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PHYSICO-CHEMICAL STUDY OF RAW SLAUGHTER HOUSE WASTEWATER IN THE CITY OF SIDI SLIMANE, MOROCCO

Fath-allah R[1]*, AyyachA[2], Belhamidi S[3], Hbaiz E.M[4], Lebkiri A[5] and El Midaoui A[6].

[1,2,3,4,5,6] Laboratory of Advanced Materials and Process Engineering LMAGP Faculty of Sciences - IbnTofaïl University.BP University Campus. 133 Kenitra – Morocco.
*Corresponding Author: rfathallah02@gmail.com

Abstract

The objective of this work is to characterize the wastewater from the Sidi Slimane slaughterhouse (Morocco) with a view to recommending an adequate treatment. This wastewater is discharged into Wadi Beht, which is one of the main tributaries of Wadi Sebou, without prior treatment. The physicochemical analyzes of the raw wastewater collected at the outlet of the slaughterhouse reveal that this water is loaded with organic matter expressed in terms of SS (603.6 mg /l), COD (10,607.048 mg /l) and BOD_5 (4284 mg /l) and in mineral matter determined by measuring a certain number of parameters: conductivity (1441 µS /cm at 20°C), total phosphorus (35.31 mg/l), total nitrogen (377, 96 mg /l) and nitrates (4.17mg /l). Analyzes of samples taken from slaughterhouse wastewater mixed with domestic wastewater, at the point of discharge into Wadi Beht show a dilution of the concentrations. Despite the load of this wastewater, it is noted that the values found remain below the accepted standards. Examination of the COD/BOD_5 ratio clearly highlights the biodegradable nature of the wastewater from the slaughterhouse in the town of Sidi Slimane, for which biological treatment seems quite suitable.

KEYWORDS: Slaughterhouse, wastewater, physicochemical parameters, Sidi Slimane, Oued Beht.

I-Introduction

Good water quality is crucial to human health, social and economic development as well as the functioning of ecosystems [1]. Economic activities, unabated population growth and unsustainable farming practices further increase pressures on water bodies [2, 3].

Water is an essential element in the food industry. The resulting wastewater is often returned to natural environments without prior treatment; which can be a major source of environmental pollution.

Among these food processing industries are slaughterhouses. The latter produce effluents on the one hand because they bring the physiological fluids of slaughtered animals into contact with the external environment, on the other hand because they consume water as a solvent for cleaning tasks [4].

In Europe, the volumes of wastewater discharged are estimated to be between 6 and 9 liters per kg of bovine carcass, and 5 to 11 liters per kg of pig carcass [4]. Most studies on the quality of wastewater slaughterhouses have been carried out in Europe [5-6], Australia [7] and the United States of America [8]. In Morocco, little research has been done on the characterization and treatment of slaughterhouse wastewater [9].

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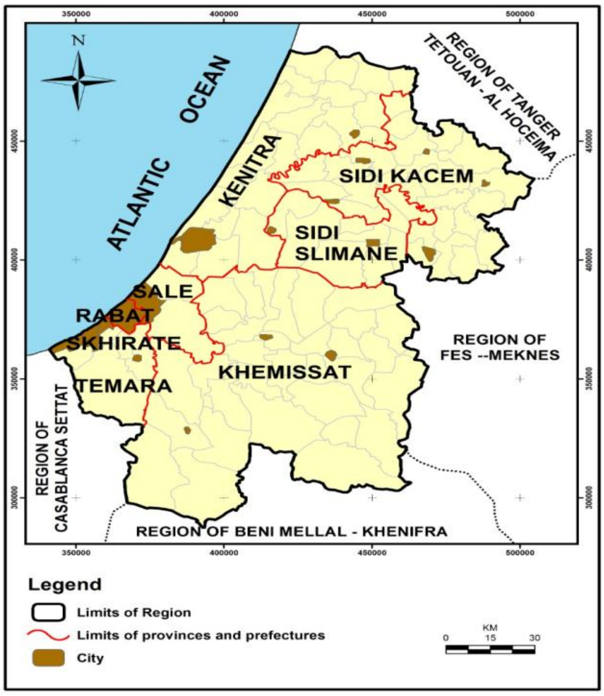
The object of this work is to characterize the physico-chemical composition of the wastewater from the municipal slaughterhouse in the city of Sidi Slimane (Morocco) in order to assess the degree of pollution generated by the wastewater from this slaughterhouse which is drained into Wadi Beht and to propose an adequate treatment allowing their reuse and thus reducing the nuisances to the receiving environment. This study is based on physicochemical parameters such as pH and temperature as well as other specific pollution parameters such as biological oxygen demand (BOD_5), chemical oxygen demand (COD)and suspended matter (MES)… etc.

II-Matériel et Méthodes

• My work was carried out in the region of rabat salé kénitra (figure 1).



Study site the town of Sidi Slimane is located 105 km northeast of the capital of Morocco. It has a 128 km unit-type sanitation network which serves approximately 86% of the population.

The rest use individual sewerage systems with soaks or septic tanks. In 2012, the production of red meat was 970 tonnes of which 60% of bovine origin and 40% of sheep origin. The wastewater from this discharge is loaded with solid waste, fat, the abundance of organic matter (rumen debris) and is concentrated by the blood of slaughtered animals.

The town of Sidi Slimane has a slaughterhouse that promotes the reception and control of animals before slaughter as well as the health and quality inspection of meat intended for final consumption.

-Sampling and analysis of wastewater: Samples were taken at the manhole located inside the slaughterhouse, the collector conveying domestic wastewater with a

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mixture of wastewater from the slaughterhouse between November 2012 and August 2013. Wastewater samples are collected in 1 liter and 500 ml polyethylene bottles. The physicochemical parameters studied are: temperature, pH, electrical conductivity, Chemical Oxygen Demand (COD), biochemical oxygen demand for 5 days (BOD_5), Suspended Matter and other parameters.
-The pH and the temperature were determined by a CONSORT C831 type pH meter fitted with a temperature probe. -The electrical conductivity was measured by a CONSORT K912 type conductivity meter. - SS (Suspended Materials) are determined by filtering a volume of waste water through a borosilicate glass fiber filter.
-The COD was determined by the colorimetric method (by oxidation by potassium dichromate in an acidic medium).
-Biochemical oxygen demand (BOD_5) was determined by the OxiTop method which is still one of the most important measurements in hydrology. It makes it possible to assess the load of water and wastewater in biodegradable substances.
- Nitrates, ammonium, total nitrogen and total phosphorus are determined by the continuous flow method.
With P1, P2 are the sampling points of the analyzed wastewater samples.
P1: Represents the raw wastewater from the slaughterhouse outlet at a manhole (grid) located inside the slaughterhouse.
P2: Represents wastewater mixed with domestic wastewater from a small town located near the slaughterhouse.

II- Physicochemical parameters
II-1-Temperature

The results shown in Figure 2 show that the evolution of the physicochemical parameters generally depends on the variation in temperature. Any change in the unit of these parameters leads to an imbalance in the aquatic ecosystem and physicochemical and biological reactions. Thus many parameters are conditioned by the temperature [10]
The calculation of the coefficient of variation of the temperature expressed as a percentage (CV = 0.91%), showed that the temperature shows a stability, with a minimum of 15.7 ° C and a maximum of 20 ° C.
Indeed, this evolution shows a strong link between the variation of the temperature of the lover and the downstream and that of the monthly and seasonal payment (R2 = 0.911).
These values would be favorable to the maintenance of colonies of "mesophilic" microorganisms which develop at a temperature between 15°C and 20°C.

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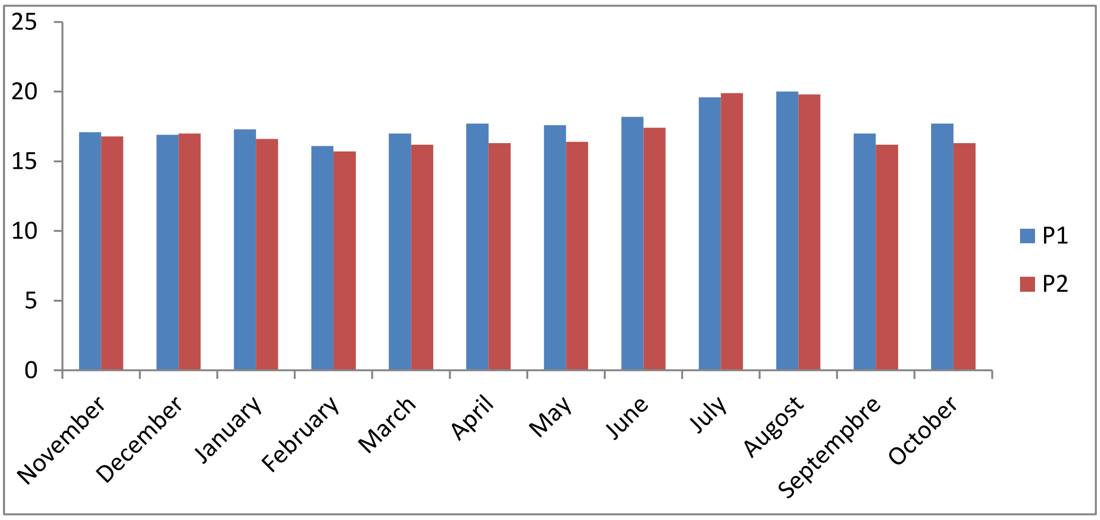

Figure 2: Monthly variation in temperature (° C) of raw slaughterhouse wastewater

II-2- Hydrogen Potential

The pH is an indicator of pollution par excellence. It varies depending on the nature of the basic (cooking, washing, etc.) or acid (acetic acid and chlorinated derivatives) effluents. The biological pH range is between 5.5 and 8.5, outside of this range the pH adversely affects aquatic life and blocks self-purification processes. According to Marier (1974) [11], a drop in pH can lead to an increase in toxicity. The results of the pH monitoring are shown in Figure 3.

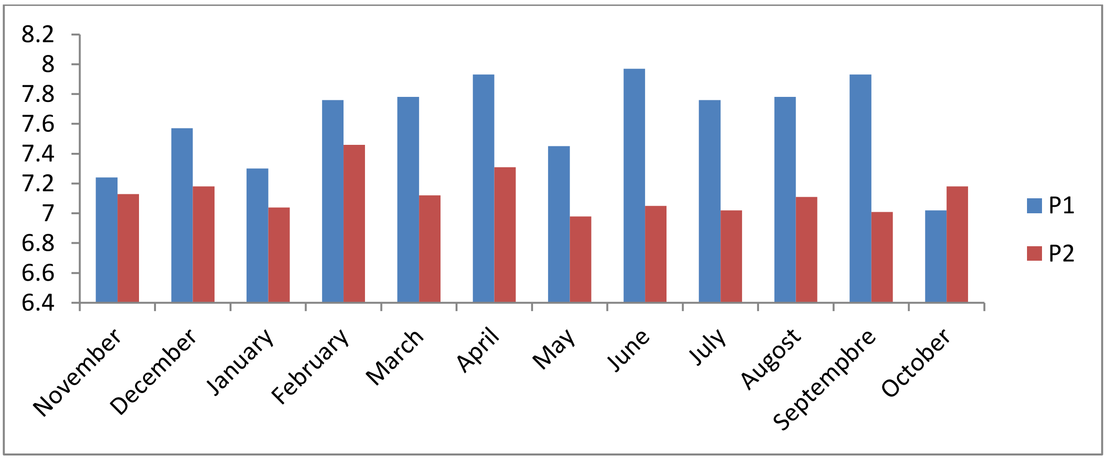

Figure 3: Monthly variation in the hydrogen potential (pH) of raw slaughterhouse wastewater

The data in the figure shows that the pH values displayed during the sampling year almost all fluctuate around their mean value 7.32 ± 0.33 (Figure 3). The evolution of the pH of Oued beht water follows a multinomial equation (R2 = 0.027). These mean value is 7.32, the results are similar to those found in Ouarzazate by El hamouri et al. (1993) [12] the measured pH values are acceptable according to Moroccan

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standards for the quality of water intended for 'irrigation. They are generally between 6.5 and 8.5 considered as limit values for direct releases CNS (1994) [13] El guemri (2009) [14].

II-3- Electrical conductivity

Figure 4 presents the results of the conductivity measurements carried out.

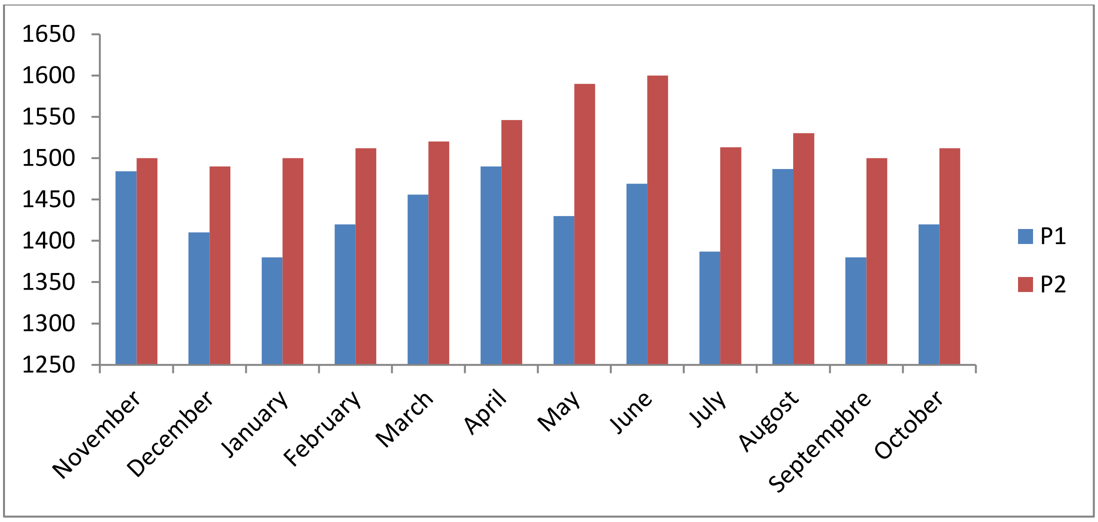

Figure 4: Monthly and seasonal variation of the C.E (µs / cm) of raw slaughterhouse wastewater

The annual average of the recorded electrical conductivity is (1485.7 ± 5.97) ms / cm. The distribution of the electrical conductivity values according to the months shows a large variation translated by a coefficient of variation of 4.02%.

Consequently, these results could be linked to the high mineral concentration in sulphate and chloride and also to the evaporation phenomena that occurred during the hot period.

Furthermore, the low values of electrical conductivity could be mainly due to the phenomenon of dilution under the effect of rainfall. The evolution of electrical conductivity follows a multinomial equation (R2 = 0.027).

For the recorded values could be attributed to the very important organic and mineral load produced by the urban population indeed these discharges are clearly higher than those obtained at the end of similar studies carried out in Sfax (Tunisia) [15]. Values are lower than those found by Gebrati L and Nejmedine A (2002) [16] Abouelouafa et al (2009) [17].

In addition, the comparison of the values of electrical conductivity at the level of the water of the stations upstream and downstream of Oued Beht of the city of Sidi Slimane with the quality standards of water intended for irrigation makes it possible to deduce that this wastewater is acceptable for even crop irrigation these average values are less than 2700µs / cm considered as limit value of direct discharge.

II-4-Nitrates (NO_3^-)

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Nitrates (NO_3-) and nitrites (NO_2-) are naturally occurring ions in the environment. They are the result of nitrification of the ammonium ion (NH_4+), present in water and soil, which is oxidized to nitrite by bacteria of the genus Nitrosomonas, then to nitrate by bacteria of the genus Nitrobacter. Nitrates are very soluble in water, so they easily migrate to the water table when levels exceed the requirements of vegetation (Health Canada, 1992) [18]. The toxicity of nitrates results from their reduction to nitrites and the formation of methemoglobin on the one hand and their possible contribution to the endogenous synthesis of N-nitrosated compounds on the other hand.
The evolution of [NO_3-] is shown in Figure 5.
The average nitrate concentration in slaughterhouse wastewater is 2.77 mg / l with extreme values of 4.36 and 1.26 mg / l. the annual change follows a polynomial equation (R2 = 0.021). Important values of nitrates are marked in the hot season. In fact, an intragroup dispersion, translated by the calculation of the coefficient of variation, shows a heterogeneity of 51.58%.

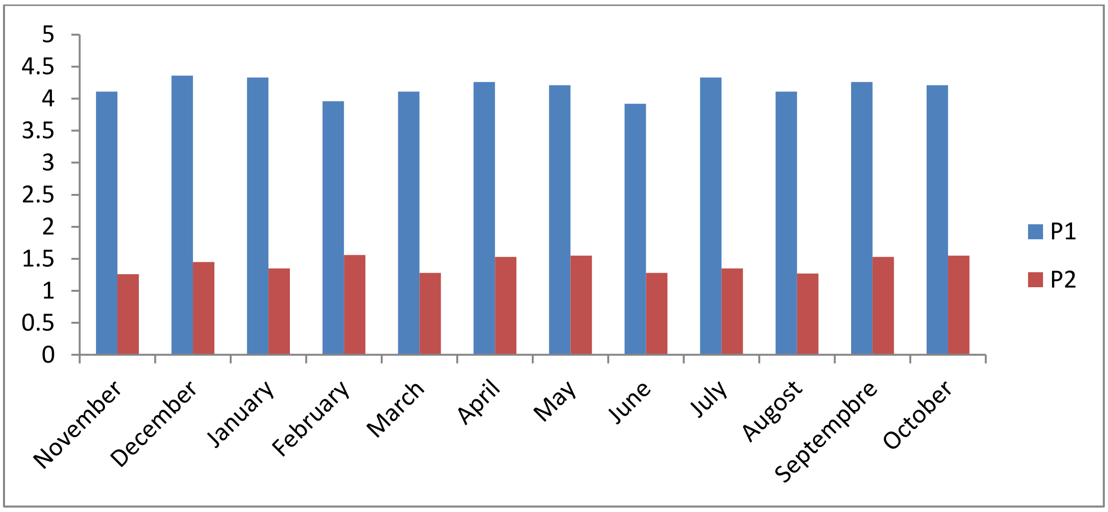

Figure 5: Monthly and seasonal variation of NO_3- (mg/l) of raw slaughterhouse wastewater

The change in the average concentration of nitrates in slaughterhouse water, coinciding with the Moroccan standard for water intended for irrigation (Ministry of the Environment. 2002) [19]. We can say that according to the water quality grid (CNS, 1994) [13] Abattoir's water is middle class; while they are acceptable according to Moroccan standards for the quality of water intended for irrigation (CNS, 1994) [13].

II-5-Chlorure (Cl^-)

Monitoring the chloride content in the water during the study period shown in Figure 6 shows remarkable temporal variations which range from 168 to 316 mg / l. This element exhibits a very clear seasonal variation with maximum concentrations displayed during the summer season and minimum values in winter and autumn.
The high chloride values coincide with the high conductivity values recorded. As a result, slaughterhouse water becomes richer and richer in mineral elements such as chlorides. The evolution of chloride concentrations seems to influence those of the

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electrical conductivity which is determined mainly by these ions. Indeed, they present the same quantitative variations.

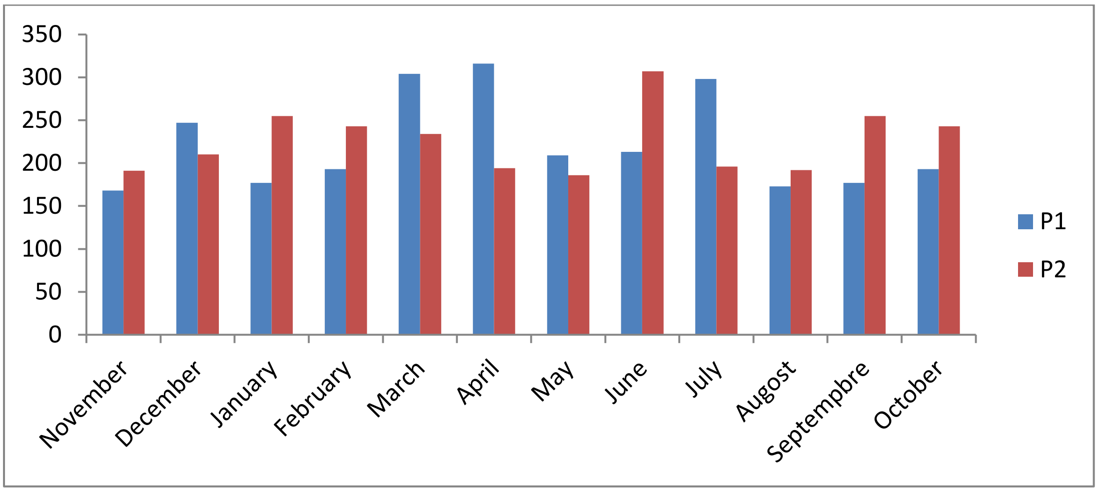

Figure 6: Monthly variation Cl- (mg / l) of raw slaughterhouse wastewater

By referring to the surface water quality grid, the water load does not exceed Moroccan standards (> 1000), so they are of very poor class.

II-6-Phosphore Total (P tot):

The evolution of total phosphorus is shown in figure 7.

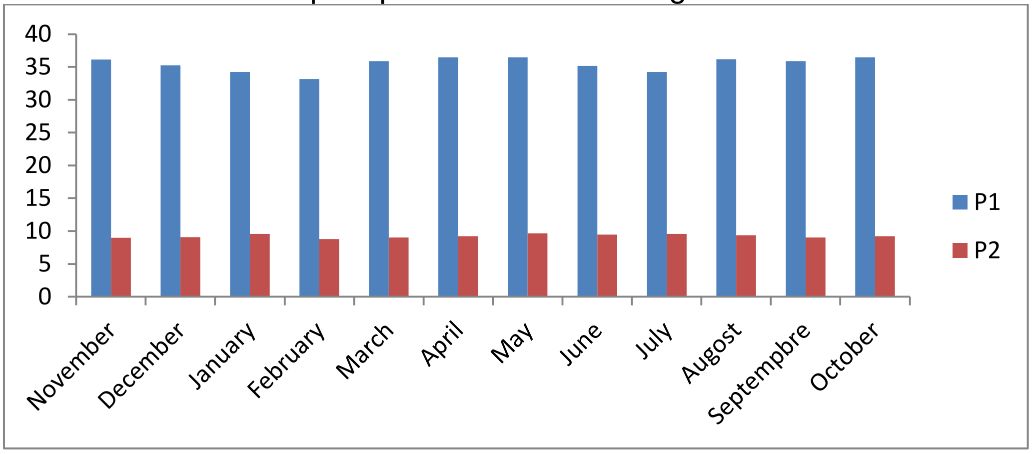

Figure 7: Monthly variation of total phosphorus (mg / l) of raw slaughterhouse wastewater

The total phosphorus is the sum of the concentrations of these two species revealed by the ammonium molybdate forming with them the phosphomolybdic complex of blue color, which allows the determination by continuous flow. The values of total phosphorus vary between 8,780 mg P / l and 36,480 mg P / l.

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II-7-Biological oxygen demand (BOD_5)

Figure 8 shows the BOD_5 measurements of the slaughterhouse wastewater.

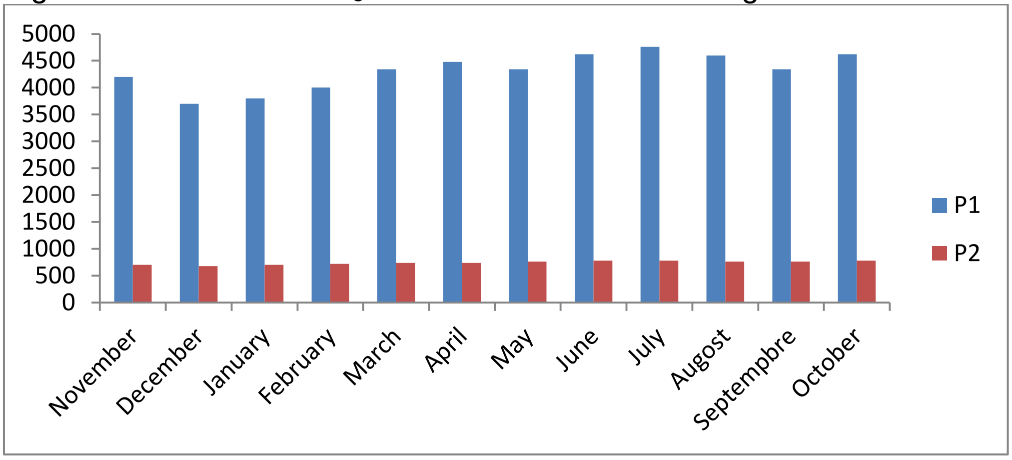

Figure 8: Monthly and seasonal variation of BOD5 (mg / l O2) of raw slaughterhouse wastewater

The annual variation in the content of oxidizable organic matter (BOD_5) imported by the slaughterhouse follows a polynomial equation (R2 = 0.706), varies between a minimum of 680 mg / l of O_2 recorded in the month of March and a maximum of 4760 mg / l of O_2 in July (Figure 45). The calculation of the coefficient of variation shows a homogeneity of 73.17%. In fact, the highest levels of BOD_5 were recorded in summer, with a slight decrease in autumn. This decrease intensifies during the winter. However, the dilution caused by wastewater from the small town located near the slaughterhouse remains the most determining factor in the BOD_5 concentration. In fact, the drop in the organic matter content in wastewater is probably linked to the phenomena of settling and the degradation of organic matter which can be oxidized by microorganisms. In conclusion, the average value of oxidizable organic matter (BOD_5) recorded in slaughterhouse wastewater (2510 mg / l of O_2) is much higher than the Moroccan standard (<100 mg / l of O_2).

II-8-Chemical oxygen demand (COD)

The results are shown in Figure 9.

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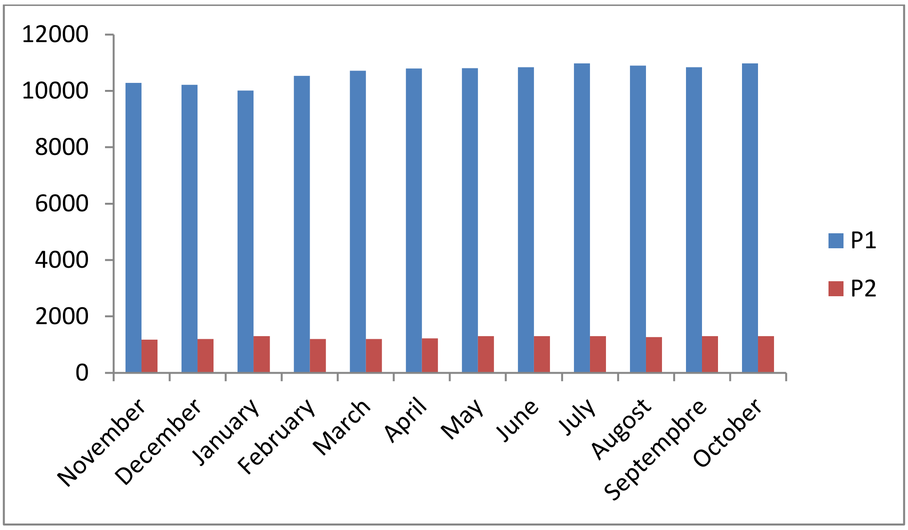

Figure 9: Monthly and seasonal variation in COD (mg / l) of raw slaughterhouse wastewater

The COD concentrations found in the slaughterhouse discharges fluctuate between 1149.2 and 10975.3 mg/l. Indeed, the COD contents seem to be linked to the rise in temperature, to the decrease in chemical load and to the effect of the evaporation of raw wastewater from the slaughterhouse outlet during the dry season.

The high COD value indicates a high organic load. The average organic COD load is 5923.85 mg/l, it remains, in particular, very high compared to the Moroccan discharge standard (120 mg/l).

II-9- Suspended matter

Suspended matter represents mineral and organic particles contained in wastewater. Their effects on the physicochemical characteristics of water are very harmful. The modification of water turbidity allows a reduction in light penetration and therefore photosynthesis. Figure 10 shows the monthly variation of the suspended matter.

Figure 10: Monthly and seasonal variation of the SS (mg / l) of raw slaughterhouse wastewater

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The suspended solids which represent all of the settleable and non-settleable matter, whether organic or mineral, have an average value of 566 mg/l which greatly exceeds the standard which is 50 mg / l imposed by the standards of the Norms and Standards Committee. from Morocco.

III- Assessment of organic pollution of slaughterhouse wastewater

For a better appreciation of the origin of the wastewater, the calculation of the COD / BOD_5, BOD_5 / COD, MES / BOD_5 ratios and the estimation of the oxidizable matter (OM) are of important interest.

The use of these characterization parameters constitutes a good way to give an image of the degree of pollution of the port effluents and also to optimize the physicochemical parameters of this wastewater in order to propose a suitable mode of treatment.

III-1- Typical slaughterhouse wastewater ratios

-To characterize industrial pollution, we often consider the BOD5/COD ratio, which gives very interesting information on the origin of pollution and its treatment possibilities:

-If the wastewater is predominantly organic, this ratio is relatively high, around 0.5. This is the general case for the food industry. The organic load makes this wastewater quite unstable, that is, it will quickly evolve into "digested" forms with the risk of the release of odors;

-If the BOD_5 / COD ratio is of the order of 0.2; there is a fairly strong inorganic pollution, which often results in the setting up of a pretreatment. The discharges may include toxic materials (Mercury, chromium, various inks, dyes, etc.) or substances which are difficult to biodegrade.

-If the BOD_5 / COD is less than 0.1; this is a predominantly chemical effluent. The composition of effluents varies greatly from one industry to another and can include substances that are toxic or difficult to biodegrade.

-The COD / BOD_5 ratio takes into account the fraction of easily biodegradable materials among all the material: if the values obtained are less than 2.5, it can be concluded that the raw wastewater is of domestic origin therefore biological treatment is perfectly fine. Adapted Abouelouafa et *al*., [20]. It is also noted that if the COD / BOD_5 ratio is greater than 3, it reflects the contribution of an industrial effluent that is more or less difficult to biodegrade. In this case, the biological treatment alone risks being unsuitable.

-The usual values of the MES / BOD_5 ratio are between 1.2 and 1.5. This report explains the percentage of sedimentation of suspended matter relative to the organic load.

-The MES / BOD_5 ratio indicates whether the organic matter is present:

• Essentially in soluble form;
• In both soluble and insoluble forms;
• Essentially in insoluble form.

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Table 1: Presents the COD / BOD_5 ratio according to the type of discharge from some industries (El Guamri, 2003)

Rejet	DCO/ DBO_5
dairy	0,76
Meat cannery	0,91
sweets	1,22
Vegetable cannery	1,35
Slaughterhouse	**1,49**
brewery	2
Domestic water	1,96
pharmacy	2,27
Laundry	2,63

III-2-COD/BOD_5 and SS/ BOD_5 ratios of raw wastewater (EUB) from the slaughterhouse

Figure 11 shows the COD / BOD_5 ratios of the raw slaughterhouse wastewater.For a better determination of the origin of raw slaughterhouse wastewater, the usual ratios for urban wastewater were used.

Abattoir wastewater exhibits an average rate of exceeding the upper limit of the usual COD/ BOD_5 ratio of urban wastewater 50%.

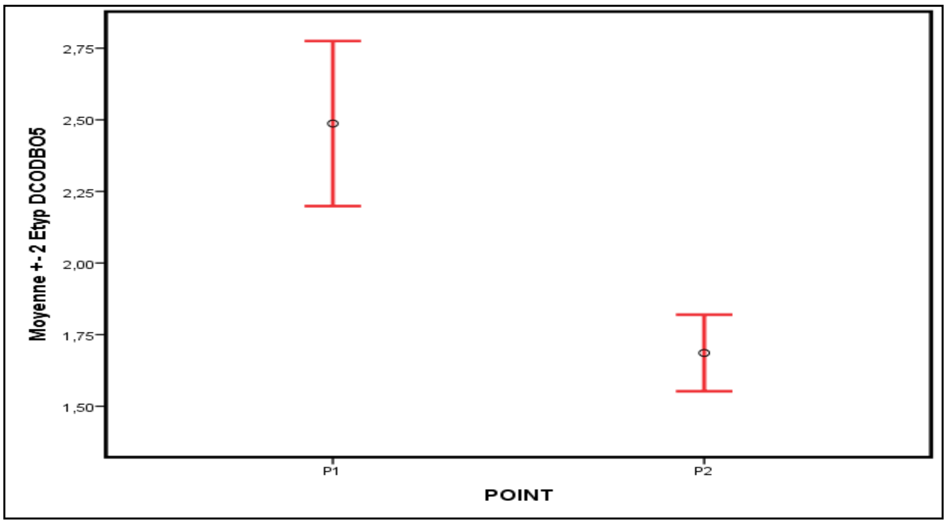

Figure 11: Representation of the COD / BOD5 ratios of a slaughterhouse in the city of Sidi Slimane

The values of the COD / BOD_5 ratio of the raw slaughterhouse wastewater are higher in comparison with that of the usual ratio and which is between 2 and 2.5.

The COD/BOD_5 ratio of raw slaughterhouse wastewater from the city of Sidi Slimane in the P1 sampling station inside the slaughterhouse around an average of 2.48 allows the slaughterhouse wastewater to be classified. This ratio is less than 2.5, allowing us to conclude that raw wastewater is biodegradable, therefore biological treatment is perfectly suitable.

Figure 12 represents the MES/BOD_5 ratios of the raw wastewater in two sampling points: P1 represents the raw wastewater leaving the slaughterhouse at the level of a

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manhole (grid) and P2 represents the wastewater mixed with the domestic wastewater from a small town located near the slaughterhouse.
The values of the MES/BOD_5 ratio of the raw slaughterhouse waste water from the two sampling points are very low in comparison with the usual ratio and are between 1.2 and 1.5. They are around an average of 0.14 with a minimum value of 0.12 and a maximum value of 0.16.
So the COD/BOD_5 and MES / BOD_5 ratios confirm the specificity of the slaughterhouse wastewater in the town of Sidi Slimane in particular, being organic matter for which an adequate biological treatment is necessary.

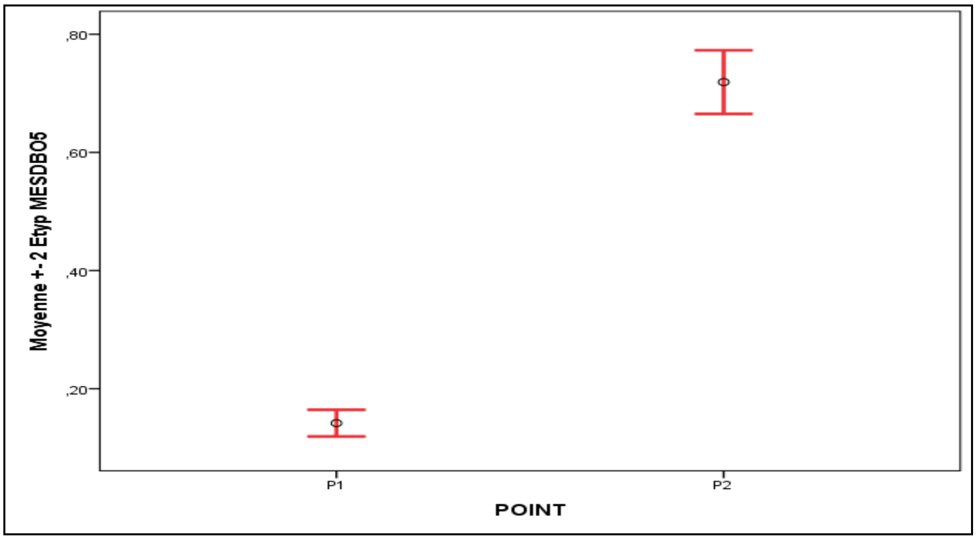

Figure 12: Représentation des rapports MES/ DBO_5

III-3- Oxidizable material (MO)

Most organic matter only becomes polluting when it is found in excess in the environment. We distinguish:
Biodegradable organic matter that decomposes in the natural environment;
Non-biodegradable organic materials (hydrocarbons).
Many organic micropollutants of industrial or urban origin affect the quality of waterways, they pass through treatment plants without being altered, resist self-purification and are found in traces in rivers. In addition to the reduction of dissolved oxygen that they cause, some give drinking water irritating properties that are sometimes toxic as well as an unpleasant odor and taste. These micropollutants can have a detrimental effect on the bacterial flora which prevents the proper functioning of wastewater treatment plants.
These pollutants can be classified into two main categories: suspended solids (SS) and dissolved solids (DM). The suspended matter is mainly composed of wood fibers which can be retained by settling during a primary treatment [21]. The dissolved matter originates from the main constituents of wood, which are hemicellulose, cellulose as well as low molecular weight lignin. Wastewater also contains, in smaller quantities, toxic extracts from wood, such as resin acids and fatty acids [22].

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The dissolved matter accounts for the major part of the biochemical oxygen demand after five days of incubation (BOD_5) and of the chemical oxygen demand (COD). If these dissolved materials containing large quantities of biodegradable compounds are released without secondary biological treatment, they greatly reduce the availability of dissolved oxygen in receiving watercourses and affect aquatic fauna and flora.

Toxic products for fish are present in wastewater from paper mills. The major toxic products are resin acids, and to a lesser extent, fatty acids. The Studies [23] have shown that dehydroabietic acid and other resin acids can significantly accumulate in fish (blood plasma, liver, kidneys, brain) exposed to these products. . Other studies [24] on the assimilation of linoleic acid in young rainbow trout, have shown that this fatty acid is found in the gills, and at levels less, in the blood and viscera.

In addition, the relationship between BOD5 and COD makes it possible to estimate the oxidizable matter (OM) according to the following expression:

MO (mg/l) $=\frac{(2\times DBO+DCO)}{3}$

The COD/BOD_5 ratio is of the order of 2.48 low values, which indicates that the oxidizable matter, estimated at 6391.68 mg/l in the raw wastewater of the slaughterhouse in the city of Sidi Slimane, is easily biodegradable.

IV- Principal Component analysis

The application of the statistical method of Principal Component Analysis (PCA) consists in evaluating the slaughterhouse wastewater from data on the spatio-temporal variability of the physical parameters (temperature, hydrogen potential, electrical conductivity, nitrate, Ammonium, Total nitrogen, Total phosphorus, Chlorides, Biological oxygen demand, Chemical oxygen demand) The results presented in Tables 2 and 3.

Tableau 2: Descriptive statistics

Variable	Observations	Minimum	Maximum	Medium	Standard deviation
T	20	15,7	20	17,4450	1,2821
pH	20	6,98	7,97	7,3295	0,3176
CE	20	1380	1600	1485,7000	59,7496
NO_3^-	20	1,26	4,3600	2,7790	1,4336
NH_4^+	20	0	72,342	33,5919	34,5865
Ntot	20	73,1	389	229,8436	153,242
Cl-	20	168	316	225,3	48,033
Ptot	20	8,78	36,48	22,291	13,3812
DBO_5	20	680	4760	2510	1836,7534
DCO	20	1149,2	10975,3	5923,8565	4810,3914
MES	20	511	623	566,1	41,4436

Tableau 3: Correlation matrix (Pearson (n))

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Variables	T	pH	CE	NO_3^-	NH_4^+	Ntot	Cl^-	Ptot l	DBO_5	DCO	MES
T	**1**	**0,6857**	-0,1467	0,2282	-0,2312	0,2442	-0,0314	0,2573	0,3117	0,2655	0,4120
pH	**0,6857**	**1**	0,3596	-0,4019	0,4150	-0,3929	-0,0391	-0,3893	-0,3369	-0,3772	-0,1802
CE	-0,1467	0,3596	**1**	**-0,7735**	**0,7752**	**-0,7601**	-0,0126	**-0,7386**	**-0,7236**	**-0,7512**	**-0,6053**
NO_3^-	0,2282	-0,4019	**-0,7735**	**1**	**-0,9900**	**0,9943**	0,1087	**0,9940**	**0,9837**	**0,9933**	**0,9257**
NH_4^+	-0,2312	0,4150	**0,7752**	**-0,9900**	**1**	**-0,9946**	-0,1001	**-0,9940**	**-0,9869**	**-0,9948**	**-0,9097**
Ntot	0,2442	-0,3929	**-0,7601**	**0,9943**	**-0,9946**	**1**	0,1231	**0,9971**	**0,9929**	**0,9992**	**0,9304**
Cl-	-0,0314	-0,0391	-0,0126	0,1087	-0,1001	0,1231	**1**	0,1027	0,1317	0,1135	0,1038
Ptot	0,2573	-0,3893	**-0,7386**	**0,9940**	**-0,9940**	**0,9971**	0,1027	**1**	**0,9917**	**0,9979**	**0,9359**
DBO_5	0,3117	-0,3369	**-0,7236**	**0,9837**	**-0,9869**	**0,9929**	0,1317	**0,9917**	**1**	**0,9956**	**0,9348**
DCO	0,2655	-0,3772	**-0,7512**	**0,9933**	**-0,9948**	**0,9992**	0,1135	**0,9979**	**0,9956**	**1**	**0,9331**
MES	0,4120	-0,1802	**-0,6053**	**0,9257**	**-0,9097**	**0,9304**	0,1038	**0,9359**	**0,9348**	**0,9331**	**1**

Values in bold are different from 0 at a significance level alpha = 0.05
Analysis of the variables shows that the F1 axis expresses 69.66% of the variance and the F2 axis 15.73%, with the two axes 85.4% in a two-dimensional system of the 11 parameters studied. These considerations allowed us to obtain the graphical representation of the correlations between the different variables (Table 4, Figure 14).

Tableau 4: Presentation of the Observation contact details

	F1	F2	F3	F4	F5	F6
Own value	7,6634	1,7313	0,9994	0,4189	0,1070	0,0600
Variability (%)	69,6671	15,7391	9,0857	3,8080	0,9729	0,5456
% cumulative	69,6671	85,4062	94,4919	98,2999	99,2727	99,8184

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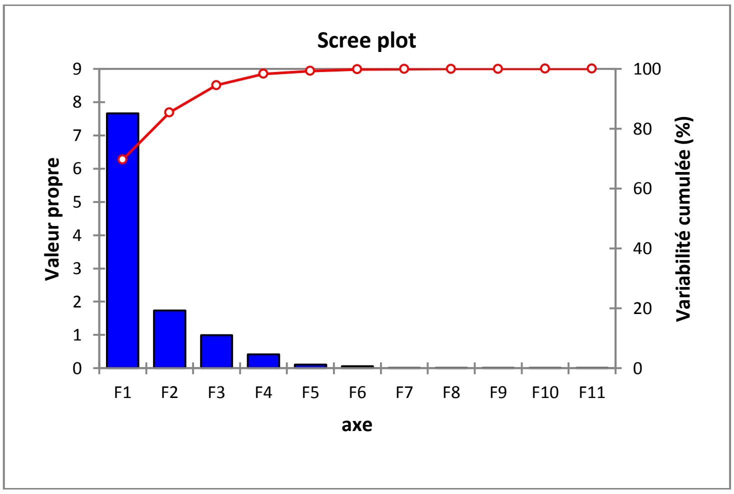

Figure 13: Presentation of the Observation contact details
- Correlations between variables and factors:

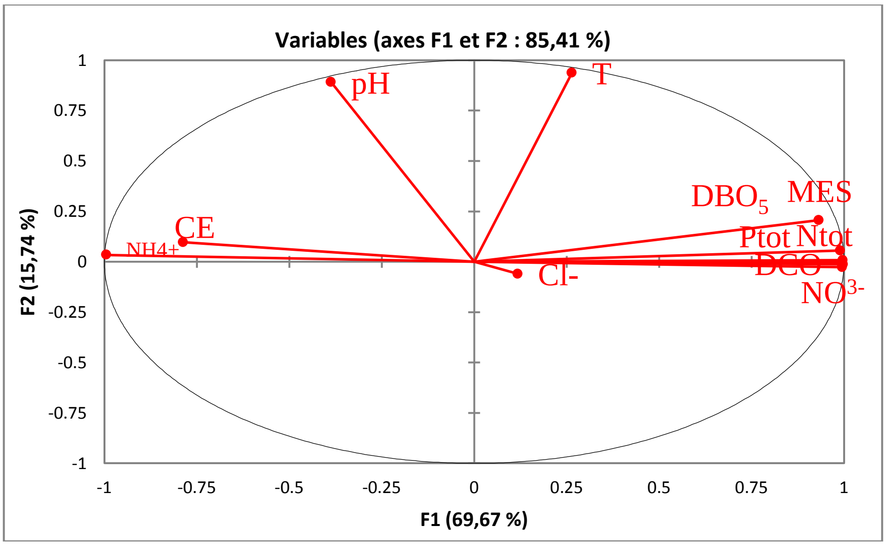

Figure 14: Representation of the six stations on the factorial plane F1 and F2

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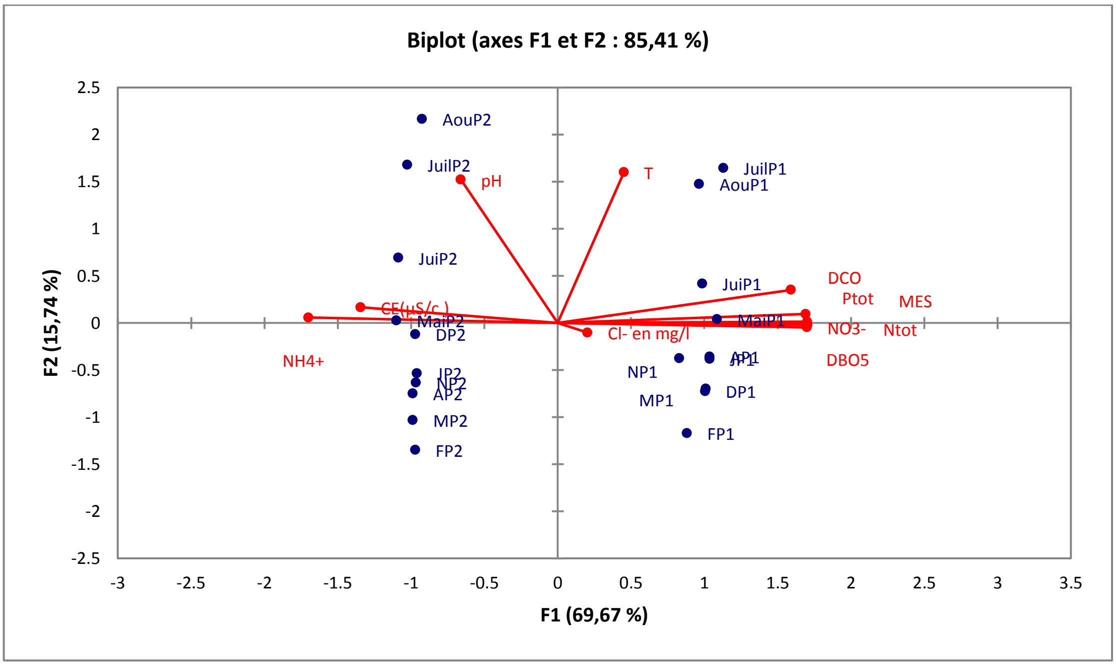

Figure 15: Projection of the 6 stations studied on the plane of the first 2 factorial axes (F1-F2) of the PCA

The analysis of the factorial map of the readings represented in Figures 14 and 15 show the individualization of 2 groups:

Group I, made up of samples taken in the hot months located on the positive side of axis F1, it represents a high rate of T, BOD5, MES, Ntot, Ptot, DCO, Cl-, NO3- then this group is characterized by high organic contamination in comparison with other stations.

Group II, includes the cold months, on the negative side of the F1 axis, which has water polluted by a mineral load pH, CE, NH^{4+}.

V- Conclusion

This work was carried out with the aim of establishing a diagnosis of the physico-chemical state of the wastewater from the slaughterhouse in the town of Sidi Slimane. This water is discharged through a unit collector in the Beht wadi without prior treatment. Examination of the results shows that the pollution parameters of the wastewater from the slaughterhouse in the city of Sidi Slimane have relatively low values compared to the average of the usual concentrations of Moroccan urban wastewater. Throughout the study period, a relatively neutral pH was recorded in the wastewater from the town of Sidi Slimane. In addition, the COD / BOD_5 ratio is of the order of 2.49 for raw slaughterhouse water and 1.69 for the unit collector which conveys the slaughterhouse wastewater mixed with the wastewater from riparian habitats. Of this slaughterhouse. The value between 1.5 and 2.5 indicates that the fraction of organic matter in the effluent is easily biodegradable. This COD / BOD_5 ratio is less than or equal to 2.5, which allows us to conclude that these two effluents are predominantly domestic. The qualitative and quantitative assessment of the

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parameters relating to wastewater from the slaughterhouse in the town of Sidi Slimane enabled us to identify a set of information:
- The water from the slaughterhouse in the town of Sidi Slimane can be classified among the effluents with the lowest ammonium content.
- Wastewater discharges from the slaughterhouse in the town of Sidi Slimane, without prior treatment, can have a considerable environmental impact. Indeed, these waters lead to the contamination of receiving watercourses and consequently cause enormous nuisance for residents, neighboring users and wildlife resources, especially during the dry period. This prompted decision-makers to plan very soon for the establishment of a wastewater treatment plant in the city of Sidi Slimane.

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