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MONITORING OF SOME SOIL MICROBES AND THEIR RELATIONSHIP TO SOIL SALINITY IN AL-HAMOUL REGION-KAFR EL-SHEIKH GOVERNORATE

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ABSTRACT

The soil samples were collected from the west to east side of the region. Most of the collected soil samples were highly saline, but salinity levels decreased as we headed east. The EC values ranged from ٤٠١٤ t٠ ٢٦,١٦. The viable counts of *R. leguminosarum* bv*. viceae, R. leguminosarum* bv*. trifolii* and *Azotobacte*r varied through different sites,they ranged from log to log ٥,٨٤; log ٢,٣٩ to ٥,٨٤; log ٢,٢٣ to ٤,٢٦, respectively and the variations between readings were ,sometimes, significant. But, there were no significant correlations between the estimated bacterial types and soil salinity. Total bacterial readings, however, showed high values, but, lowered in soil samples collected from the west sites.These bacterial counts were decreased as we headed east. They ranged from log ٧,٣٦ to log ٩,٤٦. However, there was no significant correlation between bacterial counts and soil salinity.

INTRODUCTION

Al-Hamool district located at North Delta region Kafr-El-Sheikh Governorate (٣١° ١٥' ٣٥" N , ٣١° ٩' ٣٦" E), bounded from the North by Baltim and Burollos lake, from the South Bialla and Kafr-El-Sheikh Centers, from the East Bialla Center and from the West Kafr-El-Sheikh and Al-Riad Centers. The agricultural area was about ٢٠٠،٠٠٠ feddan and called Al-Hamool due to large growth of *Cuscuta epithymum* parasite plant (Hamoul). The lands of this area are newly reclaimed, some of which have low or moderate productivity and others still under reclamation. Its soils are saline and/or alkaline with varied degrees. The most problems of this area are salinity, alkalinity, low soil fertility and scarcity of low quality of irrigation water as this area is located at the end of irrigation and drainage canals. The fields have been irrigated with mixed polluted water composed from clean (Tera canal) and drainage water; sewage, industrial and agricultural (Ketchener drainage canal) with ratio of ١:١. This water is of low quality. Some of the fields irrigated totally with drainage water and others do not get enough water and suffer from drought.

A number of bacterial species belonging to genera *Azospirillum*, *Alcaligenes*, *Arthrobacter, Acinetobacter, Bacillus, Burkholderia, Enterobacter, Erwinia, Flavobacterium, Pseudomonas, Rhizobium and Serratia* are associated with the plant rhizosphere and are able to exert a beneficial effect on plant growth (Egamberdiyeva, ٢٠٠٥ and Tilak *et al.*, ٢٠٠٥). Utilization of plant growth promoting rhizobacteria (PGPR) in order to increase the productivity may be a viable alternative to organic fertilizers which also helps in reducing the pollution and preserving the environment in the spirit of an ecological agriculture (Stefan *et al.*, ٢٠٠٨). Thus rhizospheric bacteria can be a promising source for plant growth promoting agent in agriculture and are commonly used as inoculants for improving the growth and yield of agricultural crops(Chaiharn *et al.*, ٢٠٠٨). Biological nitrogen fixation contributes ١٨٠ X $١٠^{٦}$ metric tons/year globally, out of which symbiotic associations' produces ٨٠٪ and the rest comes from free-living or associative systems (Graham, ١٩٨٨).These include symbiotic nitrogen fixing ($N_{٢}$-fixing) forms, viz. *Rhizobium*, the obligate symbionts in leguminous plants and Frankia in non-leguminous trees, and non-symbiotic (free-living, associative or endophytic) $N_{٢}$-fixing forms such as cyanobacteria, *Azospirillum* and *Azotobacter*.

Agricultural crops are exposed to many stresses that are induced by both biotic and abiotic factors. These stresses decrease yields of crops and represent barriers to the introduction of crop plants into areas that are not suitable for crop cultivation. The occurrence and activity of soil microorganisms are affected by a variety of environmental factors as well as plant-related factors (species, age). Abiotic stress factors include high and low temperature, salinity, drought, flooding, ultraviolet light, air pollution (ozone) and heavy metals. The yield losses associated with abiotic stresses can reach ٥٠٪ to ٨٢٪, depending on the crop. In many semi-arid and arid regions of the world, crop yield is limited due to increasing salinity of irrigation water as well as soil salinity. The inoculation of salt-stressed plants with PGPR strains alleviates the salinity stress in plants. Soil salinity is one of the most severe factors limiting nodulation, yield and physiological response in soybean. An increase in salinity in the soil causes a physiological response or disorder in lettuce plants (Han and Lee, ٢٠٠٥). The long-term goal of improving plant–microbe interactions for salinity affected fields and crop productivity can be met with an understanding of the mechanism of osmoadaptation in *Azospirillum* sp. The synthesis and activity of nitrogenases in *A. brasilense* is inhibited by salinity stress (Tripathi *et al.*, ٢٠٠٢). They reported that in *Azospirillum* sp. there is an accumulation of compatible solutes such as glutamate, proline, glycine betaine and trehalose in response to salinity/osmolarity; proline plays a major role in osmoadaptation through increase in osmotic stress that shifts the dominant osmolyte from glutamate to proline in *A. brasilense*. *Azospirillum*-inoculated sorghum plants had more water content, higher water potential, and lower canopy temperature in their foliage. Hence, they were less drought-stressed than noninoculated plants(Saleena *et al.*, ٢٠٠٢). The PGPR containing ACC deaminase (١-aminocyclopropane-١-carboxylate) are present in various soils and offer promise as a bacterial inoculum for improvement of plant growth, particularly under unfavourable environmental conditions such as flooding, heavy metals, phytopathogens, drought and high salt. Ethylene is an important phytohormone, but over-produced ethylene under stressful conditions can result in the inhibition of plant growth or death, especially for seedlings. PGPR containing ACC deaminase can hydrolyze ACC, the immediate precursor of ethylene, to F-ketobutarate and ammonia, and in this way promote plant growth. Inoculation of crops with ACC deaminase-containing PGPR may assist plant growth by alleviating deleterious effects of salt stress ethylene (Belimov *et al.*, ٢٠٠١).

Microbial density in soil usually are correlated with organic matter percentage and sometimes biological inoculants such as $N_{٢}$-fixing and phosphate-dissolving bacteria (Nour El-Din and Talha, ٢٠١١). They found, in long term experiment, that compost addition and inoculation with $N_{٢}$-fixing and phosphate-dissolving bacteria enhanced soil organic matter percentage and available N,P and K contents. Miransari (٢٠١٠), also claimed that biological fertilization caused increase of N and P as well as microelements in soil. On the other hand, there are some factors like salinity and heavy metals pollution negatively affecting microbial density of soil which may reflected on soil organic matter and nutrient contents.

The aim of the present investigation is the monitoring of viable counts of total bacteria, *R*. *leguminosarum* bv. *viceae*, *R*. *leguminosarum* bv. *trifolii* and *Azotobacter* in rhizosphere soil of Al-Hamoul Center, Kafr-El-Sheikh Governorate and their relationship with salinity level of soil, in order to give us an indicator for the soil quality and fertility.

MATERIALS AND METHODS

Materials:

Microbial media:

Medium ١ for counting of *Azotobacter*: Vancura and Mucura (١٩٦٠), it composed of sucrose, ٣٠ g; $K_{٢}HPO_{٤}$, ٠,١٦ g; NaCl, ٠,٢ g; $MgSO_{٤}$-٧$H_{٢}O$, ٠,٢ g; $CaCO_{٣}$, ٢,٠ g; $FeSO_{٤}$, ٠,٠٥ g; $Na_{٢}MO_{٤}$, ٠,٠٠٥ g; $NaBO_{٤}$, ٠,٠٠٥ g and distilled water, ١ liter.

Medium ٢: for total counting of bacteria (Allen, ١٩٥٩)

Glucose, ١٥,٠ g; $K_{٢}HPO_{٤}$, ١.٠g; soil extract, ١٠٠ ml; distilled water, ٩٠٠ ml, agar, ١٥ g; pH adjusted at ٦,٨- ٧,٠. Autoclaved at ١٢١° C for ١٥ min.

Soil extract:

Soil extract is prepared by heating ١٠٠٠ g of grinding soil with ١٠٠٠ ml of tap water in the autoclave for ٣٠ minuts. A small amount of calcium carbonate (٢,٥ g/l) is added on the soil suspension and filtered through a double paper filter. The filtrate was divided into quantities each equal ١٠٠ ml and then sterilized.

Methodes:

Site of samples: soil and plant (faba bean and Egyptian clover) samples sites were determined using the detailed spatial map of Al-Hamool district, as the samples designed every ٢ km with the rate of one composite sample per ٢٥٠ $km^{٢}$.

Soil sampling: Using spade, the soil bulk around the plant (٣٠cm depth) was removed and backed in plastic bags. Three faba bean samples were taken from each field and other three samples of *Trifolium Alexandrinum* were bring as possible from the same site. Different microbial groups were counted (total count of bacteria, *Azotobacter R. leguminosarum* biovar *viceae and R. leguminosarum* biovar *trifolii*).

***R. leguminosarum* biovar *viceae and R. leguminosarum* biovar *trifolii* count in soil**: The counting was done using MPN technique reported by Somasegaran an Hoben (١٩٨٥).

***Azotobacter* count:** MPN method, using medium of Vancura and Mucura (١٩٦٠) was performed according to Allen (١٩٥٩).

Total count of bacteria:

Soil extract solidified medium was poured in Petri dishes, then inoculated with the appropriate dilutions of the soil samples and incubated at ٢٨°C for three days. The appeared colonies were counted and the count per ١ g air dry soil was calculate as reported by Allen, (١٩٥٩).

EC: EC of soils were estimated according to Richards (١٩٥٤).

Statistical analysis:

Data obtained were subjected to the analysis of variance and treatment means were compared using the L.S.D methods according to Steel and Torrie (١٩٨٠).

RESULTS AND DISCUSSION

Through monitoring EC values (dS/m) for soils of many villages of Al-Hamoul Center, Kafr El-Sheikh Governorate (Table ١), it is noted that most of soil samples brought about from the Eastern villages recorded higher EC values (the first ٢٠ sample), and their EC values ranged from ٧,٤٠ to ١٢,٧١ dS/m. However, the EC values of the collected samples lowered with the direction of west, the EC values of the following twenty western sites ranged from ٤,٣٥ to ١٠,٦٠ dS/m except for two sites (No. ٣٥ and ٣٦) which were estimated as ٢٦,١٦ and ٢٣,٦٥ dS/m respectively. The following last twenty samples from the western direction recorded the lowest EC values, ranged from ٤,١٦ to ٧,١١ dS/m except the sites No. ٥٢ and ٥٣ which was of relatively high records (٩,٧ and ١٠,٣٢ dS/m).

The Al-Hamoul region consider from the sites under reclamation in Kafr El-Sheikh Governorate. Soil of some locations were reclaimed and others still had high salinity nature. The west site is the nearest from Al-bourolos Lake and most of its fields used as fish cultures, and others recently used as agricultural fields. Therefore, salinity levels in this fields still high. With the progress toward east, the soils have been reclaimed and their EC values lowered except some fields that may be neglected by farmers. The main difficulty of reclamation of these soils is the use of drainage water in irrigation (Zein *et al.*, ٢٠٠٢).

The results of monitoring *R. leguminosarum* biovar *viceae* and *R. leguminosarum* biovar *trifolii* of Al-Hamoul soils relatively varied, and there are significant variations between most of these records (Table ٢ and ٣). However, there was no significant correlation between salinity levels of soil samples and log number of these microbes (Fig ١). The lowest monitored *R. leguminosarum* biovar *viceae* count was log ٤.٠٠ soil sample No. ٤٩, while, the highest count recorded log ٥,٨٤ which repeated frequently at many sites of the studied area. On the other hand, the lowest number of *R. leguminosarum* biovar *trifolii* (log ٢.٣٩) was recorded for soil sample No. ٢٤ and the highest value were ٥,٨٤ which recorded at many sites of the studied area.

The high counts of native *R. leguminosarum* biovar *viceae* and *R. leguminosarum* biovar *trifolii* may be attributed to continuous cultivation of faba bean and Egyptian berseem since long period, therefore the indigenous specific rhizobia spread and localized in soils of the region.

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The macro-symbiont plants brought from the region were well nodulated (not presented data) which explains the potentiality of these rhizobia for root infection and formation of nodules. Nour El-Din (١٩٩٧) reported that the fields had been cultivated with *Trifolium alexandrinum* or *Vicia faba* had high density of the specific native rhizobia. But, in the present study there were no significant correlation between the counts of the microsymbionts in the plants rhizosphere and the salinity levels of the soil samples. This may be attributed to two reasons: the first is the formation of mutations in the native rhizobial populations lead to presence of new salt tolerant strains potentially able to live effectively under these stress conditions (Zahran, ١٩٩٩). The second reason is that fields of this region had been irrigated with sewage water which have a lot of nutrients and organic matter, which enriched the soil and increased the soil water holding capacity (Mohammed, ٢٠١١). Wei *et al.* (١٩٨٥) claimed that sewage sludge application to agricultural soils is an economical way of disposal. It improves the physical characteristics of the soil and increases organic matter content and essential plant nutrients, in particular N and P (Ferreira *et al.*, ١٩٩٥). Sewage sludge contains numerous components required for microbial growth and may increase the activity of soil microorganisms (Speaker *et al.*, ١٩٨٨), including rhizobial growth. But, the heavy amounts of sewage amendments for long times may negatively affect $N_٢$-fixers effeciency which may attributed to high amounts of heavy metals (Chaudhary *et al.*, ٢٠٠٤) and increase amounts of nitrates (Obbard *et al.*, ١٩٩٣).

Azotobacter viable counts were more less numbers per gm of rhizosphere soil than *R. leguminosarum* biovar *viceae* and *R. leguminosarum* biovar *trifolii*, the counts ranged from log ٢ to log ٤,٢٦ (Table, ٤). As found for counts of *R. leguminosarum* biovar *viceae* and *R. leguminosarum* biovar *trifolii*, there was no positive correlation between the *Azotobacter* counts and salinity degrees (Fig, ١). In case of total bacteria, the counts increased as we head east of the province (Table ٥), whereas, the first ٢٠ samples brought about from the far west of the province (Al-Hamoul Center) mostly gave relatively low counts (less than log ٨), while most of the following ٢٠ samples toward east, recorded counts more than log ٨, but, the following ٢٠ samples toward east (from sample No. ٤١ to No. ٦٠) attained the highest numbers (mostly higher than log ٨,٧) and there were significant variation between most samples. However, there was no significant correlation between the bacterial counts and soil salinity levels. The lower viable counts of *Azotobacter* than rhizobial counts may be due to the direct contact of *Azotobacter* cells with salty and heavily polluted soils with heavy metals because of the irrigation with sewage water (Zein *et al.*, ٢٠٠٢). Rhizobia harbored within nodules gave them relative protection against salinity and heavy metals. On the other hand, extensive planting of the host macrosymbiont plants resulted in increase of the specific rhizobia in the soil. Total bacterial counts noted to be lower in soil of west sites which were close to Al-Brolos lake, and had no enough reclamation, therefore the soils still highly saline as shown in Table ١. The deleterious effect may result from sensitivity of some sensitive bacterial types to unfavorable conditions which may lead to decrease of total count.

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The total bacterial counts increased as we head east, this may be due to increase of reclamation efforts as we head east of the region.

CONCLUSION

Al-Hamoul region is of the locations recently reclaimed, thus, there were variations in its soils fertility. Monitoring of soil salinity and microbial biomass of these soils are of important which give us an indicator for soil quality and fertility. The survey indicated that most of west sites are highly in salin than the other sites of the region. The *R. leguminosarum* bv*. viceae*, *R. leguminosarum* bv*. trifolii* and *Azotobacter* were tolerant to salinity and other unfavorable environmental conditions. The total bacterial counts mostly varied. This area needs clean irrigation water and more effective reclamation processes to increase the economic value of unit area and improve living level of the inhabitants.

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رصد أعداد ميكروبات التربة المثبتة للازوت الجوي وعلاقتها ببعض خصائص التربة بمنطقة الحامول – محافظة كفرالشيخ

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يقع مركز الحامول بالمنطقة الشمالية الغربية من محافظة كفرالشيخ، وتبلغ مساحة الاراضي الصالحة للزراعة بالمركز حوالي ٢٠٠٠٠٠ فدان، وهذه الاراضي حديثة الاستصلاح، فمنها من تم استصلاحة والاخر مازال تحت الاستصلاح. وتقع أراضي مركز الحامول في نهاية الترع والمصارف، لذلك فانها تعاني من ندرة مياه الري النظيفة، وتروي هذه الاراضي اما بمياه الصرف (صحي وزراعي وصناعي) أو بالمياه المخلوطة من مياه ترعة بحر تيرة النظيفة ومياه مصرف كتشنر الملوثة والغير معالجة، مما يجعل الاراضي بهذه المنطقة تعاني من الملوحة والتلوث بالعناصر الثقيلة وكذلك الميكروبات الممرضة. لذلك فاننا نهدف في هذه الدراسة الي رصد لحالة التربة بهذه المنطقة من ناحية درجات ملوحتها واعداد بعض الميكروبات المهمة بمنطقة جذور نباتي البرسيم المسقاوي و الفول البلدي، كي تعطينا مؤشرا عن حالة هذه الاراضي و مدي خصوبتها.

كانت معظم العينات المجلوبة من مركز الحامول عالية الملوحة، وكانت ملوحة الاراضي تقل كلما اتجهنا ناحية الشرق، وقد وجد تباين في أعداد ميكروبات الازوتوباكتر و ريزوبيا الفول البلدي و ريزوبيا البرسيم المسقاوي من موقع الي اخر. وعلي الرغم من وجود هذه الاعداد بوفرة، فلم يظهر ارتباط معنوي بين هذه الاعداد و قيم ملوحة التربة . كانت اعداد البكتريا الكلية بالتربة كبيرة نسبيا، ولكنها كانت أقل كلما تجهنا ناحية الغرب. أيضا لم يوجد ارتباطا معنويا بين الاعداد الكلية للبكتيريا بالتربة و قيم الملوحة لها. لذلك فاننا نوصي بتوصيل مياه الري النظيفة لهذه المنطقة للتقليل من ملوحة الاراضي و زيادة انتاجيتها و كذلك تقليل تلوث الاراضي والمزروعات بالعناصر الثقيلة والميكروبات الممرضة بهدف حماية الصحة العامة زيادة انتاجية الفدان لهذه المنطقة المنكوبة.

قام بتحكيم البحث

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Table ١: Monitoring of soil samples EC, dS/m, (soil extract) collected from Al-Hamoul region.

Sample No.	Coordination		EC	Sample No.	Coordination		EC	Sample No.	Coordination		EC
	X	Y			X	Y			X	Y	
١	-	-	١٠,٨٦b-h	٢١	٣٦٣١٦٨٨١	٣٤٧٧٢٨١	٦,٤٥f-p	٤١	٣٦٣١٦٧١٣	٣٤٧٣٣٩٢ ٧M	٤,١٦p
٢	-	-	١٠,٧٥b-i	٢٢	٣٦٣١٥٩٩٦	٣٤٧٩٨٣١	١٠,٢٧b-l	٤٢	٣٦٣١٧٤٩٥	٣٤٧٤٠٨٤ ٠M	٣,٩١p
٣	-	-	١٣,٠٣bc	٢٣	٣٦٣١٣٨٧٤	٣٤٨٠٥٣٦	١١,١١b-g	٤٣	٣٦٣١٧٦٥٠	٣٤٧٥٢٨٤ ١M	٤,٢٣op
٤	-	-	١٢,٠٧b-e	٢٤	٣٦٣١٣٠٧٨	٣٤٨١٤٣٠	٧,٧٨c-p	٤٤	٣٦٣١٦٢٤٨	٣٤٧٥٩٠٨ ٣M	٥,٢٢i-p
٥	-	-	٩,٣٧b-p	٢٥	٣٦٣١٣٧٣٥	٣٤٥٨٦٨٤	٦,٦٩e-p	٤٥	٣٦٣١٧٨٦١	٣٤٧٨٦٠٣ ١M	٤,٣٥p
٦	-	-	٨,٨٩b-p	٢٦	٣٦٣١٤٨٧٨	٣٤٥٨٣٧٤	٦,٥٣f-p	٤٦	٣٦٣١٦١٣٠	٣٤٨٠١٧٥ ٠M	٤,١٦k-p
٧	-	-	١١,٤٨b-f	٢٧	٣٦٣١٧٦٦٨	٣٤٦٢٢٤٢	٦,٩٧e-p	٤٧	٣٦٣١٧٠١٩	٣٤٨١٢٧٨ ٠M	٤,٥٨m-p
٨	-	-	١١,٥٠b-f	٢٨	٣٦٣١٧٤٥٢	٣٤٦٣٨٨٠	٥,٧٦g-p	٤٨	٣٦٣١٥٩٣٧	٣٤٨٢١٢٧ ٠M	٤,٩٣k-p
٩	-	-	١١,٢٦b	٢٩	٣٦٣٢١٩٤٠	٣٤٦٣٤٨٩	٥,٦٣g-p	٤٩	٣٦٣١٥٣٦٤	٣٤٨٣٤٤٩ ٠M	٥,٠٠k-p
١٠	٣٦٣١٤٢٤٠	٣٤٦٠٤٩٨	١٣,٦٠bc	٣٠	٣٦٣٢٠٢٧٤	٣٤٦٧٩٠٦-٢M	٤,٩٣k-p	٥٠	٣٦٣١٦٢٤١	٣٤٨٢٨٣٠ ٠M	٦,٤٧f-p
١١	٣٦٣١٥٥٠٢	٣٤٦٥٨١٠	٧,٤٣d-p	٣١	٣٦٣١٨٩١٣	٣٤٦٧٩٥٥-٢M	٤,٨٠ l-p	٥١	٣٦٣١٧٦٥٩	٣٤٨٢٨٢٤ ١٤M	٧,١١e-p
١٢	٣٦٣١٥٥١٢	٣٤٦٧٤	٧,٤٠d-p	٣٢	٣٦٣١٨٠٦٨	٣٤٧٠٠٣٩-٠M	٤,٩٦k-p	٥٢	٣٦٣١٨١٠٤	٣٤٨٤٥٦٦ ٠M	٩,٧٠b-o
١٣	٣٦٣١٥٥٥٠	٣٤٦٨٤٦٦	٨,٤٢b-p	٣٣	٣٦٣١٧٣٤١	٣٤٧١٥٠٥	٤,٣٥nop	٥٣	٣٦٣١٨١٨٨	٣٤٨٦٧٢١ ٠M	١٠,٣٢b-k
١٤	٣٦٣١٤٦٠٢	٣٤٦٨١٢١	١٢,٠٣b-f	٣٤	٣٦٣١٧٢٨٤	٣٤٧٣٨٤١-١M	١٠,٦٠b-m	٥٤	٣٦٣١٨١٣٨	٣٤٨٦٧٢٠ ٠M	٦,٣٢f-p
١٥	٣٦٣١٤٢٢٠	٣٤٦٥٢٠٧	١٣,٣٦b	٣٥	٣٦٣١٧٧٠٥	٣٤٧٦٨٣١-٩M	٢٦,١٦a	٥٥	٣٦٣١٩٦٤٢	٣٤٥٩١٩٢ ٢M	٤,٩٦k-p
١٦	٣٦٣١٤٢٧٥	٣٤٦٩٧٥٣	١٢,٦٦bcd	٣٦	٣٦٣١٥٥٧٧	٣٤٧٦٣٣٢-٢M	٢٣,٦٥a	٥٦	٣٦٣٢٢٢٧٧	٣٤٦٠١٩٥ ٩M	٤,٦٥m-p
١٧	٣٦٣١٠٥٧٦	٣٤٧٢٢٦٥	١٢,٧١bcd	٣٧	٣٦٣١٦٤١١	٣٤٨١١٤٢-١M	٩,٧٩b-n	٥٧	٣٦٣٢٢١٨٠	٣٤٦٠١٩٥ ٠M	٤,٧٥m-p
١٨	٣٦٣٠٧٥٩٨	٣٤٧٢٤٩٩	٨,٠٦b-p	٣٨	٣٦٣١١٣٤٩	٣٤٧٧٧٦٤ ٠M	٦,٥٣f-p	٥٨	٣٦٣٢١١٧٩	٣٤٦٣١٧٠ ٠M	٤,٩٧k-p
١٩	٣٦٣١٧٠٩١	٣٤٧٣١١٧	٧,٧٠d-p	٣٩	٣٦٣١٢٥٣٩	٣٤٧٦٦١١ ٢M	٥,٣٥i-p	٥٩	٣٦٣٢١٨٤٧	٣٤٦٠٧٤٠ ٠M	٥,٤٢h-p
٢٠	٣٦٣١٧١٥٨	٣٣٤٧٤٩٢٨	٧,١٤e-p	٤٠	٣٦٣١٣٧٠٤	٣٤٧٥٥٢٢ ٠M	٥,١٩j-p	٦٠	٣٦٣٢١٦٦٣	٣٤٦١٨٠٢ ٣M	٤,٧٦ l-p

Means with different letters differ significantly at P < ٠,٠٥.
Coordenation: is the reading of X and Y taking by GPS device.

Table ٢: Monitoring number (log) of soil samples *R. leguminosarum* biovar *viceae* (R.V.) collected from Al-Hamoul region.

Sample No.	Coordination		R.V.	Sample No.	Coordination		R.V.	Sample No.	Coordination		R.V.
	X	Y			X	Y			X	Y	
١	-	-	٥,٣١c-f	٢١	٣٦٣١٦٨٨١	٣٤٧٧٢٨١	٥,٨٤abc	٤١	٣٦٣١٦٧١٣	٣٤٧٣٣٩٢ ٧M	٥,٠٢c-g
٢	-	-	٥,٣١c-f	٢٢	٣٦٣١٥٩٩٦	٣٤٧٩٨٣١	٥,٨٤abc	٤٢	٣٦٣١٧٤٩٥	٣٤٧٤٠٨٤ ٠M	٥,٠٢c-g
٣	-	-	٥,٨٤abc	٢٣	٣٦٣١٣٨٧٤	٣٤٨٠٥٣٦	٥,٨٤abc	٤٣	٣٦٣١٧٦٥٠	٣٤٧٥٢٨٤ ١M	٥,٠٤c-g
٤	-	-	٥,٨٤abc	٢٤	٣٦٣١٣٠٧٨	٣٤٨١٤٣٠	٥,٦٥bcd	٤٤	٣٦٣١٦٢٤٨	٣٤٧٥٩٠٨ ٣M	٥,٥٥b-e
٥	-	-	٥,٨٤abc	٢٥	٣٦٣١٣٧٣٥	٣٤٥٨٦٨٤	٥,٥٥b-e	٤٥	٣٦٣١٧٨٦١	٣٤٧٨٦٠٣ ١M	٥,٠٢c-g
٦	-	-	٥,٨٤abc	٢٦	٣٦٣١٤٨٧٨	٣٤٥٨٣٧٤	٥,٥٥b-e	٤٦	٣٦٣١٦١٣٠	٣٤٨٠١٧٥ ٠M	٥,٠٢c-g
٧	-	-	٥,٣١c-f	٢٧	٣٦٣١٧٦٦٨	٣٤٦٢٢٤٢	٤,٧٥d-g	٤٧	٣٦٣١٧٠١٩	٣٤٨١٢٧٨ ٠M	٥,٢٦c-g
٨	-	-	٥,٣١c-f	٢٨	٣٦٣١٧٤٥٢	٣٤٦٣٨٨٠	٤,٢٣fg	٤٨	٣٦٣١٥٩٣٧	٣٤٨٢١٢٧ ٠M	٤,٥١efg
٩	-	-	٥,٣١c-f	٢٩	٣٦٣٢١٩٤٠	٣٤٦٣٤٨٩	٥,٨٤abc	٤٩	٣٦٣١٥٣٦٤	٣٤٨٣٤٤٩ ٠M	٤,٠٠g
١٠	٣٦٣١٤٢٤٠	٣٦٣١٤٢٤٠	٥,٣١c-f	٣٠	٣٦٣٢٠٢٧٤	٣٤٦٧٩٠٦-٢M	٥,٨٤abc	٥٠	٣٦٣١٦٢٤١	٣٤٨٢٨٣٠ ٠M	٥,٠٤c-g
١١	٣٦٣١٥٥٠٢	٣٦٣١٥٥٠٢	٥,٨٤abc	٣١	٣٦٣١٨٩١٣	٣٤٦٧٩٥٥-٢M	٥,٨٤abc	٥١	٣٦٣١٧٦٥٩	٣٤٨٢٨٢٤ ١٤M	٥,٨٤abc
١٢	٣٦٣١٥٥١٢	٣٦٣١٥٥١٢	٥,٨٤abc	٣٢	٣٦٣١٨٠٦٨	٣٤٧٠٠٣٩-٠M	٥,٨٤abc	٥٢	٣٦٣١٨١٠٤	٣٤٨٤٥٦٦ ٠M	٥,٨٤abc
١٣	٣٦٣١٥٥٥٠	٣٦٣١٥٥٥٠	٥,٨٤abc	٣٣	٣٦٣١٧٣٤١	٣٤٧١٥٠٥	٥,٥٥b-e	٥٣	٣٦٣١٨١٨٨	٣٤٨٦٧٢١ ٠M	٥,٨٤abc
١٤	٣٦٣١٤٦٠٢	٣٦٣١٤٦٠٢	٥,٠٤c-f	٣٤	٣٦٣١٧٢٨٤	٣٤٧٣٨٤١-١M	٥,٢٦c-f	٥٤	٣٦٣١٨١٣٨	٣٤٨٦٧٢٠ ٠M	٥,٨٤abc
١٥	٣٦٣١٤٢٢٠	٣٦٣١٤٢٢٠	٤,٥٤c-g	٣٥	٣٦٣١٧٧٠٥	٣٤٧٦٨٣١-٩M	٥,٥٥b-e	٥٥	٣٦٣١٩٦٤٢	٣٤٥٩١٩٢ ٢M	٥,٨٤abc
١٦	٣٦٣١٤٢٧٥	٣٦٣١٤٢٧٥	٤,٨٢c-g	٣٦	٣٦٣١٥٥٧٧	٣٤٧٦٣٣٢-٢M	٥,٨٤abc	٥٦	٣٦٣٢٢٢٧٧	٣٤٦٠١٩٥ ٩M	٥,٨٤abc
١٧	٣٦٣١٠٥٧٦	٣٦٣١٠٥٧٦	٥,٣١c-f	٣٧	٣٦٣١٦٤١١	٣٤٨١١٤٢-١M	٥,٠٤c-g	٥٧	٣٦٣٢٢١٨٠	٣٤٦٠١٩٥ ٠M	٥,٨٤abc
١٨	٣٦٣٠٧٥٩٨	٣٦٣٠٧٥٩٨	٥,٠٤c-g	٣٨	٣٦٣١١٣٤٩	٣٤٧٧٧٦٤ ٠M	٥,٠٤c-g	٥٨	٣٦٣٢١١٧٩	٣٤٦٣١٧٠ ٠M	٥,٨٤abc
١٩	٣٦٣١٧٠٩١	٣٦٣١٧٠٩١	٤,٢٣g	٣٩	٣٦٣١٢٥٣٩	٣٤٧٦٦١١ ٢M	٥,٠٤c-g	٥٩	٣٦٣٢١٨٤٧	٣٤٦٠٧٤٠ ٠M	٥,٨٤abc
٢٠	٣٦٣١٧١٥٨	٣٦٣١٧١٥٨	٥,٠٤c-g	٤٠	٣٦٣١٣٧٠٤	٣٤٧٥٥٢٢ ٠M	٤,٧٧d-g	٦٠	٣٦٣٢١٦٦٣	٣٤٦١٨٠٢ ٣M	٥,٨٤abc

Means with different letters differ significantly at P < ٠,٠٥.
Coordenation: is the reading of X and Y taking by GPS device.

Table ٣: Monitoring number (log) of soil samples *R. leguminosarum* biovar *trifolii* (R.T.) collected from Al-Hamoul region.

Sample No.	Coordination		R.T.	Sample No.	Coordination		R.T.	Sample No.	Coordination		R.T.
	X	Y			X	Y			X	Y	
١	-	-	٥,٣١abc	٢١	٣٦٣١٦٨٨١	٣٤٧٧٢٨١	٥,٠٤a-f	٤١	٣٦٣١٦٧١٣	٣٤٧٣٣٩٢ ٧M	٥,٠٢c-g
٢	-	-	٥,٨٤a	٢٢	٣٦٣١٥٩٩٦	٣٤٧٩٨٣١	٤,٧٧b-g	٤٢	٣٦٣١٧٤٩٥	٣٤٧٤٠٨٤ ٠M	٥,٠٢c-g
٣	-	-	٥,٨٤a	٢٣	٣٦٣١٣٨٧٤	٣٤٨٠٥٣٦	٤,٧٧b-g	٤٣	٣٦٣١٧٦٥٠	٣٤٧٥٢٨٤ ١M	٥,٠٤c-g
٤	-	-	٥,٨٤a	٢٤	٣٦٣١٣٠٧٨	٣٤٨١٤٣٠	٢,٣٩b-g	٤٤	٣٦٣١٦٢٤٨	٣٤٧٥٩٠٨ ٣M	٥,٥٥b-e
٥	-	-	٥,٥٥ab	٢٥	٣٦٣١٣٧٣٥	٣٤٥٨٦٨٤	٣,٥٨hij	٤٥	٣٦٣١٧٨٦١	٣٤٧٨٦٠٣ ١M	٥,٠٢c-g
٦	-	-	٥,٣٨abc	٢٦	٣٦٣١٤٨٧٨	٣٤٥٨٣٧٤	٤,٥٠c-h	٤٦	٣٦٣١٦١٣٠	٣٤٨٠١٧٥ ٠M	٥,٠٢c-g
٧	-	-	٤,٧٧b-g	٢٧	٣٦٣١٧٦٦٨	٣٤٦٢٢٤٢	٤,٢٣f-i	٤٧	٣٦٣١٧٠١٩	٣٤٨١٢٧٨ ٠M	٥,٢٦c-g
٨	-	-	٥,٣١abc	٢٨	٣٦٣١٧٤٥٢	٣٤٦٣٨٨٠	٣,٥٠ij	٤٨	٣٦٣١٥٩٣٧	٣٤٨٢١٢٧ ٠M	٤,٥١efg
٩	-	-	٥,٣١abc	٢٩	٣٦٣٢١٩٤٠	٣٤٦٣٤٨٩	٤,٣٠d-i	٤٩	٣٦٣١٥٣٦٤	٣٤٨٣٤٤٩ ٠M	٤,٠٠g
١٠	٣٦٣١٤٢٤٠	٣٦٣١٤٢٤٠	٥,٣١abc	٣٠	٣٦٣٢٠٢٧٤	٣٤٦٧٩٠٦-٢M	٥,٨٤a	٥٠	٣٦٣١٦٢٤١	٣٤٨٢٨٣٠ ٠M	٥,٠٤c-g
١١	٣٦٣١٥٥٠٢	٣٦٣١٥٥٠٢	٥,٣١abc	٣١	٣٦٣١٨٩١٣	٣٤٦٧٩٥٥-٢M	٥,٨٤a	٥١	٣٦٣١٧٦٥٩	٣٤٨٢٨٢٤ ١٤M	٥,٨٤abc
١٢	٣٦٣١٥٥١٢	٣٦٣١٥٥١٢	٥,٣١abc	٣٢	٣٦٣١٨٠٦٨	٣٤٧٠٠٣٩-٠M	٥,٣١abc	٥٢	٣٦٣١٨١٠٤	٣٤٨٤٥٦٦ ٠M	٥,٨٤abc
١٣	٣٦٣١٥٥٥٠	٣٦٣١٥٥٥٠	٥,٨٤a	٣٣	٣٦٣١٧٣٤١	٣٤٧١٥٠٥	٤,٢٧e-j	٥٣	٣٦٣١٨١٨٨	٣٤٨٦٧٢١ ٠M	٥,٨٤abc
١٤	٣٦٣١٤٦٠٢	٣٦٣١٤٦٠٢	٤,٨٠b-g	٣٤	٣٦٣١٧٢٨٤	٣٤٧٣٨٤١-١M	٤,٠٠g-j	٥٤	٣٦٣١٨١٣٨	٣٤٨٦٧٢٠ ٠M	٥,٨٤abc
١٥	٣٦٣١٤٢٢٠	٣٦٣١٤٢٢٠	٤,٣٠d-i	٣٥	٣٦٣١٧٧٠٥	٣٤٧٦٨٣١-٩M	٥,٠٤a-f	٥٥	٣٦٣١٩٦٤٢	٣٤٥٩١٩٢ ٢M	٥,٨٤abc
١٦	٣٦٣١٤٢٧٥	٣٦٣١٤٢٧٥	٤,٣٠d-i	٣٦	٣٦٣١٥٥٧٧	٣٤٧٦٣٣٢-٢M	٥,٨٤a	٥٦	٣٦٣٢٢٢٧٧	٣٤٦٠١٩٥ ٩M	٥,٨٤abc
١٧	٣٦٣١٠٥٧٦	٣٦٣١٠٥٧٦	٤,٠٠g-j	٣٧	٣٦٣١٦٤١١	٣٤٨١١٤٢-١M	٥,٣١abc	٥٧	٣٦٣٢٢١٨٠	٣٤٦٠١٩٥ ٠M	٥,٨٤abc
١٨	٣٦٣٠٧٥٩٨	٣٦٣٠٧٥٩٨	٤,٢٣f-i	٣٨	٣٦٣١١٣٤٩	٣٤٧٧٧٦٤ ٠M	٤,٧٧b-g	٥٨	٣٦٣٢١١٧٩	٣٤٦٣١٧٠ ٠M	٥,٨٤abc
١٩	٣٦٣١٧٠٩١	٣٦٣١٧٠٩١	٤,٢٣f-i	٣٩	٣٦٣١٢٥٣٩	٣٤٧٦٦١١ ٢M	٤,٥٠c-h	٥٩	٣٦٣٢١٨٤٧	٣٤٦٠٧٤٠ ٠M	٥,٨٤abc
٢٠	٣٦٣١٧١٥٨	٣٦٣١٧١٥٨	٥,٠٤a-f	٤٠	٣٦٣١٣٧٠٤	٣٤٧٥٥٢٢ ٠M	٤,٥٠c-h	٦٠	٣٦٣٢١٦٦٣	٣٤٦١٨٠٢ ٣M	٥,٨٤abc

Means with different letters differ significantly at P < ٠,٠٥.
Coordenation: is the reading of X and Y taking by GPS device.

Table ٤: Monitoring number (log) of soil samples *Azotobacter* (Az.) collected from Al-Hamoul region.

Sample No.	Coordination		Az.	Sample No.	Coordination		Az.	Sample No.	Coordination		Az.
	X	Y			X	Y			X	Y	
١	-	-	٣,٠٠c-f	٢١	٣٦٣١٦٨٨١	٣٤٧٧٢٨١	٤,٢٦a	٤١	٣٦٣١٦٧١٣	٣٤٧٣٣٩٢ ٧M	٢,٧٦
٢	-	-	٣,٠٠c-f	٢٢	٣٦٣١٥٩٩٦	٣٤٧٩٨٣١	٤,٠٠a	٤٢	٣٦٣١٧٤٩٥	٣٤٧٤٠٨٤ ٠M	٢,٧٦
٣	-	-	٣,٥٠abc	٢٣	٣٦٣١٣٨٧٤	٣٤٨٠٥٣٦	٣,٠٠c-f	٤٣	٣٦٣١٧٦٥٠	٣٤٧٥٢٨٤ ١M	٢,٥٠
٤	-	-	٣,٥٠abc	٢٤	٣٦٣١٣٠٧٨	٣٤٨١٤٣٠	٢,٢٦ef	٤٤	٣٦٣١٦٢٤٨	٣٤٧٥٩٠٨ ٣M	٢,٥٠
٥	-	-	٣,٢٣b-e	٢٥	٣٦٣١٣٧٣٥	٣٤٥٨٦٨٤	٣,٢٦b-e	٤٥	٣٦٣١٧٨٦١	٣٤٧٨٦٠٣ ١M	٢,٢٦
٦	-	-	٣,٠٠c-f	٢٦	٣٦٣١٤٨٧٨	٣٤٥٨٣٧٤	٣,٥٠c-f	٤٦	٣٦٣١٦١٣٠	٣٤٨٠١٧٥ ٠M	٢,٧٦
٧	-	-	٢,٧٦c-f	٢٧	٣٦٣١٧٦٦٨	٣٤٦٢٢٤٢	٢,٥٠c-f	٤٧	٣٦٣١٧٠١٩	٣٤٨١٢٧٨ ٠M	٢,٥٠
٨	-	-	٢,٧٥c-f	٢٨	٣٦٣١٧٤٥٢	٣٤٦٣٨٨٠	٣,٠٠c-f	٤٨	٣٦٣١٥٩٣٧	٣٤٨٢١٢٧ ٠M	٢,٧٣
٩	-	-	٢,٥٠c-f	٢٩	٣٦٣٢١٩٤٠	٣٤٦٣٤٨٩	٣,٠٠c-f	٤٩	٣٦٣١٥٣٦٤	٣٤٨٣٤٤٩ ٠M	٣,٢٣
١٠	٣٦٣١٤٢٤٠	٣٦٣١٤٢٤٠	٢,٧٣c-f	٣٠	٣٦٣٢٠٢٧٤	٣٤٦٧٩٠٦-٢M	٢,٧٦c-f	٥٠	٣٦٣١٦٢٤١	٣٤٨٢٨٣٠ ٠M	٣,٠٠
١١	٣٦٣١٥٥٠٢	٣٦٣١٥٥٠٢	٣,٠٠c-f	٣١	٣٦٣١٨٩١٣	٣٤٦٧٩٥٥-٢M	٣,٢٦ef	٥١	٣٦٣١٧٦٥٩	٣٤٨٢٨٢٤ ١٤M	٢,٧٦
١٢	٣٦٣١٥٥١٢	٣٦٣١٥٥١٢	٢,٧٦c-f	٣٢	٣٦٣١٨٠٦٨	٣٤٧٠٠٣٩-٠M	٢,٧٦c-f	٥٢	٣٦٣١٨١٠٤	٣٤٨٤٥٦٦ ٠M	٢,٢٦
١٣	٣٦٣١٥٥٥٠	٣٦٣١٥٥٥٠	٢,٥٠c-f	٣٣	٣٦٣١٧٣٤١	٣٤٧١٥٠٥	٣,٢٦b-e	٥٣	٣٦٣١٨١٨٨	٣٤٨٦٧٢١ ٠M	٢,٢٦
١٤	٣٦٣١٤٦٠٢	٣٦٣١٤٦٠٢	٢,٢٣ef	٣٤	٣٦٣١٧٢٨٤	٣٤٧٣٨٤١-١M	٢,٧٦c-f	٥٤	٣٦٣١٨١٣٨	٣٤٨٦٧٢٠ ٠M	٢,٧٦
١٥	٣٦٣١٤٢٢٠	٣٦٣١٤٢٢٠	٢,٧٣c-f	٣٥	٣٦٣١٧٧٠٥	٣٤٧٦٨٣١-٩M	٢,٢٦ef	٥٥	٣٦٣١٩٦٤٢	٣٤٥٩١٩٢ ٢M	٣,٠٠
١٦	٣٦٣١٤٢٧٥	٣٦٣١٤٢٧٥	٢,٧٣c-f	٣٦	٣٦٣١٥٥٧٧	٣٤٧٦٣٣٢-٢M	٣,٢٦b-e	٥٦	٣٦٣٢٢٢٧٧	٣٤٦٠١٩٥ ٩M	٣,٢٣
١٧	٣٦٣١٠٥٧٦	٣٦٣١٠٥٧٦	٢,٢٢ef	٣٧	٣٦٣١٦٤١١	٣٤٨١١٤٢-١M	٣,٥٠abc	٥٧	٣٦٣٢٢١٨٠	٣٤٦٠١٩٥ ٠M	٣,٢٣
١٨	٣٦٣٠٧٥٩٨	٣٦٣٠٧٥٩٨	٢,٥٠c-f	٣٨	٣٦٣١١٣٤٩	٣٤٧٧٧٦٤ ٠M	٢.٢٣ef	٥٨	٣٦٣٢١١٧٩	٣٤٦٣١٧٠ ٠M	٣,٠٠
١٩	٣٦٣١٧٠٩١	٣٦٣١٧٠٩١	٣,٠٠-f	٣٩	٣٦٣١٢٥٣٩	٣٤٧٦٦١١ ٢M	٢,٢٣ef	٥٩	٣٦٣٢١٨٤٧	٣٤٦٠٧٤٠ ٠M	٢,٧٦
٢٠	٣٦٣١٧١٥٨	٣٦٣١٧١٥٨	٣,٥٠c-f	٤٠	٣٦٣١٣٧٠٤	٣٤٧٥٥٢٢ ٠M	٢,٠٠ef	٦٠	٣٦٣٢١٦٦٣	٣٤٦١٨٠٢ ٣M	٢,٥٠

Means with different letters differ significantly at P < ٠,٠٥.
Coordenation: is the reading of X and Y taking by GPS device.

Table ٥: Monitoring number (log) of soil samples total bacteria (T.B.) collected from Al-Hamoul region.

Sample No.	Coordination		T.B.	Sample No.	Coordination		T.B.	Sample No.	Coordination		T.B.
	X	Y			X	Y			X	Y	
١	-	-	٧,٥٧pqr	٢١	٣٦٣١٦٨٨١	٣٤٧٧٢٨١	٨,٠٧m-q	٤١	٣٦٣١٦٧١٣	٣٤٧٣٣٩٢ ٧M	٩,١٢a-g
٢	-	-	٧,٥٧pqr	٢٢	٣٦٣١٥٩٩٦	٣٤٧٩٨٣١	٨,٠٦n-q	٤٢	٣٦٣١٧٤٩٥	٣٤٧٤٠٨٤ ٠M	٩,٢٢a-e
٣	-	-	٨,٠٩m-q	٢٣	٣٦٣١٣٨٧٤	٣٤٨٠٥٣٦	٨,١٢ l-p	٤٣	٣٦٣١٧٦٥٠	٣٤٧٥٢٨٤ ١M	٩,٣٧abc
٤	-	-	٨,٢ l-p	٢٤	٣٦٣١٣٠٧٨	٣٤٨١٤٣٠	٨,١٣ l-	٤٤	٣٦٣١٦٢٤٨	٣٤٧٥٩٠٨ ٣M	٩,١٤a-f
٥	-	-	٨,١ l-p	٢٥	٣٦٣١٣٧٣٥	٣٤٥٨٦٨٤	٨,١l-p	٤٥	٣٦٣١٧٨٦١	٣٤٧٨٦٠٣ ١M	٨,٩٣b-h
٦	-	-	٧,٣٩pqr	٢٦	٣٦٣١٤٨٧٨	٣٤٥٨٣٧٤	٨,٠٤ n-q	٤٦	٣٦٣١٦١٣٠	٣٤٨٠١٧٥ ٠M	٩,١a-h
٧	-	-	٨,١٦ l-p	٢٧	٣٦٣١٧٦٦٨	٣٤٦٢٢٤٢	٨,١٥ l-p	٤٧	٣٦٣١٧٠١٩	٣٤٨١٢٧٨ ٠M	٩,٥٨a
٨	-	-	٨,٣٦i-n	٢٨	٣٦٣١٧٤٥٢	٣٤٦٣٨٨٠	٨,٢٢k-p	٤٨	٣٦٣١٥٩٣٧	٣٤٨٢١٢٧ ٠M	٩,٣٤abc
٩	-	-	٧,٥٧qr	٢٩	٣٦٣٢١٩٤٠	٣٤٦٣٤٨٩	٨,١٢ l-p	٤٩	٣٦٣١٥٣٦٤	٣٤٨٣٤٤٩ ٠M	٨,٨١d-j
١٠	٣٦٣١٤٢٤٠	٣٦٣١٤٢٤٠	٧,٣٦r	٣٠	٣٦٣٢٠٢٧٤	٣٤٦٧٩٠٦-٢M	٨,٣٤j-o	٥٠	٣٦٣١٦٢٤١	٣٤٨٢٨٣٠ ٠M	٨,٢١ l-p
١١	٣٦٣١٥٥٠٢	٣٦٣١٥٥٠٢	٧,٨١o-r	٣١	٣٦٣١٨٩١٣	٣٤٦٧٩٥٥-٢M	٨,٣٤j-o	٥١	٣٦٣١٧٦٥٩	٣٤٨٢٨٢٤ ١٤M	٨,٢٢k-p
١٢	٣٦٣١٥٥١٢	٣٦٣١٥٥١٢	٧,٧٨pqr	٣٢	٣٦٣١٨٠٦٨	٣٤٧٠٠٣٩-٠M	٨,١١ l-p	٥٢	٣٦٣١٨١٠٤	٣٤٨٤٥٦٦ ٠M	٨,٨٢d-j
١٣	٣٦٣١٥٥٥٠	٣٦٣١٥٥٥٠	٧,٧٥pqr	٣٣	٣٦٣١٧٣٤١	٣٤٧١٥٠٥	٨,٦٢f-l	٥٣	٣٦٣١٨١٨٨	٣٤٨٦٧٢١ ٠M	٨,٧٨d-j
١٤	٣٦٣١٤٦٠٢	٣٦٣١٤٦٠٢	٧,٦٧pqr	٣٤	٣٦٣١٧٢٨٤	٣٤٧٣٨٤١-١M	٨,٣٨ i-n	٥٤	٣٦٣١٨١٣٨	٣٤٨٦٧٢٠ ٠M	٨,٨٨c-i
١٥	٣٦٣١٤٢٢٠	٣٦٣١٤٢٢٠	٧,٦٢pqr	٣٥	٣٦٣١٧٧٠٥	٣٤٧٦٨٣١-٩M	٨,٦١g-l	٥٥	٣٦٣١٩٦٤٢	٣٤٥٩١٩٢ ٢M	٨,٨٣d-j
١٦	٣٦٣١٤٢٧٥	٣٦٣١٤٢٧٥	٧,٩٢n-q	٣٦	٣٦٣١٥٥٧٧	٣٤٧٦٣٣٢-٢M	٩,٤٣ab	٥٦	٣٦٣٢٢٢٧٧	٣٤٦٠١٩٥ ٩M	٨,٧٨d-j
١٧	٣٦٣١٠٥٧٦	٣٦٣١٠٥٧٦	٧,٨٦n-r	٣٧	٣٦٣١٦٤١١	٣٤٨١١٤٢-١M	٩,٣٧ab	٥٧	٣٦٣٢٢١٨٠	٣٤٦٠١٩٥ ٠M	٨,٧٧d-j
١٨	٣٦٣٠٧٥٩٨	٣٦٣٠٧٥٩٨	٧,٧٧pqr	٣٨	٣٦٣١١٣٤٩	٣٤٧٧٧٦٤ ٠M	٩,٣٧abc	٥٨	٣٦٣٢١١٧٩	٣٤٦٣١٧٠ ٠M	٨,٥٨h-m
١٩	٣٦٣١٧٠٩١	٣٦٣١٧٠٩١	٧,٨pqr	٣٩	٣٦٣١٢٥٣٩	٣٤٧٦٦١١ ٢M	٩,٤٦a	٥٩	٣٦٣٢١٨٤٧	٣٤٦٠٧٤٠ ٠M	٨,٧٢e-k
٢٠	٣٦٣١٧١٥٨	٣٦٣١٧١٥٨	٧,٩٤n-q	٤٠	٣٦٣١٣٧٠٤	٣٤٧٥٥٢٢ ٠M	٩,٢٦ab	٦٠	٣٦٣٢١٦٦٣	٣٤٦١٨٠٢ ٣M	٨,٧٧d-j

Means with different letters differ significantly at P < ٠,٠٥.
Coordenation: is the reading of X and Y taking by GPS device.

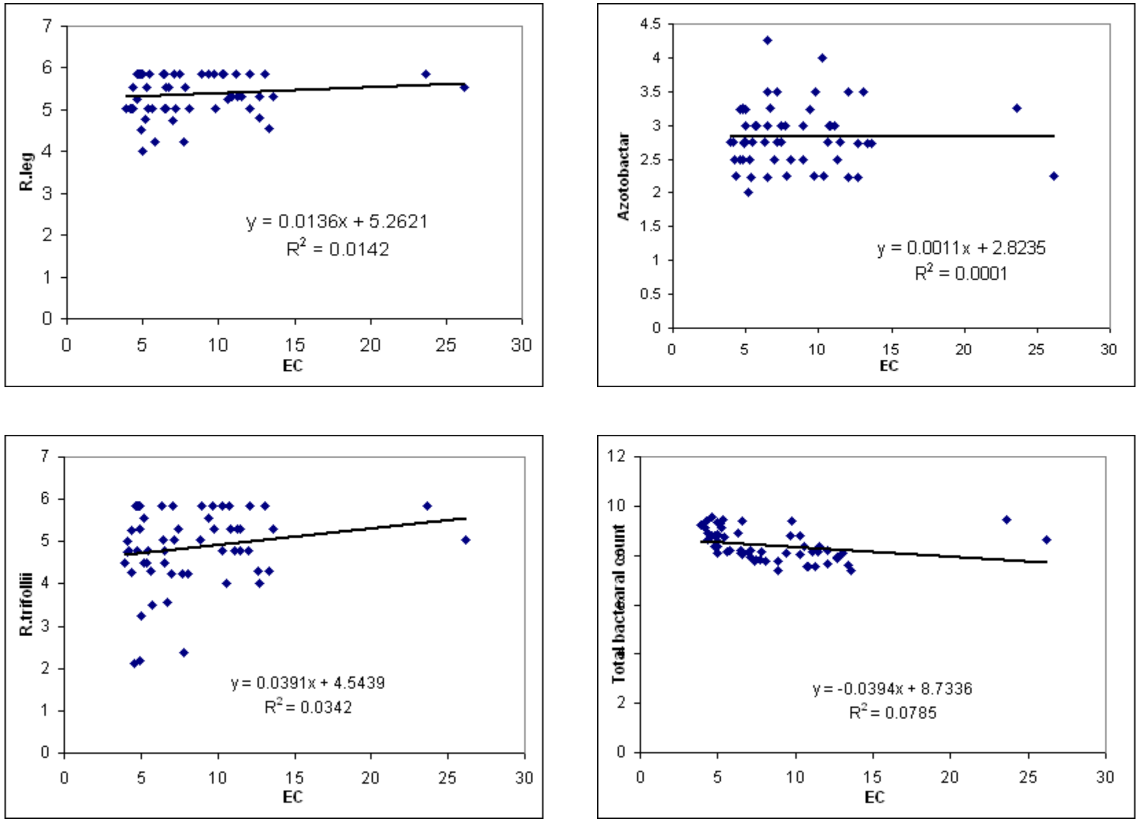

Figure ١: Correlations between salinity and log numbers of different studied microbes.