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معامل التأثير العربي 1.5
العدد 19

مجلة التربوي

مجلة علمية محكمة تصدر عن كلية التربية

جامعة المرقب

العدد التاسع عشر

يوليو 2021م

- **المجلة ترحب بما يرد عليها من أبحاث وعلى استعداد لنشرها بعد التحكيم .**
- **المجلة تحترم كل الاحترام آراء المحكمين وتعمل بمقتضاها .**
- **كافة الآراء والأفكار المنشورة تعبر عن آراء أصحابها ولا تتحمل المجلة تبعاتها .**
- **يتحمل الباحث مسؤولية الأمانة العلمية وهو المسؤول عما ينشر له .**
- **البحوث المقدمة للنشر لا ترد لأصحابها نشرت أو لم تنشر .**

ضوابط النشر:

يشترط في البحوث العلمية المقدمة للنشر أن يراعى فيها ما يأتي :

- أصول البحث العلمي وقواعده .
- ألا تكون المادة العلمية قد سبق نشرها أو كانت جزءا من رسالة علمية .
- يرفق بالبحث تزكية لغوية وفق أنموذج معد .
- تعدل البحوث المقبولة وتصحح وفق ما يراه المحكمون .
- التزام الباحث بالضوابط التي وضعتها المجلة من عدد الصفحات ، ونوع الخط ورقمه ، والفترات الزمنية الممنوحة للتعديل ، وما يستجد من ضوابط تضعها المجلة مستقبلا .

تنبيهات :

- للمجلة الحق في تعديل البحث أو طلب تعديله أو رفضه .
- يخضع البحث في النشر لأولويات المجلة وسياستها .
- البحوث المنشورة تعبر عن وجهة نظر أصحابها ، ولا تعبر عن وجهة نظر المجلة .

Information for authors

1- Authors of the articles being accepted are required to respect the regulations and the rules of the scientific research.
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Comparison of Different Indicators for Groundwater Contamination by Seawater Intrusion on the Khoms city, Libya

Abdulrhman Mohamed Egnebr
Department of Chemistry ,faculty of Art and Science \ Masallate, Elmergib university
Abdooo198642@gmail.com

الملخص

ثم اختيار عدد عشرة عينات من الشرق الي الغرب في اتجاه المجاور للبحر وعدد تسعة ابار من الشمال الي الجنوب في اتجاه عمودي من البحر لعدد من ابار المياه الجوفية بمنطقة الخمس الواقعة بالشمال الغربي من ليبيا وتم اخذ العينات لمدة ثلاثة اشهر متتالية من نفس البئروخضعت للتحاليل الفيزيائية والكيميائية

وعند مقارنة النتائج المتحصل عليها من عينات المأخودة باتجاه الشرق الي الغرب باتجاه المجاورللبحر مع نتائج الشمال الي الجنوب باتجاه عمودي من البحر لوحظ بان المتغيرات الكيميائية التي تتضمن الحموضة والاملاح الكلية الذائبة والكلوريد والكبريتات والبيكربونات والنيترات والصوديوم والبوتاسيوم والماغنيسيوم والكالسيوم تتميز بارتفاع لبعض الكاتيونات والانيونات وخصوصا في الابار القريبة من البحر في الاتجاه المجاور للبحر.

ABSTRACT

Ten wells were chosen in east-west trend and nine wells were chosen in north south of ground water well samples at AL- Khoms region north west of libya. . Water sampling was done on a monthly basis for three months starting from April till June. The study covered the average analysis of physical and chemical parameters.

When the present result are comprised east-west trend with the vertical trend, number of ten ground water samples at the east-west trend and nine ground water samples at the nor-west trend were analyzed for th eir chemical characteristics including pH, total dissolved solids (TDS), chloride, sulphate, bicarbonate,nitrate, sodium, potassium, magnesium and calcium content. High concentrations of some cations and anions were observed specialty in wells near the sea at the east-west trend. An over-reliance on ground water to meet an ever-increasing water demand has resulted in an excessive depletion of the fresh ground water stock and the situation is being exacerbated by seawater intrusion.

KEYWORDS: *Libya, ground water, seawater, intrusion, salinity.*

INTRODUCTION

Sea water intrusion into coastal aquifers leads to impairment of the quality of the fresh water aquifers. The extent of saline water intrusion is influenced by nature of geological settings, hydraulic gradient, rate of groundwater withdrawal and its recharge **[1-3].**
The intrusion of seawater to groundwater system has recently emerged as a serious problem damaging ground water systems, in Libya. This problem is triggered by the compulsive consumption of ground water in domestic, agricultural, and industrial applications, **[4-7].** Seawater intrusion (or salt-water intrusion) is the underground flow of seawater into freshwater wells and aquifers. Seawater intrusion is limited to aquifers where groundwater and seawater are in hydraulic continuity. Freshwater has lower density than Seawater and floats on top of it. The interface between the two bulks is not distinctive boarder; it is a mixture of fresh and salt water (saline water). The shape of the interface is established by the hydrodynamic balance along the contact plan. This interface has an inclination towards land and its toe intersects with the bottom of the aquifer **[8-11].**

MATERIALS AND METHODS

Study Area:

This work was carried out at khoms district which has 20 km coastal stretch on the south shoreline of the Mediterranean sea, It is bounded by Wadi Libda from the northwest, and Wadi Kaam from southeast and googase region from southeast. Ten wells were chosen in east-west trend and nine wells were chosen in north-south trend The wells between latitudes 32o 22` and 32o 37` N and longitudes 14o 11` and 14o 26` E. Water sampling was done on a monthly basis for three months starting from April till June 2012. To monitor the existing study, we obtain map of the area under investigation. Fig(1) shows the area that covered by our study, which was obtained from Google.

Fig(1):Map of the area under consideration.

Experimental work:

Fifty seven groundwater samples were collected from 19 wells, water was sampled on a monthly basis, during three months starting from April till June. 57 samples were taken from Khoms city from different sits, the pH were measured for Water samples using pH-meter type HANNA model HI8014, and electric conductivity E C values were measuresd using E C meter model 4520. The total dissolved solids (TDS) were weighted after sample evaporation. Chloride, carbonate, sulphate bicarbonate, calcium and magnesium were determined according to Adams[1990], while sodium and potassium were measured by using flame photometer type JENWAY model PFP7, Phosphide ion were measured by UV Visible Spectrophotometer from varian Company, USA, at wavelength 400nm using Planck detector.

RESULTS AND DISCUSSION:

- Statiscal analysis of wells samples three months at the vertical trend and the horizontal trend.

Table (1): Results of wells samples three months at the vertical trend and the horizontal trend

Sample collection period months at the vertical trend and the horizontal trend									
		the horizontal trend				the vertical trend			
TEST	Unit	Average	Std.Deviation ±	Minimum	Maximum	Average	Std.Deviation ±	Minimum	Maximum
TDS	ppm	4229	1692.2	2222	8975	2709	854.74	1425	4788
Cl^-	ppm	1465.2	695.8	701.5	3305.1	744.2	388.1	46	1753.7
SO_4^{2-}	ppm	1018.8	494.7	408.7	2304.5	607.8	222.26	232	1225.4
HCO_3^-	ppm	393.6	119.3	235.5	756.4	286.4	35.4	252	351.4
Na^+	ppm	909.1	421.2	424.2	2110.8	566.8	244.9	32	1133
K^+	ppm	19.19	8.5	7.9	51.6	12.5	3.9	5.8	21.2
TH		1586	802	842	3780	925	193.9	654	1330
Mg^{2+}	ppm	246.8	167.7	81.9	674.6	113.4	42.4	49.9	204.8
Ca^{2+}	ppm	184.7	21.1	131.4	213.3	189.8	15.15	152.4	222.9
pH	----	7.4	0.23	6.9	7.8	7.7	0.271	7.19	8.18
P_3^-	ppm	0.791	0.792	0.019	2.926	1.29	3.49	0.013	14.26
PO_4^{3-}	ppm	2.4	2.5	0.05	8.9	3.9	8.9	0.2	43.7
Salinity	ppm	3.4	1.43	1.7	6.6	2.1	0.79	1.1	3.8
E.C	ms/cm	6009	2508.9	1260	12070	4064	1273.57	2530	7000

*All concentrations are measured in ppm, pH unit, electrical conductivity in µS/cm

Total dissolved solids

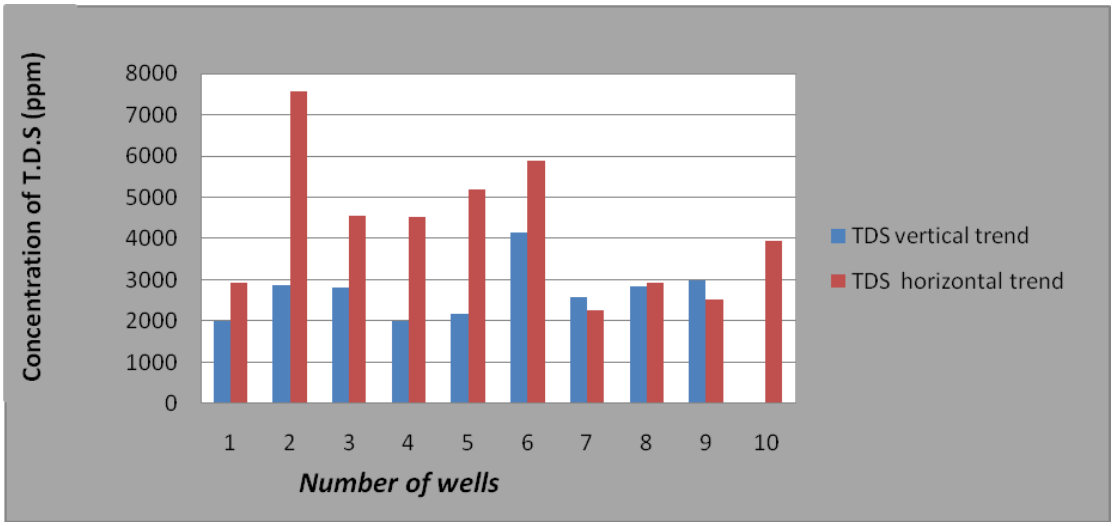

Fig (2): Shows T.D.S values for all water samples

Figure 28 shows the TDS value in the area's ground water. TDS concentration varied between (8975-2222)ppm landward of the study area in vertical trend, (4788-1592)ppm, near the Mediterranean Sea in horizontal trend and The concentration of TDS content indicates a gradual decrease in TDS concentration landward.

Comparing the horizontal trend TDS values with the vertical trend TDS values, TDS content increased significantly through the horizontal trend (4788-1592)ppm. This could be attributed to seawater intrusion that is triggered by the increased consumption of ground water and near the Mediterranean Sea in horizontal trend.

Chloride Ion

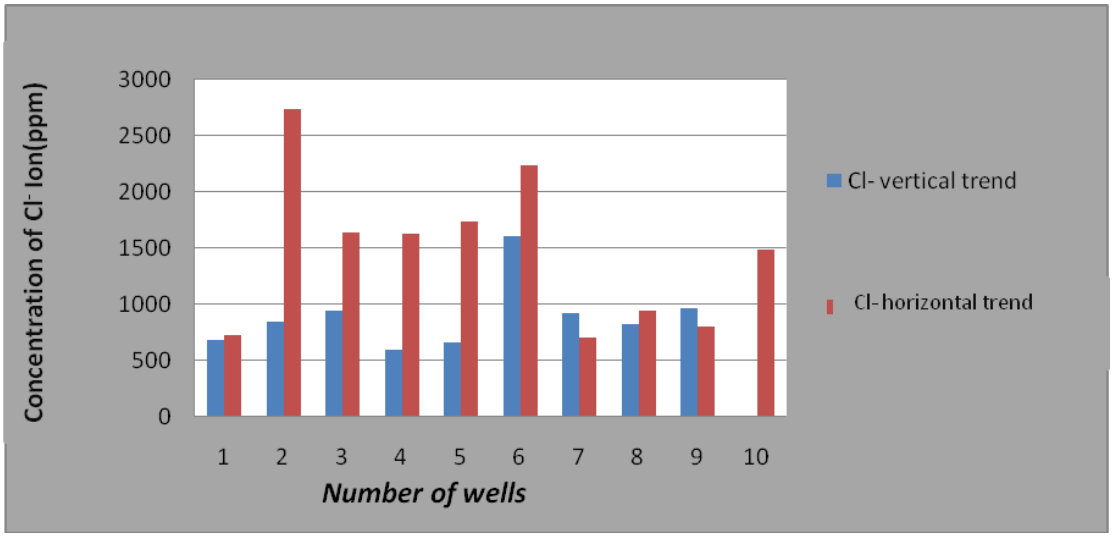

Fig (3): Shows Chloride ion concentration for all water samples Shows

The variation of chloride content is represented in Figure 29 It has a similar profile to that of TDS. It shows that, chloride concentration varies between (3305.1-701.5) ppm landward of the study area in vertical trend and (1753.7-50.9)ppm near the Mediterranean Sea in the horizontal trend.The horizontal trend chloride value (3305.1-701.5)ppm is much higher than the vertical trend chloride value (1753.7-50.9)ppm . Which due to wells located far from coast and depth of the study area in the vertical trend.

Sulphate Ion

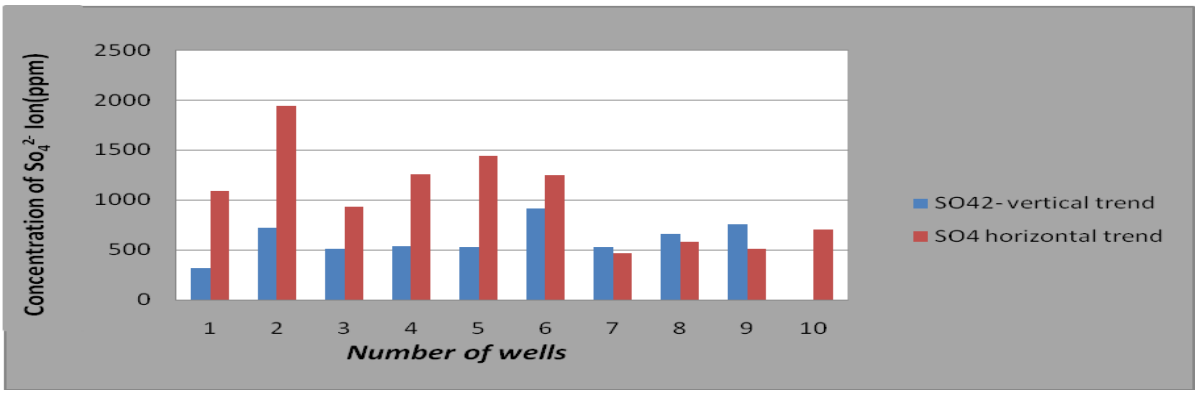

Fig (4): Shows Sulphate ion Concentration for all water samples

Sulphate constitutes the second predominant anion after chloride and varies in content between (2304.5-408.7) ppm near the Mediterranean Sea in the horizontal trend . and (1225.4-257.4)ppm landward in vertical trend of the study area (Table3 & Fig 30). sulphate enrichment is associated with TDS rise. The The horizontal trend sulphate content (2304.5-408.7) ppm is much higher than the vertical trend sulphate content(1225.4-257.4)ppm.

Bicarbonate Ion

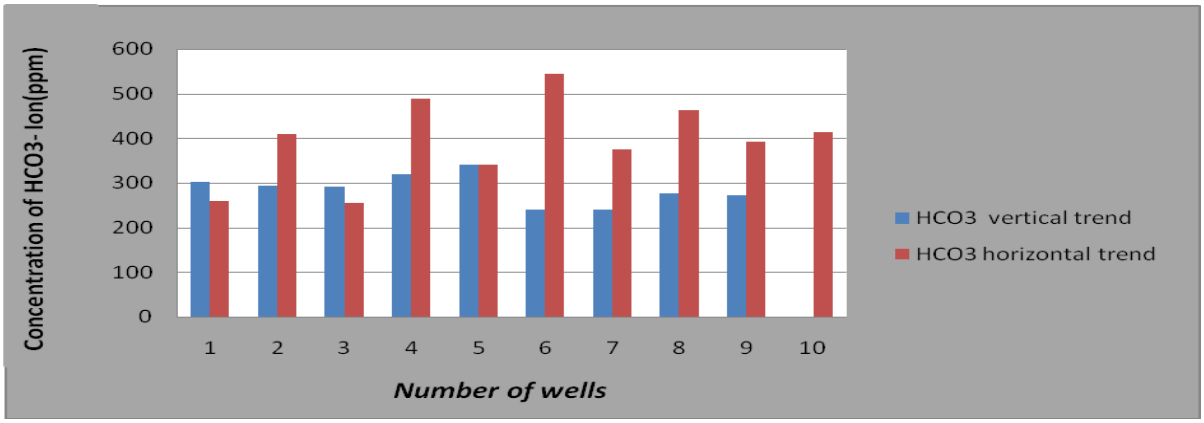

Fig (5): Shows Bicarbonate ion concentration for all water samples

The studied water wells show low contents of bicarbonate and lack carbonate ion. Bicarbonate concentration ranges between (756.4-235.5)ppm at the horizontal trend of the study area and (351.4-229.4)ppm at the vertical trend (Table 3 & Fig 31). The higher value of bicarbonate content at the horizontal trend of the study area may be attributed to local calcareous water bearing sediments.

Sodium Ion

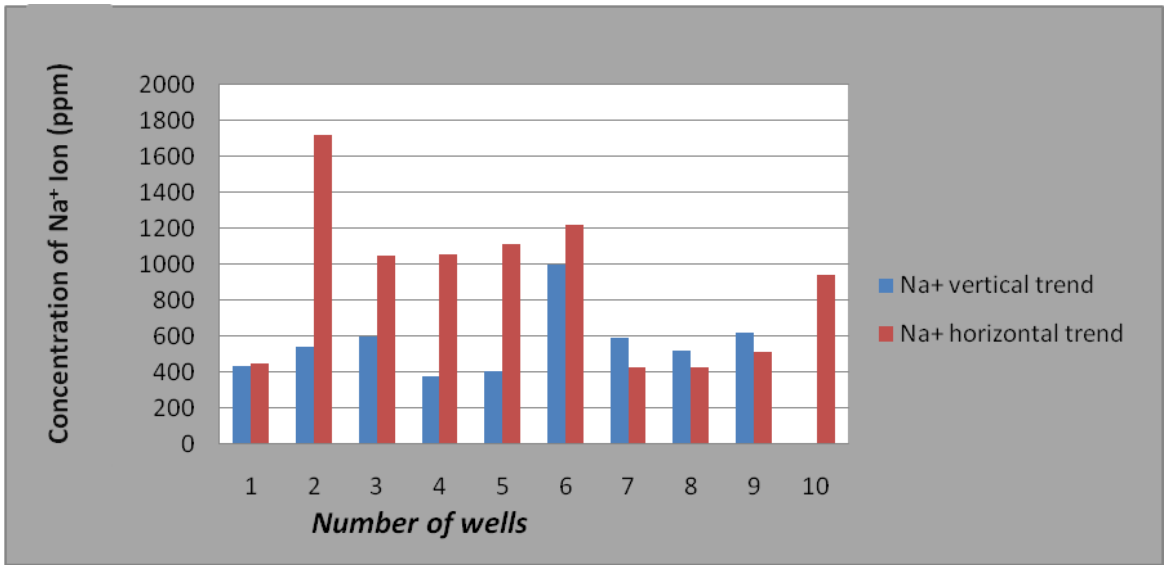

Fig (6): Shows Na^+ values for all water samples

Sodium concentration ranges between (2110.8-424.2)ppm near the Mediterranean Sea in the horizontal trend and (1133-30.8)ppm at the vertical trend of the study area (Table 3 & Fig 32). figure of sodium content shows a gradual decrease landward (Fig 32). The horizontal trend sodium content is higher than the vertical trend (1133-30.8)ppm.
which is wells located far from coast and depth at the vertical trend of the study area.

Potassium Ion

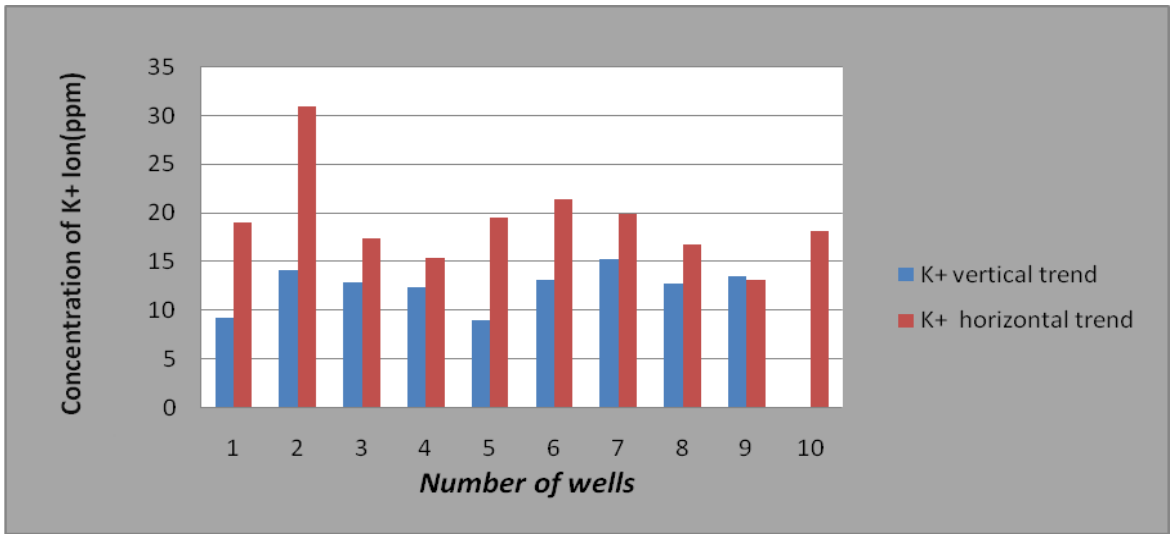

Fig (7): Shows Concentration Potassium Ion for all water samples

Potassium content is generally lower than that of sodium. The potassium content ranges between (51.6-7.9)ppm30.93 ppm near the Mediterranean Sea at the horizontal trend and

(21.2-5.8)ppm at the vertical trend of the study area (Table 3 & Fig 33). Generally, potassium content is rather similar to that of sodium content (Figs 32 and 33) .

Magnesium Ion

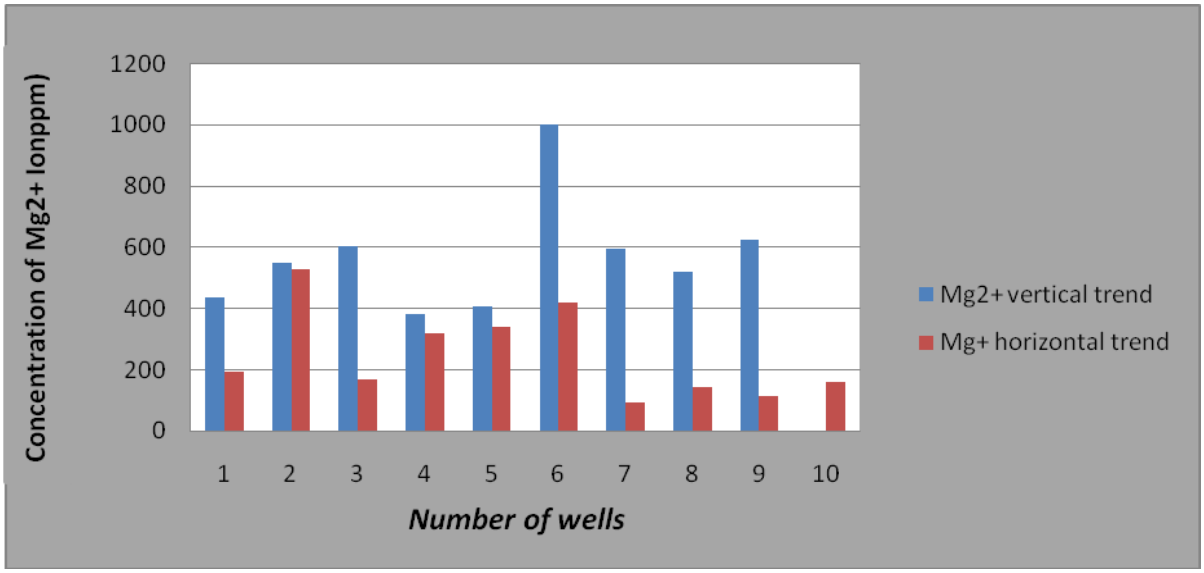

Fig (8): Shows Concentration of Mg^{+2} ion for all water samples Shows

Magnesium content varies between (674.6-81.9)ppm near the Mediterranean Sea at the horizontal trend and (204.8-49.9) ppm at the vertical trend of the study area (Table 3 & Fig 34).

Calcium Ion

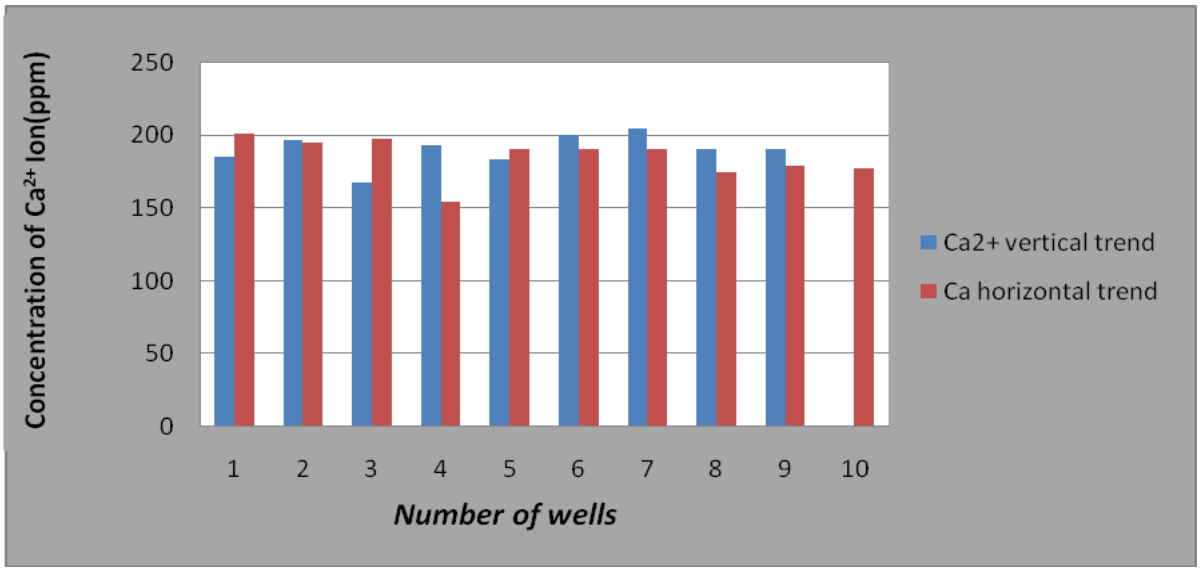

Fig (9): Shows Calcium ion concentration for all water samples Shows

Calcium content varies between (213.3-131.4)ppm near the Mediterranean Sea at the horizontal trend and (222.9-152.4)ppm at the vertical trend of the study area Table (3). The figure of calcium content shows decrease in calcium content toward the Mediterranean Sea

Fig (35). This may give an indication about its source mainly from the land. The high values of calcium may be related to the lithology of water–bearing sediments and surface calcareous materials which is dominant along the study area.

Acidity and basity of samples (PH-Value)

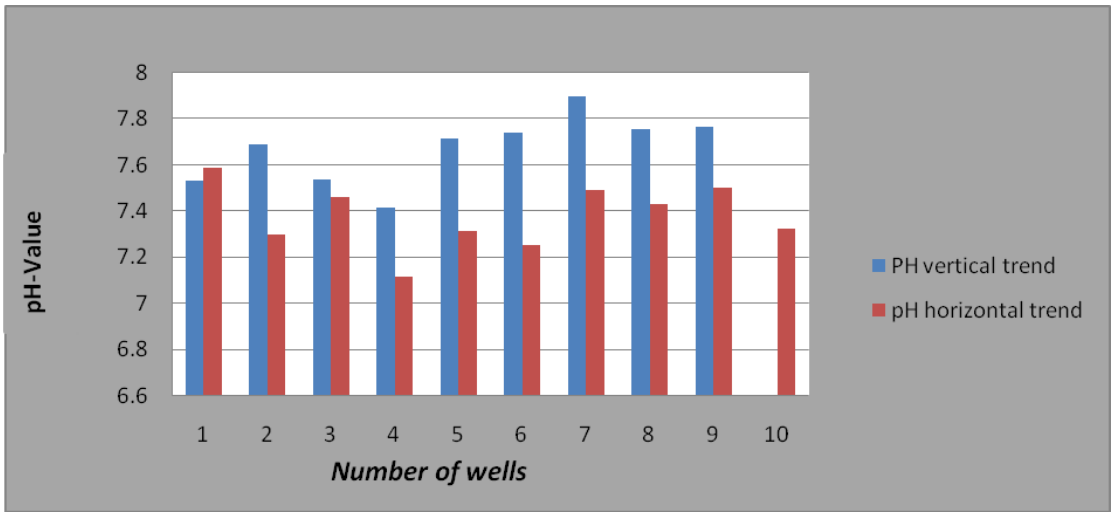

Fig (10): Fig (3.1.4): Shows pH values for all water samples

The pH values of the collected samples range between 7.8-6.9 at the horizontal trend and 8.18-7.19 at the vertical trend of the study area (Table 3). The pH values across the study area Fig 36 indicate that, the ground water is dominantly alkalineand becomes acidic near the Mediterranean Sea at the horizontal trend. This may give indication that, the TDS is not the single factor affecting the pH value of the studied ground water and may be attributed to the recharging of the ground water by rainfall, which is relatively high in the study area.

Electrical Conductivity(EC)

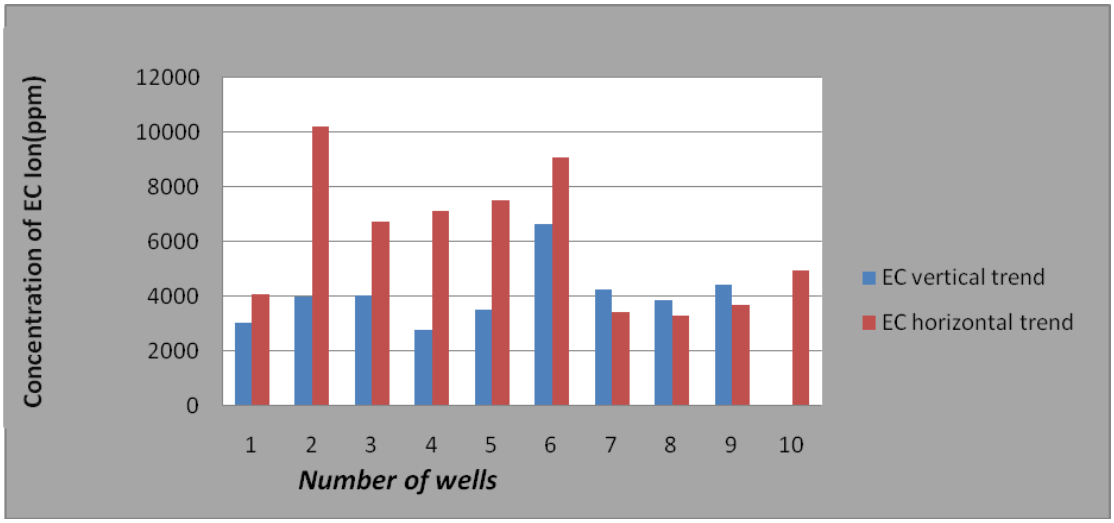

Fig (11): Shows EC values for all water samples

E.C values are listed in table 3 and their values across the study area is shown in Fig 37. The ground water show high E.C values ranging between (12070-1260)µS/cm, near the Mediterranean Sea at the horizontal trend, and (7000-2530) µS/cm at the vertical trend of the study area.

Phosphide ion

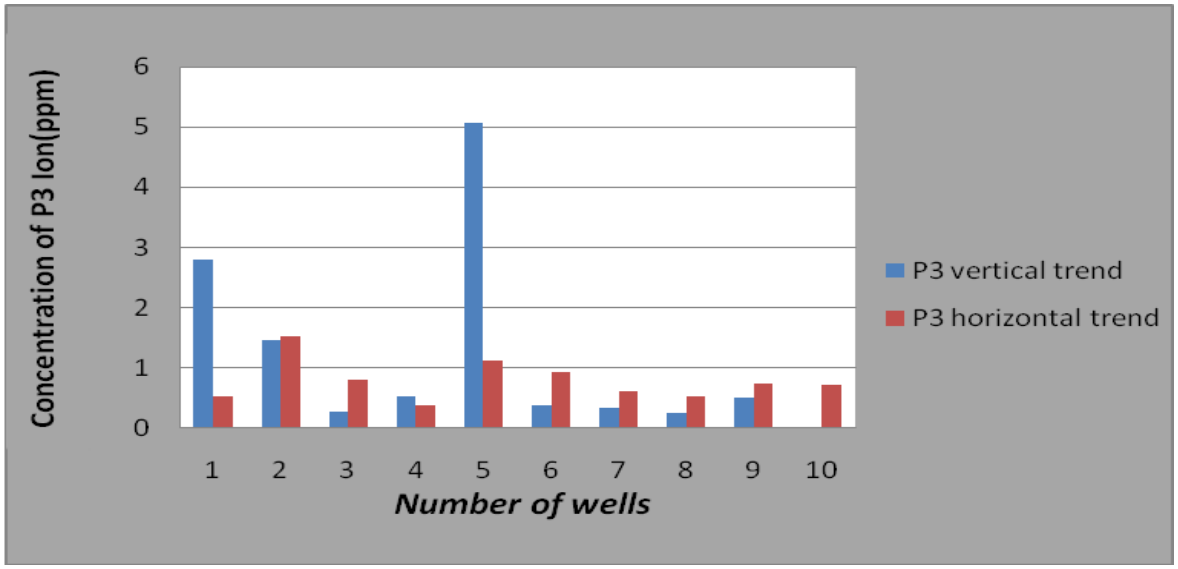

Fig (12): Phosphide ion content varies between (2.926-0.019)ppm near the Mediterranean Sea at the horizontal trend and (14.26-0.013)ppm at the vertical trend of the study area (Table 3 & Fig 38).

Phosphate ion

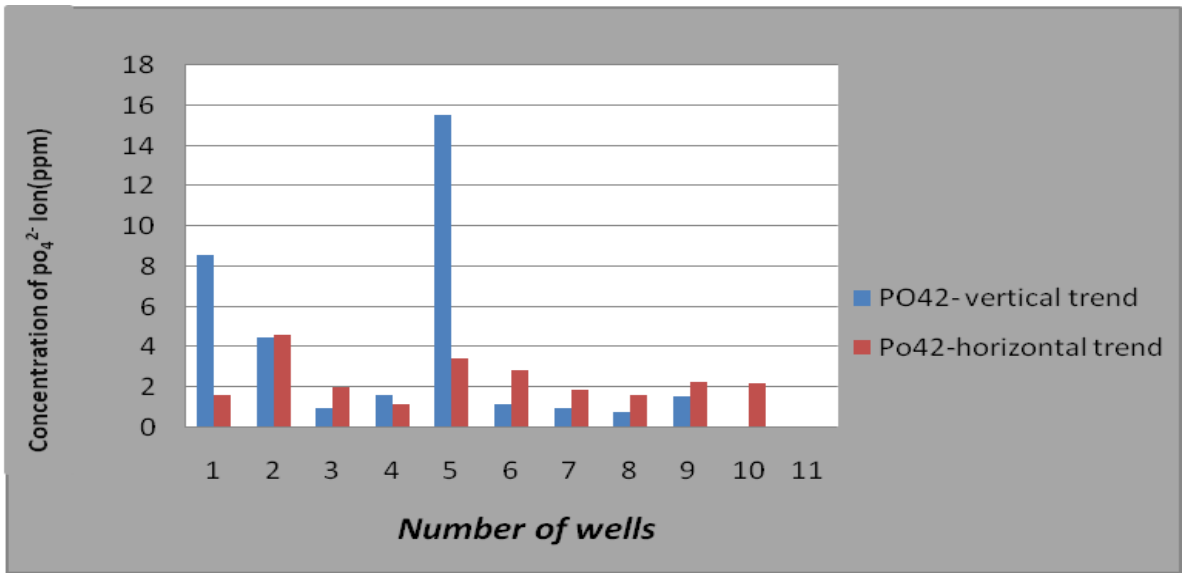

Fig (13): Phosphate ion content varies between (8.9-0.05)ppm near the Mediterranean Sea at the horizontal trend and (43.7-0.2)ppm at the vertical trend of the study area (Table 3 & Fig 39). Since it is calculated from P_3^-.

salinity

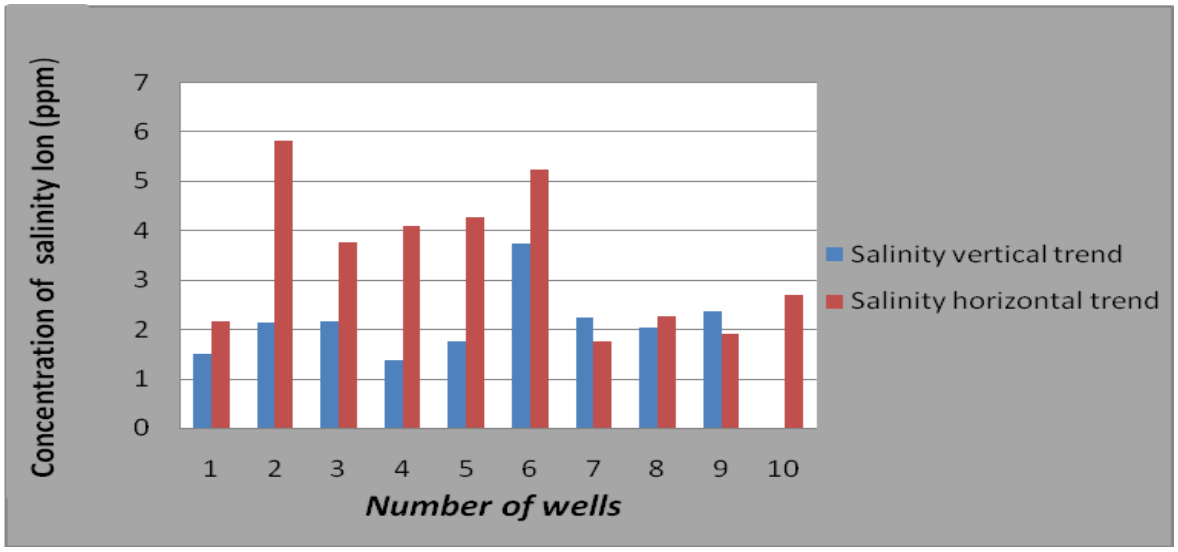

Figure 14: PO_4^{3-}value showed also an increasing trend during the whole period of observation at the horizontal trend of the study area.

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