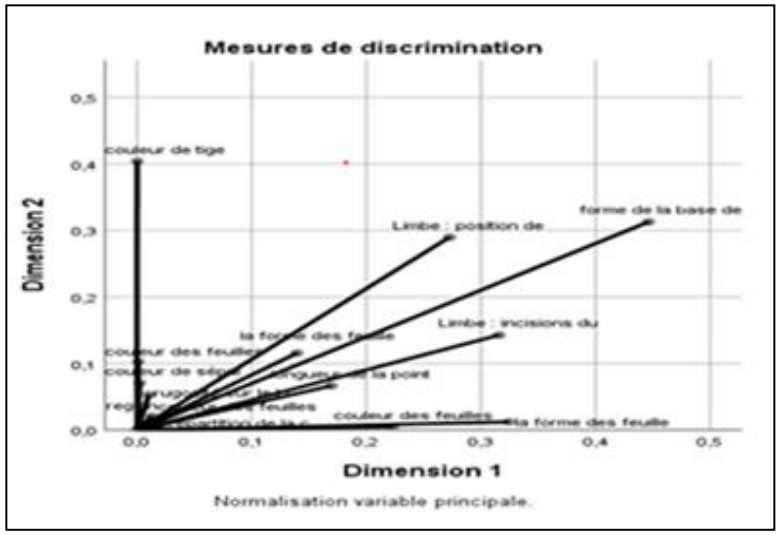

Figure 9. Presentation of the parameters of the Officinal Sage population studied.

The two axes present 25.61% of total inertia. The shape of the lamina base, the position of the widest part, the gord incision in the lamina, and the length of the tip in the lamina are probably pleotropic. A single gene or a small number of genes controls all of these parameters.

For the characters stem color, color of small medium and large leaves, color of sepals, roughness on the blade and distribution of the secondary color they are influenced by the region as these change from one region to another.

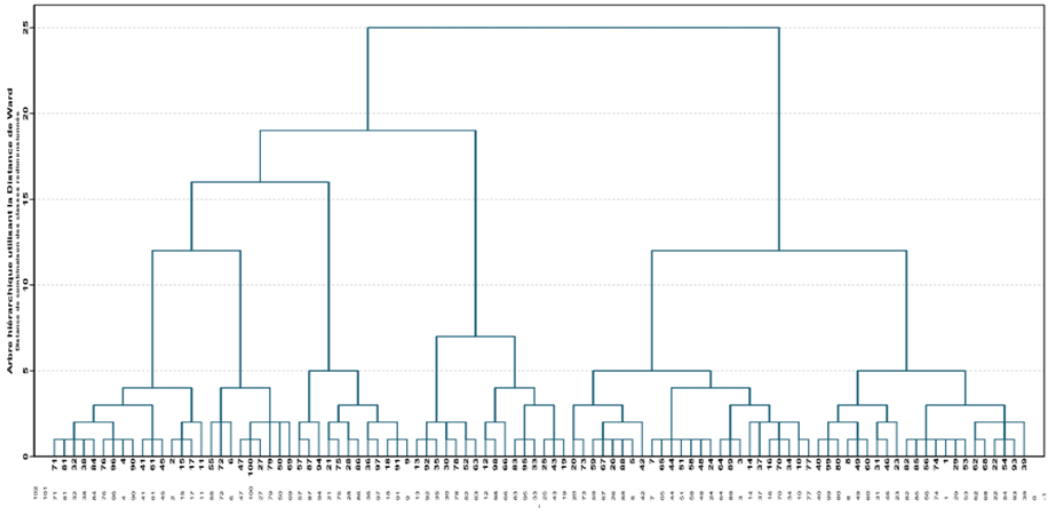

Figure 10. Hierarchical tree using the ward test method on the population studied.

The dendrogram of the ascending hierarchical classification (Figure. 09) made it possible to identify five classes (Table 7).

Table 7. Characteristics of the classes determined by the analysis by A

Qualitative characters		Class 01	Class 02	Class 03	Class 04	Class 05
		16	9	12	16	47
Small leaf color	whitish green	87.5 %	66.7 %	100 %	93.8 %	91.5 %
	Gray green	12.5 %	33.3 %	-	6.3 %	8.5 %
Medium leaf color	whitish green	100 %	77.8 %	83.3 %	93.8 %	93.6 %
	Gray green	-	22.2 %	16.7 %	6.3 %	6.4 %
Large leaf color	whitish green	93.8 %	88.9 %	100 %	93.8 %	89.4 %
	Gray green	6.2 %	11.1 %	-	6.3 %	10.6 %
The shape of the leaves	narrow elliptical	87.5 %	55.6 %	75 %	93.8 %	87.2 %
	large oval	12.5 %	44.4 %	25 %	6.3 %	12.8 %
The shape of the leaves: angle of the top	sharp	68.8 %	66.7 %	83.3 %	37.5 %	78.7 %
	right	31.2 %	33.3 %	16.7 %	62.5 %	21.3 %
Tip length	short	87.5 %	55.6 %	50 %	-	74.5%
	average	12.5%	33.3 %	50 %	12.5 %	23.4 %
	long	-	11.1 %	-	87.5 %	2.1 %
The shape of the lamina base	obtuse	81.3 %	-	25 %	81.3 %	80.9 %
	sharp	18.8 %	66.7 %	75 %	12.5 %	17 %
	rounded	-	33.3 %	-	6.3 %	2.1 %
Leaf blade edge incisions	Low	62.5 %	100 %	75 %	50 %	61.7 %
	absent or very weak	37.5 %	-	25 %	50 %	38.3 %
Mesh color	clear white	100 %	100 %	100 %	100 %	100 %
Anthers color	purple	100 %	100 %	100 %	100 %	100 %
Stigma color	white-purple	100 %	100 %	100 %	100 %	100 %
Style color	purple	100 %	100 %	100 %	100 %	100 %
Sepal color	mauve	68.8 %	77.8 %	33.3 %	87.5 %	72.3 %
	mauve-green	31.2 %	22.2 %	66.7 %	12.5 %	27.7 %
Rod color	Gray	93.8 %	66.7 %	33.3 %	68.8 %	78.7 %
	Gray green	6.2 %	33.3 %	66.7 %	31.2 %	21.3 %
Leaf blade position of the widest part	moderately towards the base	75 %	-	91.7 %	56.3 %	44.7 %
	between	25 %	44.4 %	8.3 %	37.5 %	38.3%
	strongly towards the base	-	55.6 %	-	6.2 %	17 %
Leaf type	composed	100 %	100 %	100 %	100 %	100 %
Distribution of secondary color on the leaf blade	all over	50 %	100 %	58.3 %	87.5 %	63.8 %
	marginal zone	50 %	-	41.7 %	12.5%	36.2%
Roughness on the limbus	absent or very weak	-	-	58.3 %	31.3 %	85.1 %
	Low	18.8 %	22.2 %	25 %	31.3 %	12.8 %
	average	81.2 %	77.8 %	16.7 %	37.4 %	2.1 %
Inflorescence at the top	semi-erect	100 %	100 %	100 %	100 %	100 %

In order to know the diversity rate of the populations studied and to compare them, we calculated the Shannon-Weaver H ’diversity index (table 08) with the following formula:

$$H' = - \Sigma pi \log 2\ pi$$

We obtained following the calculation of the Shannon and Weaver H’ diversity index an overall rate equal to 0.44 for the population of Marsa Ben M'hidi; 0.42 for the population of Maghnia and 0.43, 0.42, 0.38 the population of Ghazaouet, Ouled Ben Yahia and Bider; respectively. This is almost identical. This index is relatively average for the five localities which is probably the reflection of a significant genetic diversity. The characters which present the index of diversity H 'equal to 0 for the five regions, are probably characters not influenced by the environment and that the genes which control them, also control important characters on the plant physiological for the species studied

Table 8. Comparison of the Shannon-Weaver diversity index between the five regions studied.

Caractère	Marsa Ben M'hidi	Maghnia	Ghazaouet	Ouled Ben yahia	Bider	**Moyenne totale**
H' Color of small leaves	0.33	0.42	0.42	0.33	0	**0.29**
H' Medium leaf color	0.42	0.33	0.33	0.20	0	**0.25**
H' Color of large leaves	0.33	0.20	0.33	0.33	0	**0.23**
H' The shape of the leaves	0.42	0.50	0.42	0.42	0.42	**0.43**
H' The shape of the leaves (angle of the top)	0.65	0.61	0.56	0.61	0.61	**0.60**
H' Tip length	0.97	0.97	0.89	0.89	0.90	**0.92**
H' Shape of blade base	0.89	0.82	0.80	0.89	1	**0.88**
H' blade incisions of the edge	0.61	0.67	0.65	0.67	0.61	**0.64**
H' Mesh color	0	0	0	0	0	**0**
H' Color of anthers	0	0	0	0	0	**0**
H' Stigma color	0	0	0	0	0	**0**
H' Style color	0	0	0	0	0	**0**
H' Sepal color	0.56	0.61	0.65	0.61	0.61	**0.60**
H' Shank color	0.61	0.56	0.61	0.61	0.56	**0.59**
H' Leaf blade position of the widest part	1.01	0.90	0.99	0.94	0.94	**0.95**
H' Type of leaves	0	0	0	0	0	**0**
H' Distribution of secondary color on the leaf blade	0.67	0.61	0.61	0.56	0.65	**0.62**
H' Roughness on the limbus	1.06	0.86	0.97	1.08	0.97	**0.98**
H' Inflorescence habit of the top	0	0	0	0	0	**0**
Total average	**0.44**	**0.42**	**0.43**	**0.42**	**0.38**	**0.42**

Biochemistry Analysis

The essential oil of Officinal Sage was extracted from its leaves and stems cut into small pieces. These were harvested in Ghazaouet and Marsa Ben M'hidi in March. The yield of this extraction was 16.42% and 14.36% for the regions of Marsa Ben M'hidi and Ghazaouet; respectively. Other researchers (Bouzaoui, N & Haridi, Z., 2013) say that a low yield is 0.8%.

Conclusion

The research work undertaken falls within the framework of the promotion of aromatic and medicinal plants. We were interested in the study of morphometric characterizations as well as the extraction of essential oils from Officinal Sage.

Obtaining the essential oil by the assembly of hydro-distillation remains a simple and effective method and gives an interesting yield. The calculation of the average essential oil yield of our plant revealed values varying from 0.16 to 0.14 for the stations of Marsa Ben M'hidi and Ghazaouet studied. It should be noted that the HE contents are very variable within another study.

According to all the results obtained during our studies and our experiments on identification and morphometric characterization of the quantitative and qualitative characters of Officinal Sage, we have concluded that there is an important genetic diversity because of the presence of a polymorph for the differing parameters to study.

Given the absence of data on the phenotypic and morphometric characterization of this species, we can therefore propose these phenotypic criteria as a key to racial identification of the Officinal Sage population in Algeria.

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