Contributions Methods Of Statistical Analysis Of Leachate From The Landfill Ouled Berjal (Kenitra, Morocco)

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Abstract: In Morocco, the amount of household waste produced by the population now exceeds 0.75 kg per person and per day and is increasing, so Morocco became aware of the seriousness of the problem of solid waste and products that they generate. As part of a physico-chemical characterization of leachate from the landfill Ouled Berjal, Kenitra, we conducted from November 2011 to October to 2012 physico-chemical analyzes of leachates collected at the accumulation of leachate pond. Time tracking of the samples revealed the following results: Temperature varies between 26.01 and 20.03 ° C, the pH is voisinage neutrality, the electrical conductivity is through 24982.5 S / cm, salinity 13, 62 g / l, the turbidity is 16 September 9,66 NTU, BOD5 is medium 5000 mg O_2 / l, the COD is 24858.33 mg O 2 / l. The hardness leachate with means 1510.75 mg / l ; Va lue of NH^{4+} of leachate of 2005, 90 mg / l. The high values of chlorides coincide with high values of conductivities ; Na+ ion has an average of 3686.2 mg / l ; the average concentration of nitrates is 13.15 mg / l ; The average value of bicarbonate ion, is approximately 1009.95 mg / l. The application of principal component analysis for such a task could be beneficial. This is in view of such an application 17 that physico-chemical parameters from the analysis of water samples collected were analyzed. The principal component analysis applied to the data showed that the variables can be grouped into two main components. Also, the PCA showed a possible reduction in the number of dimensions without major loss of information. This reduction is even more interesting that the variables to be taken into account are 3 simple steps.According to this study, liquid" and" solid waste leachate discharge of ouled berjel releases are a real environmental impact mainly on the quality of surface water, groundwater, and soil.

KEY WORDS: Leachate pollution, physico-chemical, the Ouled Berjal's discharge Berjal, Kenitra, Morocco.

1 INTRODUCTION

landfilling remains the most economical and therefore the most used in the world for waste disposal compared to other modes, it has, however, of the potential risks of environmental degradation by the emanation foul odors, the production of biogas and leachate especially that convey a significant pollutant load. These leachate seeping into the basement, cause significant degradation of groundwater. Without proper management, however, it can cause various problems, both for hygiene and health plans as well as environnemental ones [1][2]. There for we have to make the appropriate choice of landfills to avoid any damage to the environment. The underlying soil must necessarily be waterproof and have large capacity confinement contaminants [3]. To assess and highlight the impact of these releases. This work aims to Determine through analysis of physico-chemical indicators the degree of pollution of the leachate from the landfill Ouled Berjal Kenitra in a twelve-month period from November to October 2012.

2 MATERIALS AND METHODS STUDY

2.1 Presentation of the ouled berjal discharge Kenitra

The landfill Kenitra " of OuledBerjal "Is located 5 Km north of the city, on the secondary road from Sidi Allal Tazi to Kenitra , On the left bank of the estuary of the river Sebu. This is a landfill located within the urban area in a loop of the Oued Sebu surrounding sides East, South and West, not far from the port and industrial area.

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The landfill is located 3 km north of the town of Kenitra. Area during its commissioning in 1970 did not exceed 6 ha. Currently, the landfill covers 15 ha practically overflowing into neighboring lands. With its current population of 390,273 inhabitants, the city of Kenitra generates quantities of increasingly growing solid waste. Population estimated at 359,142 inhabitants according to the DGPH 2004 with a growth rate of 3.1% (specifications for the delegated management of public discharge of ouledberjal, Urban Community of Kenitra (Ex-Maamora) community. the annual production of household and similar waste is estimated for the year 2004 to 108,000 tonnes with an accepted variation of plus or minus 5%.

2.2 Physico-chemical analyzes

Analyses are performed at the level of the laboratory environment of the Faculty of Science:

- The pH of the sample was measured using a multi-parameter analyzer-type Consort C535.
- The temperature, conductivity and salinity of the sample are determined by a conductivity type Cond315i/SET, WTW 82362.
- The turbidity with a turbidimeter and Biological Oxygen Demand (BOD5) consumed during 5 days using a BOD meter.
- The chemical oxygen demand (COD) Photometer multi parameter C214 (HI83214) HANNA instrument.
- Dosage and Ammonium Nitrate (NH^{4+} and NO^{3-}) is effected by distillation of Parnas and Wagner (Buchi apparatus distiller brand, Kjel K-Flex 360).
- Determination of Sodium and Potassium (K^+ and Na^+) is done with a flame photometer type : JENWAY, CLINICAL PFP7.
- The dosage of sulphate ions is effected by the colorimetric method
- Determination of Calcium and Magnesium: This is a complex dosage e metric EDTA ethylene diamine tetra acetic

- The Determination of chloride (Cl^-) is By Argentimetry, Chlorides were determined by a standard solution of silver nitrate in the presence of potassium chromate (K2CrO4) as an indicator
- Dosage carbonate (CO^{3-}) and bicarbonate (HCO^{3-}) By Acidimetry.

Statistical analysis was based on the PCA (Principal Component Analysis). The matrix of intermediate correlations, correlations between variables and axes and projection of variables in the space of axes F1 and F2 were obtained with a statistical analysis software

3 RESULTS AND DISCUSSION

Landfill leachate contains many minerals con contaminants often highly toxic. This composition is specific to each discharge, varis depending on the nature of the waste, the age of the landfill, the technical operating and climatic conditions. Leachate results from the waste water, meteoric precipitation and water arises from groundwater [4] [5].

3.1 Variation of the pollution load of leachate

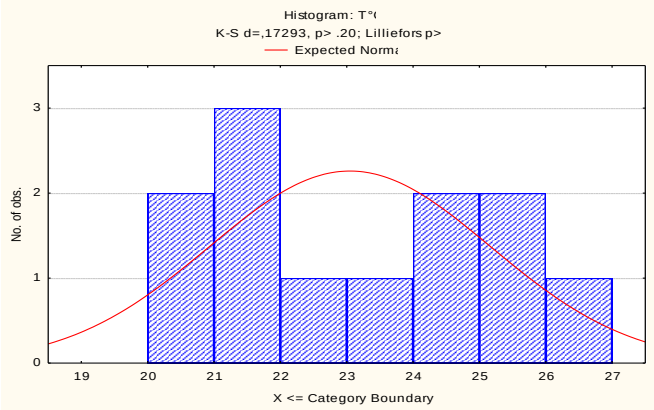

Fig 1 : Temperature in ° C leachate

-According to (figure 1) the recorded values of the temperature of leachate vary between 20 C in the month of January as the minimum value and a maximum value about 26.01 ° C in the month of July with an average of 23.04 ± 2.11 ° C. These results show a seasonal pattern, these values are below 35 ° C, considered indicative limit value for water for irrigation.

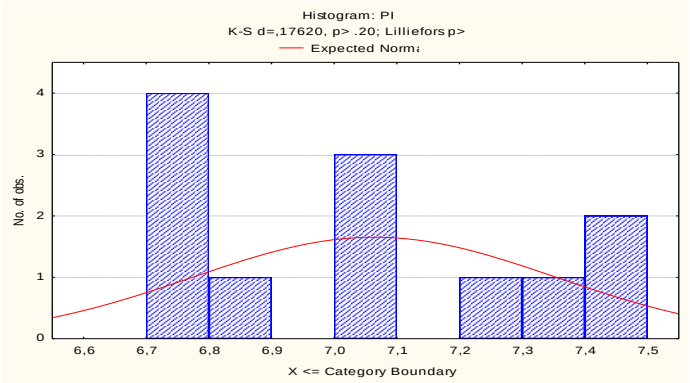

Fig 2: Potential hydrogen leachate

- The recorded values of the hydrogen potential (Figure 2) during the study period from November to October are in the vicinity of neutrality with an average of about 7.064 the maximum value recorded was coincident with the High temperature records for the same period of the year, and this value concords with chofqi's results 2000 [6].

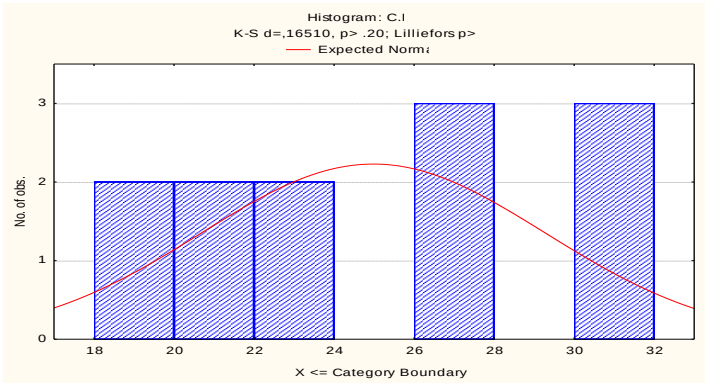

Fig 3: Electrical conductivity of leachate µS / cm

- The maximum and minimum electrical conductivity of leachate stored are respectively (31220 mS/ cm, 19790 mS/cm) with an average of 24,980 mS/cm (Figure 3) the study of the seasonal variation of electrical conductivity; shows that there is variation in season. These results could be related to both the mineralization of organic matter and also the phenomenon of evaporation. During the winter season. We are witnessing low conductivity values which may be due to the phenomenon of dilution under the influence of due to rainfall in this période. Moreover, the comparison of the values of electrical conductivity with the standards of water quality for irrigation (limit : Conductivity <8700) allows us to deduce that this juice is unacceptable for crop irrigation.

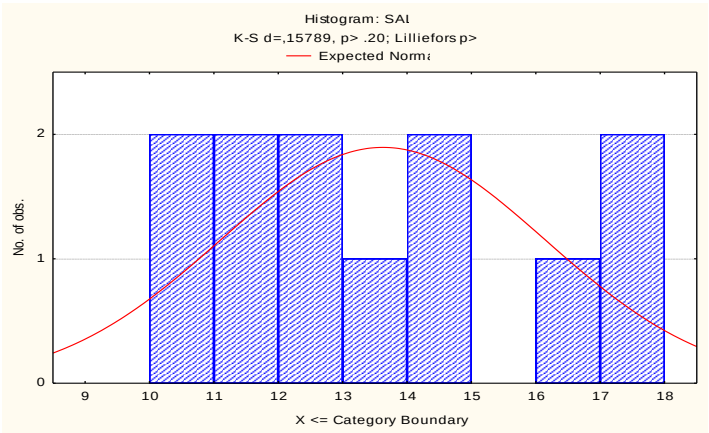

Fig 4: Salinity leachate g / l

- The values of the salinity leachate ranged from a minimum of 10.43 g / l and up to 17.56 g/l with an average from 14, 2 g/l (Figure 4). These results were correlated with results of conductivity expressed in mS/Cm. Increasing salinity is controlled by a temperature increase, the decrease is due to occasional rainfall diluting medium. Salinity could be attributed to the contribution of urban waste. We note that these concentrations greatly exceed the limit values recommended by the Moroccan standard on suitability of water for irrigation.

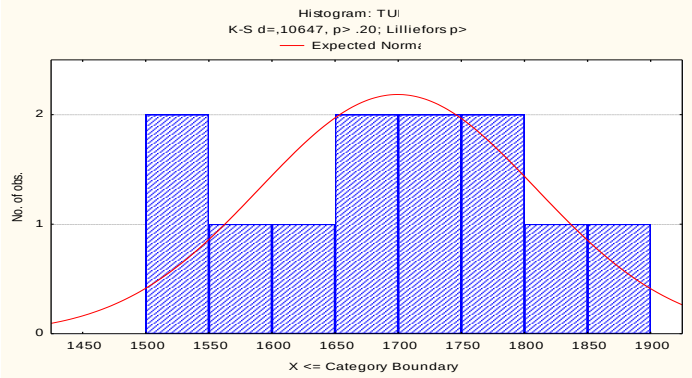

Fig 5: Turbidity NTU leachate

- According to (figure 5) and the results of leachate vary between a minimum of 1532 NTU and up to 1865 NTU. The average value is studied 1699.66 NTU. It was established that leachate is rich in dissolved solids. Moreover, comparing the results with (NTU> 50) allows us to deduce that leachate are disorders. This value exceeds the standards of Moroccan releases this urban hard garbage causes human health problems [7].

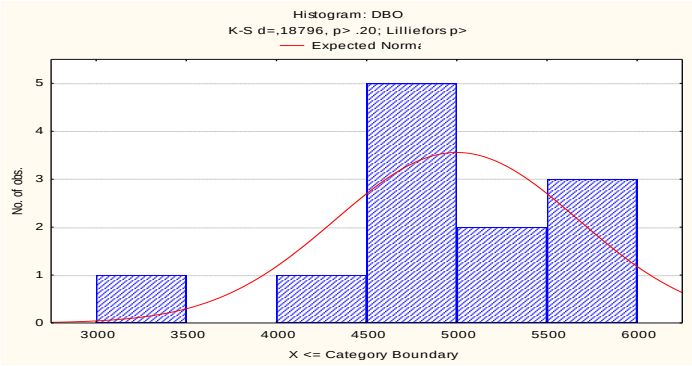

Fig 6: Biological Oxygen Demand leachate mg / l O_2

-The biological oxygen demand BOD_5, quantifies the biodegradability of leachate. It is determined depending on the amount of oxygen consumed by the microorganisms present in the leachate. It is expressed in mg O_2 consumed per liter of leachate. Chemical oxygen demand, quantifies the oxidation state of the substances present in the leachate. The maximum level of BOD_5 5800mg/l O_2 (Figure 6) BOD_5 value is well above the limit of the standard Moroccan direct discharges is 100 mg O_2 / l .

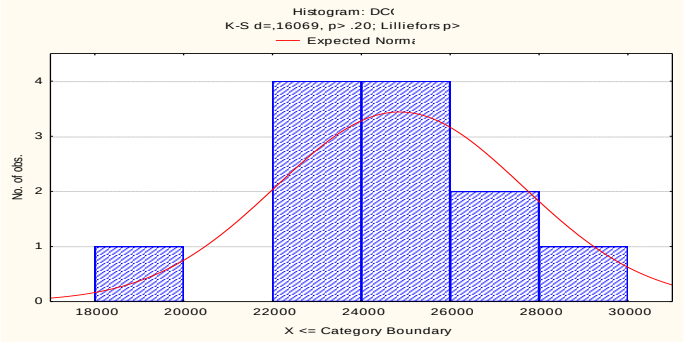

Fig 7: Chemical oxygen demand of leachate mg / l

COD is measured very high average COD value of 24858.33 mg/l, this value generally much greater than that allowed by the Anglicized standards (150ppm), WHO (<80ppm).

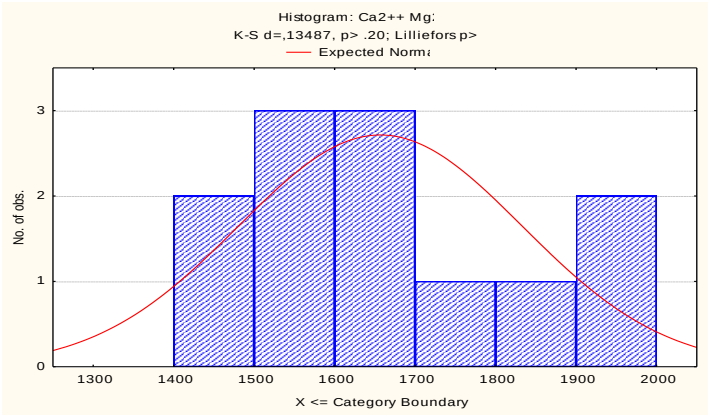

Fig 8: The hardness of leachate mg / l

Analysis of hardness results leachate varies during the fl ude of 1421.4 mg/l to 1932.72 mg/l. Exceeding discharge limits set by Moroccan standards. These higher values indicate leachate is very hard and very rich in minerals. This parameter has a large variation would be related to the lithology of the aquifer and in particular its composition in magnesium and calcium. Moreover, its maximum value is 50 meq/l. Moroccan standards according potability of water, the TH is an indicator of the presence of Calcium and Magnesium ions factor. Rock formations containing divalent metals (Mg^{2+}, Ca^{2+} ....) responsible for this hardness.

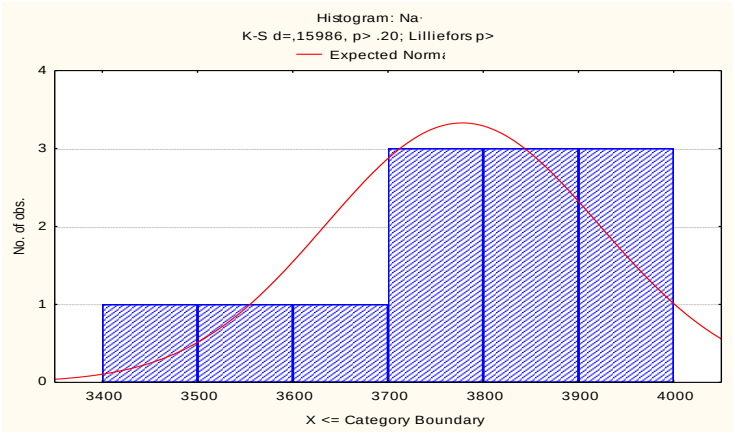

Fig 9: Sodium leachate mg / l

The value of the concentration of Na^+ ion, recorded is between 3492.78 mg / l, as the minimum value in March and 3776.6 mg /l in May. With a mean of 3686.2 mg/l maximum concentrations recorded during the hottest month (June)

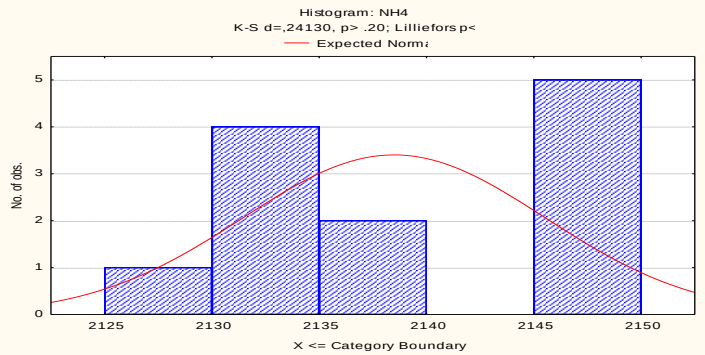

Fig10: Ammonium leachate mg / l

The average value of the concentration of NH^{4+} in the leachate, recorded during the study period of 2005, 90 mg/l. Extreme values noted ammonium in April is 2126.70 mg/l as maximum and 1872.72 mg / l in the month of June. The decrease in NH^{4+} ion is probably related to algal uptake car. Ammonium does not present dangers to health, but it is a food for several bacteria. It comes mainly from the bacterial decomposition of organic nitrogen (ammonification phenomenon) or direct animal waste (urine, feces).

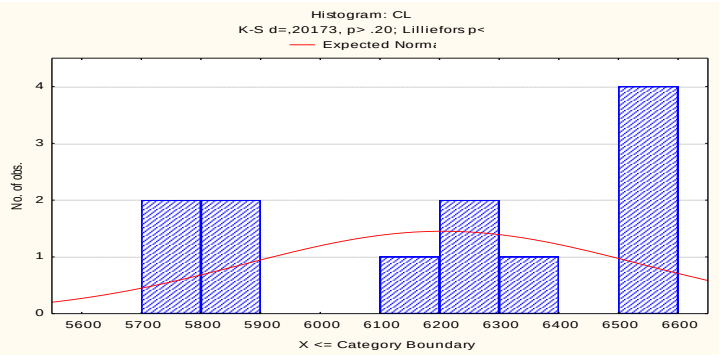

Fig 11: Chlorine leachate mg / l

The chloride contents evolve 5757.5 to 6571.05 mg / l. The highest values were observed in months 6, 7, 8 and 9. The high values of chlorides coincide with high values of conductivity recorded in the leachate. (These results are consistent with those of Chofqi and al.2004). Referring to the grid e quality of surface waters. They are widely exceeded standards (> 1000). Therefore, they are very poor class.

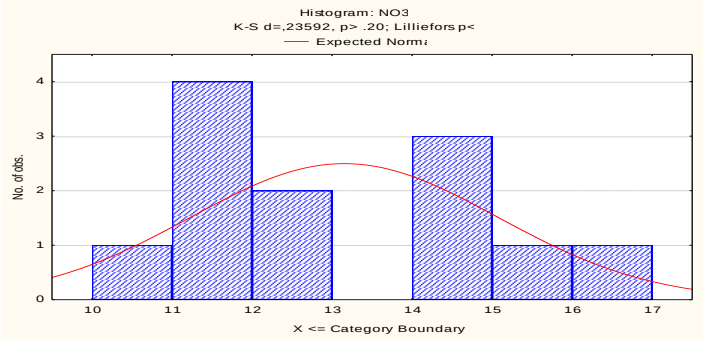

Fig 12: Nitrate leachate mg / l

The analysis result shows that the average concentration of nitrates stored in leachate is 13.15 mg/l with extreme values of 16.12 mg/l and 10.66 mg / l. However, nitrate levels in leachate are low compared to other minerals, following the reduction phenomena prevailing in the basin discharge following Nitrate in leachate.

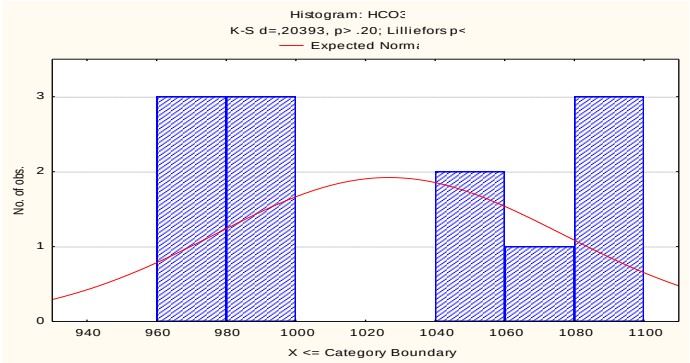

Figure 13: Bicarbonate leachate mg / l

Registered during the study period bicarbonate ion mean value is of the order of 1009.95 mg/l, with a maximum value of 1093.36 mg/l recorded in the month of September, and a decrease of 960 recorded, 14 mg/l in the month of January. Under the effect of leachate mineralization by microorganisms, these concentrations greatly exceed the limits recommended by Moroccan standard in water for 518 irrigation (Ministry of the Environment., 2002).

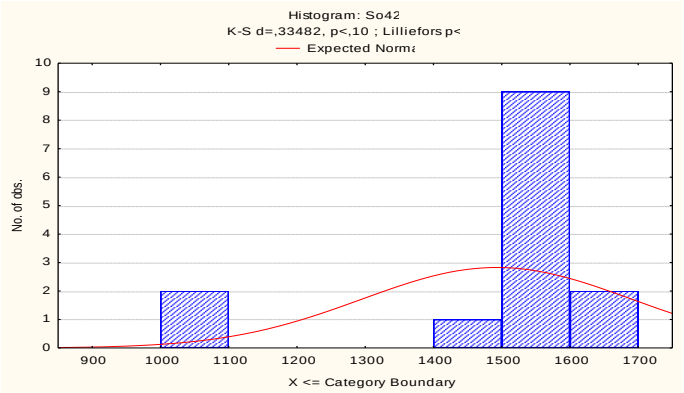

Fig14: ions sulfatent leachate mg / l

Sulfate ions varies during the study between 1043, 2 mg/l in 1667, 52 mg/l, the maximum allowable value is 400 mg/l by Moroccan standards of potability of water, so these values exceed the maximum allowable value, this increase may have originated discharges of waste from the landfill, following its release to groundwater level by the presence of a large quantity sulfate in the soil.

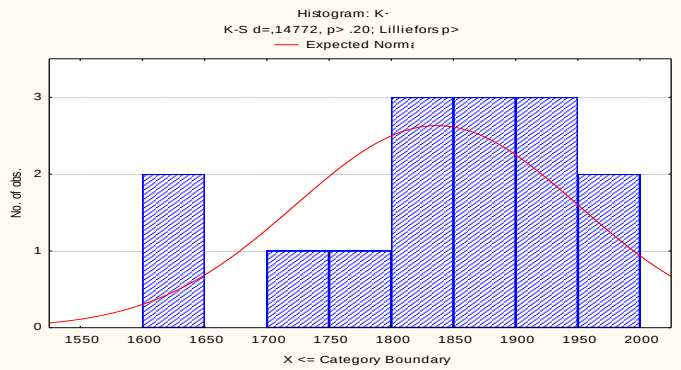

Fig15: Potassium leachate mg / l

For potassium, we recorded at the study area, a maximum value of 1977.69 mg/l and a value Minimum 1622.4 mg/l with an average value of 1842.16 mg/l. This can be explained by the discharges which contain a large amount of fertilizer over the surrounding sheet of Sebou is contaminated.

3.2 Study Statistics variation degrees of leachate pollution

TABLE 1
THE MAIN AXES

Variable	F1	F2
T	0 ,81715	-0 ,48203
PH	0 ,89834	-0 ,32999
C.E	0 ,95882	-0 ,05085
SAL	0 ,94089	-0 ,17402
TUR	0 ,93917	-0 ,17547
DBO_5	0 ,95026	-0 ,04481
DCO	0 ,89297	-0 ,13776
Ca^{2+}+Mg^{2+}	0 ,79970	0 ,54366
Ca^{2+}	0 ,78200	0 ,55944
Mg^{2+}	0 ,86536	0 ,32370
Na^{+}	0 ,89206	0 ,36807
NH^{4+}	0 ,06869	-0 ,14669
Cl^{-}	0 ,75910	-0 ,43332
NO^{3-}	0 ,62916	-0 ,73238
HCO^{3-}	0 ,95670	0 ,13228
SO_4^{2-}	0 ,15044	-0 ,26204
K^{+}	0 ,84496	0 ,42589

The ACP 17 applied to variables measured at the discharge was obtained 3 uncorrelated components. Analysis of F1 and F2 factorial design shows that more than 66.39% are expressed. The axis is expressed by the temperature, pH, electrical conductivity, salinity, BOD_5, COD, hardness, Ca^{2+} and Na^{+} CL^{-} (Table 1). The axis F2 has a variance equal to 13, and is 46% consisting of NO^{3-} .

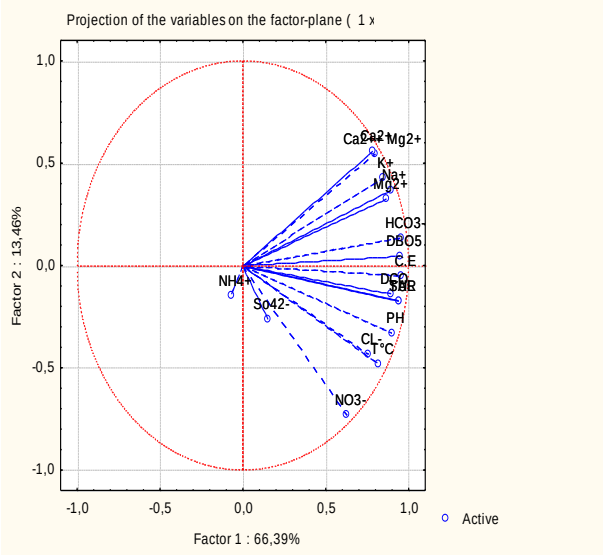

Fig16: Representation of variable rest days on the plane of the two axes F1 and F2

The ACP shows the existence of three groups: a basic large group leachate, rich in minerals and organic matter expressed by the BOD 5, a high-water Cl^{-} and NO^{3-} and a third group NH^{4+} and SO_4^{2-}.

4Conclusion

The evaluation qualitativ leachate of ouled Berjal's discharge in Kenitra by the realization of physico-chemical analysis shows that the values exceed the quality standards of wastewater recommended by [13]and[14]. The spatio-temporal monitoring of several factors has given us the image of an intense pollution, in fact the area of the discharge is affected by biological and chemical pollution that threatens the groundwater and constitutes a serious threat to the environment, which requires its treatment before discharge. [15]Thus; we hope that this study shed light on the importance of this issue and make the authorities overcome this great environmental challenge to achieve sustainable development in morocco. We therefore hope in the light of results from this study have led to a real awareness of the competent authorities and the need for Morocco to meet the environmental challenge and put themselves in a logic of sustainable development has led to an awareness of this problem. Ministry of the Environment. 2002).

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