Biometric and ecological characteristics of *Malva subovata* in north-west Algeria (Rachgoune)

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Abstract

Plants and the shapes of their leaves, petals and flowers are essential for distinguishing the different species present on earth. This study was carried out in the coastal region of Tlemcen with the aim of determining the morphology and morphometry of *M.subovata*. Our study area belongs to the semi-arid bioclimatic zone.

The morphometric study has two main components: morphological measurements supported by controlled univariate and bivariate analyses (ANOVA1,2) to assess the impact of the site on the growth in stem length and exposure of this species, and to better define the influence of environmental factors on its development.

In conclusion, the morphometric study shows a very good correlation between the various parameters measured, and it is important to emphasise the importance of the rich flora of this region and the need to implement a strategy to conserve and develop these natural resources.

Keywords: *Malva subovata*, Morphometric, Tlemcen, Environment

Introduction

The flora of the Tlemcen region is unanimously considered to be of exceptional diversity, and as such deserves special consideration for its conservation at the international level. diversity, and as such deserves special consideration for its conservation in view of its importance its importance (ecological, historical and heritage).(Barka; 2017).

Lavatera maritima is a species that characterizes the coastline, it is well developed, the appearance of young plants from March, their growth and flowering begin in May. The seeds ripen in August (Ghalem; 2023).

A morphometric study of the measured parameters was carried out in the field 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 to highlight the impact of several environmental factors on its growth in width and length. (Ghalem, 2021).

In the natural environment, vegetation is expressed by its above-ground phytomass, and its study can be used to identify the characteristics of plant communities, and to understand how species the behaviour of species in relation to environmental factors.Biometric studies are still necessary and will enable us to assess the degree of response and possibly the adaptive systems of a given species.(**Mostefai A,2017).**

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, 2017).

M. *subovata* is more developed in the coastal stations than in the Rachgoune station. In the Monts de Tlemcen, it shows a regressive evolution clearly exposed to anthropozoogenic pressure. On the other hand, in the Monts des Traras, this species is protected due to the difficult access to these stations, where conditions are favourable for its development.

In this study, we were interested in *Malva subovata*, which is part of the Malvaceae family, and which generally characterises coastal areas. This is why we tried to apply the measurement technique to this species by sampling several times a month and taking several samples, in order to obtain raw results statistically processed by ANOVA (MINITAB 16) in order to highlight the impact of several environmental factors on its growth in width and length.

In order to gain a better understanding of the specific characteristics of this species, as well as its resilience in a particular area, we th$ought it would be useful to carry out a number of measurements.

Materials and methods

In the context of our work, the study of bioclimatology is necessary, as this discipline attests to the influence of climatic factors on the development of vegetation, and therefore the floristic composition of *M. subovata.*

Our bioclimatic study was carried out over two periods (1918 - 1938) and (1992 - 2018). The stations were chosen on the basis of their general relief and in order to cover the entire study area as well as possible. We therefore chose the Béni-saf station as the reference station for our climatic study.

Geographical location

It is located on the north-western part of the Algerian coastline, a few metres from the Béni-Saf-Rechgoun-Tlemcen intersection on the way to Siga. It is bordered by the Oued Tafna and rises to an altitude of no more than 15 metres with a north-south exposure. This station is dominated by the following species: *Atriplex halimus, Withania frutescens, Lavatera maritima, Sueada fructicosa, Phragmites communis*.

Figure 1. Location of the station studied.

Figure 2. Photo of the study station April 2019

Sampling methods

The analysis of the plant structure considers the method of floristic surveys which boils down to an exhaustive list of all the plant species present. This floristic list changes from one station to another, from one year to another in the same station (Chamouri, 2017).

Methodology for the morphometric studies

For our measurements we used a decameter when the clump is large. Knowing that the human and environmental impact influences the morphology of the species. In our situation, only the double meter was used. Measurements were randomized and reported in multiple (32) localized chunks. The variables measured are Height (length) (cm); Diameter (cm); leaf width and length (cm); For the morphometric parameters studied (length, width, diameter), the data collected were combined in order to calculate Malva subovata means for each variable. We tried to apply the measurement technique to our species in the matorral station since the latter is a species that characterizes the coast to know its adaptation and this is done by several samplings per month and several samples, from March 2019 until in August 2019 and this to obtain raw results statistically processed by ANOVA (MINITAB 16) in order to highlight the impact of several environmental factors on its growth in width and length. (Ghalem, 2023).

Results

Rainfall is one of the main components of the climate that contributes to the desertification of arid zones. In fact, aridity is a consequence of a deficit of rainfall in relation to evapotranspiration during a more or less long period of the year, and this influences the growth of *M. subovata*. Examination of the annual rainfall pattern at the study station led to a chronological comparison of two periods (old and new).

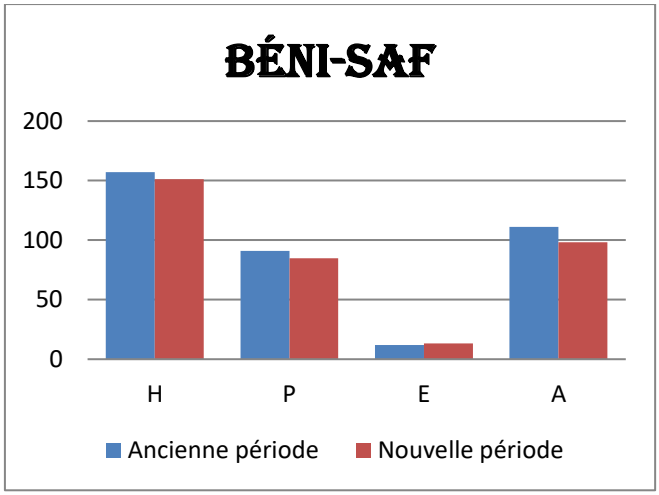


Figure 3. Seasonal variations in precipitation

The coastline of the Tlemcen region shows four types of precipitation regime, for both the old and the new HAPE periods. Winter and autumn are predominant in both periods.

Many stations have abundant rainfall in winter and autumn and dry conditions in summer (Bouayad, 2017).

To characterise the bioclimate of a station or study area, the tool of choice is the "Emberger quotient".

Emberger's rainfall-temperature quotient is designed to characterise the Mediterranean climate and its nuances. Indeed, Emberger (1930) noted that in Mediterranean regions, thermal amplitude is an important factor in the distribution of vegetation. The rainfall parameter taken into account is the product of the average number of days of rainfall per year multiplied by the average height of rainfall. For temperatures, it takes into account the average (m) of the minimum temperatures in the coldest month and the average (M) of the maximum temperatures in the warmest month.

Figure 04 shows that our study station belongs to the semi-arid zone with warm winters for both periods.

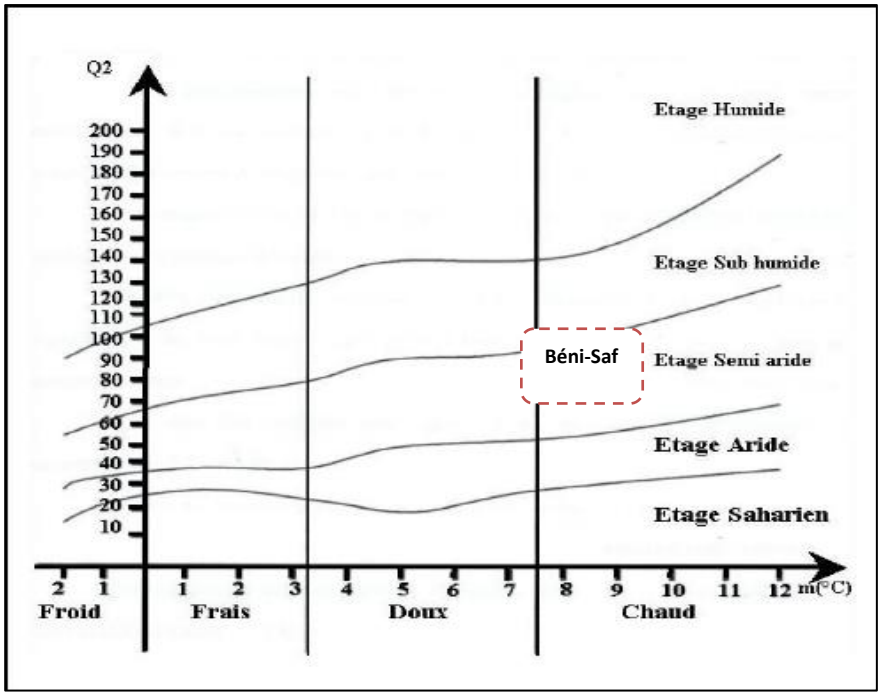


Figure 4. Emberger rainfall-thermograph for the Béni-saf station

- The results obtained from morphometry in the study area are presented in these tables and figures. They show a comparison of the averages of the various parameters measured at the Rachgoune station over five dates.

1st date

The ANOVA study with a single control factor shows significant tuft growth for an F= 15.03 at P=0.000, which is highly significant. (Table 1).

Table 1: One-way ANOVA: Stem length versus orientation

Source	DF	SS	MS	F	P
Orientation	**3**	**12160**	**4053**	**15,03**	**0,000**

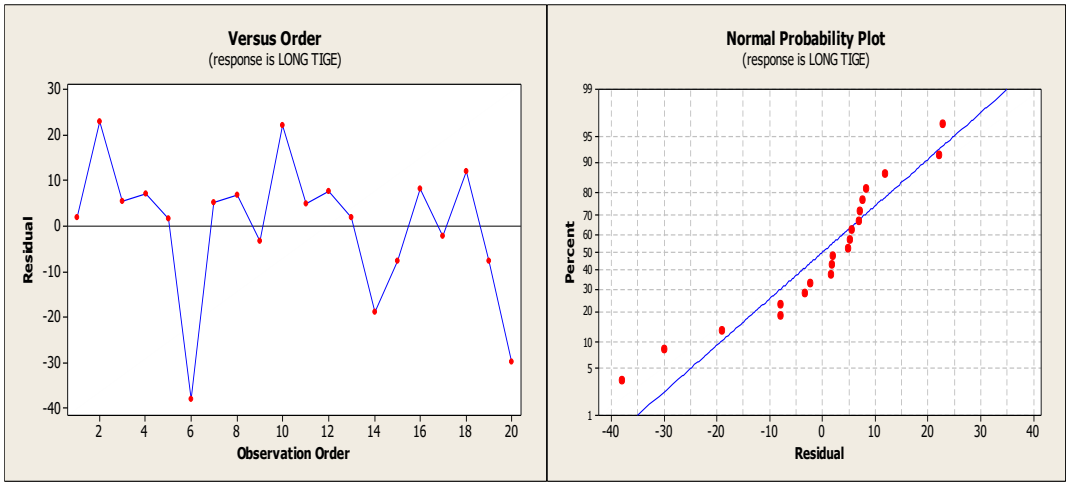
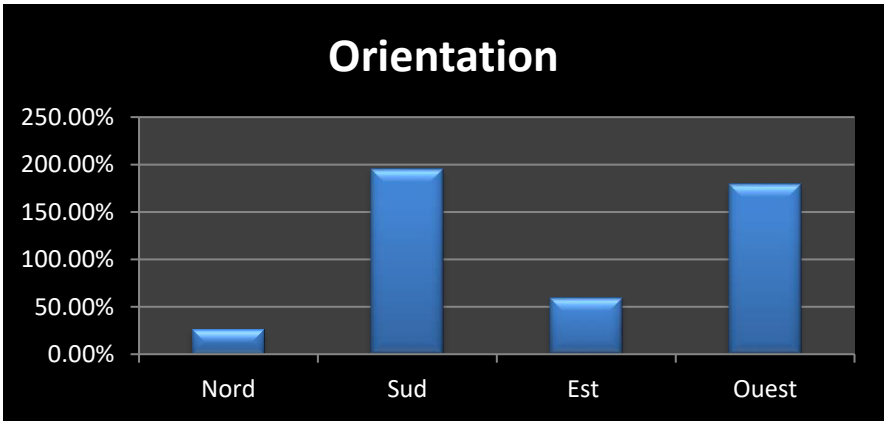


Figure 5: Effect of orientation on clump length growth at the Rachgoune station.

Table 2: Average as a function of orientation

Level	N	Mean	StDev
1	8	7,30	2,58
2	8	68,00	27,21
3	8	17,82	7,14
4	8	51,94	16,75

Table 2 and the figure below show that growth is strongest in the south-facing area, followed by the west-facing area, then the east-facing area and the north-facing area.



Orientation = Exposure To to Sun

Figure 6: Average as a function of orientation for the first date

2nd date

The ANOVA study with a single control factor shows significant tuft growth for a P=0.000, which is highly significant.

Table 3: One-way ANOVA: Stem length versus orientation

Source	DF	SS	MS	F	P
Orientation	3	16896,9	5632,3	541,29	0,000

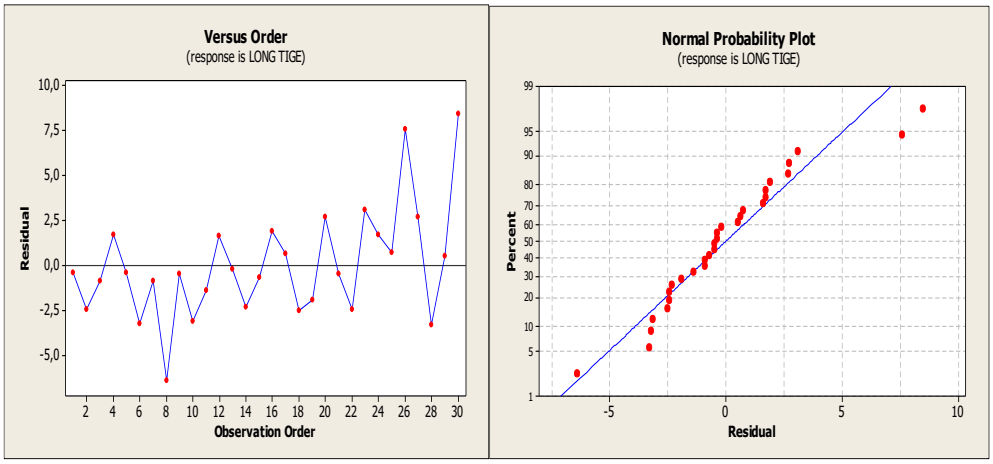
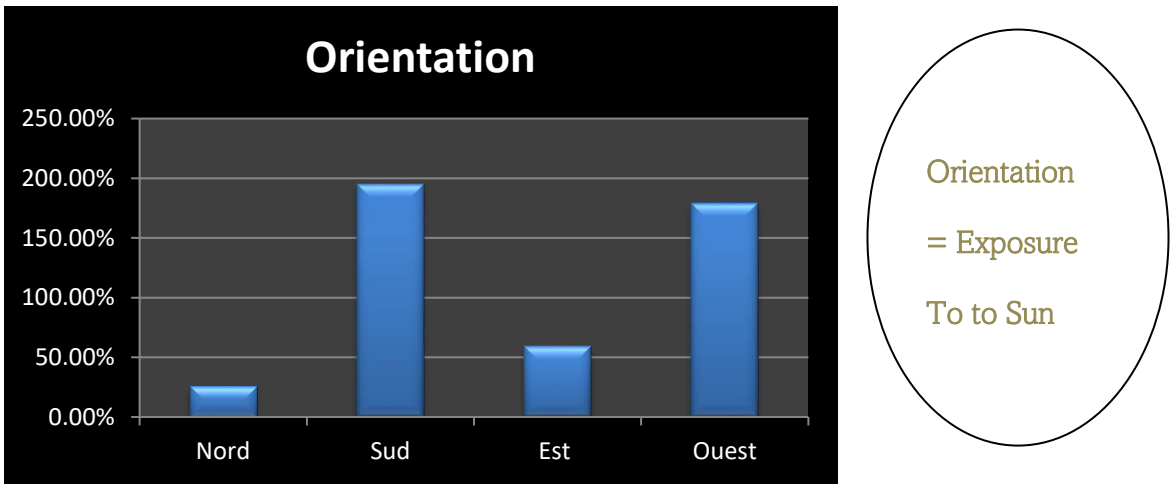


Figure 7: Effect of orientation on tuft length growth at the Rachgoune station.

Table 4: Average as a function of orientation

Level	N	Mean	StDev
1	8	8,375	0,528
2	8	62,425	4,970
3	8	18,900	2,024
4	8	57,286	3,442

Table 4 and the figure below show that growth is strongest in the south-facing area, followed by the west-facing area, then the east-facing area and the north-facing area.



igure 8: Average as a function of orientation for the second date

3rd date:

The ANOVA with a single control factor combining length and orientation shows an impact of the ecological factor Orientation with an F= 1.92 for a P= 0.150.

Table 5: One-way ANOVA: long stem versus orientation

Source	DF	SS	MS	F	P
Orientation	3	3027	1009	1,92	0,150

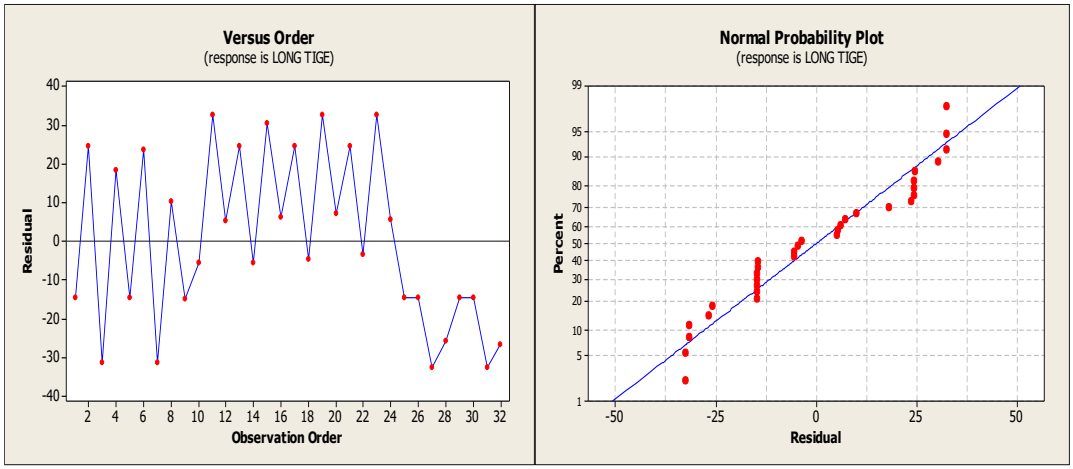


Figure 9: Effect of orientation on tuft length growth at the Rachgoune station

Table 6: Average as a function of orientation

Level	N	Mean	StDev
1	8	22,66	20,26
2	8	35,52	15,47
3	8	49,51	34,26
4	8	40,76	16,75

Significant growth is seen in the eastern exposure, followed by the western exposure, then the southern exposure and finally the northern exposure.

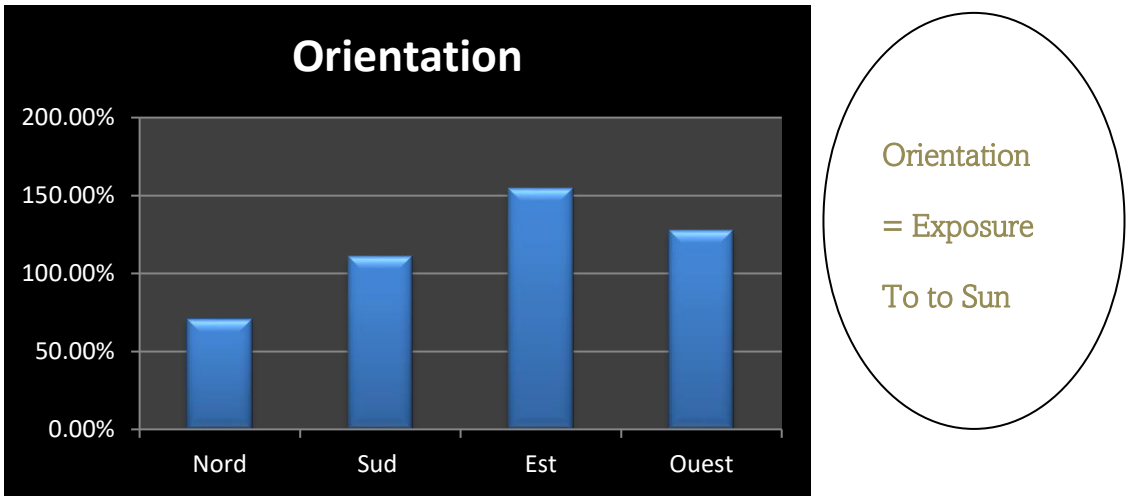


Figure 10: The average as a function of orientation for the third date

4th date :

The ANOVA study with a single controlled factor combining length and orientation shows significant tuft growth for a P=0.000 and which is highly significant.

Table 7: One-way ANOVA: stem length versus orientation.

Source	DF	SS	MS	F	P
Orientation	3	22133	7378	51,79	0,000

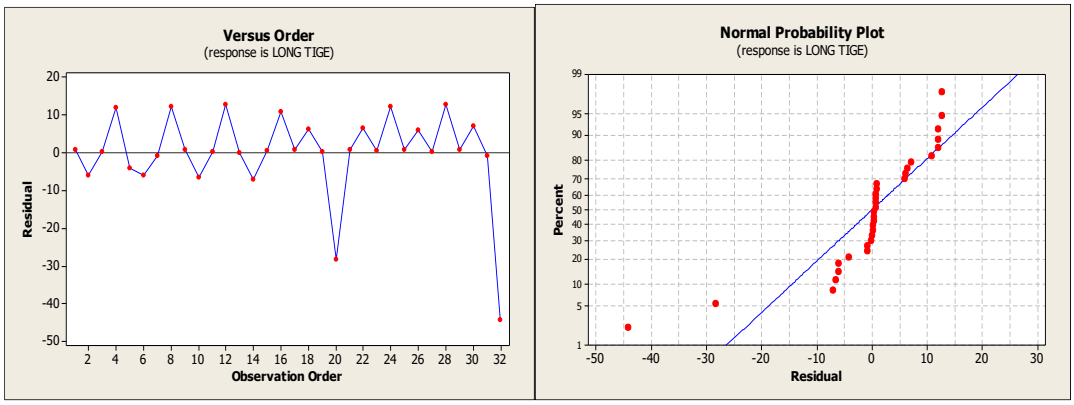
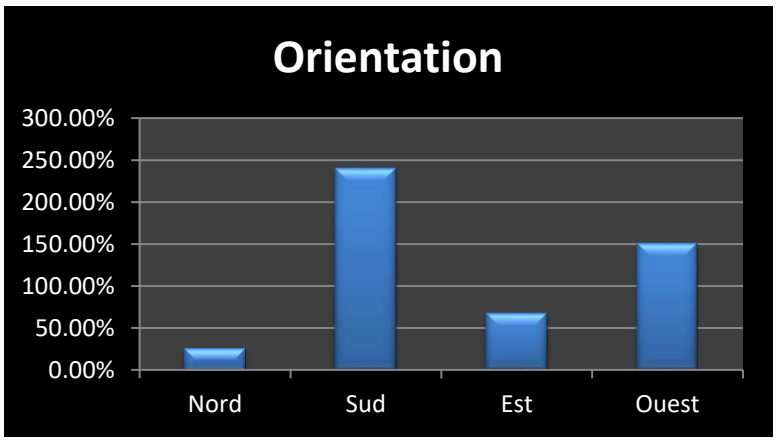


Figure 11: Effect of orientation on tuft length growth at the Rachgoune station

Table 8: Average as a function of orientation

Level	N	Mean	StDev
1	8	8,26	1,75
2	8	76,91	6,90
3	8	21,70	0,50
4	8	48,24	22,78

Significant growth is seen in the south-facing area, followed by the west-facing area, then the east-facing area and finally the north-facing area.



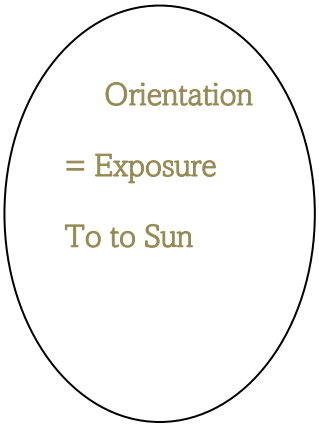


Figure 12: Average as a function of orientation for the fourth date

5th date:

The single factor ANOVA study controlling for length and orientation shows significant tuft growth at P=0.000, which is highly significant.

Table 9: One-way ANOVA: long stem versus orientation

Source	DF	SS	MS	F	P
Orientation	3	12181	4060	11,46	0,000

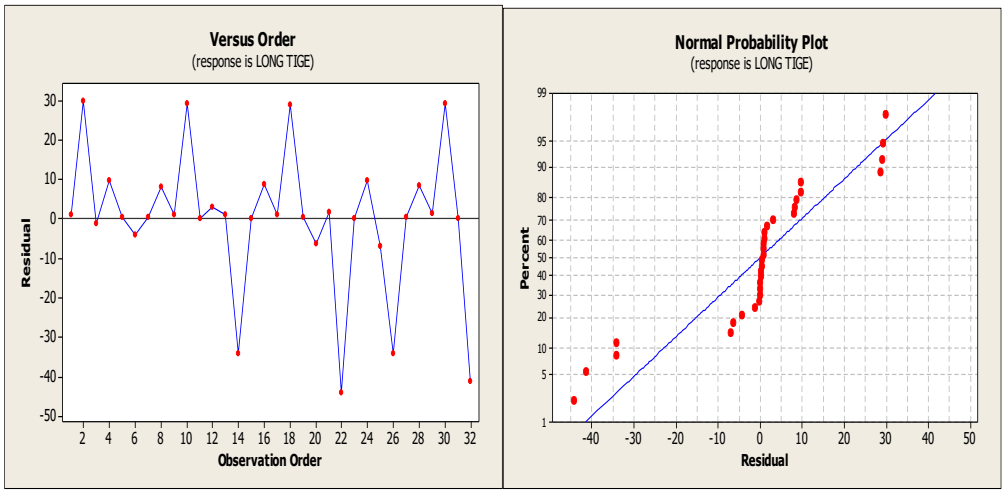
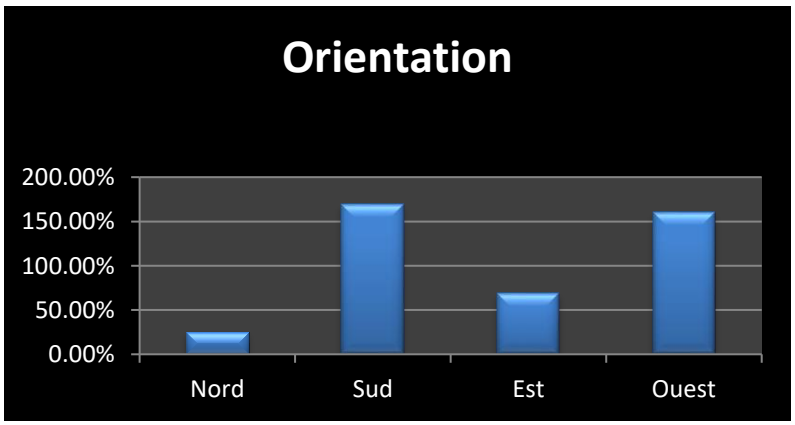


Figure 13: Effect of orientation on tuft length growth at the Rachgoune station

Table 10: Average as a function of orientation

Level	N	Mean	StDev
1	8	8,04	2,87
2	8	54,19	33,20
3	8	22,00	0,50
4	8	51,24	17,51

Significant growth is seen in the southern exposure, followed by the western exposure, then the eastern exposure and finally the northern exposure.)



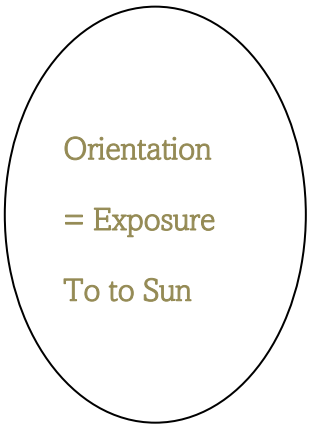


Figure 14: The average as a function of orientation for the 5th date

Discussion

Lavatera maritima is a woody plant, over 1m tall. Flowers of a pale pink ± purplish in the center, isolated and long stalked in the axils of the leaves. The flowers are arranged all along the branches and have a good holding in clusters. The leaves are deciduous, persistent, downy of a beautiful ash-green, gray. (Ghalem, 2022)

the seasonal pattern is of the H A P E type, with significant precipitation falling in winter, f with a first maximum in winter, a first minimum in summer, a second maximum in autumn and a second minimum in spring for both the old and new periods.

This pluviothermal diagram can be used to determine the position of each weather station and to delimit the bioclimatic area of a species or plant group. The Q2 values and the minima of the coldest month have enabled us to position our weather station on the D'Emberger rainfall-thermal climagram. It shows that the Béni-Saf station is located in the semi-arid zone, characterised by a warm winter.

According to Bensouna 2014, the study area has a Mediterranean climate and belongs to the upper semi-arid bioclimatic stage according to Emberger's classification. Application of the rainfall-thermone quotient to recent climate data revealed that the Béni-Saf station is classified in the upper semi-arid stage with warm winters.

M.subovata, 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. (Ghalem, 2021).

However, during our field surveys we noticed that the groups in Lavatera are in continual regression and, our results obtained confirm to us that under the effect of several degradation actions, the dynamics of vegetation in the study area is in the regressive sense. (Ghalem,2021).

The development of the foot of the plant is of course dependent on environmental conditions. However, good development in relation to a high rate of cover means that the species is in perfect balance and seems to derive maximum benefit from its environment (Barka, 2017).

Conclusion

The ANOVAS carried out show a highly significant correlation between the impact of orientation on the development in length of the twigs of the shrubs at our station and during most of the samplings.

Calculating the average length growth of M. subovata at the Rachgoune station reveals significant variations.

 The effect of orientation has a strong influence on height.

 The clump factor is very important as it shows the vigour of each clump.

The morphometric results observed are probably due to the fact that the species has not been subjected to anthropozoic action and that it is able to evolve normally because it is a plant that is not palatable by animals and evolves in association with a thorny plant, *Withania frutescens*. In conclusion, the morpho-metric parameters are correlated, with growth in length and width showing a very strong correlation.

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