EGYPTIAN ACADEMIC JOURNAL OF

BIOLOGICAL SCIENCES

PHYSIOLOGY & MOLECULARBIOLOGY

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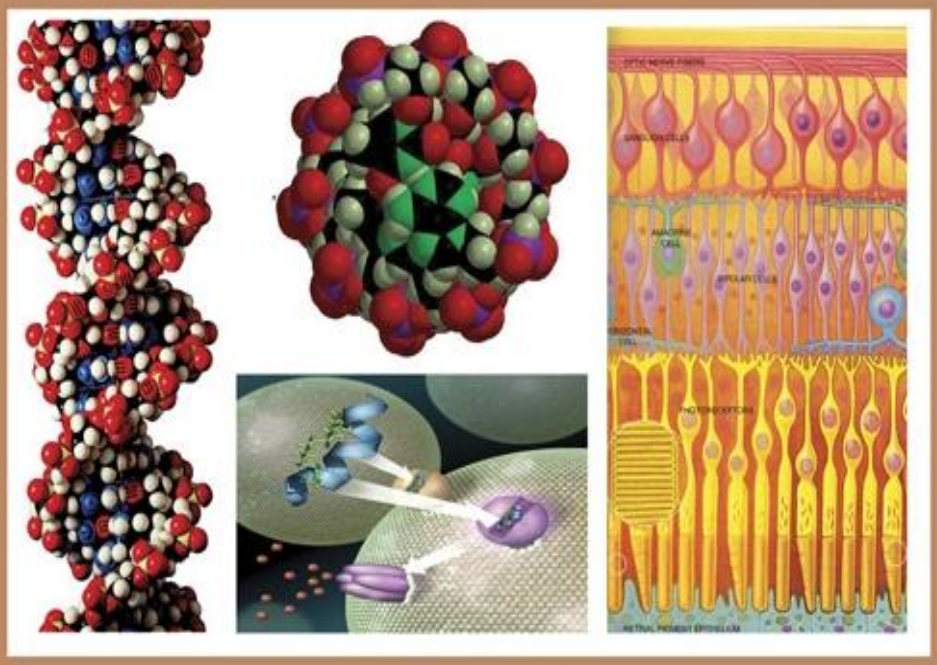

ISSN
2090-0767

WWW.EAJBS.EG.NET

Vol. 14 No. 2 (2022)

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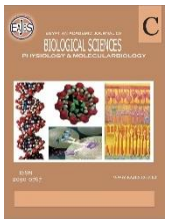
Citation: *Egypt.Acad.J.Biolog.Sci. (C.Physiology and Molecular biology) Vol. 14(2) pp237-248 (2022)*
DOI: 10.21608/EAJBSC.2022.268230

Egypt. Acad. J. Biolog. Sci., 14(2):237-248 (2022)

Egyptian Academic Journal of Biological Sciences
C. Physiology & Molecular Biology
ISSN 2090-0767
www.eajbsc.journals.ekb.eg



Behavioral Analysis of Cereal Crops on Salted Soils from the Oran Region (Western Algeria)

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ARTICLE INFO
Article History
Received:28/8/2022
Accepted:29/10/2022
Available:2/11/2022

Keywords:
Cereals, Salted Soils, Correlation, Yields, Oranais.

ABSTRACT

Our objective is to analyze the behaviour of cereals at the level of soils characterized by different salinity rates, in Oranais and to see the correlation between the nature of the soil and the yield. We studied the regional bioclimate and carried out physicochemical analyzes of the soils of plots sown during the 2016-2017 agricultural campaign in durum wheat (Semito variety) and barley (Saida variety), at three sites. In particular at the CFPA (Professional Training and Learning center) of Misserghin in the Province of Oran, Si Zidane pilot farm in the Province of Sidi Bel Abbes and at the level of INRAA of H'madena in the Province of Relizane. Our study allowed us to identify variability in salinity,with extreme salinity at the level of the sebkha of Oran which is used as the benchmark for the extreme rate of salinity observed. Other physicochemical parameters, different from one site to another, were determined with a view to looking for correlations of other parameters with salinity. The Misserghin site stood out in terms of yields compared to other sites thanks in particular to its low salinity rate which is 1.73ds m-1 and a rainfall of 296 mm with better distribution. Followed by the site of the Si Zidane pilot farm in Sidi Bel Abbes, and then followed by the INRAA site which revealed a low yield, given the aridity with low cumulative precipitation, as well as its situation in a Semi-arid lower than warm winter. Barley adapted best relative to durum at all three sites.

INTRODUCTION

Salinization is a process of accumulation of salts on the surface of the soil and in the root zone which causes harmful effects on plants and the soil, resulting in a decrease in yield and gradual sterilization of the soil (Mermoud, 2006) and also comes from irrigation, which is often poorly controlled (Ben naceur *et al.,* 2001). The insufficiency or sometimes even the lack of drainage of lands with salt generally appears in particular geomorphological situations inscribed in depressions and even in closed endorheic basins functioning as evaporating machines (Tsaki, 2003). The soil is an essential element for plants and disappearance is often irreversible. Cereals are sensitive. Cereals are sensitive to salts in addition to the influence of the climate which exerts by the intensity of rainfall and by strong evaporations the accumulation of salts from shallow water tables (Lahoual H, 2014).

The rigorous monitoring and control of the salinity of agricultural land seem to be a condition of sustainability of the agricultural activity of cereal production.

MATERIALS AND METHODS

1-Presentation of the Study Sites:

The study region is located in the western part of northwest Algeria. It is part of the Algerian coast for some study cities and sublittoral for others. We have three study sites are mentioned in Table 1.

Table 1. Presentation of the study sites**.**

Sites	Geographic coordinates	Seasonal pattern	Bioclimatic floor
Si Zidane pilot farm (Province of Sidi Bel Abbes).	Altitude: 509 m Latitude, 35° 09'59.8 " N Longitude 0° 31'00.4"W	WSAS	Laughedat arid
INRAA of H'madena, (Province of Relizane)	Altitude: 48 m Latitude, 35° 54'00 " N Longitude 00° 47'00"W	WSAS	Lower semi-arid
Vocational Training Center (CFPA) of Misserghin (Province of Oran)	Altitude : 117 m Latitude 35° 36'51.7 " N Longitude 00° 43'34.1"W	WSAS	Semi-arid

2-Methodology:

Soil sampling was carried out at the three sites to carry out for physicochemical analyzes at INSID (National Institute of Soils, Irrigation and Drainage) of El Matmar Province of Relizane during 2016 - 2017, The sowing of cereals with barley (variety Saida) and durum wheat (variety Semito), was carried out on three sites with pronounced salinity (EC which is between 1.73 to 4.89 ds m^{-1}), to observe the relation between the edaphic factors and the yields.

RESULTS AND DISCUSSION

1-The Climate of The Study Region:

The climate of Orania is characterized by a recurrent and persistent drought with a marked decrease in rainfall. Examination of precipitation for the periods 1987-2015 shows a decrease in quantities of approximately 25% for the Western region and the number of rainy days per year is between a minimum of 36 days and a maximum of 101 days (Yahiaoui, 2015).

2-Ombrothermic Diagrams of Gaussen:

The 2016/2017 agricultural campaign was characterized by a hot and dry summer and a mild winter. Three ombrothermic curves of the three cereal crop monitoring sites are presented in Fig 1.

3-Climatic Character:

3.1. Misserghin (Oran), CFPA

Temperature variations oscillate between 5, 16°C to 22°C for minimum temperatures and they vary by 15°C to 32°C for Maximum temperatures. The precipitation showed variations between 0.5 mm to 102 mm. The dry period is 08 months from February to October.

3.2. Sidi Bel Abbes (Si Zidane pilot farm)

Represented by (Fig. 1), the temperatures have varied, for the minimum temperatures of 5.5°C to 19°C and the maximum temperatures; vary from 20°C to 45°C. Precipitation ranges from 2 mm to 148 mm. The dry period lasts from February to November, for a total of 10 months.

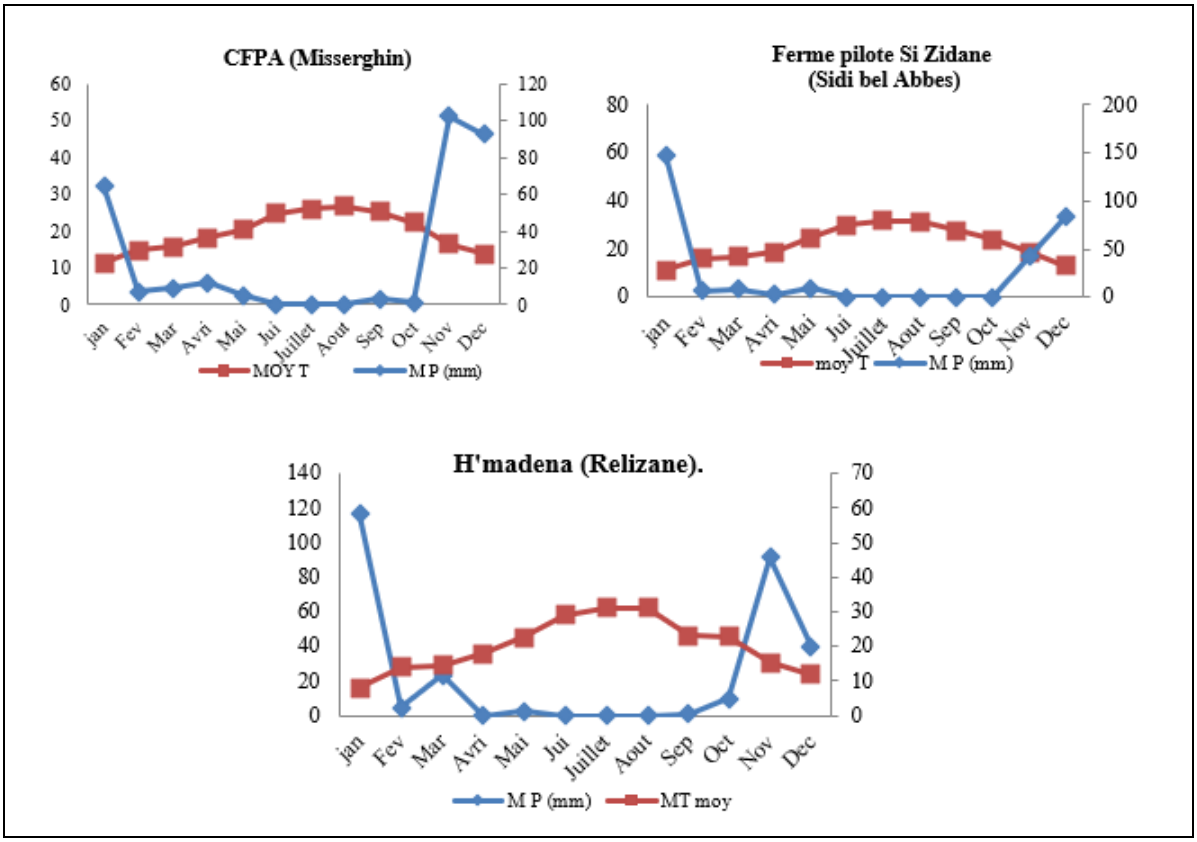


Fig. 1. Ombrothermal diagram of the three study stations. **(PS:** dry period; **PH:** wet period).

3.3. Relizane (INRAA H'madena)

Significant temperature variations between 2,85 °C to 21 °C for minimum temperatures and between 13.72°C to 41°C for maximum temperatures. Rainfall also varied from 2.3 mm to 116.7 mm. The dry period is 09 months.

3.4- Aridity Index:

To find variations in this index, e calculated the De Martonne annual aridity index (IAA) of the aforementioned study regions.

This index is written: **I = P / T + 10**

with **P:** annual rainfall (mm) and **T:** annual mean temperature (°C).

The results of our calculations of the aridity index appear in (Table 2).

Table 2. Aridity index of study regions from 2013 to 2017

Sites	Region	P (mm)	T (moy °C)	T + 10	IAA
CFPA	Misserghin (Oran)	283.04	18.66	28.66	9.87
F Pilot	Sidi bel abbes	284.03	21.30	31.30	9.07
INRAA	Relizane	242.57	21.02	31.02	7.81

The pluviothermal quotient which is expressed as follows:

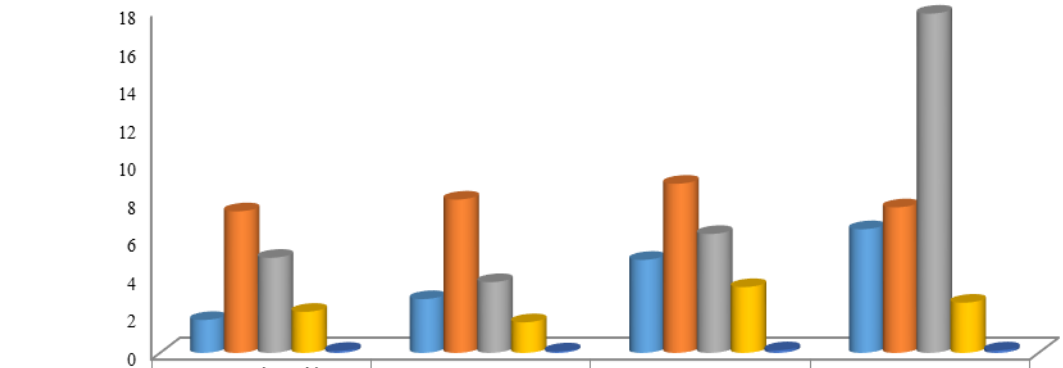
Q2 = 1000 P / (M + m) / 2 (Mm) Or Q2 = 2000 P / M2 - m2

During the last five years 2013/2017, the aridity index of Misserghin (CFPA), was 09.87 that of Sidi Bel Abbes of 09.07 slightly more accentuated and that of the region de Relizane was 07.81, highlighting that this region has very pronounced aridity compared to the two other study regions, in particular, Misserghin and Sidi Bel Abbes. The aridity index varies from site to site, this variation in aridity is a function of the rainfall, which has decreased on the one hand, and of the increase in temperature. Misserghin region has revealed a better distribution of rainfall at the critical stages of

the cereal compared to the two other sites.

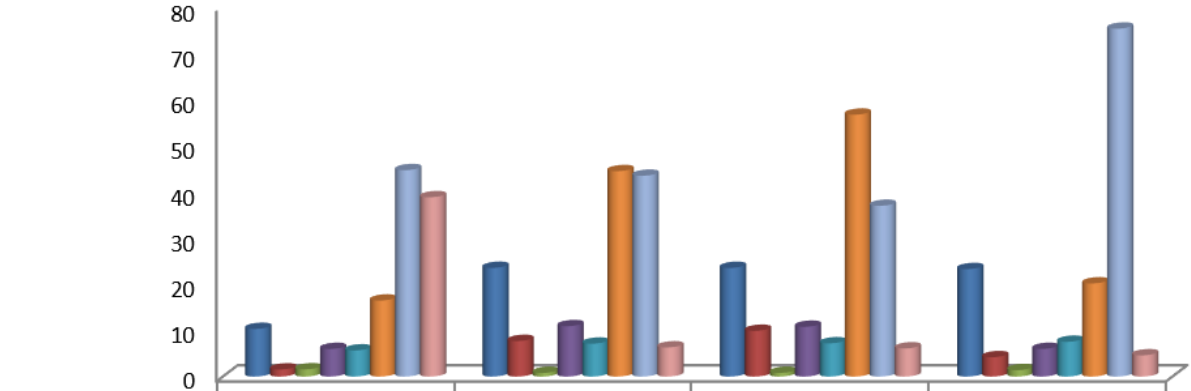
3.5-Physical-Chemical Soils Analyses:

The Results of the physicochemical soils analyzes are shown in two parts in Figures 2 and 3.



	CFPA Misserghin	SBA	INRAA REL	SEBKHA
Ce (1/5) (ds/m)	1,73	2,83	4,89	6,5
pH	7,44	8,06	8,89	7,65
CaCo3 actif%%	5	3,72	6,25	17,83
MO%	2,16	1,61	3,46	2,64
N total %	0,11	0,08	0,14	0,132

Fig. 2. Graphic representation of soil analysis results.



	CFPA-1	SBA	INRAA Rel	SEBKHA
CEC (meq/100g)	10.31	23.51	23.5	23.25
Na+ (meq/100g)	1.53	7.7	9.89	4.19
K+ (meq/100g)	1.56	0.78	0.79	1.39
Ca++ (meq/100g)	5.97	10.9	10.77	5.98
Mg++ (meq/100g)	5.65	7.12	7.19	7.52
A%	16.44	44.43	56.66	20.15
L%	44.65	43.44	36.94	75.26
S%	38.79	6.31	6.09	4.59

Fig. 3. Graphic representation of soil analysis results (Continued).

3.6- Electrical Conductivity (CE):

Soils of the various sites of studies reveal a different salinity of 1,73 to 4,89 ds m^{-1}. The soil of the sebkha has EC of 6,5 ds m^{-1} which results in an intense salinity. The electrical conductivity of soils determines their degree of salinity. This salinity results in different behaviour of the cultures through the salinity classes. problems of salt accumulation and creeping sand dunes, especially in the western and eastern parts thereof, which has a direct negative effect on

agricultural productivity (Ayad Kadhim Ali Muhaimeed 2016 *et al*., 2019).

3.7- PH:

Most soils in Misserghin, Sidi bel Abbes and Relizane; have a pH that is moderately basic to alkaline prone. They vary from 7,64 to 8,6. The pH values seem to agree with the level of alkalinity encountered in the soils. The PH value varies with the water state of the soil.

3.8- Active limestone:

The soils represent different contents of CaCO3 and with an average of 3.72, 5 and 6.25% here for the load in limestone is average because according to the interpretation standards the percentage of carbonate is located from 3 to 25%. Relizane site, the level of active limestone ≥ 6% which is the threshold for the iron chlorosis index (Masson, 2012). In comparing by the standards established by (Hanitet, 2021), these percentages showed the existence of two classes of soils: Class 1: medium calcareous soil for Sig, Oran and Tlemcen where the rate varies from 11,64 % to 15,67 %; Limestone plays an essential role not only in plant nutrition but also in pedogenesis. For example, in Sebkhait is 17,83%. The presence of limestone in large quantities affects the quality of the soil and lowers its fertility and consequently plant production.

3.9- Organic Matter (MO);

The analysis of the organic matter revealed particular: 2,16; 1,61 and 3,46 % at Misserghin; Sidi bel Abbes and Relizane. Relizane has a low organic matter. Organic matter improves the physicochemical characteristics of the soil because it plays a favourable role in the structure and structural stability of soils, water retention, cation exchange capacity as well as stimulation of the soil and growth (Drouet, 2011).

3.10- Nitrogen Contents Total*:*

The level of total nitrogen in the monitoring soils remains poor. We note the highest rate is at the Relizane site with a value of 0.26 at the level of the wheat plots and the value of 0.36 at the level of barley plots, while the other plots have a nitrogen rate of 0.11 to 0.14%. The interpretation of nitrogen standards indicates that a rate below < 0, 5% is considered soil poor in nitrogen. Nitrogen is also an important element in soil fertility. Indeed, it is essential for the plant and it constitutes one of the essential factors of the yield.

3.11- The Cation Exchange Capacity (CEC):

Analysis of the follow-up soils showed that the cation exchange capacity is low to medium, which is indicated in the interpretation standards. Because it is 10.31 at the Misserghin site and 23.5 meq $100g^{-1}$ for the other study sites. Cation exchange capacity is a measure of the power of soil to retain and exchange cations. It is a relative indicator of the fertility potential of soil (Maaro 2006).

3.12- Potassium Level (K +):

Our plots have potassium levels that are low for all the sites, which are between 0,7 to 1,5 meq 100 g^{-1}. From the interpretation standards for exchangeable potassium; a K + rate in soil that is < 60 ppm is very low.

3.13- The Calcium (Ca ++):

Through the results obtained we note that the amount of calcium is approximately equal at the level of the three sites, the rate of calcium is 5,97 - 10,9 and 10,77 and 5,31 at the level respectively of Misserghin-Sidi bel Abbes –Relizane and the sebkha.

3.14- The rate of Magnesium (Mg ++):

Exchangeable magnesium levels between 5,66 to 7,19 meq 100 g^{-1} are recorded at the level of the various monitoring sites. We can say from the interpretation standards that our soils have an average rate of this element.

3.15- Particle Size Analysis:

According to the texture triangle (FAO) which makes it possible to determine the textural class of soils, the study area presents mainly soils clayey to silty which promotes some retention of mineral elements. The nature and the textural heterogeneity of the soil influence the biochemical functioning and the

microbiological activity of the soil, depending on the availability and dynamics of soil water.

4. Comparison of The Yields of The Three Study Sites:

Our work consists of studying the influence of salinity on the yield of cereals, in particular the cultivation of wheat (Semito) and barley (Saida), to follow the varietal behaviour of the saline environment.

4.1 Wheat and Barley Yield Results:

The results of Yields of durum wheat and barley are summarized in Table3. Although the EC is different at the level of the three monitoring sites; see (Table 3); extremely salty at the INRAA of H'madena, very salty at the pilot farm of Sidi bel Abbes and Salé at the CFPA Misserghin site; we recorded the following results.

Table 3. Yields of durum wheat and barley.

Cultivation Sites / Settings	CFPA Misserghin (Oran)		Pilot farm (Sidi bel abbes)		INRAA from H'madena (Relizane)	
	Durum wheat	Barley	Durum wheat	Barley	Durum wheat	Barley
Number of tillers / m^2	236	310	290	250	111	240
Beard Length (cm)	12,55	15	10,85	16	10,3	9
Epi Length (cm)	6,95	5,5	4,9	5,85	4,95	4,5
Peduncle length (cm)	20,2	14,25	25.05	25,6	8,5	6,85
The number of kernels ear^{-1}	30,9	25,72	20,5	39	19,8	17,2
The weight of kernels ear^{-1} (g ear^{-1})	15,8	11,35	10.19	19,05	7,53	6,36
Yields (Qx ha^{-1})	37,19	35,08	29,13	46,8	8,35	15,27
EC extract 1/5 (ds m^{-1})	1, 73		2, 83		4,89	

Systematic counting of plants was carried out at the level of elementary plots previously determined by the experimental protocol.

For wheat: The number of tillers is higher (290 tillers / m^2) at the Si Zidene pilot farm because rainfall is recorded higher, than at the CFPA Misserghin site which follows at (236 tillers / m^2). In H'madena in the province of Relizane, we record the smallest number of tillers (111 tillers / m^2).

For barley: This parameter is calculated like that of wheat and recorded on the same date, however, it is (310 tillers / m^2) at the level of the Misserghin site and (260 talles / m^2) at Sidi bel Abbes and (240 tillers / m^2) at Relizane. The rainfall is more important and beneficial at the critical stages of the cereal, in particular at the start of the crop's vegetation as well as at the milky and pasty stages of the cereal. This explains the correlation between culture and climate (See ombrothermal curves).

***As It Concerns the Beard Length*:**

For wheat: This parameter is 12,5cm at the level of durum wheat at the Misserghin site followed by the other two sites.

Barley: Recorded a significant length of the beard at the Si Zidene site which is 16 cm because this parameter is closely linked to the climatic conditions of the environment which is harsh, the more the beard lengthens and the better the photosynthesis. The length of the wheat beard is related to the crop's need for light for better photosynthesis.

About the Epi length:

Wheat: The Misserghin site has the greatest length of the ear, which is 6,95 cm. For the other two sites namely; Si Zidene and H'madena which marks a reduced length this is explained by a lack of rainfall at the heading stage of the cereal.

Barley: The length of the ear is greater at the Si Zidene site which is 5,85 cm, followed by the Misserghin site at 5,5 cm, then the Relizane site at 4,5 cm.

Add To the Peduncle Length:

Wheat*:* The best peduncle length is recorded at the Si Zidene pilot farm which is 25,05 cm.

For barley: This parameter lets us see that the Si Zidene barley tracking site represents the longest peduncle length which is 25,6 cm. From this result, we can say that the

length of these parameters is closely related to the harsh conditions of the region of Sidi bel Abbes.

And The Number of Kernels Ear^{-1}:

For Wheat: The calculation of this parameter enabled us to record see the best value at the level of the CFPA site of Misserghin which is 30,9 followed by the site of the pilot farm of Sidi bel Abbes where we noted 20,5 then the H'madna site which revealed a value of 19,8 kernels/ear.

For barley*:* It is at the level of the Barley site of Si Zidene that we recorded the best number of grains ear^{-1}, which is 39, then the Misserghin site with a value of 25,7, and finally the site of INRAA with a value of 17,2. The most important component of yield is the number of kernels/ear and more precisely the number of kernels spikelets.

The Weight of The Kernels Per Ear*:*

For Wheat: The best wheat grain weight was recorded at the Misserghin site which is 15,8 g ear^{-1}see (**Fig. 4**), then the Misserghin CFPA site with a weight of 10,19g ear^{-1}. And at the end the H'madena site at 7,53g ear^{-1}.

For Barley: It is the site of the pilot farm of Si Zidene which presents the best grain weight which is 19,5; then the site of Misserghin with 11,35g ear^{-1}, and at the end, it is the site of H'madena with 6,36g ear^{-1}. Barley is an earlier cereal than wheat, which explains why its cultivation has developed well in areas with dry springs.

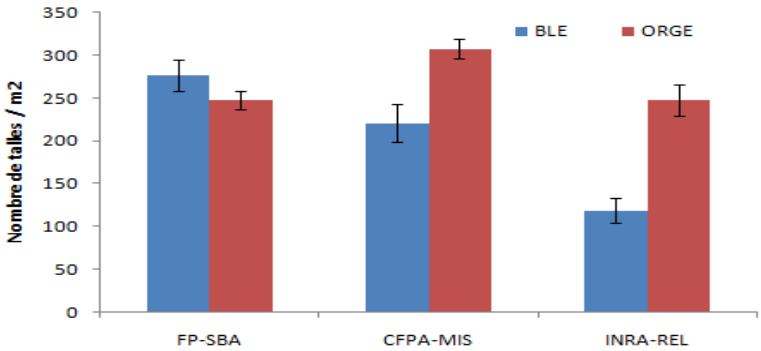


Fig. 4. Number of tillers / m^2 of the Wheat and Barley sites

5-The Yield: Number of Tillers / m^2

Systematic counting of plants was carried out at the level of elementary plots previously determined by the experimental protocol.

For wheat; the number of tillers is higher (290 tillers / m^2) at the Si Zidene pilot farm because rainfall is recorded higher, than at the CFPA Misserghin site which follows at (236 tillers / m^2). In H'madena in the province of Relizane, we record the smallest number of tillers (111 tillers / m^2).

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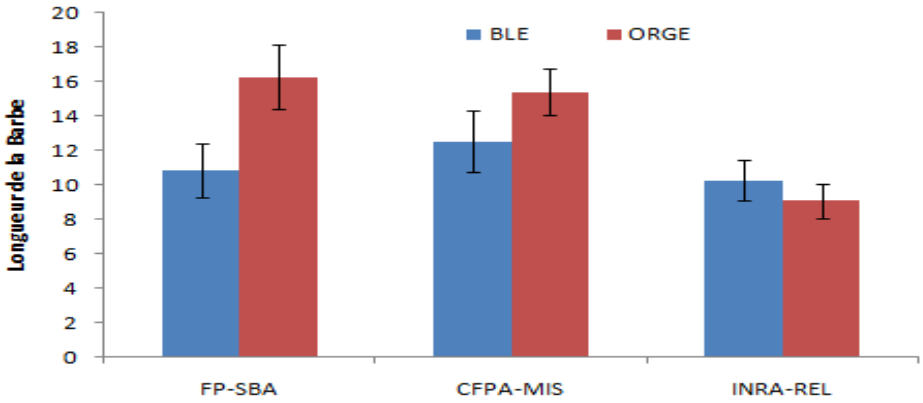

Fig.5. Length of the beard (cm) of the sites of Wheat and Barley

Beard length:

We notice in (Fig. 5) a difference between the following parameters:

length of the beard: For wheat; this parameter is 12.5cm at the level of durum wheat at the Misserghin site followed by the other two sites.

barley; recorded a significant length of the beard at the Si Zidene site which is 16 cm because this parameter is closely linked to the climatic conditions of the environment which is harsh, the more the beard lengthens and the better the photosynthesis. The length of the wheat beard is related to the crop's need for light for better photosynthesis.

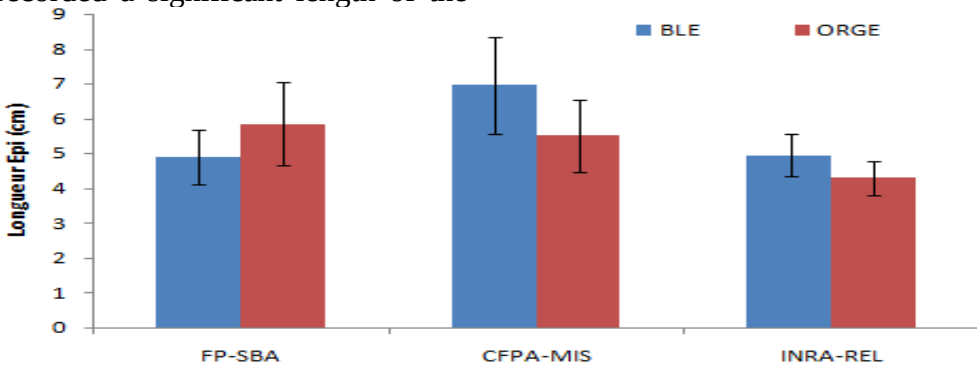

Fig.6. Length of the ear of the Wheat and Barley sites.

The length of the Epi:

Wheat; the Misserghin site has the greatest length of the ear, which is 6.95 cm. For the other two sites namely; Si Zidene and H'madena which marks a reduced length this is explained by a lack of rainfall at the heading stage of the cereal.

Barley; the length of the ear is greater at the Si Zidene site which is 5.85 cm, followed by the Misserghin site at 5.5 cm, then the Relizane site at 4.5 cm. Fig.6.

Peduncle length,

For Wheat; the best peduncle length is recorded at the Si Zidene pilot farm which is 25.05 cm.

For barley; this parameter lets us see that the Si Zidene barley tracking site represents the longest peduncle length which is 25.6 cm. From this result, we can say that the length of these parameters is closely related to the harsh conditions of the region of Sidi bel Abbes Fig. 7.

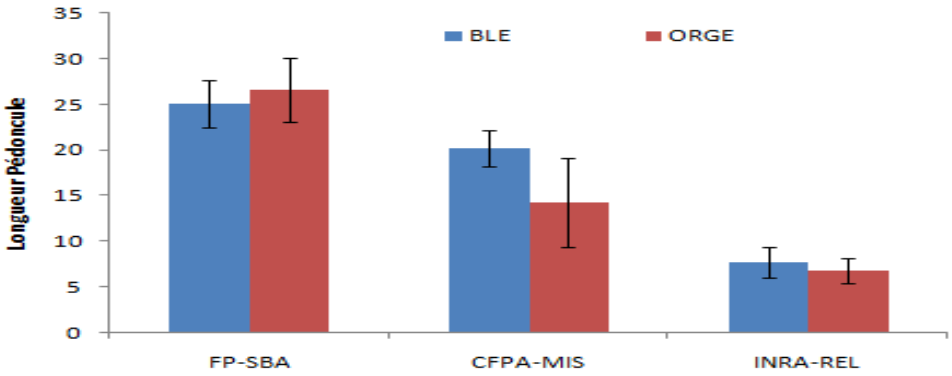

Fig. 7. Peduncle length of the Wheat and Barley sites.

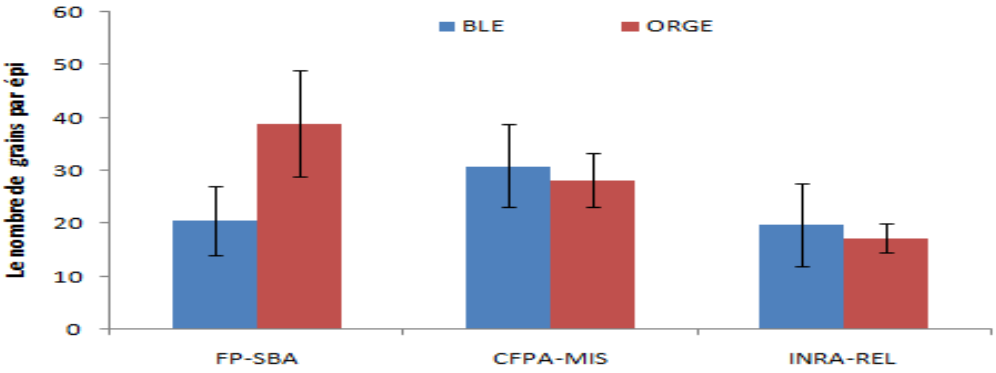

Fig.8 -Number of grains per ear of Wheat and Barley.

The Number of Kernels Ear^{-1}:

For Wheat: the calculation of this parameter enabled us to record see (Fig. 8) the best value at the level of the CFPA site of Misserghin which is 30.9 followed by the site of the pilot farm of Sidi bel Abbes where we noted 20.5 then the H'madna site which revealed a value of 19.8 kernels/ear.

For barley; It is at the level of the Barley site of Si Zidene that we recorded the best number of grains ear^{-1}, which is 39, then the Misserghin site with a value of 25.7, and finally the site of INRAA with the value of 17.2. The most important component of yield is the number of kernels/ear and more precisely the number of kernels spikelets, .

Fig.8.

The Weight of The Kernels Per Ear:

For Wheat: The best wheat grain weight was recorded at the Misserghin site which is 15.8 g ear^{-1}see (Fig. 9), then the Misserghin CFPA site with a weight of 10.19g ear^{-1}. And at the end the H'madena site at 7.53g ear^{-1}.

For Barley;It is the site of the pilot farm of Si Zidene which presents the best grain weight which is 19.5, then the site of Misserghin with 11.35g ear^{-1}, and at the end, it is the site of H'madena with 6.36g ear^{-1}.Barley is an earlier cereal than wheat, which explains why its cultivation has developed well in areas with a dry spring.

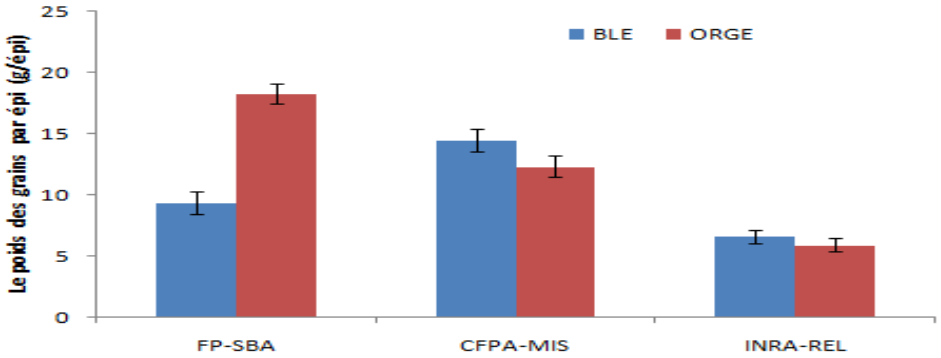

Fig.9. Weight of grains per ear (g) of the Wheat and Barley sites

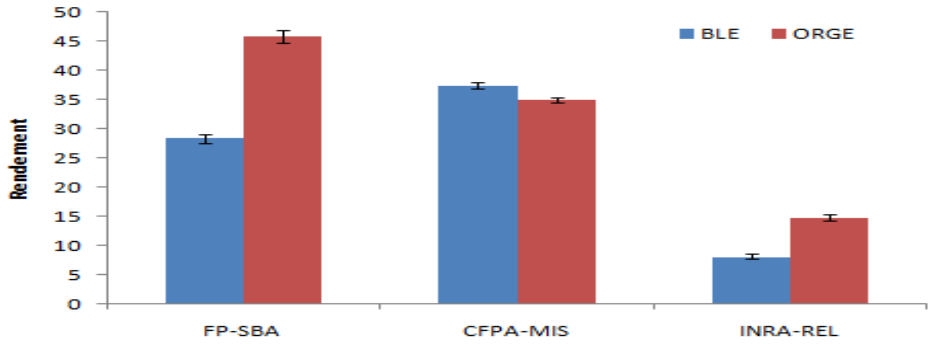

Fig. 10. Yield of Wheat and Barley.

The Yield:

For Wheat: A yield of 37, 19 qx ha^{-1} was recorded at Misserghin then 29,13qx ha^{-1} at the pilot farm of Zidene and 8.35qx ha^{-1} at the INRAA of H'madena.

For barley:

We observed that the Si Zidene pilot farm site presents the best result with a yield which is 46,8 qx ha^{-1} in Si Zidene, 35,08 qx ha^{-1}, at the level of the CFPA and 15,27 qx ha^{-1}, on the H'madena site. For this parameter, it reached its optimum at the Si Zidene pilot farm site, which can be explained by the adaptation of the barley to the soil and the climatic conditions of the region. There is a considerable difference in yields between monitoring sites, seen through representative figures this is related to the pedoclimatic conditions of the site. The water requirements are slightly lower at the end of the cycle but are especially important at the beginning of the vegetation Fig.10.

For wheat (Semito): It was performed by adopting the Kruskal-Walli's test on k-independent samples (**Fig.10**). It is used to test whether k samples (k > 2) come from the same population or populations with identical characteristics. The comparison was made between the three sampling sites CFPA, FP, INRAA

Statistical Analysis was performed by adopting the Kruskal-Walli's test on k independent samples. It is used to test whether k samples (k> 2) come from the same population or populations with identical characteristics. The comparison was made between the three sampling sites CFPA, FP, INRAA.

For wheat (Semito).

Alpha 0.050, An approximation was used to calculate the p-value.

HS: Highly significant effect

NS: Insignificant effect

Multiple pairwise comparisons following the procedure of Steel- Dwass- Critchlow-Fligner.

Alpha 0.050, An approximation was used to calculate the p-value.

HS: Highly significant effect

NS: Insignificant effect

Multiple pairwise comparisons using the

Steel-Dwass-Critchlow- Fligner procedure.

Interpretation of the Test:

H0: The samples come from the same population.

Ha: The samples come from different populations.

Since the calculated p-value is less than the significance level alpha = 0.05, we must reject the null hypothesis H0, and retain the alternative hypothesis, Ha.

CONCLUSION

The salinization of the soil considerably limits the production of crops and therefore has negative effects on food security which depends on agricultural products. The data collected illustrate the climatic variability of the western region, which is characterized by an alternation of dry and wet periods. Temperature fluctuations are variable and significant during this 2016-2017 study period.

On a monthly scale, December and January are the rainiest months for the three monitoring sites. Misserghin and Relizane have a semi-arid climate characterized by a long, dry, hot summer period and low rainfall. Sidi bel Abbes is classified in the arid bioclimate. Precipitation is low and highly variable, while thermal regimes are relatively homogeneous. According to (Ben chergui and Tahari, 2009), the province of Relizane suffers from pronounced summer drought and a rainfall deficit which makes supplemental irrigation a complementary means. In these areas, droughts varying in time and space remain the limiting factor facing crops (Annichiarico et al 2005). The differences in the behaviour of the cereal crop at the different sites can be explained by the exposure of wheat and barley seedlings at the start of their cycle and critical stages to very harsh climatic conditions. An indirect effect through the increase in osmotic pressure limits water transfers to the cells of the roots of the plant. Durum wheat (Semito) has a slight tolerance to salinity. Indeed, in the case of this variety, the tolerance threshold for soluble salts of the NaCl type would be less than 2 g of salts L^{-1} (i.e., approximately an electrical conductivity of 3,5 Dsm^{-1}). Saida variety has better tolerance compared to wheat. However,

ACKNOWLEDGEMENTS

Authors thanks the general direction of scientific research and technological development (Ministry of Higher Education and Scientific Research, Algeria) for its support in making this work.

REFERENCES

Annichiarico *et al* (2005). Defining subregions and estimating benefits for a specific adaptation strategy by breeding programs. *A case study Crop Science*, 45: 1741–1749. DOI: 10.2135 / cropsci2004.0524

AyadKadhim Aliand *et al* (2019). Land Degradation Index using Salinity Index by GIS-MCDM Method in Al-Hashimiya Irrigation Project in Babil Province, Iraq.*Indian Journal of Ecology*, 46(4): 697-702.

Ben Naceurand et *al* (2001). Effect of salt stress on germination, growth and grain production of some North African varieties of wheat. Effect of salt stress on germination, growth and grain production of some North African varieties of wheat Pp 69-78.

BencherguiAand Tahari A. (2009). Ethnobotanical study of medicinal plants used by the local population the region of Relizane. Thesis ing, University of Mascara, 133p.

Hanitet K (2021). Floristic and Ecological Analyzes of Weeds in Citrus Groves in the Oranian Phytogeographic Sector (Western Algeria). Plant Biodiversity Laboratory: Conservation and Valorization, Faculty of Natural and Life Sciences, Djillali Liabes University, Sidi Bel Abbes, Algeria. *Indian Journal of Ecology*, 48(1): 292-299.

Lahoual H. (2014). Contribution to the study of the influence of salinity on cereal yield (case of barley) in the H'madena region in Relizane. Master in Agronomy. Faculty of Natural and Life Sciences. Univ

Aboubaker Belkaid Tlemcen Algeria.

Mermoud (2006). *Soil physics course:* Control of soil salinityPp.1- 14.

Tsaki H (2003). Morpho-pedological diagnosis of edaphic environments and paleo-climatic environments of the Algerian steppe as a useful basis for decision-making in terms of development, land use planning and environmental monitoring, Doctoral Thesis, Faculty University of Agronomic Sciences of Gembloux (Belgium), 394 p.

Yahiaoui D (2015). Impact of Climate Variations on Agriculture in Oranie; Magister'sthesis in biology; faculty of natural and life sciences department of biology. Univ Oran 1. Algeria, 111p.