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CONTRIBUTION TO A MORPHOMETRIC STUDY OF *LAVATERA MARITIMA* IN THE LITTORAL (MARSA BEN M'HIDI) OF TLEMCEN REGION OF ALGERIA

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ABSTRACT

This work is devoted to a morphological study of *Lavatera maritima* in Marsa ben m'hidi region. Results are obtained on the morpho-metric and ecological aspect. To better understand the adaptation of *Lavatera maritima* a morpho-metric study is required. The morphometric study deals with two main parts : morphological measurments supported by single controlled (ANOVA 1et 2), to assess the impact of the station on the growth in length of the stems and the size of the tufts of *Lavatera maritima* and even of the exhibition on the growth of this species.

Keywords:*Lavatera maritima*, Marsa ben m'hidi, morphometric, ecology.

INTRODUCTION

Plant morphology is the part of botany that describes the extreme forms and internal structure of plants and their organism. It allowed us to assess parameters that do not exist in the scientific literature, especially for species considered endemic. (Barka F, 2016). Biometrics is a statistical study of the size and growth of living things. (Schreider, 1952) defined it as the science of variability, the phenomena attached to it and the problems which arise from it. The most classic of biometrics is to make it possible to distinguish either different species between them, or within the same species, subspecies or racial groups, according to the variations of certain morphological parameters linked or not to ecological conditions. . You can also find plants of the same family or the same genus in often extremely varied regions. However, shapes and characters may change depending on the environment in which they are found Barbero *et al.,* (1990).

A morphometric study of the measured parameters was carried out in the field in order to compare the different correlations that may exist between them. In this study, we focused on *Lavatera maritima*, which is part of the Malvaceae family. In this study, we tried to apply the technique of measurements on this species in the station of Marsa ben m'hidi by several samples per month and several samples, since February 30, 2019 and the data obtained were analyzed using the Minitab software. 16 in order to highlight the impact of several environmental factors on its growth in width and length.

• Latitude and longitude, given by a GPS
• Altitude, using a GPS
• Exposure, it is determined for each station using a compass

MATERIALS AND METHODS

The territory of the commune of Marsa Ben M'Hidi is located to the north-west of the wilaya of Tlemcen. Marsa Ben M'Hidi is a coastal town in the Mediterranean Sea on the Algerian-Moroccan border (bordering the Moroccan city of Saïdia), located 120 km north-west of Tlemcen and 60 km north-west of Maghnia (figure 01).

This study consists of using morphological parameters to understand the influence of ecological factors including anthropogenic pressure on the development of clumps of *Lavatera maritima*. We therefore chose the Marsa ben m'hidi station as our reference station.

For our station and on 32 tufts; a certain number of criteria are taken into account for the mensuration; and who are the following

• the diameter, measured with a metric tape measure

• hight, to understand ecological factors influencing development of *Lavatera maritima*

This is the best known, usual and universally accepted method **(**Frontier, 1983). It also allows the application of certain hypothesis tests (analysis of variance, correlation coefficient). Theoretically, this is the solution which should be the most satisfactory for the subsequent application of the statistical test; but in practice, this is not so, because this often amounts to favoring the identification of units which do not provide much ecological information (Long, 1975).

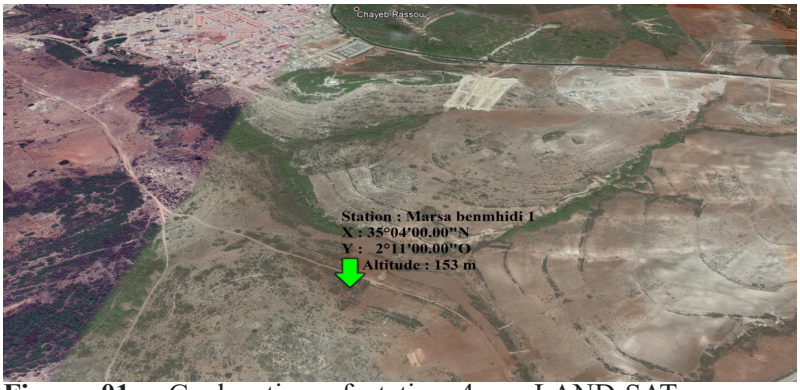


Figure 01 : Geolocation of station 4 on LAND-SAT satellite image (Google earth Professional, 2019).

RESULT AND DISCUSSION

The results obtained for the study area are combined and presented in these tables. They show the comparison of the means of the different parameters measured over five field trips.

The correlation coefficient indicates to what extent the relationship, if it exists, can be represented by a straight line (Demelon, 1968). In addition, we plan to explain this relationship that exists between these measured parameters and some of the environmental factors by the correlation method which has the advantage of quickly giving results on the relationships that may exist between the elements.

Morphometry represents the relationship between shape and size, or in other words the morphological changes strictly induced by variations in growth. According to (Kebbas, 2016) Plant growth of a plant is the set of irreversible quantitative changes in the plant that occur over time. She understands

- Elongation of joints and roots
- Multiplication of cells
- The multiplication and growth of leaves.

Based on the results obtained from the correlation analysis; it appears that the morphometric parameters are correlated between them and those for our station, the growth in length of the leaves presents a very strong correlation.

The ANOVAS carried out prove the existence of a highly significant correlation of the impact of orientation on the development in length of the branches of shrubs in the station and during most of the sampling

The development of the foot of the plant remains of course dependent on environmental conditions. However, good development in relation to a high recovery rate means that the species is in perfect equilibrium and seems to derive maximum benefit from its environment (Barka F, 2016).

Effect of Orientation on the lengthwise growth of tufts

- **First date**

The ANOVA has a single control factor combining length and orientation shows the presence of the impact of the ecological factor Orientation with an F = 1.98 for a P = 0.140 (Table 41).

Table 01: One-way ANOVA: Long Rod versus Orientation

Source	DF	SS	MS	F	P
Orientation	3	3453	1151	1,98	0,140

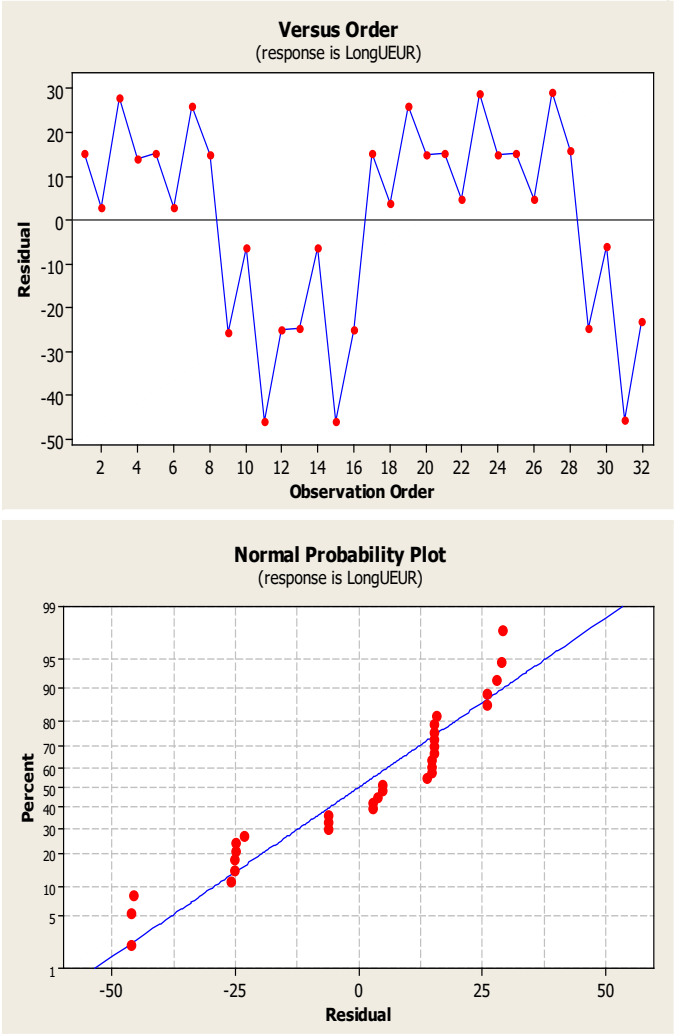


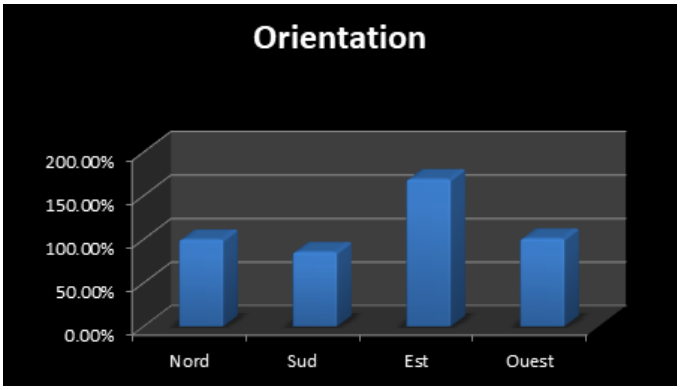
Figure 02: Effect of orientation on the growth of long tufts in the station of Marsa ben m'hidi

Table 02: Average according to orientation

Level	N	Mean	StDev
1	8	31,90	20,92
2	8	27,30	5,22
3	8	54,05	38,07
4	8	32,27	20,37

Significant growth is noted at the East exposure followed by the West exposure Then the North exposure with a small difference and finally at the South exposure (Figure 03, Table 02).

Figure 03: The average according to the orientation (the



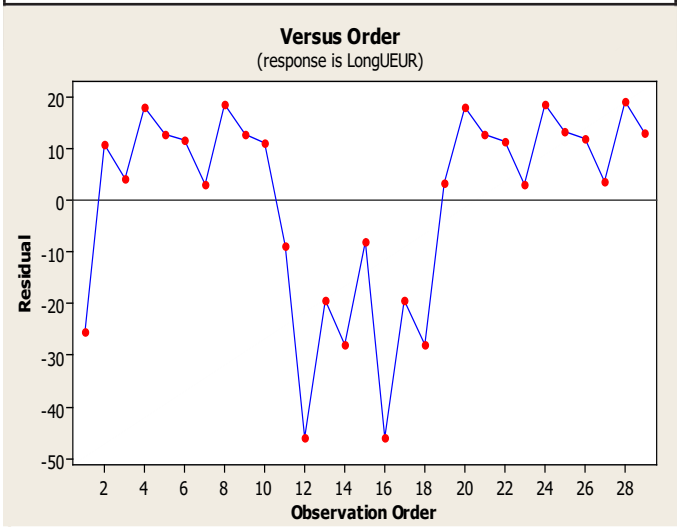
first date) for the station of Marsa ben m'hidi

• Second date

The ANOVA has a single control factor combining length and orientation shows the presence of the impact of the ecological factor Orientation with an F = 3.85 for a P = 0.022 (Table 03)

Table 03: One-way ANOVA: Long Rod versus Orientation

Source	DF	SS	MS	F	P
Orientation	3	4887	1629	3,85	0,022



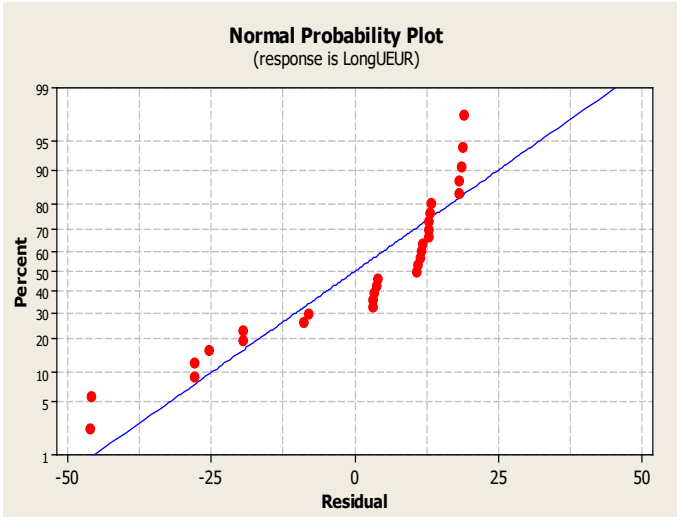


Figure 05: Orientation effect on lengthwise tuft growth at Marsa ben m'hidi station for the second date.

Table 04: Average according to orientation

Level	N	Mean	StDev
1	8	36,27	19,18
2	8	28,96	5,83
3	8	63,00	31,46
4	8	34,52	17,90

Significant growth is noted at the East exposure followed by the North exposure Then the West exposure and finally at the South exposure (Figure 06, Table 04).

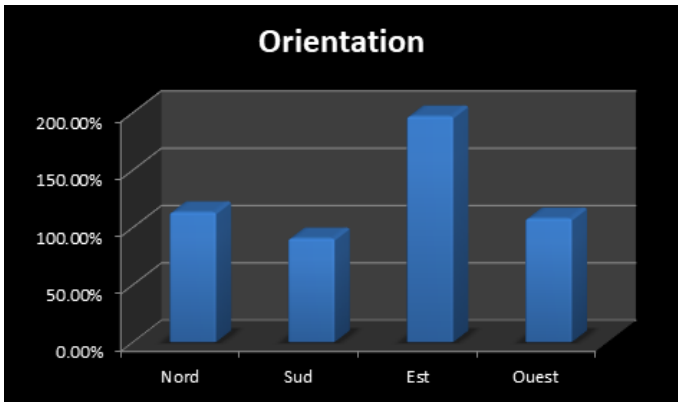


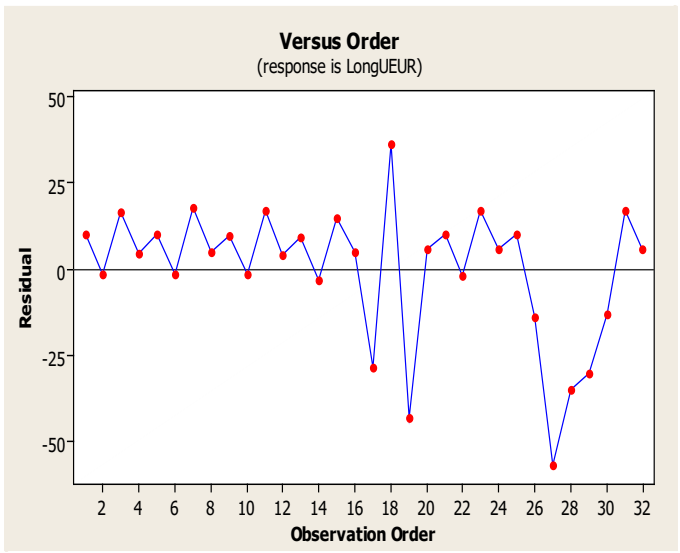
Figure 06: The average according to the orientation (the second date) for the station of Marsa ben m'hidi

• 3rd date

The ANOVA has a single control factor combining length and orientation shows the presence of the impact of the ecological factor Orientation with an F = 3.55 for a P = 0.027 (Table 45).

Table 05: One-way ANOVA: Long Rod versus Orientation

Source	DF	SS	MS	F	P
Orientation	3	4672	1557	3,55	0,027



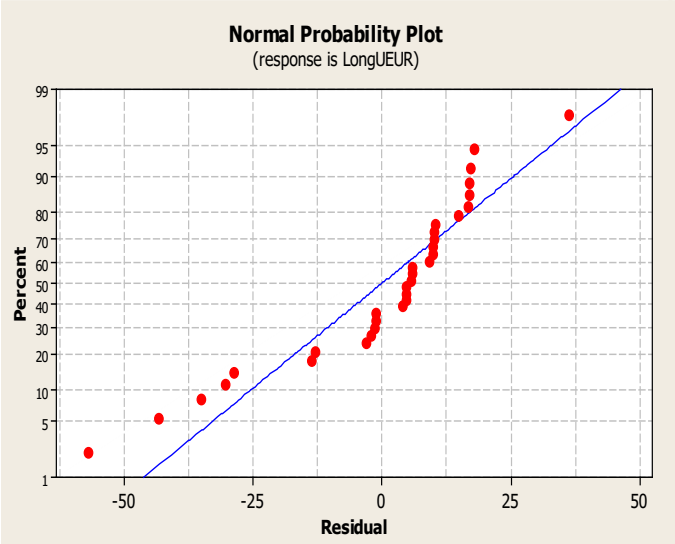


Figure 07: Effect of orientation on length wise tuft growth at Marsa ben m'hidi station for the third date.

Table 06: Average according to orientation

Level	N	Mean	StDev
1	8	37,79	18,30
2	8	34,11	15,54
3	8	65,15	31,21
4	8	42,25	14,26

Significant growth is noted at the East exposure followed by the West exposure Then the North exposure and finally at the South exposure (Figure 08, Table 06).

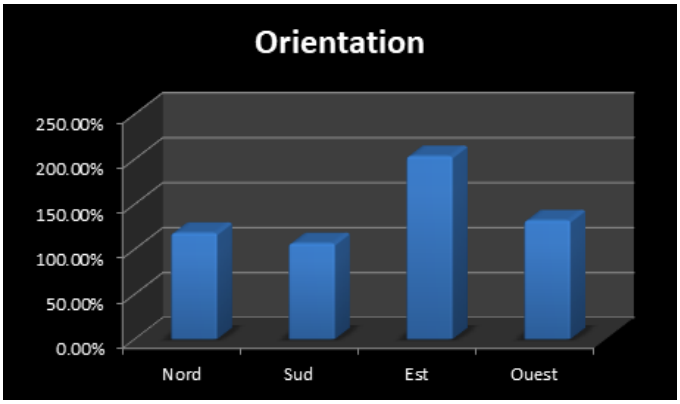


Figure 08: The average according to the orientation (the third date) for the station of Marsa ben m'hidi

• 4th date

The ANOVA has a single control factor combining length and orientation shows the presence of the impact of the ecological factor Orientation with an F = 1.99 for a P = 0.138 (Table 07).

Table 07: One-way ANOVA: Long Rod versus Orientation

Source	DF	SS	MS	F	P
Orientation	3	3825	1275	1,99	0,138

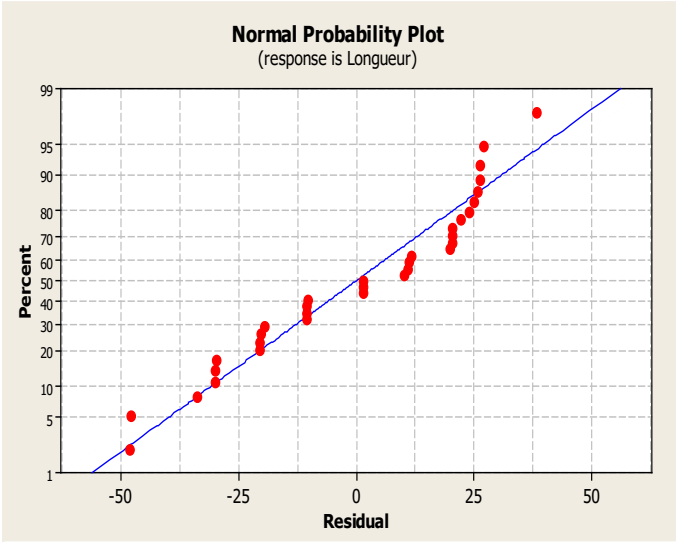


Figure 09: Effect of orientation on the growth of long tufts at the Marsa ben m'hidi station for the fourth date.

Table 08: Average according to orientation

Level	N	Mean	StDev
1	8	27,57	21,65
2	8	31,66	16,54
3	8	56,11	36,16
4	8	36,96	23,02

Significant growth is noted at the East exposure followed by the West exposure Then the South exposure and finally at the North exposure. (Figure 10, Table 08).

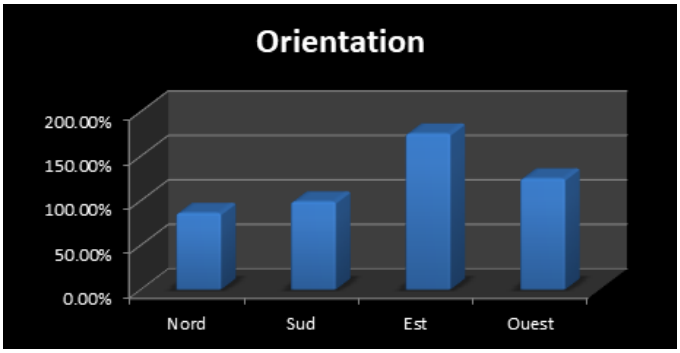


Figure 10: The average according to the orientation (the

fourth date) for the station of Marsa ben m'hidi

• **5th date**

The ANOVA has a single control factor combining length and orientation shows the presence of the impact of the ecological factor Orientation with an F = 0.89 for a P = 0.457 (Table 10).

Table 10: One-way ANOVA: Long Rod versus Orientation

Source	DF	SS	MS	F	P
Orientation	3	1811	604	0,89	0,457

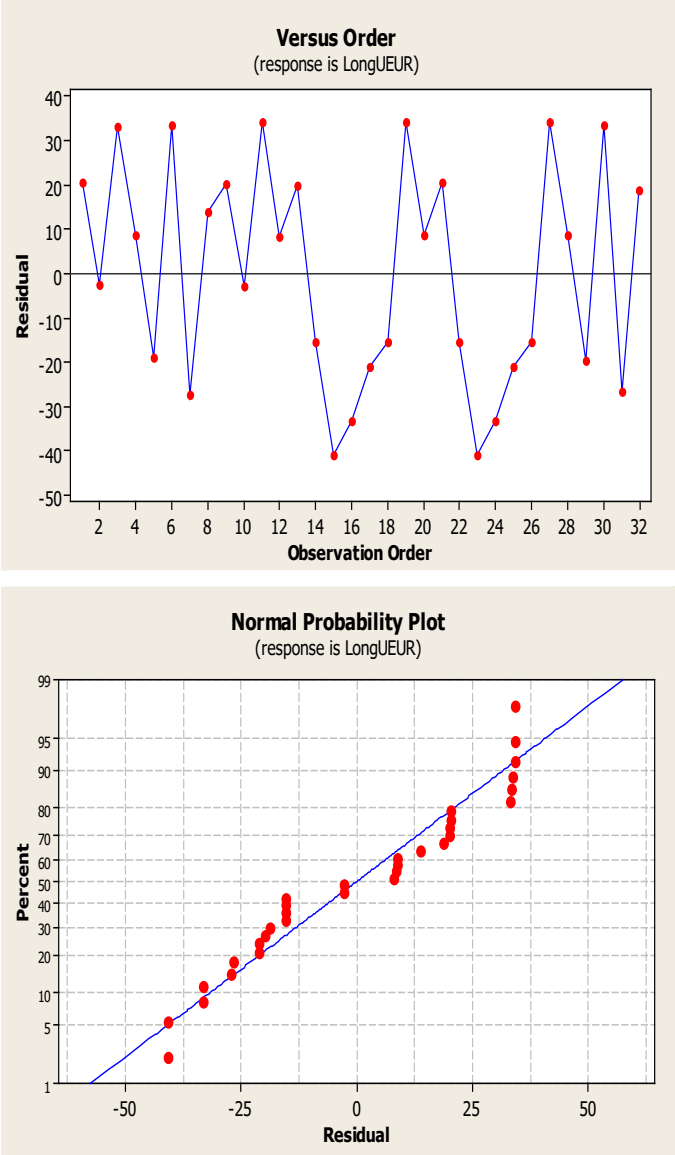


Figure 12: Effect of orientation on the growth of long tufts in the Marsa ben m'hidi station for the 5th date.

Table 11: Average according to orientation

Level	N	Mean	StDev
1	8	27,91	21,62
2	8	36,44	21,41
3	8	48,84	36,63
4	8	40,29	20,87

Significant growth is noted at the East exposure followed by the West exposure Then the South exposure and finally at the North exposure (Figure 13, Table 11).

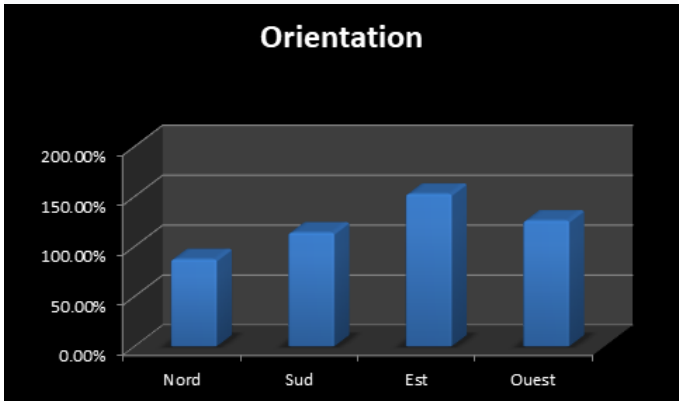


Figure 13: The average according to the orientation (the 5th date) for the station of Marsa ben m'hidi

INTERPRETATION AND DISCUSSION

Morphometry, represents the existing relationship between shape and size, or in other terms the morphological changes strictly induced by variations in the growth (Kebbas, 2016).

The *Lavatera maritima* plant that we have studied grows in all directions on a regular basis. Field observations show that the populations of our species in the study station are well established.

The morphometric results observed are probably due to the fact that the species has not undergone an anthropozoic action and that it manages to evolve normally because it is a plant not palatable by animals which evolves in association with a thorny plant which is *Withania frutescens*.

The morphometric approach, allowed us to know results to fully understand the dynamics and growth of this species in the station of Marsa benm'hidi :

• Significant growth is noted at the East exposure followed by the West exposure Then the North exposure with a small difference and finally at the South exposure. (the 1st date).

• Significant growth is noted at the East exposure followed by the North exposure Then the West exposure and finally at the South exposure .(The 2nd date).

• Significant growth is noted at the East exposure followed by the West exposure Then the North exposure and finally at the South exposure. (The 3rd date).

• Significant growth is noted at the East exposure followed by the West exposure Then the South exposure and finally at the North exposure.(The 4th date).

• Significant growth is noted at the East exposure followed by the West exposure Then the South exposure and finally at the North exposure.(The 5th date).

CONCLUSION

Lavatera maritima, which is a species characteristic of limestone substrates and which grows on rocky slopes, it generally thrives in climates with maritime influence.
The morphometric approach was carried out on *Lavatera maritima*, it allowed to explain certain correlations. The relationships that exist between the measured parameters can be related to ecological factors «location, and exposure» that facilitate growth in length or by the influence and adaptation of this species in the coast of the Tlemcen region by report on the different station conditions on the morphology of plant species.

From this approach, it seems that the correlation is positive for the station of Marsa Ben m'hidi.

The calculation of the averages of the growth in length of Lavatera along the coastline reveals variations which are significant.

-The effect of orientation strongly influences the height of plants.

-The tuft factor is very essential because it shows the vigor of each tuft.

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