RELATIONS GROUND-VEGETATION IN THE FORMATIONS WITH JUNIPERUS PHOENICEA, AND PINUS HALEPENSIS IN THE MATORRALS OF THE MOSTAGANÉMOIS LITTORAL

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Abstract

In the present work we have been able to verify the utility of splitting the organic matter that seems to be indispensable, especially when it comes to soil humus and very little polymer containing a large proportion of non-decomposed organic matter. The study even if it remains incomplete, however, provides some useful information.

The work in question reflects the fundamental influence exerted by organic matter as soil and as a driving force behind its dynamic.

Humus factor in the vocation of a soil can promote or remove certain plant species.

The statistical analysis shows that among other humification of organic matter is fast on substrate sandstone limestone (Calabrien) as a substrate Tithonique Upper Cretaceous which can be explained by the very high rate of humic acids that the substrate sandstone limestone.

At the level of plant organic matter provided by mixedwoods (*Eucalyptus, Pinus halepensis, Juniperus phoenicea*) with a sub made of wood (*Retama monosperma, Calycotome spinosa, Pistacia lentiscus, Phylaria latifolia, Lavandula stoecka*) has a very good humification with a predominance of humic acids that indicate accelerating the training complex humic clay and a wealth of permanent energy reserves. This concept therefore place humus as predominant factor in the vocation of a soil, humus and a determined will not promote a rather limited number of plant species.

Keywords: Organic matter, Humus, Soil, humic acids, vegetable Training, clay and humic complex, Forest Bourahma, Mostaganem, Algeria

Introduction

The forest medium is an example particularly Net of ecosystem organized in superimposed layers, which allows the maximum use of solar energy as well as a greater ecological diversification of the niches (Dajoz, 1985).

Among the essential components in this medium there is the organic matter which plays a crucial role in the environment (Aubert George, 1965). It constitutes the substrate essential to the development of the biological life (Duchauffour ph, 1977), because it is a major source of carbon and energy for the micro-organisms (Ruellan Alain, 1971). It conditions the chemical properties (stocks of carbon, nitrogen and phosphorus) and physics (permeability, structural stability, circulation and water holding capacity) of the ground (Fustec-Mathon et al. , 1975; Jambu and Al, 1983; Dutartre and Al, 1993).

The grounds are particular mediums which allow the vegetable life (Pouget M., 1980), but each alive species has its requirements in mineral substances, and in organic substances, water and thus occupies only one limited part of a ground of given nature (Becker, 1971).

Methods:

Soil sampling:

There are several methods and standards of sampling and analysis of the grounds being able to be adapted for the study of the ground:

- Random method;
- Random method laminate;
- Systematic method;
- Random systematic method;
- Random semi systematic method;
- Systematic method laminate in plan;

In our case the random method laminated bearing on the unit of the zone is preferable, this method which requires the realization of a number of taking away from where the choice of their sites is based on determining factors.

Several factors can be taken into account for the realization of this operation such as the geological substrate, the lithosols, the geomorphology, the occupation of the grounds and the vegetation (Baise and Jabiol, 1995).

The strategy of sampling to be set up to carry out the investigation of the grounds is guided much by the nature of required information (Laperche and Mossman, 2004).

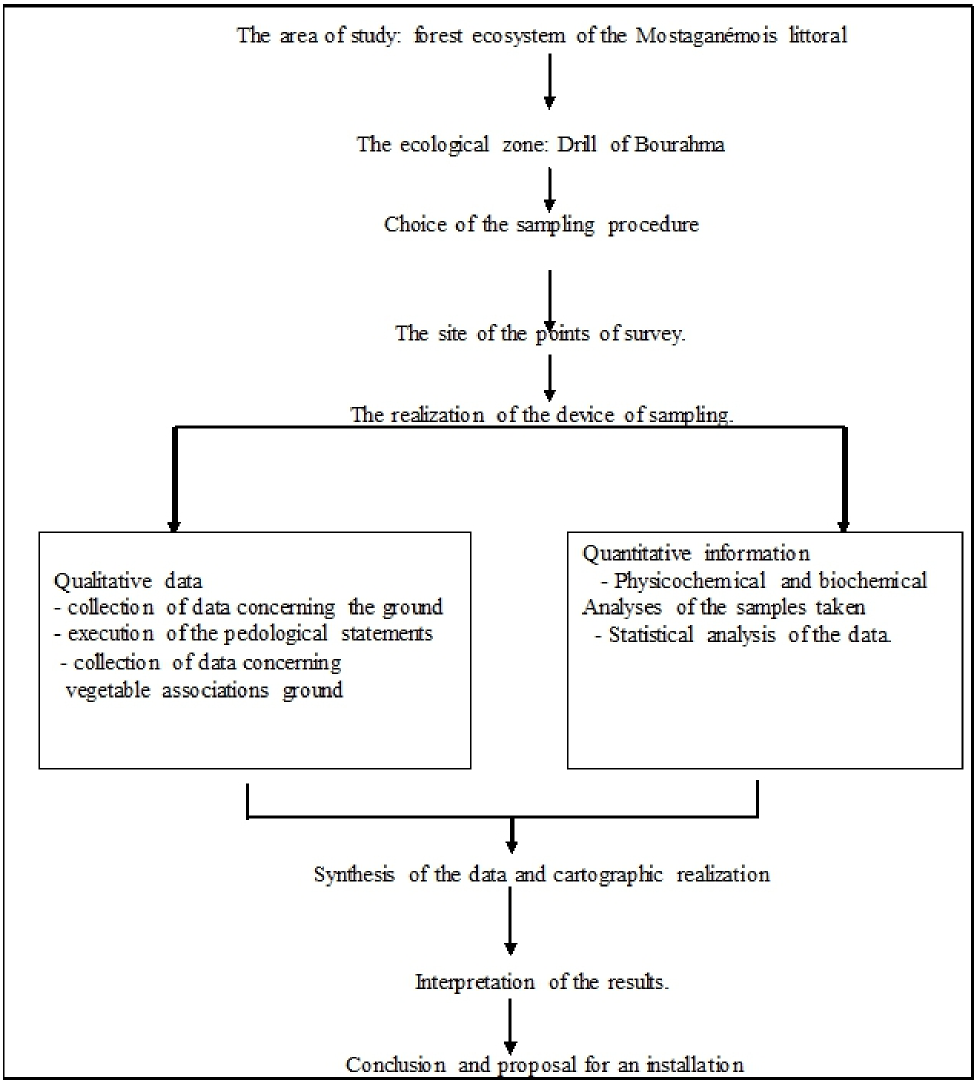

Fig. 1: Experimental methodological approach

Laboratory analysis: Extraction and fractionation of humic matters of the soil

Description of the technique:

To have perfectly reproducible results, it is essential to standardize as much as possible the mode of extraction according to:

The Soil was grinding and sieving with sieve 0.2mm. Reactive the ground ratio/is of 5/100 for each extract; but in the case of the poor grounds, it is sometimes necessary to take 20/100.

- To agitate during ½ hour 10g ground in H_3PO_4 200ml (136ml per liter of water). To start again the operation twice, them light vegetable matters are collected on filter and are dried. Carbon is analyzed by dry combustion,

- The phosphoric solution containing the free acids fulvic is preserved,

- Washing the soil with water until pH reach 4.5 to 5. After washing, the soil is agitated 4 hours with 200ml of $Na_4P_2O_7$, 0.1M the liquid of extraction is centrifuged and elutriated on filter,

- The residue of soil is agitated 4 hours with 200ml Na OH 0.1M, is centrifuged and elutriated on filter. The process was repeated two times. The filtrats corresponding to the extraction pyrophosphate and soda are preserved separately,

- Aliquot of each solution is desiccated with the drying oven and carbon is proportioned, either by potassium dicromate, or by combustion and determination of released CO_2, One determines total organic materials thus (fulvique. A + humique. A) (Duchaufour P. and al., 1963).

- On another aliquot, the humic acids are precipitated by H_2SO_4 at pH 1, the precipitate is washed and the carbon determined like previously (Humic acid).

- The fulvic acids are obtained by difference: %C fulvic acid = %C humic acid total-%C organic materials,

- The free fulvic acids are directly given by sulfochromic oxidation of the phosphoric extract,

- The residue of soil after the second extraction with soda, is dried, and residual total carbon is proportioned. Thus obtains the insoluble fraction or humin,

- There are thus ultimately seven fractions different of organic matters:

*C% of the light vegetable matters,
+C% of the free fulvic acids,
+C% of the fulvic acids extracted with sodium pyrophosphate,
+C% of the humic acids extracted with sodium pyrophosphate,
+C% of the fulvic acids extracted with soda,
+C% of the humic acids extracted with soda,
+C% Humin,

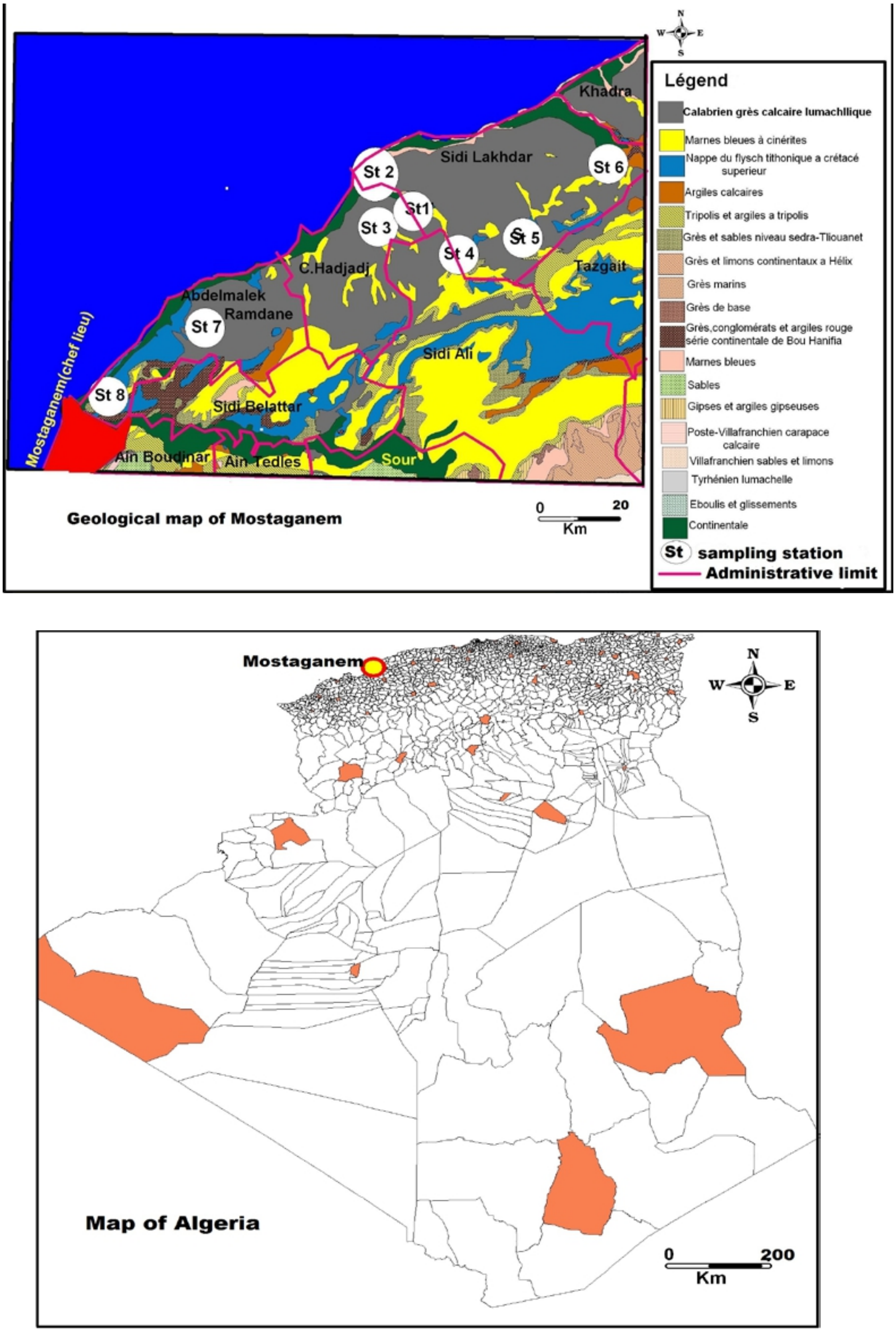

Fig. 2: Location map showing the study area.

Results and discussion

After studying the results of physical and chemical, we made a detailed statistical analysis to better interpret these data.

In the first place and how to check the distribution of some variables measured at each layer, and between different layer we made a ANOVA which aims to see if there is consistency between the profiles in each station and subsequently between all stations.

Test of homogeneity of all stations layer

a)- Organic matter

Source	DL	S.squares	CM	F	P
Sample	2	3,04	1,5176	0,07	0,934
Station	7	56,51	8,0735	0,37	0,918
Interaction	14	22,37	1,5976	0,07	1,000
Error	48	1061,69	22,1185		
Total	71	1143,60			

S = 4,703 R^2= 7,16 % R^2 (ajust) = 0,00 %.

Based on these results we see that the production fresh organic matter is the same in each station and for all stations at each layer.

b)- Nitrogen

Source	DL	S.squares	CM	F	P
Sample	2	256,43	128,216	6,80	0,003
Station	7	4327,22	618,174	32,79	0,000
Interaction	14	767,57	54,827	2,91	0,003
Error	48	904,98	18,854		
Total	71	6256,20			

S = 4,342 R^2 = 85,53 % R^2(ajust) = 78,60 %

For nitrogen and from the values of (P) we see that there is a significant difference between layers in profile of station and for all stations that can be explained by the variability decomposition of organic matter.

c)- pH

Source	DL	S.squares	CM	F	P
Sample	2	0,5242	0,262101	0,83	0,441
Station	7	3,1224	0,446053	1,42	0,221
Interaction	14	3,2829	0,234492	0,74	0,720
Error	48	15,1255	0,315114		
Total	71	22,0549			

S = 0,5614 R^2= 31,42 % R^2 (ajust) = 0,00 %.

For the pH test indicates that there is not significant difference between the stations.

d)- Fulvic acids

Source	DL	S.squares	CM	F	P
Sample	**2**	**98,13**	**49,0646**	**5,63**	**0,006**
Station	**7**	**538,91**	**76,9875**	**8,84**	**0,000**
Interaction	**14**	**552,22**	**39,4440**	**4,53**	**0,000**
Error	**48**	**418,19**	**8,7124**		
Total	**71**	**1607,45**			

S = 2,952 R^2= 73,98 % R^2 (ajust) = 61,52 %.

Based on the values of (P) we see that there is a perfect heterogeneity at each layer between all stations for the production of fulvic acids that explains that decomposition of organic matter differs between stations.

e)- Humic acids

Source	DL	S.squares	CM	F	P
Sample	**2**	**4,317**	**2,1586**	**1,10**	**0,340**
Station	**7**	**142,194**	**20,3135**	**10,40**	**0,000**
Interaction	**14**	**61,857**	**4,4184**	**2,26**	**0,018**
Error	**48**	**93,779**	**1,9537**		
Total	**71**	**302,147**			

S = 1,398 R^2= 68,96 % R^2 (ajust) = 54,09 %

Based on the values of (P) we see that there is a perfect heterogeneity at each layer between all stations for the production of humic acids that explains the difference in degrees of evolution of matter fresh organic.

Test for homogeneity of all the stations profile

a) - Organic Matter

Source	DL	S.squares	CM	F	P
Sample	**2**	**994,69**	**497,347**	**458,97**	**0,000**
Station	**7**	**65,78**	**9,397**	**8,67**	**0,000**
Interaction	**14**	**109,05**	**7,789**	**7,19**	**0,000**
Error	**48**	**52,01**	**1,084**		
Total	**71**	**1221,54**			

S = 1,041 R^2= 95,74 % R^2(ajust) = 93,70 %

Based on these results we see that the rate of fresh organic matter is different from one layer to another at each station and between all stations.

b) - Fulvic acids

Source	DL	S.squares	CM	F	P
Sample	**2**	**225,98**	**112,992**	**10,20**	**0,000**
Station	**7**	**3308,89**	**472,698**	**5,12**	**0,000**
Interaction	**14**	**123,96**	**8,854**	**0,19**	**0,999**
Error	**48**	**214,26**	**4,464**		
Total	**71**	**3873,10**			

S = 2,113 R^2= 94,47 % R^2(ajust) = 91,82 %

Based on these results we see that the rate of fulvic acids is different from one layer to another at each station and between all the stations which shows that decomposition of organic matter varies with the depth.

C)- Humic Acids

Source	DL	S.squares	CM	F	P
Sample	**2**	**48,064**	**24,0322**	**4,00**	**0,025**
Station	**7**	**204,759**	**29,2512**	**9,68**	**0,000**
Interaction	**14**	**10,709**	**0,7649**	**1,45**	**0,169**
Error	**48**	**59,327**	**1,2360**		
Total	**71**	**322,859**			

S = 1,112 R^2= 81,62 % R^2(ajust) = 72,82 %

Based on the values of (P) we see that there is a perfect heterogeneity between layers for all stations for humic acids that explains the difference in levels of development of fresh organic matter.

d) – Nitrogen

Source	DL	S.squares	CM	F	P
Sample	**2**	**921,7**	**460,84**	**10,38**	**0,000**
Station	**7**	**8116,7**	**1159,52**	**26,36**	**0,000**
Interaction	**14**	**729,2**	**52,08**	**0,96**	**0,502**
Error	**48**	**1931,8**	**40,24**		
Total	**71**	**11699,2**			

S = 6,344 R^2= 83,49 % R^2 (ajust) = 75,58 %

Based on these results we see that the rate of nitrogen differs completely from one layer to another depending on the depth at every station and between stations.

e)- pH

Source	DL	S.squares	CM	F	P
Sample	**2**	**0,6059**	**0,302956**	**6,15**	**0,004**
Station	**7**	**2,1757**	**0,310815**	**2,69**	**0,020**
Interaction	**14**	**9,0800**	**0,648570**	**3,85**	**0,000**
Error	**48**	**8,0400**	**0,167500**		
Total	**71**	**19,9016**			

S = 0,4093 R^2= 59,60 % R^2 (ajust) = 40,24 %

The pH also presents a great variability between the different layer's levels for each station and between all stations.

Study of variables (parameters)

The Principal Component Analysis (PCA) built graphics for visualizing relationships between variables. Proper interpretation requires the determination of axis that take better account of the dispersion of the cloud, for it must take into account the following parameters:

- Coordinates of the variables on the axis in the graph;
- Contribution which is the share of each variable in the axis formation factor or percentage;
- Cosine (actually the angle between the factor and the variable) is the linear correlation coefficient, the greater the cosine is, the more it contributes to the formation of the axis.
- Graphical

Plan 1-2: Particle size (sand) and organic matter (OM)

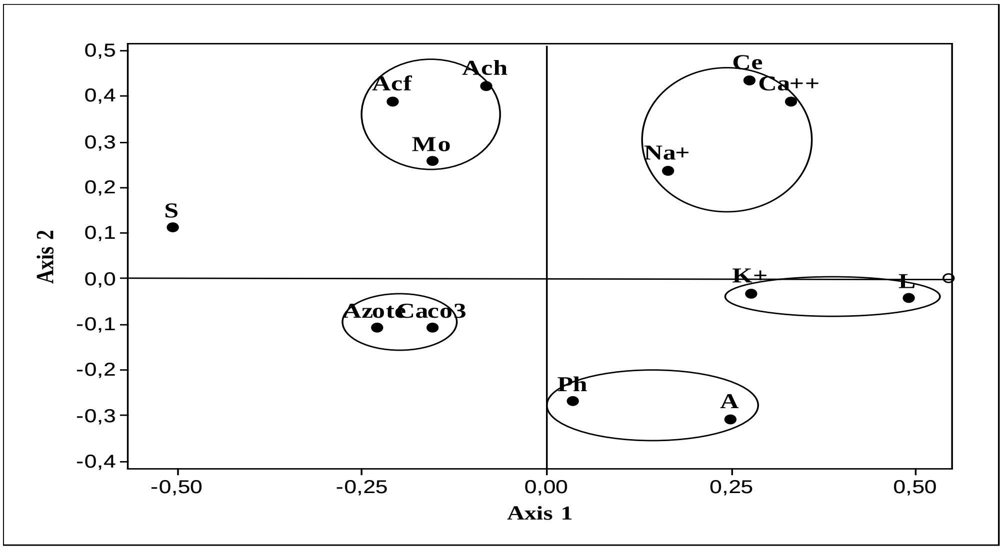

Fig. 3: Graphical representation of Plan1-2 (correlated variables).

In our distribution there is interaction not only between stations but also between themselves and descriptors on the overall results it seems that the combination of Plan 1-2 gives the highest discriminating power is 43%.

This Plan 1-2 expresses that there is a strong correlation between the four groups of variables: (F.Ac, OM and H.Ac) which opposes the group (clay, and pH) and the group of (Na^+, Ca^{++} and EC) which opposes the group (Nitrogen, and CaCO3) and a correlation between the group (K^+ and silt).

Plan 1-3: Particle size (sand) and limestone (CaCO3)

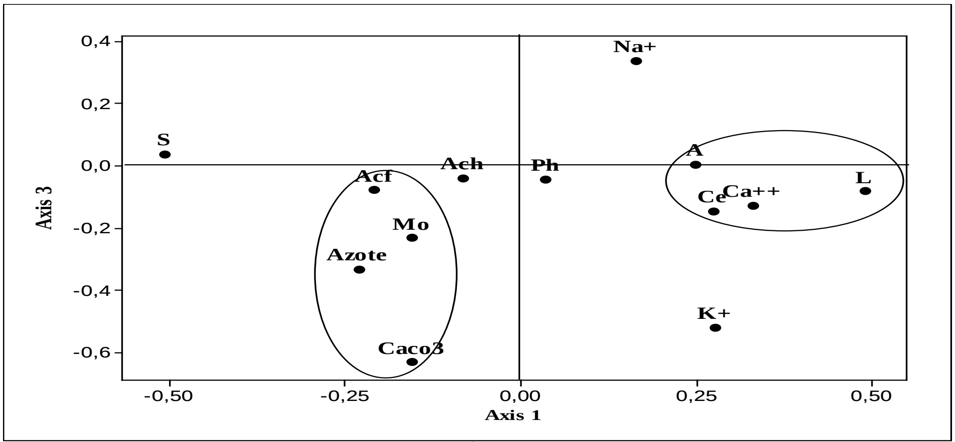

Fig. 4: Graphical representation of the Plan 1-3 (correlated variables).

According to the Plan 1-3 explains 35% of the information shows that there is a strong correlation between two groups (OM, nitrogen, and F .Ac CaCo3) and from the group consisting of (Ca +, clay, silt and EC).

Plan 2-3: Organic matter (OM) and limestone (CaCO3)

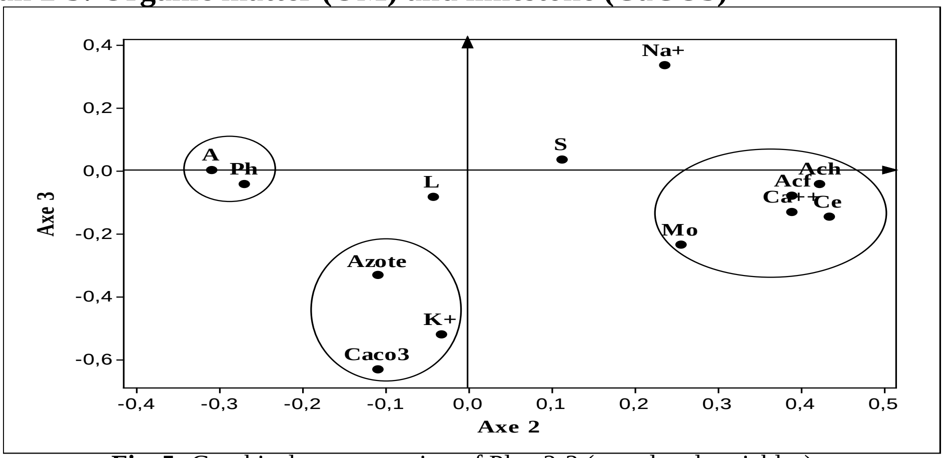

Fig. 5: Graphical representation of Plan 2-3 (correlated variables).

Plan 2-3 provides the discriminating power is the lowest of 33%.

This plan expresses that there is a strong correlation between the three groups of variables: (F.Ac, H.Ac, Ca +, EC and OM) which opposes the group (pH, clay) and another group (nitrogen, and K + CaCO3).

The Principal Component Analysis (PCA) has allowed us to see that there is a strong correlation between organic matter and fulvic acids and nitrogen opposition to the values of pH of the soil.

A more detailed study using the non-linear model "logistics" actually confirms the results obtained using the Principal Component Analysis (PCA) to know that fulvic acids and nitrogen contribute significantly to the rate of wealth of a soil fresh organic matter so that the pH of the soil, high opposes.

Test Logistics

The following table shows the distribution of the wealth level of soil organic matter:

Rate of organic matter (Mo)	***Soil***
<4	**Poor**
>4	**Rich**

Binary logistic regression

This is a test that is based on two levels of value for organic matter:

We initially grouped into two classes the rate of organic matter (Given samples obtained), as follows:

Mo = 1 (high) (Rate of Mo> 4)

Mo = 0 (poor) (Rate of Mo <4)

The results are shown below.

Logistic regression table

Prédictor	**Coeff**	**Z**	**P**	**Ratio.Odd**	**95% CI**
Constant	**3,66**	**1,14**	**0,25**		**Lower Upper**
PH	**-1,11**	**-2,04**	**0,04**	**0,33**	**(0,11 ; 0,96)**
Nitrogen	**0,06**	**2,01**	**0,04**	**1,06**	**(1,00 ; 1,13)**
F.Ac	**0,12**	**1,92**	**0,049**	**1,13**	**(1,00 ; 1,29)**

Logistic Regression Table shows the estimated coefficients, standard error of the coefficients, z-values, p-values , odds ratio, and a 95% confidence interval for the odds ratio.

The value labeled Const(1) is estimated intercept for the logits of the probabilities of richness in organic matter for Mo=1.

The coefficient of -1.11 for pH is the estimated change in the logit of the cumulative richness in organic matter time probability when the PH is >7 compared to pH <7 1, with the covariates nitrogen and F.Ac held constant. Because the p-value for estimated coefficient is <0.05, there is sufficient evidence to conclude that pH has an effect upon richness in organic matter time.

There is one estimated coefficient for each covariate, which gives parallel lines for the factor levels. Here, the estimated coefficient for the single covariate, nitrogen, is -0.06, with a p-value of < 0.05 and for the single covariate F.Ac ,is -0.17, with a p-value of = 0.05 . The p-value indicates that for most a-levels, there is sufficient evidence to conclude that the nitrogen affect richness in organic matter,and and the F.Ac does too. The positive coefficient, and odds ratio that are higher than one indicates that higher nitrogen, tend to be associated with lower values of richness in organic matter.

Based on these results we see that the richness in organic matter is positively correlated with the rate of fulvic acids and nitrogen and opposite the pH level.

These results confirm (as seen in Fig. 3) that the level of richness in organic matter is positively correlated with the rate of fulvic acids and nitrogen and opposed to soil pH.

General conclusion

Forest ecosystems are integrated into the management, conservation of biodiversity. Rational management and multifunctional facing sustainable development seems to ensure a balance between economic needs and environmental requirements.

We performed this study is to characterize the organic matter in a forest ecosystem of the coastal Mostaganem's region, informative and useful especially in timber production.

Precise knowledge of the main plant formations, lithological substrate and physico-chemical properties of soil and bioclimatic characterization are the fundamentals to better understand the evolution of humic compounds in the ecosystem.

The study of climatic variables indicates that the region of Mostaganem has a Mediterranean climate characterized by two distinct seasons: the rainy winter and the summer drought.

The study of the physicochemical parameters provides the following findings:

- The study area is characterized by soils with textural diversity, the most dominant are the sandy texture, and texture sandy loam. These soils are more or less acidic, with a pH ranging between 4.5 and 6.5

Regarding organic matter, these soils vary from rich through with rates between 10% and 2%.

The total limestone area has a low charge because its values vary between 1 and 2% for all profiles.

For a more detailed analysis and better understanding of the interplay of environmental factors related to soil on plant diversity, however, it is necessary to consider statistical processing.

Agglomerative hierarchical clustering (AHC) obtained using the software "Minitab" allowed us to distinguish three classes of backgrounds, mentioned above, according to the different chemical and physical parameters.

To make proposals very appropriate and well managed forest ecosystem that is the subject of this study, data are organized by theme and integrated into a geographic information system that can serve as the basis for managing the forest information.

Makers responsible for the promotion of forestry and environmental protection must take into account the speed of degradation of forest ecosystems and soil quality in the long term for this region, they are obliged to intervene :

- The preservation of forest communities that are relatively stable vegetation structures in floristic species significant features.

- The restoration of pre-forest groups far the most frequent, representing structures, often in the form of matorrals treed stuck in current ecological conditions and human actions always present.

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Schedule

Table no. 01: Stational data and analytical station 01

		Station 1								
Géographic Coordinates		**X =261.9 Y = 4003.1**								
Plant association		**Forest spieces :-***Eucalyptus ;Juniperus phoenicea* and *Pinus halepensis* **under wood:** *Acacia lentiscus* and *Rétama retama*								
Géological Substrate		Calabrien; grès calcaire lumechlique								
Profils		**P_1**			**P_2**			**P_3**		
Layer depth		**L_1**	**L_2**	**L_3**	**L_1**	**L_2**	**L_3**	**L_1**	**L_2**	**L_3**
Color		**7.5YR 5/6**	**2.5YR 4/8**	**2.5YR 4/8**	**7.5YR 4/6**	**2.5Y R 4/8**	**10R 4/6**	**2.5YR 4/6**	**2.5YR 5/8**	**7.5YR 4/8**
Partical Distri-bution	**F.S (%)**	**32.2**	**40.2**	**32.1**	**67.8**	**59.6**	**46.9**	**43.6**	**38.1**	**43.2**
	C.S (%)	**46.5**	**30.7**	**31.2**	**25.6**	**27.8**	**34.4**	**37.8**	**33.2**	**35.4**
	F.Z (%)	**4**	**5.2**	**11.4**	**2.3**	**4.1**	**7.9**	**5.2**	**8.6**	**11.5**
	C.Z (%)	**7.1**	**14.2**	**16.6**	**1.2**	**3.1**	**4.9**	**1.6**	**10.5**	**3.7**
	C (%)	**10.2**	**9.7**	**8.7**	**3.1**	**5.4**	**5.9**	**11.8**	**9.6**	**6.2**
pH		**5.8**	**6.9**	**4.7**	**6.08**	**6.8**	**5.4**	**6.3**	**5.9**	**5.7**
OM (%)		**9.03**	**1.29**	**0.86**	**2.58**	**1.29**	**0.86**	**2.75**	**2.06**	**1.5**
C (%)		**15,5**	**2,2**	**1,5**	**4,4**	**2,2**	**1,5**	**4,7**	**3,5**	**2,6**
EC (µS /cm) at T=29 °c		**44**	**21.3**	**9.33**	**26.7**	**19.44**	**12.49**	**35.28**	**21.53**	**19.45**
Caco3 (%)		**1.72**	**2.15**	**1.29**	**0.86**	**3.01**	**1.29**	**2.13**	**1.87**	**0.98**
TN (%)		**108.6**	**38.9**	**25.3**	**42.5**	**30.8**	**22.4**	**40.5**	**39.1**	**25.4**
C /N		**0,14**	**0,06**	**0,06**	**0,10**	**0,07**	**0,07**	**0,12**	**0,09**	**0,10**
Exchangeable Cations ($Cmole.Kg^{-1}$)	**Ca^{++}**	**0.64**	**0.042**	**0.037**	**0.32**	**0.27**	**0.22**	**0.38**	**0.29**	**0.25**
	K^+	**0.05**	**0.013**	**0.020**	**0.018**	**0.038**	**0.021**	**0.035**	**0.027**	**0.017**
	Na^+	**0.37**	**0.36**	**0.082**	**0.21**	**0.39**	**0.091**	**0.43**	**0.26**	**0.18**
	Mg^+	**0.7**	**0.5**	**0.4**	**0.6**	**0.8**	**0.7**	**0.3**	**0.4**	**0.2**
FA (%)		**14.6**	**13.8**	**11.4**	**7.6**	**6.3**	**5.4**	**10.3**	**8.4**	**7.7**
H A (%)		**5.2**	**4.1**	**3.6**	**5.6**	**3.3**	**2.6**	**4.8**	**4.2**	**3.1**

Table no. 02: Stational data and analytical station 02

		Station 2								
Géographic Coordinates		**X =261.5 Y = 4004.5**								
Plant association		**Forest spieces :-** *Juniperus phoenicea; Eucalyptus ;* and *Pinus maritima* **under wood:***Rétama monosperma;Calicotom spinosa and Pistachialentiscus*								
Géological Substrate		Calabrien ; grès calcaire lumechlique								
Profils		**P_1**			**P_2**			**P_3**		
Layer depth		**L_1**	**L_2**	**L_3**	**L_1**	**L_2**	**L_3**	**L_1**	**L_2**	**L_3**
Color		**2.5YR 5/8**	**7.5YR 4/6**	**2.5YR 6/8**	**7.5YR 4/3**	**7.5YR 5/8**	**10R 4/6**	**2.5YR 6/2**	**7.5Y R 4/8**	**7.5Y R 4/6**
Partical Distribu-tion	**F.S (%)**	**80.6**	**83.9**	**69.7**	**80.5**	**63.3**	**66.3**	**75.8**	**64.1**	**55.4**
	C.S (%)	**46.5**	**30.7**	**31.2**	**25.6**	**27.8**	**34.4**	**37.8**	**33.2**	**35.4**
	F.Z (%)	**11.2**	**7.1**	**15.1**	**6.4**	**17.3**	**13**	**13.5**	**20.7**	**17.1**
	C.Z (%)	**7.1**	**14.2**	**16.6**	**1.2**	**3.1**	**4.9**	**1.6**	**10.5**	**3.7**
	C (%)	**8.2**	**9**	**15.2**	**13.1**	**19.4**	**20.7**	**11.2**	**15.2**	**17.5**
pH		**5.06**	**6.03**	**5.3**	**5.2**	**5.7**	**6.01**	**6.1**	**6.3**	**6.8**
OM (%)		**5.3**	**2.7**	**1.5**	**8.1**	**3.6**	**1.8**	**5.8**	**2.3**	**1.3**
C (%)		**9,11**	**4,64**	**2,58**	**13,93**	**61,92**	**3,09**	**9,97**	**3,95**	**2,23**
EC (µS /cm) at T=29 °c		**33.3**	**21.4**	**17.9**	**35.4**	**24.1**	**19.7**	**25.4**	**22.3**	**18.4**
Caco3 (%)		**3.44**	**1.29**	**1.72**	**1.78**	**2.45**	**1.78**	**3.21**	**2.87**	**1.95**
TN (%)		**67.8**	**56.8**	**32.4**	**32.1**	**25.1**	**15.4**	**38.2**	**29.7**	**23.6**
C /N		**0,13**	**0,08**	**0,08**	**0,43**	**0,25**	**0,20**	**0,26**	**0,13**	**0,09**
Exchangeable Cations ($Cmole.Kg^{-1}$)	**Ca^{++}**	**0.089**	**0.074**	**0.28**	**0.045**	**0.034**	**0.023**	**0.31**	**0.24**	**0.16**
	K^+	**0.05**	**0.023**	**0.047**	**0.041**	**0.036**	**0.022**	**0.021**	**0.012**	**0.015**
	Na^+	**0.37**	**0.34**	**0.33**	**0.36**	**0.25**	**0.18**	**0.32**	**0.23**	**0.18**
	Mg^+	**0.6**	**0.4**	**0.3**	**0.7**	**0.5**	**0.8**	**0.6**	**0.2**	**0.3**
FA (%)		**16.2**	**14.2**	**12.3**	**9.4**	**7.8**	**6.1**	**11.1**	**9.3**	**8.2**
H A (%)		**13.4**	**12.1**	**8.9**	**11.2**	**10.5**	**7.3**	**8.4**	**6.2**	**5.1**

Table no. 03: Stational data and analytical station 03

		Station 3								
Géographic Coordinates		**X =250.6 Y = 3998.3**								
Plant association		**Forest spieces :-** *Pinus pinaster; Pinus halepensis*								
Géological Substrate		Nappe du Flysch : Tithonique à Crétacé supérieur								
Profils		**P_1**			**P_2**			**P_3**		
Layer depth		**L_1**	**L_2**	**L_3**	**L_1**	**L_2**	**L_3**	**L_1**	**L_2**	**L_3**
Color		**2.5YR 4/6**	**10R 4/6**	**10R 5/6**	**2.5YR 4/3**	**10R 5/8**	**10R 4/6**	**2.5YR 5/3**	**10R 5/1**	**10R 4/6**
Partical distribution	**F.S (%)**	**83.9**	**93.5**	**68.7**	**78.3**	**81.6**	**75.4**	**75.5**	**75**	**65.4**
	C.S (%)	**46.5**	**30.7**	**31.2**	**25.6**	**27.8**	**34.4**	**37.8**	**33.2**	**35.4**
	F.Z (%)	**13**	**5.4**	**20.3**	**12.3**	**14.2**	**21.2**	**16.8**	**11.6**	**13.2**
	C.Z (%)	**7.1**	**14.2**	**16.6**	**1.2**	**3.1**	**4.9**	**1.6**	**10.5**	**3.7**
	C (%)	**3.1**	**1.1**	**11**	**9.4**	**4.2**	**13.4**	**7.7**	**13.4**	**12.4**
pH		**4.4**	**6.01**	**6.3**	**5.8**	**5.9**	**6.2**	**6.02**	**6.1**	**6.2**
OM (%)		**23,2**	**6,02**	**3,44**	**19,26**	**4,98**	**2,23**	**21,15**	**3,95**	**2,58**
C (%)		**39,9**	**10,3**	**5,9**	**33,1**	**8,5**	**3,8**	**36,3**	**6,7**	**4,4**
EC (µS /cm) at T=29 °c		**10.9**	**36.1**	**43.2**	**9**	**22.4**	**25.8**	**12.3**	**23.6**	**33.4**
Caco3 (%)		**3.44**	**3.01**	**2.58**	**4.02**	**3.87**	**3.54**	**3.4**	**2.56**	**1.76**
TN (%)		**22.1**	**10.2**	**13.8**	**11.5**	**9.2**	**8.5**	**18.4**	**10.6**	**8.7**

C /N		1,81	1,02	0,43	2,88	0,93	0,45	1,98	0,64	0,51
Exchangeable Cations (Cmole.Kg^{-1})	Ca^{++}	0.018	0.18	0.34	0.032	0.21	0.31	0.21	0.29	0.38
	K^{+}	0.016	0.017	0.021	0.018	0.018	0.013	0.012	0.02	0.024
	Na^{+}	0.095	0.34	0.35	0.12	0.14	0.21	0.085	0.16	0.23
	Mg^{+}	0.6	0.4	0.3	0.7	0.5	0.8	0.6	0.2	0.3
FA (%)		6.1	4.2	4.8	7.3	6.8	5.2	7.8	5.9	4.5
H A (%)		4.3	3.3	3.1	4.6	3.8	2.9	5.02	3.8	2.2

Table no. 04: Stational data and analytical station 04

		Station 4								
Géographic Coordinates		X =250.4 Y = 3998.5								
Plant association		**Forest spieces :-** *Pinus halepensis* **under wood:***Phylleria latifolia; Pistachia lentiscus*								
Géological Substrate		Calabrien ; grès calcaire lumechlique								
Profils		P_1			P_2			P_3		
Layer depth		L_1	L_2	L_3	L_1	L_2	L_3	L_1	L_2	L_3
Color		2.5YR 2.5/2	10YR 3/3	10R 4/6	2.5Y R3/1	10Y R 4/8	10Y R 5/1	10YR 2.5/2	10Y R 4/8	10YR 5/1
Partical distribution	F.S (%)	59.5	38	39.6	65.8	47.7	41.7	62.3	43.2	35.4
	C.S (%)	46.5	30.7	31.2	25.6	27.8	34.4	37.8	33.2	35.4
	F.Z (%)	32.3	43.4	45.2	27.7	35.1	43.5	28.2	37.5	47.9
	C.Z (%)	7.1	14.2	16.6	1.2	3.1	4.9	1.6	10.5	3.7
	C (%)	8.2	18.6	15.2	6.5	17.2	14.8	9.5	19.3	16.7
pH		5.8	6.2	5.7	6.01	6.1	6.09	5.09	5.7	6.03
OM (%)		16.5	3.8	1.7	12.4	3.3	1.2	10.3	2.8	1.2
C (%)		28,3	6,5	2,9	21,3	5,6	2,0	17,7	4,8	2,0
EC (µS /cm) at T=29 °c		177.2	231	185.9	205.3	187.6	196.4	166.2	178.3	171.8
Caco3 (%)		2.15	2.7	3.22	1.23	1.87	2.04	2.45	2.96	3.19
TN (%)		18.7	16.3	14.2	11.02	13.6	12.2	22.4	21.8	17.8
C /N		1,52	0,40	0,21	1,94	0,42	0,17	0,79	0,22	0,12
Exchangeable Cations (Cmole.Kg^{-1})	Ca^{++}	2.09	0.59	2.39	1.89	0.54	1.95	1.84	0.79	2.21
	K^{+}	0.04	0.07	0.63	0.014	0.023	0.3	0.016	0.032	0.28
	Na^{+}	0.47	0.19	0.25	0.31	0.23	0.27	0.21	0.17	0.34
	Mg^{+}	0.6	0.4	0.3	0.7	0.5	0.8	0.6	0.2	0.3
FA (%)		7.6	7.02	5.1	6.03	4.2	4.09	8.1	7.4	6.07
H A (%)		4.5	4.1	3.8	5.2	4.9	4.07	6.7	5.4	6.3

Table no. 05: Stational data and analytical station 05

		Station 5								
Géographic Coordinates		X =250.0 Y = 3998.0								
Plant association		**Forest spieces :-** *Pinus halepensis* **under wood:***Phylleria latifolia; Pistachia lentiscus and Lavandula stoecka*								
Géological Substrate		Calabrien ; grès calcaire lumechlique								
Profils		P_1			P_2			P_3		
Layer depth		L_1	L_2	L_3	L_1	L_2	L_3	L_1	L_2	L_3
Color		10YR 4/1	10R 5/1	2.5Y R 5/2	10YR 4/6	2.5YR 5/8	10Y R 3/1	10R 5/1	10R 4/8	10R 4/1
Partical distribution	F.S (%)	45.7	49.6	43.2	55	39.5	36.4	47.8	45.2	43
	C.S (%)	46.5	30.7	31.2	25.6	27.8	34.4	37.8	33.2	35.4
	F.Z (%)	30.7	43.3	40.7	26.1	48.2	38.2	31.5	37.8	38.4
	C.Z (%)	7.1	14.2	16.6	1.2	3.1	4.9	1.6	10.5	3.7
	C (%)	23.6	11	16.1	18.9	12.3	15.4	20.7	17	18.6
pH		5.7	6.6	6.2	6.02	6.1	5.4	6.7	6.4	6.08

OM (%)		**7**	**2.7**	**1.4**	**5.6**	**2.1**	**2.6**	**6.2**	**2.4**	**1.9**
C (%)		**12,0**	**4,6**	**2,4**	**9,6**	**3,6**	**4,4**	**10,6**	**4,1**	**3,2**
EC (µS /cm) at T=29 °c		**56.5**	**54.1**	**31.5**	**45.8**	**36.3**	**33.7**	**52.1**	**48.7**	**34.8**
Caco3 (%)		**1.37**	**1.07**	**0.6**	**1.48**	**1.26**	**1.12**	**1.78**	**1.62**	**1.35**
TN (%)		**14.8**	**12.3**	**8.5**	**13.2**	**12.6**	**9.1**	**13.6**	**10.7**	**8.9**
C /N		**0,81**	**0,38**	**0,28**	**0,73**	**0,29**	**0,49**	**0,78**	**0,39**	**0,37**
Exchangeable Cations ($Cmole.Kg^{-1}$)	**Ca^{++}**	**0.38**	**0.59**	**1.95**	**0.35**	**0.47**	**1.25**	**0.25**	**0.33**	**1.15**
	K^+	**0.025**	**0.07**	**0.045**	**0.018**	**0.031**	**0.038**	**0.021**	**0.037**	**0.043**
	Na^+	**0.38**	**0.19**	**0.28**	**0.25**	**0.12**	**0.97**	**0.29**	**0.32**	**1.41**
	Mg^+	**0.6**	**0.4**	**0.3**	**0.7**	**0.5**	**0.8**	**0.6**	**0.2**	**0.3**
FA (%)		**5.7**	**4.6**	**4.07**	**4.6**	**3.8**	**2.9**	**5.9**	**5.6**	**4.8**
H A (%)		**8.2**	**7.09**	**6.5**	**7.9**	**6.6**	**6.02**	**9.01**	**8.7**	**6.8**

Table no. 06: Stational data and analytical station 06

		Station 6								
Géographic Coordinates		**X =249.1 Y = 3996.1**								
Plant association		**Forest spieces :-** *Pinus halepensis* **under wood:** *Pistachia lentiscus*								
Géological Substrate		Calabrien ; grès calcaire lumechlique								
Profils		**P_1**			**P_2**			**P_3**		
Layer depth		**L_1**	**L_2**	**L_3**	**L_1**	**L_2**	**L_3**	**L_1**	**L_2**	**L_3**
Color		**2.5YR 5/6**	**10R 4/8**	**10R 5/8**	**10R 3/3**	**10R 4/6**	**10R 4/8**	**2.5YR 5/8**	**10R 4/6**	**10R 5/8**
Partical distribution	**F.S (%)**	**65.7**	**65.9**	**73.1**	**68.3**	**73.4**	**77.7**	**65.6**	**64.8**	**69.8**
	C.S (%)	**46.5**	**30.7**	**31.2**	**25.6**	**27.8**	**34.4**	**37.8**	**33.2**	**35.4**
	F.Z (%)	**20.1**	**17.7**	**17.2**	**18.3**	**17.9**	**17.1**	**15.2**	**16.4**	**17.8**
	C.Z (%)	**7.1**	**14.2**	**16.6**	**1.2**	**3.1**	**4.9**	**1.6**	**10.5**	**3.7**
	C (%)	**14.2**	**16.4**	**9.7**	**13.4**	**8.7**	**5.08**	**15.3**	**17.1**	**13.4**
pH		**5.2**	**5.2**	**6.5**	**4.9**	**5.7**	**6.08**	**5.08**	**5.1**	**6.01**
OM (%)		**9.8**	**3.4**	**1.7**	**7.9**	**2.7**	**1.6**	**10.2**	**3.1**	**1.3**
C (%)		**16,8**	**5,8**	**2,9**	**13,5**	**4,6**	**2,7**	**17,5**	**5,3**	**2,2**
EC (µS /cm) at T=29 °c		**47.7**	**11.7**	**14.1**	**33.2**	**21.4**	**17.9**	**41.8**	**15.4**	**28.6**
Caco3 (%)		**1.76**	**1.17**	**1.63**	**2.1**	**1.98**	**2.07**	**1.58**	**1.22**	**1.34**
TN (%)		**5.6**	**4.1**	**3.6**	**4.5**	**3.9**	**2.5**	**6.5**	**5.5**	**4.4**
C /N		**3,0**	**1,4**	**0,8**	**3,0**	**1,2**	**1,1**	**2,7**	**1,0**	**0,5**
Exchangeable Cations ($Cmole.Kg^{-1}$)	**Ca^{++}**	**0.3**	**1.29**	**0.079**	**0.49**	**1.12**	**0.089**	**0.25**	**1.22**	**0.063**
	K^+	**0.01**	**0.015**	**0.05**	**0.021**	**0.078**	**0.065**	**0.012**	**0.3**	**0.089**
	Na^+	**0.35**	**0.092**	**0.086**	**0.48**	**0.18**	**0.097**	**0.34**	**0.082**	**0.072**
	Mg^+	**0.6**	**0.4**	**0.3**	**0.7**	**0.5**	**0.8**	**0.6**	**0.2**	**0.3**
FA (%)		**10.4**	**8.1**	**6.4**	**9.7**	**8.6**	**7.4**	**11.2**	**8.4**	**7.9**
H A (%)		**7.4**	**6.8**	**5.9**	**7.2**	**6.4**	**6.3**	**5.7**	**5.4**	**5.1**

Table no. 07: Stational data and analytical station 07

	Station 7								
Géographic Coordinates	**X =262.1 Y = 3996.2**								
Plant association	**Forest spieces :-** *Pinus halepensis; Juniperus phoenicea* **under wood:** *Pistachia lentiscus*								
Géological Substrate	Calabrien ; grès calcaire lumechlique								
Profils	**P_1**			**P_2**			**P_3**		
Layer depth	**L_1**	**L_2**	**L_3**	**L_1**	**L_2**	**L_3**	**L_1**	**L_2**	**L_3**
Color	**10R 2.5/1**	**10R 2.5/1**	**10R 2.5/2**	**10R 4/6**	**10R 2.5/3**	**10R 2.5/2**	**10R 3/3**	**10R 4/2**	**10R 4/6**

Partical distribution	F.S (%)	47.8	62	63.2	57.6	47.7	52.1	62.1	58.4	52.9
	C.S (%)	46.5	30.7	31.2	25.6	27.8	34.4	37.8	33.2	35.4
	F.Z (%)	42	20.8	27.3	33.3	41.7	37.2	29.5	30.8	30.6
	C.Z (%)	7.1	14.2	16.6	1.2	3.1	4.9	1.6	10.5	3.7
	C (%)	10.2	17.2	9.5	9.1	10.6	10.7	8.4	9.1	16.5
pH		6.5	5.9	5.6	6.2	5.8	5.3	6.9	6.4	5.8
OM (%)		11	3.1	1.2	12.8	4	1.7	13.8	3.9	1.7
C (%)		18,9	5,3	2,06	22,01	6,8	2,9	23,7	6,7	2,9
EC (µS /cm) at T=29 °c		91	83.1	82.8	101.4	99.06	84.6	97.5	83.7	79.8
Caco3 (%)		1.33	0.99	0.56	1.29	0.84	0.65	1.36	1.24	0.95
TN (%)		15.1	8.9	7.8	16.5	13.6	11.2	18.7	16.5	15.7
C /N		1,3	0,6	0,3	1,3	0,5	0,3	1,3	0,4	0,2
Exchangeable Cations ($Cmole.Kg^{-1}$)	Ca^{++}	0.79	0.69	0.43	0.54	0.49	0.43	0.85	0.78	0.65
	K^{+}	0.024	0.12	0.012	0.035	0.12	0.018	0.023	0.046	0.017
	Na^{+}	0.17	0.21	0.27	0.23	0.31	0.38	0.19	0.2	0.26
	Mg^{+}	0.6	0.4	0.3	0.7	0.5	0.8	0.6	0.2	0.3
FA (%)		31	21	19.5	25.6	23.8	18.4	27.1	20.6	16.7
H A (%)		6.4	5.3	4.9	7.8	6.2	5.5	7.01	5.4	4.2

Table no. 08: Stational data and analytical station 08

		Station 8								
Géographic Coordinates		X =263.5 Y = 3997.2								
Plant association		**Forest spieces :-** *Pinus halepensis; Juniperus phoenicea* **under wood:** *Pistachia lentiscus; Diss*								
Géological Substrate		Nappe du Flysch : Tithonique à Crétacé supérieur								
Profils		P_1			P_2			P_3		
Layer depth		L_1	L_2	L_3	L_1	L_2	L_3	L_1	L_2	L_3
Color		10YR 6/6	7.5YR 6/8	2.5YR 5/8	2.5YR 4/6	10YR 4/8	2.5YR 3/3	10YR 5/1	7.5YR 5/6	2.5YR 4/8
Partical distribution	F.S (%)	71.3	58.2	69.5	69.3	68.1	75.3	73.2	54.1	44.2
	C.S (%)	46.5	30.7	31.2	25.6	27.8	34.4	37.8	33.2	35.4
	F.Z (%)	21.3	17.5	23.3	25.9	26.8	22.4	17.7	23.6	29.9
	C.Z (%)	7.1	14.2	16.6	1.2	3.1	4.9	1.6	10.5	3.7
	C (%)	7.4	6.3	7.2	4.8	5.1	2.3	9.1	6.4	3.8
pH		4.5	5.9	5.8	5.1	6.2	6	4.7	6.1	5.3
OM (%)		11.2	2.6	1.4	9.7	3.7	1.6	10.4	2.8	1.3
C (%)		19,2	4,4	2,4	16,6	6,3	2,7	17,8	4,8	2,2
EC (µS /cm) at T=29 °c		313	241	217	265	231	197	305	278	218
Caco3 (%)		0.51	0.9	0.13	1.02	1.12	0.83	1.8	3.1	2.4
TN (%)		8.5	7.5	6.4	7.6	7.1	5.8	6.9	5.2	4.9
C /N		2,3	0,6	0,4	2,2	0,9	0,5	2,6	0,9	0,5
Exchangeable Cations ($Cmole.Kg^{-1}$)	Ca^{++}	2.34	1.89	1.84	2.22	2.1	1.97	2.47	2.38	1.94
	K^{+}	0.08	0.015	0.023	0.01	0.012	0.016	0.04	0.021	0.018
	Na^{+}	0.52	0.49	0.48	0.98	0.74	0.49	0.56	0.35	0.28
	Mg^{+}	0.6	0.4	0.3	0.7	0.5	0.8	0.6	0.2	0.3
FA (%)		27	31	18.4	16	13.2	8.4	13.5	6.4	5.1
H A (%)		6.4	2.1	5.4	9.1	7.4	8.2	6.6	8.5	4.3