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A survay of bacterial pollution of different fresh water sources

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ABSTRACT

Bacteriological examination was carried on two types water samples were collected from River Nile water and ground water at different cities of El gharbia government., Egypt during 2012 /2013 in order to determine the levels and total counts of bacterial isolates .During this study about 60 bacterial isolates were present in our water collected samples . These isolates were tested on different selective bacterial media like nutrient agar ,Staph., Serratia ,Proteus , Pantoae and Aeromonas media for determine the total counts of these genera. The highest number of total bacteria was found on summer in both types of water . After that the number of different bacterial genera were presence on River Nile water while *Proteus mirabilis* , *Serratia Plymuthica* and *Pantoea* spp . were few on ground water .

Keywords : Nile water ,ground water ,bacterial pollution , Elgharbia governorate.

INTRODUCTION

River Nile is the main source of water and unfortunately, receives heavy loads of industrial, agricultural and domestic wastes. Water must meet specific criteria and standards to ensure that water supplied to the public to be safe and free-from pathogenic microorganisms as well as hazardous compounds (WHO, 1993).

Ali *et al*., (2000) studied the biological characteristics of the River Nile water to evaluate the trophic and autotrophic state of the River. They revealed the presence of faecal bacteria, high number of pathogenic bacteria and yeasts because the River body receiving big quantities of domestic, industrial and agricultural wastes

Rifaat (2007) showed that the water contaminated with microbiological constituents cause a variety of diseases. Water intended for human consumption should be safe, palatable and/or aesthetically pleasing.

Water sources have different qualities influenced by natural or anthropological pollution. In Egypt, the availability of safe and clean water is a serious problem. The presence of different bacterial genera in the water of the River Nile at Cairo is due to direct contamination caused by human activities and indirect effect by ecological disturbances. People discharge their domestic and/or agricultural wastes into the river. Birds and some animals inhabiting the water and contaminate the water through direct defecation and urination. In addition, the presence of organic suspended materials promotes the growth of microorganisms.

Sabae ,*et. al* ., (2006) reported that the evaluation of the microbial quality of the River Nile water at Damietta branch and the bacteriological analysis showed that maximum counts were recorded during summer and the minimal were detected in winter. Also, they found that the faecal indicators counts revealed that their densities increased from up- to down stream and one hundred pathogenic bacterial isolates included: *Esherichia coli* (16%), *Klebsiella pneumoniae* (14%), *Pseudomonas aeruginosa* (12%), *Pseudomonas flourcsence* (4%), *Salmonella colerasuis* (11%), *Shigella* spp. (9%), *Serratia liquefaciens* (8%), *Proteus vulgaris* (8%), *Acinetobacter* spp. (7%), *Brenneria nigrifluens* (5%), *Flavimonas oryzihabitans* (3%) and *Chryseomonas lutecla* (3%) . This work aims to study the bacterial pollution of drinking water in Elgharbia to Know the total counts of microbial pathogens of the water for human consumption.

MATERIALS AND METHODS

Source of water samples :

Tow different types of water samples namely , Nile water and ground water were tested for microbiological examinations . The samples were collected from five different cities namly ,Tanta , Elmehala- Elkobra , Mehala -Abo Ali ,Samanod and Mehala -roh. at during winter ,spring ,summer and autumn at 2012/2013 years. Samples taken for microbiological examinations were collected in 100 ml sterile glass bottles , preserved in ice box and examined within 8 hours . All analysis were carried out in the microbiological laboratory of Microbiology Department , Faculty of Agriculture , Mansoura University , Mansoura city .Egypt .

Bacterial isolates used :

Bacterial isolates were obtaind from colonies total count plates after purification and identification according to (Bergy's Manual 2005 and Vitek Microbial identification using the biomérieux vitek® 2 system david h. Pincus bioMérieux, Inc Hazelwood, MO, USA)

Microbiological examinations for two types of water:

Total bacterial count :

Poured plate method was used . Three plates for replicates and incubated at 37 ^{0}C for 24hrs and other plates were incubated at 20^{0} C for 48 hrs (APHA,1998).

***Staphylococci* count :**

Staphylococci was determined as descrbed in medium staph 110 (Murray , *et al* .,2007)

***Aeromonas* sp. count :**

An aliquot from each sample (0.1 ml) was streaked onto a hydrophila agar plates and incubated at 37°C for 24 hrs, after which the grown yellow colonies were counted as Aermonas count/100 ml of original sample (Rippey and Cabelli, 1979).

***Proteus* sp .count :**

Proteus was determined as described in selective medium heart infusion agar Difco plates and incubated at 37^{0}C for 24 hrs ., (Baird –parker 1962).

***Serratia* sp. count :**

Serratia was determined as described in selective medium SD medium (Grimont , *et.al.*, 1988) .

***Pantoea* sp. count :**

Pantoea was determined as described nutrient agar (N A) medium (Walcott .*et.al.*, 2002) .

RESULTS AND DISCUSSION

Microbiological examinations of River Nile water

Microbiological examinations of River Nile water analyzed during 2012/2013 (Summer ,Autumn, Winter and Spring) at different sites in El Gharbia governorate.

Total bacterial counts in River Nile water :

The result of the total bacterial count in River Nile water are show in Figure (1). Total bacterial counts at 20 ^{0} C was in the autumn in Tanta (0.06 cfu x10^5/100 ml). Among of all water samples of different sites , the highest bacterial counts were recorded for both groups (at 20^0 C and 37 ^{0}C) during summer . This might be due to the high temperature during this season.

On the other hand ,the minimum count of total bacterial at 37 ^{O}C (Figure 2) ranged from 0.01 x10^5 to 2.6 cfu x 10 ^{5} / 100 ml the highest numbers was recorded during summer in Mehalt - roh but the number was during summer in Mehala -Abo Ali city . Mean of total bacterial counts in the summer was the highest count while the minimum one was in the spring which were 0.782 . Means of the total bacterial counts at 20^0 C were 0.941 0.8632 0.815 and 0.7698. cfu x 10 ^{5}/100 ml in the summer , autumn , winter and spring , respectively . Whereas means of the total bacterial counts at 37^0 C 0.93 0.892 0.794 and 0.782 cfu x 10 ^{5} /100 ml in the summer , autumn , winter and spring , respectively . This data are agreement with (Nsanze *et.al* ., 1999) reported that all four types of bottled mineral water investigated in the united Arab Emiratas (UAE)contained some bacterial contamination . There were more than 10 different species of contaminating bacterial agents. The obtained results are in good agreement with recently published data (Osman ,2006) and show that , the average of the total bacterial count at 22^{0}C and 37 ^{0}C were ranged from 20 to 44.67 cfu and from 23.7 to 74.2 cfux10^5/100ml respectively .

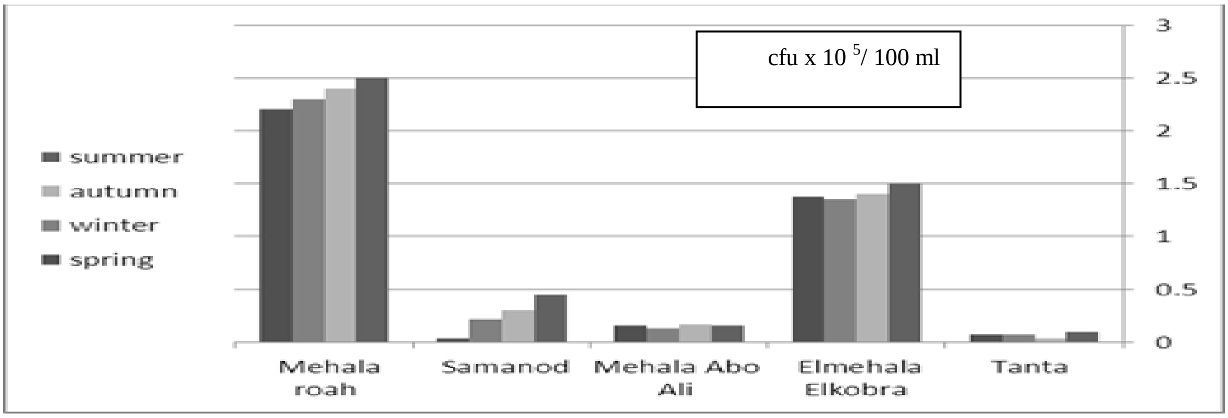

Fig (1) Total bacterial count's in River Nile water at 20 ^{0}C El Gharbia governorate during 2012/2013.

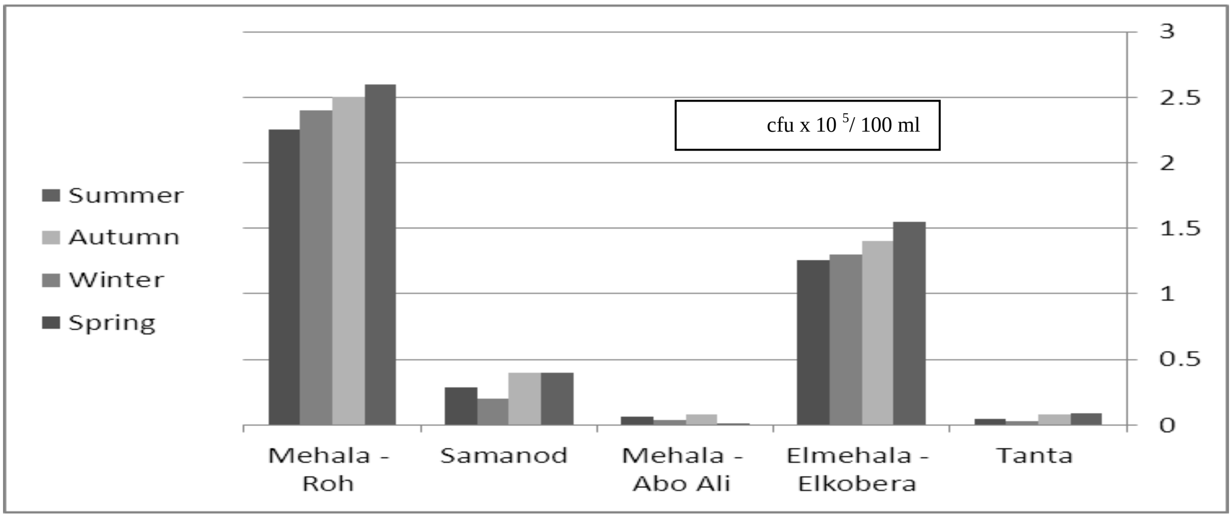

Fig (2) Total bacterial count in River Nile water at 37 ^{0}C El Gharbia governorate during 2012/2013.

Aeromonas sobria and Staphylococci count's in River Nile water:

Figure (3&4) shows the comparison between the results of *Aeromonas sobria* bacterial count's and *Staphylococci* count in River Nile water during 2012 /2013 . Among of all River Nile water samples , Figure (3) the detection counts of *Aeromonas sobria* bacteterial count were almost greater during summer1.988 cfu x 10^4 / 100 ml) . However, in the autumn sample contain the minimum number (1.738 cfu x 10^4 / 100 ml) , similar results were reported by(Schubert, 1991) confirmed the presence of *A . hydophila* in drinking water along with other enteropathogens reflecting contamination of the environment. . Aeromonads are generally readily killed by chlorine and other commonly used water disinfectants. Aeromoads are copable of growth in relatively low nutrient environments . Thus , the presence of *Aeromonas* in drinking water does not indicate faecal pollution but may reflect deteriorating water quality (WHO,1996)

Figure (4) also present the results of the values of *Staphylococci* counts in River Nile water, the minimum value was (0.01 cfu x 10^5 / 100 ml , it was in the summer in Tanta and the highest values was 3.9 cfu x 10^5 / 100 ml , in the summer in Mehalt -roh. mean values was ranged between 2.14 and 1.174 cfu x 10^5/ 100 ml .

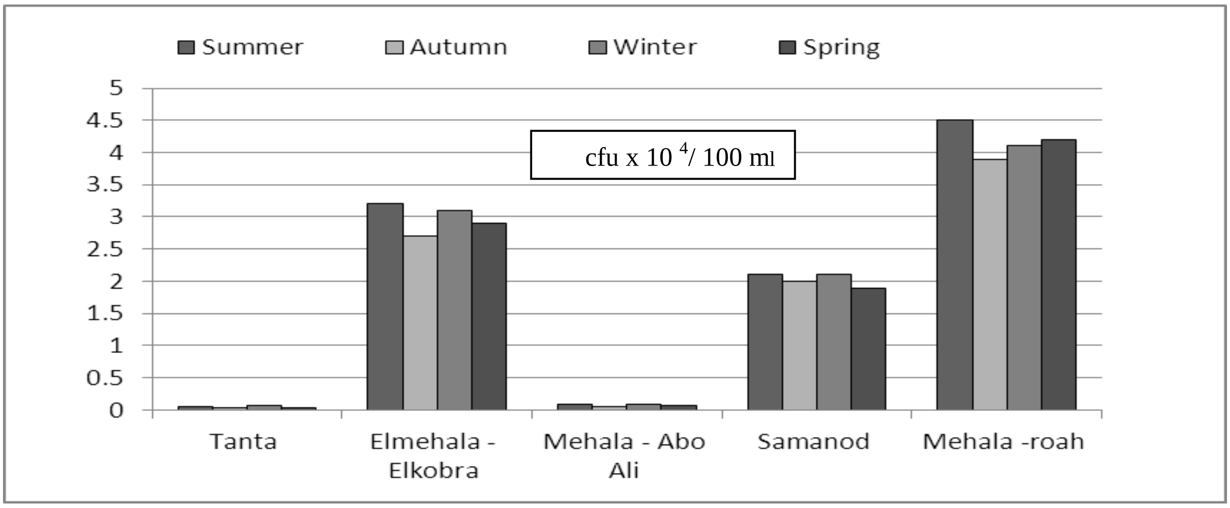

Fig (3) Total count of *Aeromonas sobria* in River Nile water at El Gharbia governorate during 2012/2013.

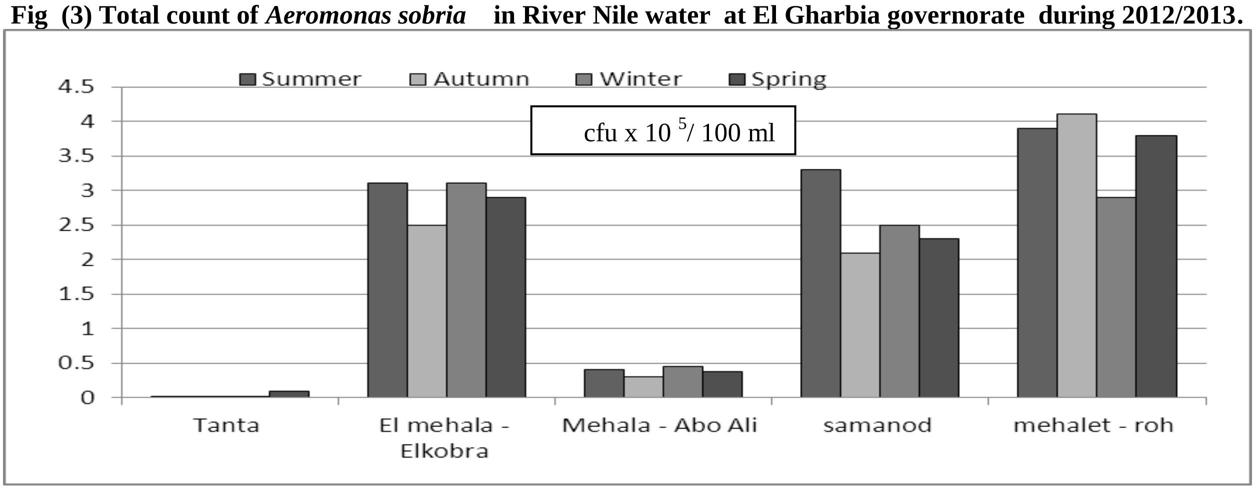

Fig (4) Total count of *Staphylococci* in River Nile water at El Gharbia governorate during 2012/2013.

Pathogenic bacteria indicators in River Nile water :

Montoring of different pathogens in water could be used as a tool to assess the health status of the community. Thus ,*proteus* spp. , *Serratia* sp. and *Pantoae* sp . count's were determined . Data showed that there was no detectable *Proteus* sp. and other genera. Obtained results are in good agreement with published data (Osman , 2006) and other found that the Nile water was potentially contaminated with the pathogenic bacteria (Arafat , 2013) .

***Proteus* sp . count :**

Proteus mirabillis count was determined in this investigation as pathogenic bacteria and Figure (5) showed numbers of *proteus mirabillis* count the maximum count of *proteus mirabillis* was in the summer in El Mehala- Elkobra (2.3 cfu x 10^3 / 100) and the minimum count 0.06 cfu x10^3 was in the summer in Mehala -Abo Ali .

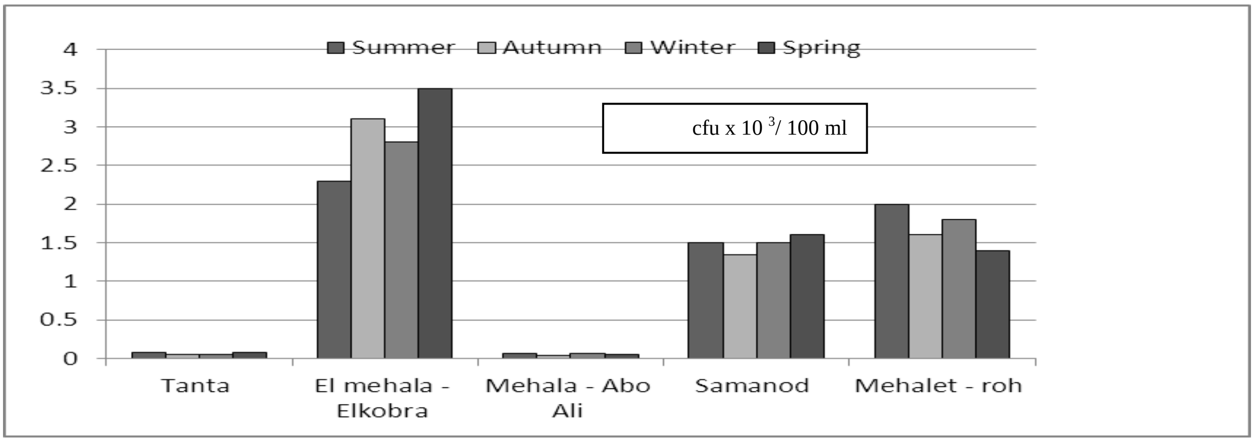

Fig (5): Total bacterial count's of *Proteus mirabillis* at El-Gharbia governorate during 2012/2013.

Serratia* and *Pantoea* spp. count *:

Figure (6) represent *Serratia plymuthica* present values of count's in River Nile water. The minimum value 0.21 cfu x 10^{3}/100 ml , it was in the winter in samanod while , the maximum value was 1.45cfu x 10^{3} / 100 ml during summer in El mehala -Elkobra. means value was fluctuated between 1.038and 0.682cfu x 10^{3} / 100 ml in summer and winter respectively . At the same timeFigure (7) represent numbers of *Pantoea* sp. the maximum count of *Pantoea* sp. was in the summer in Mehalet -roh (1.73 cfu x 10^3 / 100 ml) and the minimum count 0.36 cfu x10^3 in the spring at Samanod means value was fluctuated between 1.21and 0.668 cfu x 10^{3} / 100 ml in summer and spring respectively.

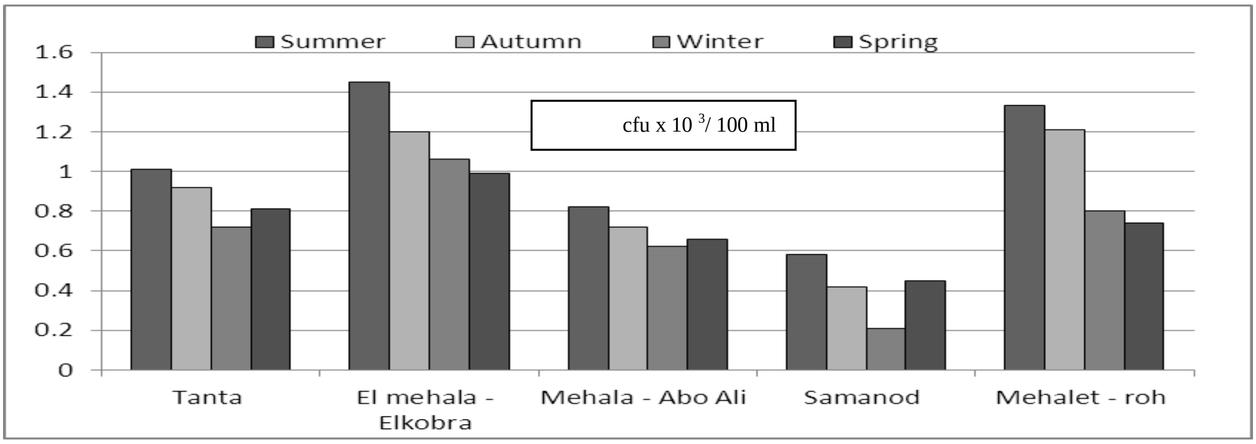

Fig (6): Total count of *Serratia Plymuthica* at El-Gharbia governorate during 2012/2013.

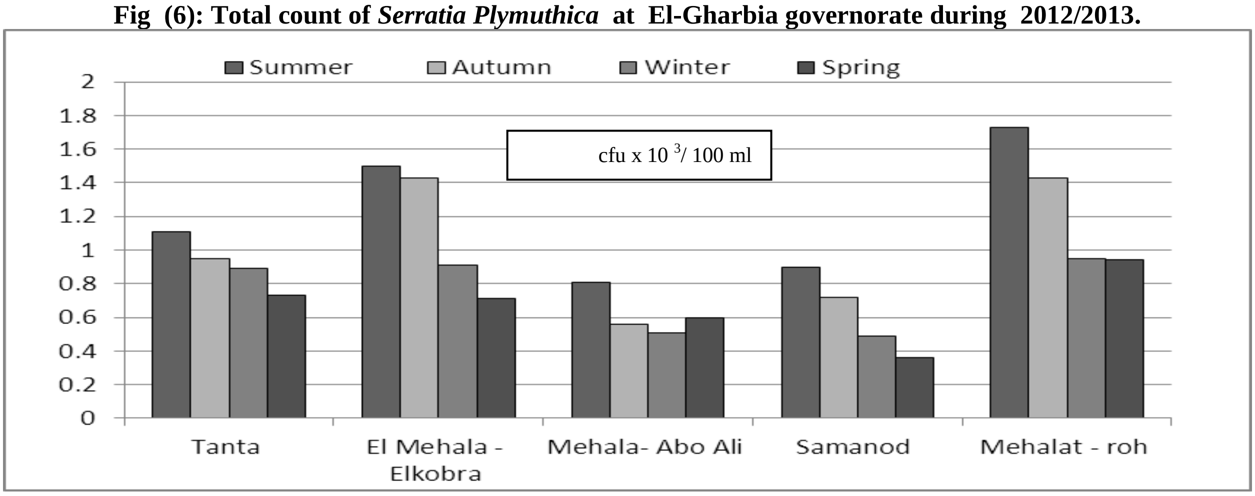

Fig (7): Total count of *Pantoea* sp. at El-Gharbia governorate during 2012/2013

Microbiological examinations of ground water:

Most of the ground waters were treated or disinfected before pumping to the drinking water pipeline . Ground water contamination is nearly always the result of human activites when ground water becomes contaminated , it is difficult and expensive to purity liquid waste discharged on to soil initiates solute and microbe movement may contaminate groundwater**.**

Total bacterial count in ground water :

The normal microbiological quality monitoring of groundwater is a determination of colony counts at 20^0 C and 37^0 C which shows general microbial status of water.

Figure (8) shows that total bacterial counts in ground water during 2012/2013 at 37^0 C varied from 0.15 to 4.5 x 10^3 /100 mL , the maximum value 4.5 cfu x 10^3/100ml was in the summer at Mehalet - roh but the minimum value was at the winter at Mehala- Abo Ali mean of the total bacterial count in the summer was maximum count and the minimum in the winter were 2.52 and 1.97 respectively .

Figure (9) on the other hand the minimum count of total bacterial counts at 20^0C at the Spring at Tanta (0.37 cfu x 10^3 /1 ml) and the maximum at the summer at Mehala - roh(4.2 cfu /x10^3 /100 ml).

Means of total bacterial count at 20^0 C were 2.022, 2.34 , 2.02 and 1.828 cfu x 10^3 /100 ml in the summer autumn winter and spring, respectively in addition to that all samples of different sites of Tanta and Mehala- Abo Ali city were lower in total bacterial counts at 20^0 C and at 37 ^{0} C than other sites.

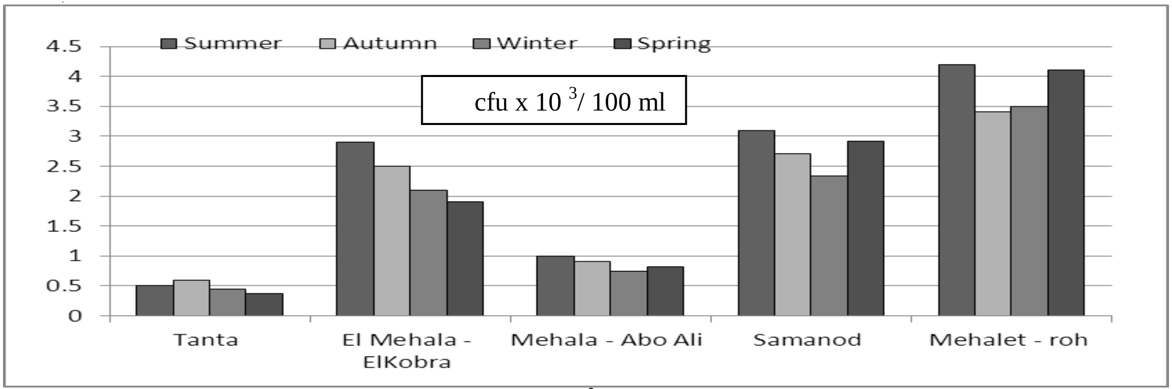

Fig (8): Total bacterial count in ground water at 20 ^{0} C in El-Gharbia governorate during 2012/2013

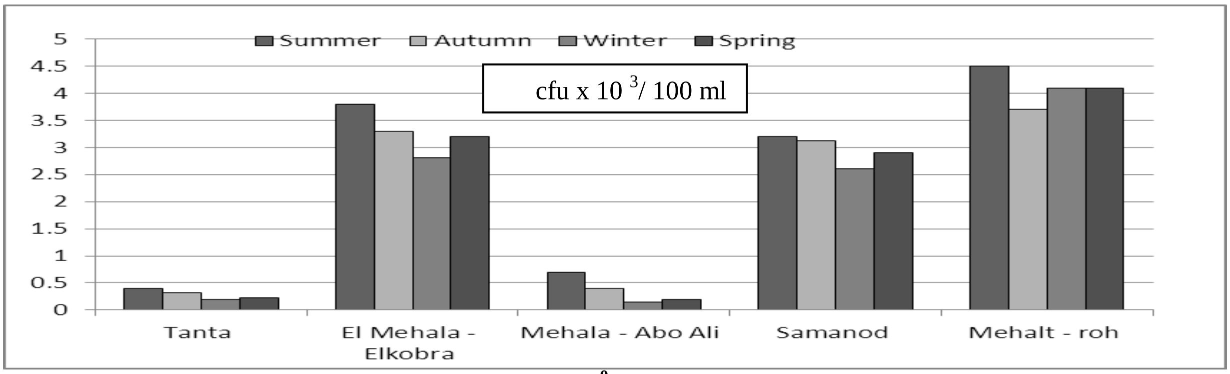

Fig (9): Total bacterial count in ground water at 37 ^{0} C in El-Gharbia governorate during 2012/2013

***Aeromnas Sobria* and Staphylococci count in ground water**

Figure (10) Among of all ground water samples , the detection counts of *Aeromonas sobria* counts were almost greater in the Summer (5.5 cfux 10^4 /100 ml) in summer at Mehalt-roh on the other hand , the minimum value was in Autumn at Mehala- Abo Ali , (0.7 cfux 10^4/100 ml)(Massa *et. al.*, 2001) reported that *Aeromonas* spp . were isolated from five of 20 examined wells , with cell numbers ranging from 26 to 1609/250 ml . In two wells , the presence of *Aeromanas* spp. was not associated to the presence of faecal indicators i.e . coliforms and faecal coliforms (EL-Taweel (2003) reported the high counts of *A. hydrophila* in aquatic environments might be referred to the ground water polluted by surface seepage of sewage from septic tanks and sewers lines or from land application .Figure (11) illustrate the results of the values of *Staphylococci* count in ground water ,the minimum value was 0.005 cfux 10^3/100 ml , it was in the spring at Tanta and the maximum value was 6.0 cfu x $10^3$100 ml in the Summer at Mehalet-roh means were ranged between 3.602 and 2.783 cfu x10^3 /100ml in Summer and Spring respectively . The obtaind results were in harmany with (Vaerewijck ,*et .al.*, 2005) .

Pathogenic bacteria indicators in ground water :

***Proteas* sp . count :**

Proteus mirabillis counts were determined in this investigation as pathogenic bacteria . Result value *proteus mirabillis* count not detected in all site in ground water

***Serratia* and *pantoea* spp. count :**

Was no detectable *Serratia plymuthica* and *Pantoea* spp. in all tested sample in ground water during 2012 / 2013 .

Data showed that , there was no detectable *Salmonella* spp. and other genera in water obtained results are in good agreement with published data (Osman , 2006) .

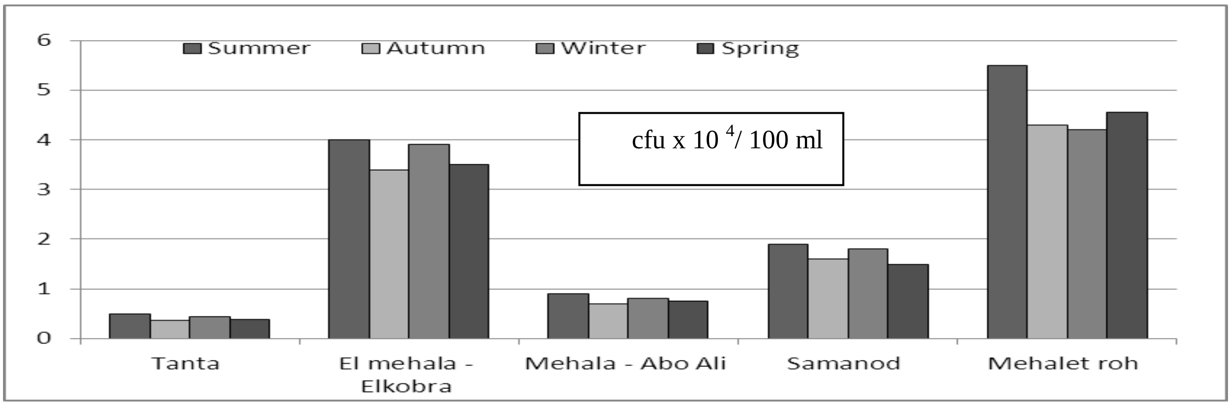

Fig (10): Total count of *Aeromonas sobria* in ground water at El-Gharbia governorate during 2012/2013.

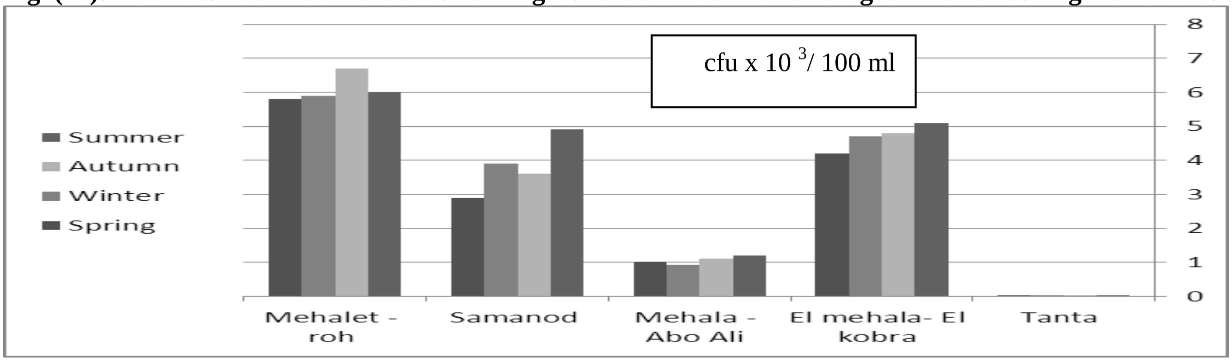

Fig (11): Total count of *Staphylococci* in ground water at El-Gharbia governorate during 2012/2013.

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حصر التلوث البكتيرى فى المصادر المختلفه للمياه العذبه

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أجريت الاختبارات الميكروبيولوجيه على نوعين من المياه (مياه نهر النيل والمياه الجوفيه) فى مدن مختلفه من محافظه الغربيه خلال عامين ٢٠١٢-٢٠١٣ وذلك باجراء العد الكلى للعزلات البكتيريه حيث تم الحصول على حوالى ٦٠ عزله بكتيريه فى عينات المياه وذلك بتنميه العزلات البكتيريه على الاجار المغذى وبيئات متخصصه لاجناس أخرى مثل Staph ., Serratia , Proteus and Pantoae بالاضافه الى العد الكلى لهذه الاجناس وكانت النتائج المتحصل عليها تفوق اعداد البكتيريا فى فصل الصيف ومن جهه أخرى وجد ان الاجناس البكتيريه كان نموها أقل فى المياه الجوفيه