International Journal of Applied Mathematics & Statistical Sciences (IJAMSS)
ISSN(P): 2319-3972; ISSN(E): 2319-3980
Vol. 4, Issue 5, Aug - Sep 2015, 25-30

International Academy of Science, Engineering and Technology
Connecting Researchers; Nurturing Innovations

ANALYTIC STUDY FOR SOIL FERTILITY IN DIFFERENT SOIL SAMPLES IN SULAYMANI

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ABSTRACT

Seven representative soil samples were collected from different regions in Sulaimani governorate namely Kalar, Penjwen, Chwarta, Ranya, Qaradagh, Chamchamal and Bakrajo, representing different climatic regions. The samples were subjected chemical, physical and microbiological analysis, *Azotobacter* bacteria were isolated from collected soil samples, to know which soil is more fertility. The experiment carried out in Completely Randomized Design (CRD) with three replications. Duncan's multiple test were used to comparison among the means.

Data Specification

The data used in this study was achieved from the department of biology college of science in the University of Sulaimani by using SPSS package.

KEYWORDS: Complete Randomized Design, ANOVA Table, Duncan's Test

KNOWLDGEMENT

I would like to express my sincere thanks to Bayan Amin at the university of Sulaymani.

1. THEORETICAL PART

1.1 Concept of Soil Fertility

The status of a soil with respect to its ability to supply elements for plant growth without dangers toxic elements.[6]

1.2 INTRODUCTION

Molecular nitrogen or dinitrogen (N_2) makes up four-fifths of the Atmosphere but is metabolically unavailable directly to both higher plants and animals. It is an essential component of protein, nucleic acid, hormones and chlorophyll, which is one of the most growth limiting element in agricultural system and it makes up approximately 12% of microbial cell dry weight. Nitrogen is fixed in soil clay, lattices, oxidized and assimilated by plants or microorganisms; this element enters to the soil through biological fixation, atmospheric, deposition or fertilization.

Biological symbiotic and non symbiotic nitrogen fixation is the most significant contributor accounting for about 65% of the total annual fixation. In this way molecular dinitrogen in the air enters the organic nitrogen pools in the biosphere through a certain group of prokaryotes which contain nitrogenase enzyme, a complex that fix N_2 by the expense of ATP. Nitrogen is directly taken from the air by free living aerobic (*Azotobacter*) or anaerobic (Clostridium) present in soil and other and symbiotic nitrogen fixer of the genus of *Rhizobium*. *Azomonas*, and *Azotobacter* are among the most

species of Azotobacteraceae, which occur in the soil, in the rhizosphere, and in aquatic habitats, the organisms are capable of nitrogen fixation-typically under free-living conditions, but sometimes in association with higher plants.

Detection the ability of nitrogen fixation of *Azotobacter* and other nitrogen fixing bacteria is important because can be used as biofertilizer instead of chemical fertilizer as the intensive use of chemical fertilizers has side effects in polluting under ground water, destroying microorganisms, insects making plant more susceptible to the attack of disease and reducing soil fertility.[(1)]

1.3 The Object of Study

The aim of this study is determining the degree of difference fertility between the different soils and that is by knowing the amount of nitrogen fixation to select most fertility soil in Sulaymani governorate**.**

1.4 Sampling Technique

Repetition soil samples were collected from seven regions of Sulaimani governorate (Kalar, Bakrajo, Qaradagh, Ranya, Penjwen, Chwarta, and Chamachamal), during August and September 2009, from cultivated soils. Samples were withdrawn at a depth of 10-15 cm below the surface. All samples were kept in plastic bags, transported to the laboratory, and stored at room temperature prior to be analyzed. These samples were ground to pass through 2mm sieve before the physiochemical analysis.[(1)]

1.5 Experimental Design

This is a process of planning a study to meet specific objectives. Planning an experiment properly is very important in order to ensure that the right type of data and a sufficient sample size and power are available to answer the research questions of interest as clearly and efficiently as possible. Completely Randomized Design. Subjects are assigned to treatments completely at random. [(3)]

1.6 Completely Random Design

Each experimental unit in completely randomized design has an equal and independent chance of receiving any one of the treatments. The basic assumption underlying this design is that the observed values in any one group represent a random sample of all possible values of all experimental units under that particular treatment. We assume that the responses are normally distributed about the treatment mean and that the variation among observations treated alike is identical for all treatments.

Calculation from analysis of variance techniques are customarily displayed in an ANOVA table

Table 1: ANOVA

Source of Variation	Degreesof Freedom	Sum of Squares	Mean Squares	F
Between treatments **Within treatments** **Total**	**K-1** **N-K** **N-1**	**SSt** **SSe** **SST**	**MSt** **MSe**	$\frac{MSt}{MSe}$

The Total Sum of Squares (SST) is the total of the squared deviations of the observation from the overall mean of

the data $SS_{Total} = SST = \sum_{i=1}^{N} Y_i^2 - \frac{\left(\sum_{i=1}^{N} Y_i\right)^2}{N}$

The within treatments variation SSe is the variation associated with experimental

$$SS_{within} = SSe = \sum_{i=1}^{N} Y_i^2 - \sum_{j=1}^{r} \frac{\left(T_j\right)^2}{n_j}$$

Between groups sum of squares SSt is the final source of variation is given by

$SS_{Between} = SSt = \sum_{j=1}^{r} \frac{\left(T_j\right)^2}{n_j} - \frac{\left(\sum_{i=1}^{N} Y_i\right)^2}{N}$ and SSe is rarely computed directly SSe = SST - SSt. After that compute the degrees of freedom and enter in the table ANOVA.

Finally we compute the mean square by $MSt = \frac{SSt}{K-1}$ and $MSe = \frac{SSe}{N-K}$

The test of the significance of differences among means is accomplished by computing the ratio of the estimate of σ^2 based on between variation MSt to the estimate and based on within variation MSe. This ratio is called F statistic: $F = \frac{MSt}{MSe}$ [(4), (5)]

1.5 Duncan's Multiple Range Test (MRT)

In appropriately is frequently used to compare treatments that are factorial in nature or correspond to several levels of a quantitative or continuous variable. The statistical hypothesis that the true average responses of 3 or more treatments are all equal is tested by means of the F-test in an analysis of variance table. If this hypothesis is rejected, it does not necessarily follow that the averages are all unequal. The next stage in the data analysis is to determine which pairs of treatment means are different, using a so-called multiple comparison procedure, of which Duncan's MRT.

This method used when replication of groups are equal, in the first we calculated $S_X = \sqrt{\frac{S_e^2}{r}}, S_e^2$ is the mean square error in ANOVA table and r is the number of replication in each group . From Duncan's table we get the significant studentized range (SSR) with error degree of freedom N-K and K is the number of mean inside the comparison. Second step find the least significant range (LSR) where

$LSR = SSR \times S_X$. After that find the different between the means. So any different greater than LSR is significant different. [(2), (5), (7)]

2. PRACTICAL PART

2.1 Introduction

We have complete randomized design with seven treatment by three replication for each treatment means the replications are equal.

2.2 Hypotheses Tests

H_0: There is no difference between two fertility treatment means.

H_1: At least there are difference in fertility between two treatment mean.

2.3 ANOVA Table

ANOVA

treatment

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.007	6	.001	1.893	.152
Within Groups	.009	14	.001		
Total	.016	20			

F_{table} (6, 14) = 2.85 greater than $F_{calculate}$ (6, 14), from ANOVA table clear Sine F table greater than F calculate, then we can note reject the null hypothesis that there is no significant difference between the different climates but from the table of data clear that the sensitivity of data make us to take the Duncan test to select the more climates fertility.

3.4 Duncan Test

treatment

Duncan[a]

factors	N	Subset for alpha = .05	
		1	2
4(Ranya)	3	.1100	
5(Penjuen)	3	.1133	
6(Chwarta)	3	.1200	.1200
1(Kalar)	3	.1267	.1267
7(Chamchamal)	3	.1467	.1467
2(Bekrejo)	3	.1467	.1467
3(Qaradax)	3		.1633
Sig.		.132	.077

Means for groups in homogeneous subsets are displayed.

a. Uses Harmonic Mean Sample Size = 3.000.

From Duncan table there are a significant differences between the climates of Qaradax and Ranya, Penjuen

CONCLUSIONS

The results of this study show that there is a different between the climate of Q and the two climates of R and P because these regions are mountainous there is more organic materials that causes more fertility.

RECOMMENDATION

It could be argued that biofertilisers are more useful than chemical fertilizer. This is due to the fact that the chemical fertilizers have many adverse affects. For instance, increase the acidity when the acidity increase might be affecting the soil bacteria because bacteria could not able growth in the acidic pH. However, biofertilisers have no adverse affects because bacteria are used to increase the fertility of soil such as *Azotobacter* which is responsible for nitrogen fixation as a result of this process NH3 formed and this is important for plant growth. Then Azotobacter can be used as biofertiliser instead use of chemical fertilizer. Nowadays, its made in different countries. For instance, in Europe and Latin American countries such as Argentina. as well as in China and India, We can benefit from the experience of these countries and the use of the techniques used in this area for the development of the relevant areas.

In area such as the region mentioned above biofertilisers should be used more extensively than chemical fertilizer for their economical benefits and avoids their unwanted effects, for the benefit of the environment and people consuming them.

APPENDIX

The Data	Treats	Obs. (N fixation)
Kalar	1	.11
Kalar	1	.13
Kalar	1	.14
Bakrajo	2	.14
Bakrajo	2	.16
Bakrajo	2	.14
Qaradax	3	.20
Qaradax	3	.10
Qaradax	3	.19
Ranya	4	.11
Ranya	4	.11
Ranya	4	.11
Penjwen	5	.11
Penjwen	5	.12
Penjwen	5	.11
Chwarta	6	.13
Chwarta	6	.11
Chwarta	6	.12
Chamchamal	7	.12
Chamchamal	7	.18
Chamchamal	7	.14

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