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Assessment Of NPK Status At Different Locations And Cropping Patterns In District Kech,Balochistan,Pakistan.

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Abstract*: The purpose of this study was to evaluate the soil basic knowledge of soil fertility status as well cropping patterns of that locations cultivated crops. Soil field were selected from different locations of district Kech, Balochistan. The data shows that use of nitrogen and phosphorous is not sufficient according to crop demands and soil survey. Soil samples were analyzed for soil fertility parameters: soil pH, electrical conductivity (EC), total nitrogen (N), available phosphorous (P), available potassium (K) and organic matter (SOM). Comparison of various soil depth, cropping patterns and locations were compared. Result showed that soil was alkaline, sandy loam in texture and non-saline and normal soil in nature . pH and EC were statistically non- significant while the total nitrogen, available phosphorous, available potassium and organic matter. Crop, depth and union councils were statistically significant. Among all studied cropping patterns, the highest value of soil pH (8.77), Electrical conductivity (3.39 dSm^{-1}), total nitrogen (0.18%), available phosphorous (14.06 mg kg^{-1}), available potassium (118.0 mg kg^{-1}) and organic matter (0.60%) were maintained in tomato cropping patterns while the lowest value of soil pH (8.28), EC (0.69 dSm^{-1}), N (0.008%), P (2.31 mg kg^{-1}), K (1.05 mg kg^{-1}) and OM (0.017%) were observed in union council Koshkalat under tomato field soil at 0-10cm soil depth. Strong relationship (p > 0.05) were exhibited between K and OM with available nutrients.*

Keywords: Assessment, Nitrogen, Phosphorous, Potassium and Organic matter.

INTRODUCTION

Pakistan is an agricultural state, where agriculture not only to feeds a huge and ever- increasing population but also plays as a backbone of Pakistan financial system, contributing about 23% to public economy. Moreover, most of the agricultural activities are conventional with less use of technology due to small land holdings, lack of knowledge, and incomplete resources of farmers. For the purpose of achieving a good profit margin imbalanced utilization of fertilizers is considered one of crucial problems decreasing crop yield in Pakistan. Knowledge gape regarding the application of nitrogen and phosphorus is sufficient but farmers are applying fertilizer according to their financial resources, though not in accordance with crop demand and soil study (Wakeel *et al*., 2013).

Kech, the land of a romance legend, has always been a place of importance for its geographical location. It has been, and still is, the center of Makran region; geographically, and socially. The history showed that the district kech is dry arid zone, and with limited rainfall <250mm. The mean maximum temperature were recorded as>45 ^{0}C in the months of June and July; whereas the minimum were 8-10 ^{0}C in the month of December and January.

The nutrients that are required by crops in the largest amounts are N, P and K. For that reason, they are often considered as the most important nutrients. The main functions of N and P are that they are constituents of proteins and nucleic acids, which are important components of plant tissue.

K is the only nutrient that is not a constituent of organic plant compounds, but is mainly of importance in the regulation of processes in the plant, such as osmosis and enzyme activities. K is generally playing an important role for the quality of harvested plant products.For the optimal growth of crops, sufficient amounts of nutrients should be available in the root zone of the crops. Those nutrients can be partly supplied by the soil and should be partly added with organic manures and fertilizers. Soils will contain different amounts of available nutrients, depending of the parent material (e.g. sand, clay, peat), and differences in the management.

By differing other essential macronutrients N, P and K have non-similar reactions in soil. N and P are not majorly obtained from clay minerals rather external sources are used to feed the plants in fields. For that reason, it is more essential for K to make a managed K fertilizer recommendations and achieve consequences from crops (Wakeel *et al*., 2013).Extra using of potassium K, phosphorus P, and nitrogen N, fertilizers has been a non- particular process in management of field, which led to grave environmental pollution and resource waste (Dang *et al.*, 2015). Due to that, for precise management of fertilization and agricultural growth short and set time non-destructive diagnosis are vital. The most commonly and widely utilized

techniques in non-destructive nutrition diagnosis are hyper spectral imaging analysis and digital image processing analysis. As the technique (spectrometry) and imaging technologies, hyper spectral imaging analysis has effected a tremendous impression of concentration in different experiment areas, for example of plant nutrition diagnosis (Liu *et al.*, 2015).

For plants Nitrogen is needed in a huge amounts and, thus, its lack of sufficiency symptom is generally available in crops. Plants receive nitrogen like $NH4^{+}$ and $NO3^{-}$ ions from organic substance, inorganic matters and fixing free nitrogen by microorganisms (Mengel *et al*., 2001). Nitrogen acts as an important function in protein synthesis and is a part of chlorophyll. Chlorophyll is needed for light e energy absorption by the process of photosynthesis. As a result, sufficient N supply will improve the concentration of chlorophyll then photosynthesis is enlarged consequently. If N becomes absent in the process there will be reduction of developing of chlorophyll, as a result plants numbering 6 lose their green color top to minimization in the rate of photosynthesis. Furthermore, when dry matter collection gets reduced, growth of plants goes on the wane. Nevertheless, excessive of N in relation to P, K and Scan setback crop middle age tending to widen the age of expansion of fruits and vegetables. Plants take up phosphorus as $H2PO-4$ and $HPO4^{-2}$ ions. Phosphorus plays a role in plant sat the middle of force storage and move through adenosine diphosphate and adenosine tri phosphate (Duarah *et al.*, 2011). Energy attains between photosynthesis and carbohydrates are stored in phosphate compounds for using in fruiting and reproductive strengthening potassium is utilized as an activator in many enzymatic reactions in the plant. Potassium also controls guard cell turgor therefore curbing the opening and concluding of the stomata and as a consequence the transpiration rate. Transpiration is the loss of moisture through the stomata (Tisdale *et al*., 1993, Piercel *et al*., 1987 & Hochmuth *et al.*, 2001).

MATERIAL AND METHODS

Climate description the experimental areas

Climate of district Kech is hot and long summer it start from March to November however the highest temperature recorded above 45 ^{0}C. while the winter season started December to February but the coldest month is January mercury goes to 8-10 ^{0}C. Kech is considered rain fed and dry arid climate category of the area. In the year total annual rainfall less than 250 millimeters and it is measured rain fed and arid zone area of Balochistan province.

Historical background of experiment site

The study survey were conducted at tehsil Turbat of three union councils Malik abad, Koshkalat and Gokdan four cultivated vegetables like tomato, onion, brinjal and cabbage in district Kech. The soil of this area is mainly sandy loam and it comes under arid zone and the soil is called as aridisol. The soil pH of this area is slightly basic thus termed as alkaline soil.

The main aim of the recent research was to estimate the macro nutrients status in the tomato, onion, brinjal and cabbage field soil district Kech. Foure different field were selected for visit and before collection of soil sample 3-4 visit were organized to generate the primary data and allocation of suitable study site. Triplicate soil sample were collected from the allocated sites by using augur and steel shovel. A total 108 soil sample of various depth such that at 0-10cm, 10-20cm and 20-30cm of soil layer were collected. The collected soil sample were taken to lab for further soil physico- chemical properties and nutrients analysis.

Field visited, Allocation of study sites and collection of soil samples

Before start the experiment 3-4 field visit were arranged of district Kech to allocate the suitable study sites after that selection of three union councils cultivated cro

S.NO	Farmers Names	Area	Crops	Fertilizer dose	Land property
1	Bashir	Koshkalat	Tomato	Mixing of Urea and DAP fertilizer 5-6 kg per Acre	1 Acre
2	Ashraf	Koshkalat	Onion	Urea+DAP10-15kg& Cow dung 20 ton per Acre	1 Acre
3	Imdad	Gokdan	Onion	Cow dung 20 ton per Acre	1 Acre
4	Rayaz	Malik abad	Brinjal	Cow dung 20 ton per Acre	1 Acre

(tomato, onion, cabbage and brinjal). Interviewed were conducted with local farmers of those sites which were discussed under table.

For the fulfilment of the objective of this survey study a total of four different composite soil samples were collected. The samples were taken at different soil depths from the four different distributed field study areas in Kech i.e. the fields were named after the owner's name.

1. Bashir tomato field
2. Ashraf onion field
3. Javid cabbage field
4. Ryaz brinjal field
5. Bashir Ali onion field

Factorial RCBD design soil sample were taken at various depth of soil layer and brought in lab for further processing of sample such clean with sieve and to remove stone and plant root materials from soil sample. Furthermore, soil samples prepared for analyzed of soil macro nutrients like nitrogen (N), phosphoroue (P), pottasium (K), soil texture , pH, EC electrical conductity (SOM) organic matter is tested by the standaratized procedure (Walkely-Black method 1930).
During the fields survey, it was recorded that study sites may be defficient in macro and nutrients.

Soil sampling before and after cultivation

Before cultivation of the allocated sites soil samples were collected to assess the fertility level of soil. After harvesting of crops from same allocated sites soil samples were collected.

Analysis of soil physico-chemical properties

For the analysis measurement soil pH used a potentiometer determines the degree of acidity or alkalinity in soils suspended in water and in 0.01 molar calcium chloride solution. The potentiometer is calibrated with buffer solution of known pH prior to the analysis soil samples. Electrical conductivity saturation extract tell exactly how much salt is in soil and can be converted to soil salinity. It is measured by taking a soil sample making a saturated paste of soil and deionized water extracting the water and then measuring the EC of the extracted solution. For nitrogen the use of kjeldahl method a hot acid digestion to convert protein to ammonia which is then distilled into a standardized acid and the acid is back titrated to give the quantitative estimate. The Olsen test are colorimetric, which means the amount of light passing through a liquid is measured to determine Phosphorous levels. Potassium is extracted from air dried soil samples by shaking with 0.5M ammonium acetic acid solution for 30 minutes. This effectively displace the potentially available K+ ions. Common method for analysis of soil organic matter are the walkley-Black digestion method.

Description of the parameters pH

Soil pH is a measurement that indicate the alkalinity or acidity of soil. It is calculated by finding the negative logarithm of the concentration of hydrogenion in the soil and rang from 0-14. The lower soil pH more acidic it is and higher the pH the more alkaline. (Chadwick O. A *et al.,* 2016)

Electrical conductivity

The electrical conductivity indicates the amount of soluble salt ion in soil. The determination of EC is made with a conductivity cell by measuring the electrical resistance of 1:5 soil: water suspension. (Rayment GE *et al.,* 1992)

Total nitrogen

The kjeldal method permits the available nitrogen to be precisely determined in the plant and soil developed by (Johan kjedahl *et al.,* 1883)

Available potassium

Potassium is extracted from air dried soil sample shaking with 0.5m ammonium acetate and acetic acid solution for 30 minutes. This effectively displaces the potentially available k + ion. The potassium content of the filtered extract is then determined using Jenway flame photometer (J. Biol *et al*., 1947)

Available phosphorous

The plant available phosphorous fraction is normally a small proportion of available P. Available P measurement involves digestion of a soil sample with a strong acid the dissolution of all in soluble inorganic and organic P form of minerals. This measurement is usually employed only for soil genesis or mineralogical studies. (Olsen and Sommers *et al.*, 1982)

Organic matter

Organic matter (SOM) is tested by the standaratized procedure (Walkely-Black Method 1930)

Statistical analysis

The analysis data of three different locations with three different soil layer. The collected data were analyzed through three-way ANOVA (Factorial design) by statistical software 8.1 version "analysis of variance" (ANOVA). The means significant were separately analyzed using the fisher's least significant difference (F – LSD) at 5% level of probability that is according to Steel and Torrie (1980).

RESULTS AND DISCUSSIONS

Table.1 Soil texture analysis data in three soil layers of four different vegetables e.g (Tomato, Onion, Cabbage and Brinjal) field in different locations in district Kech.

Textural Class	0-10 cm	10-20 cm	20-30 cm	Remarks
Koshkalat	Sandy loam	Sandy loam	Sandy loam	Soil is light in texture
Malik abad	Loam	Loam	Loam	Soil is medium in texture
Gokdan	Sandy loam	Sandy loam	Sandy loam	Soil is light in texture

Soil pH status under different locations and cropping patterns

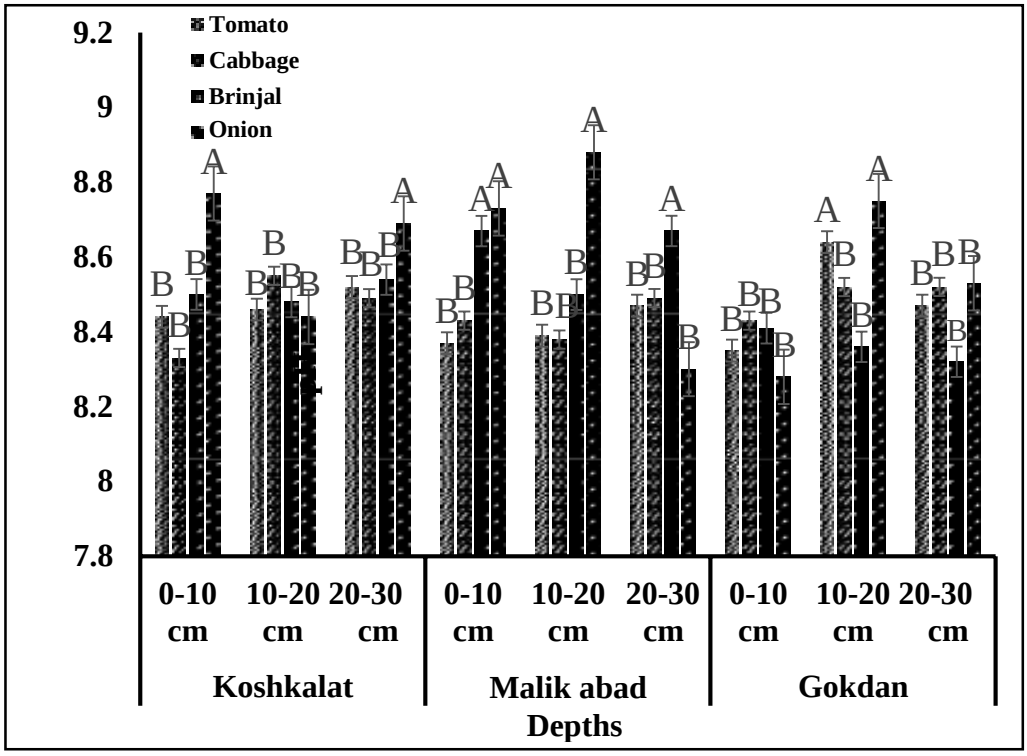
In this study analysis result showed that in the soil pH of different cultivated crops like (tomato, brinjal, cabbage and onion) and their various soil depths like 0-10 cm, 10-20 cm and 20-30 cm union councils (Koshkalat, Malik abad and Gokdan) in district Kech remained statistically non-significant (Table 4.1). Statistical significant of mean square from analysis of variance revealed that all the source of variance i.e. crop (c), depth (d) and union council (u) and their interaction (c×d×u) were non-significant and had no impact on increasing fertility of soil in district Kech Balochistan. Moreover, result show that the lowest pH (8.28) was found under onion crop union council Gokdan at 0-10 cm soil depth and the highest pH (8.77) was noted same cultivated crop in union council Koshkalat at 0-10 cm soil depth. Soil were alkaline and sandy loam in nature the primary reason for alkaline soil in district Kech of three union council Koshkalat, Malik abad and Gokdan and their cultivated crops soil could be due to over liming acid and irrigation water may cause soil alkalinity and primarily caused by calcium carbonate and rich parent material weathering developing in arid reagon. The similar finding result were reported by Adhikari *et al*., 2015, Adekiya *et al*., 2009, Agbede *et al*., 2009 and Hussain *et al.,* 2017. Several studies showed that cropping system play a key role in enhancing the fertility level of soil. The soil is alkaline in nature pH rang of (8.06-8.70) and there was no perceivable change in soil reaction observed for different cropping system. However, the cropping patterns effect on pH and EC were not observed significantly. Rich in carbonetes and bicarbonate of sodium and calcium might have raised the soil pH stated by Akram *et al.,* 2017.

Table No.2. Analysis of variance soil pH status in different locations and cropping patterns in district Kech.

Source	DF	SS	MS	F	P
Crops	3	0.135	0.045	2.23	0.03*
Depth	2	0.009	0.004	0.23	0.800ns
U/C	1	0.008	0.008	0.41	0.536ns
C×D×U	6	0.1444	0.024	1.19	0.376ns

Error	12	0.144	0.024		
Total	35				

Source of Variance DF= Degree of Freedom SS= Sum of square



MS= Means sum of square *=Significant at 5% probability NS= Non- significant

Figure No. 4.1 Analysis of variance soil pH status in different locations and cropping patterns in district Kech.

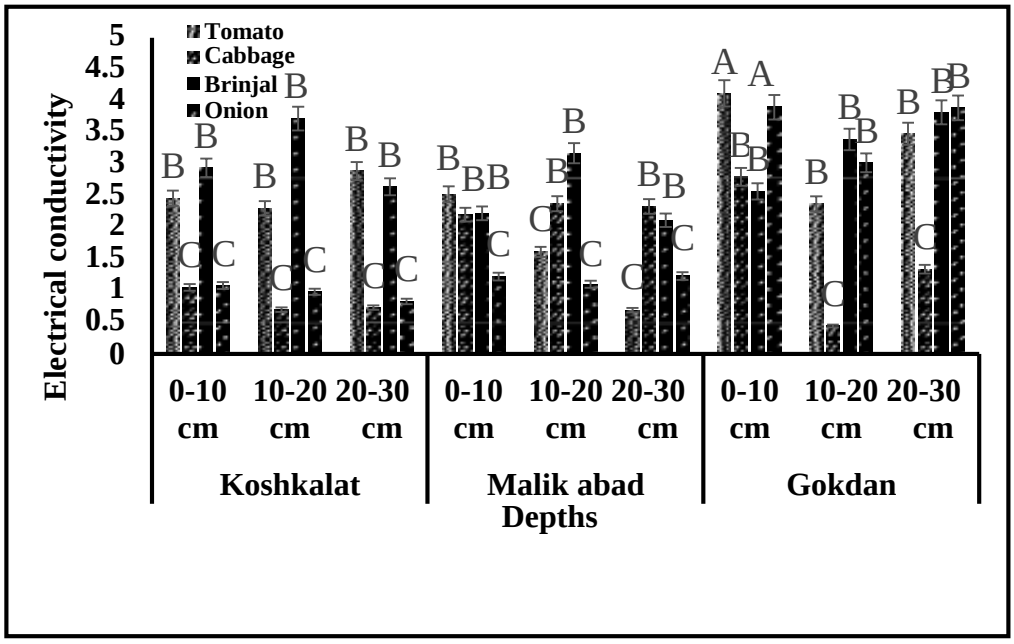
Soil electrical conductivity status under different locations and cropping patterns

In this study analysis result showed that in (Table 4.2) the soil electrical conductivity of different cultivated crops like (tomato, brinjal, cabbage and onion) and their various soil depths like 0-10 cm, 10-20 cm and 20-30 cm union councils (Koshkalat, Malik abad and Gokdan) in district Kech remained statistically non-significant. Statistical significant of mean square from analysis of variance revealed that all the source of variance i.e. crop (c), depth (d) and union council (u) and their interaction (c×d×u) were non-significant and had no impact on increasing fertility of soil in district Kech Balochistan. Moreover, result show that the lowest EC (0.69) was found under tomato crop union council Malik abad at 20-30 cm soil depth and the highest EC (3.89) was noted onion cultivated crop in union council Gokdan at 20-30 cm soil depth. Soil were saline soil in district Kech of three union council Koshkalat, Malik abad and Gokdan and their cultivated crops soil could be due to mismanagement that leads to low organic matter, poor infiltration, poor drainage saturated soil or compaction can increase soil EC and the soil ability to buffer EC leaving crop residues on the surface limits evaporation and retain soil moisture allowing rainfall and irrigation to be more effective in leaching salt. The related discovery result stated by Baligar *et al*., 1986, Bennett *et al*., 2009, Balir *et al*., 2002 and Robert *et al.,* 2008. The reason for low accumulation of salts in soils is that texture of the most of soils is sandy loam to loam and high and sporadic rainfall in monsoon season leaches / washes the salts, if any, from the root zone. The drainage is also very good due to high slopes. Salt affected area was negligible in Campbellpur as per survey carried out during 1971. Anon *et al*. 2009 but with the passage of time, no considerable increase in salt affected area was observed which might be due to soil texture. These results are in line with those of Roca *et al*., 1991. and Mahmood *et al*., 2000.

Table No.3 Analysis of variance soil electrical conductivity status in different locations and cropping patterns in district Kech.

Source	DF	SS	MS	F	P
Crops	3	7.618	2.539	0.88	0.04*
Depth	2	2.600	1.300	0.45	0.647ns
U/C	1	4.104	4.104	1.42	0.255ns
C×D×U	6	1.143	0.190	0.07	0.998ns
Error	12	34.586	2.882		
Total	35				

Source of Variance DF= Degree of Freedom SS= Sum of square



MS= Means sum of square *=Significant at 5% probability NS= Non- significant

Figure No. 4.2 Analysis of variance soil electrical conductivity status in different locations and cropping patterns in district Kech.

Soil total nitrogen status under different locations and cropping patterns

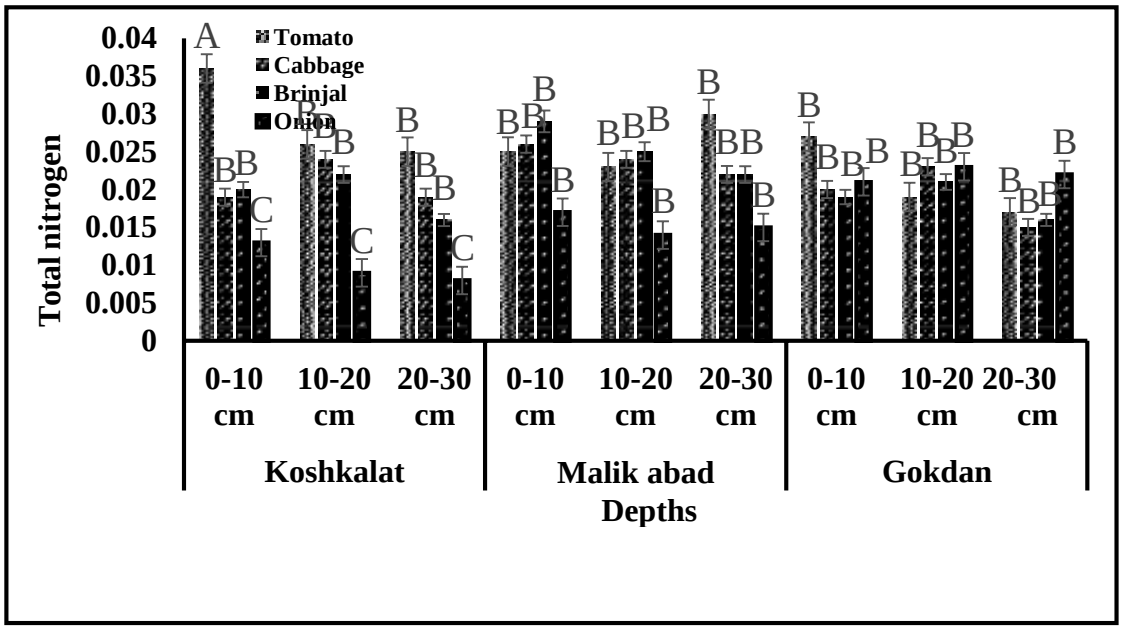
The experiment analysis data presented that (Table 4.3) the soil of total nitrogen in different cultivated crops as (tomato, brinjal, cabbage and onion) from various depths of soil at 0-10 cm, 10-20 cm and 20-30 cm union council Koshkalat, Malik abad and Gokdan of district Kech Balochistan. Effect of total nitrogen soil of that locations of crops that had impact but in depth they had not showed any impact furthermore the interaction effect of total nitrogen of each crop, depth and locations had impact. The results were remaining statistically significant. Statistical significance of mean square from analysis of variance revealed that all the source variance i.e. crop (c), depth (d) and union council (u) and their interaction (c×d×u) were significant ($p > 0.00$ Table 4.3) and have impact on increasing fertility of soil in district Kech. It shown that there was significant difference found between (c×d×u). Furthermore, the cultivated crops soil and three union councils in district Kech the lowest total nitrogen (0.008) under onion crop union council Koshkalat at 20-30 cm soil depth and the highest N (0.187) was noted tomato crop union council Koshkalat at 0-10 cm soil depth. The lower N content in upland and lower land might be due to low soil organic matter content and may be due to tillage since soil tilling increase the susceptibility to erosion Funderburg *et al*., 2016. About 90% of total nitrogen in soil derives from organic sources by Chen *et al.,* 2014. Soil nitrogen conversion of nitrogen in air to organic N-form which occurs either by soil organisms or in association with legume volatilization- Ammonia nitrogen loss from N- fertilizer and other source reported by Wani *et al.,* 2013, Li D *et al*., 2012.

Legume crops system have to ability to accumulate a notable quantum of atmospheric nitrogen in the rhizosphere by Caraco *et al*., 1998. Available N content depend upon organic matter present in soil. The accumulation of a relatively higher amount of available N may be due to higher organic matter content by root biomass stated by Moharana *et al.*, 2012

Table No.4 Analysis of variance soil total nitrogen status in different locations and cropping patterns in district Kech.

Source	DF	SS	MS	F	P
Crops	3	0.012	0.004	3.66	0.044*
Depth	2	0.001	0.000	0.82	0.461ns
U/C	1	0.000	0.000	0.66	0.433ns
C×D×U	6	0.016	0.002	2.40	0.037*
Error	12	0.013	0.001		
Total	35				

Source of Variance DF= Degree of Freedom SS= Sum of square MS= Means sum of square



*=Significant at 5% probability NS= Non- significant

Figure No. 4.3 Analysis of variance soil total nitrogen status in different locations and cropping patterns in district Kech.

Soil available phosphorus status under different locations and croppingpatterns

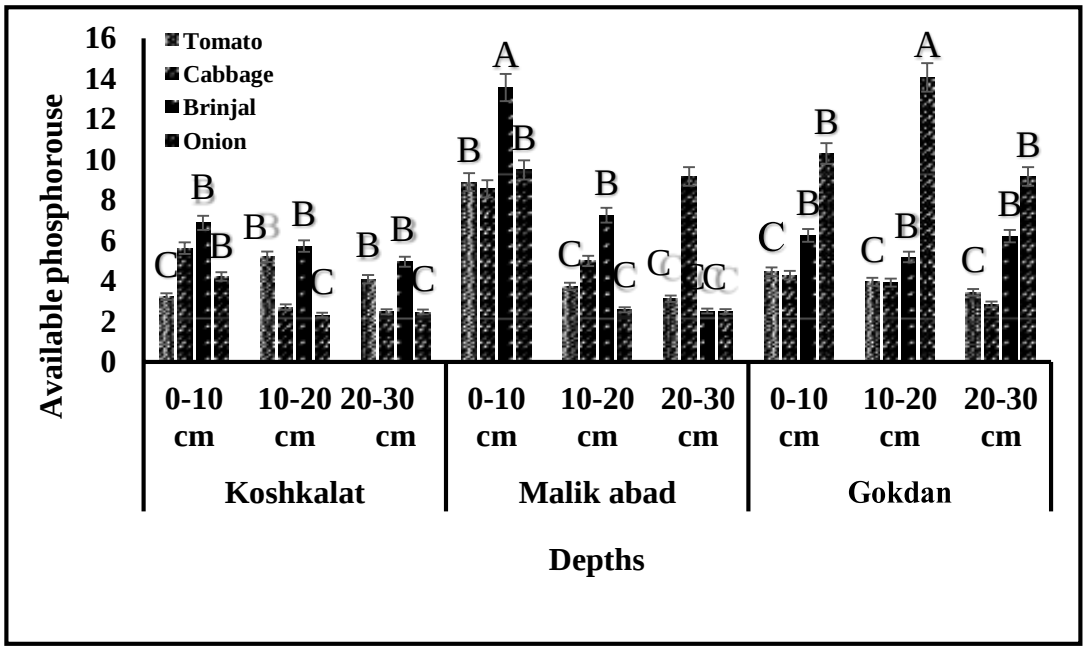
The experiment analysis data presented that (Table 4.4) the soil of available phosphorous in different cultivated crops as (tomato, brinjal, cabbage and onion) from various depths of soil at 0-10 cm, 10-20 cm and 20-30 cm union council Koshkalat, Malik abad and Gokdan of district Kech Balochistan. Effect of available phosphorous of that locations on field crop were have most significant also depth was significant but locations were not significant effect and their interaction between crop, depth and locations were significant impact. The results were remaining statistically significant. Statistical significance of mean square from analysis of variance revealed that all the source variance i.e. crop (c) and depth (d). Their interaction (c×d) were significant (p
> 0.02 Table 4.4) and have impact on increasing fertility of soil in district Kech. It shown that there was significant difference found between (c×d). Furthermore, the cultivated crops soil and three union councils in district Kech the lowest available phosphorous (2.31) under onion crop union council Koshkalat at 10-20 cm soil depth and the highest P (14.06)

was noted onion crop union council Gokdan at 10-20 cm soil depth. The low phosphorous level or inadequate phosphorous fertilizing and wet soil condition. Moreover, the reason for insufficient amount of phosphorous fertilizer low soil temperature especially early season and low soil pH < 5.5 or high soil pH > 7.2 also drought is main cause of low P in soil. These result were stated by Eifedivis *et al*., 2010, Remoron *et al.,* 2010, Gosh *et al.,* 2004 and Hati *et al*., 2004. This increase might have been related to change in the rhizosphere activity that resulted in the release of plant available P. It is also reported that available P content increase owing to the irrigation of different cropping patterns Sing *et al.,* 2013. It has been observed that continuous cropping for long time without addition of manure and fertilizer has brought a steady decrease in soil P but cropping with manuring as well addition of phosphatic fertilizer either maintained it at original level or increase its status in soil similar result found by Mandal *et al*., 2007.

Table No.5 Analysis of variance soil available phosphorous status in different locations and cropping patterns in district Kech.

Source	DF	SS	MS	F	P
Crops	3	21.639	65.35	0.71	0.009**
Depth	2	110.790	55.395	5.27	0.020*
U/C	1	2.734	2.733	0.27	0.612ns
C×D×U	6	26.500	34.416	0.44	0.02*
Error	12	121.423	10.118		
Total	35				

Source of Variance DF= Degree of Freedom SS= Sum of square



MS= Means sum of square *=Significant at 5% probability NS= Non- significant

Figure No. 4.4 Analysis of variance soil available phosphorous status in different locations and cropping patterns in district Kech.

Soil available potassium status under different locations and cropping patterns

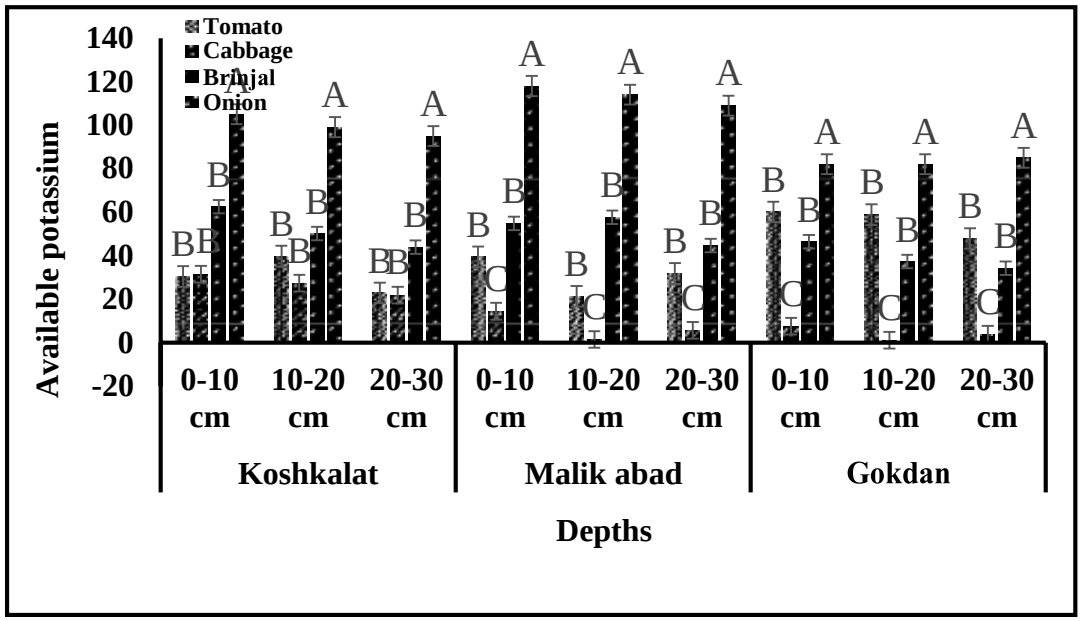
The experiment analysis data showed that (Table 4.5) the soil of available potassium in different cultivated crops as (tomato, brinjal, cabbage and onion) from various depths of soil at 0-10 cm, 10-20 cm and 20-30 cm union council Koshkalat, Malik

abad and Gokdan of district Kech Balochistan. Effect of available potassium just crop had significant impact. The results were remaining statistically significant. Statistical significance of mean square from analysis of variance revealed that all the source variance i.e. crop (c). Their interaction (c) were significant ($p > 0.000$ Table 4.5) and have impact on increasing fertility of soil in district Kech. It shown that there was significant difference in (c). Furthermore, the cultivated crops soil and three union councils in district Kech the lowest available potassium (1.05) under cabbage crop union council Gokdan at 10-20 cm soil depth and the highest P (118.0) was noted onion crop union council Malik abad at 0-10 cm soil depth. The reason for un availability of potassium level in soil inadequate potassium fertilization, excessive nitrogen application and cold wet soil also drought is the main impact of losing of K in soil by Chauhan *et al*., 2014. The availability of K increase with increasing pH as calcium (Ca) displace K from the clay lattice and make it more available in solution for plant by Sarkar *et al*., 2012, Jilani *et al*., 2009. Suggesting that the current rate of potassium application in arid region was insufficient to sustain soil potassium fertility in the present crops based cropping system where crop residues. Particularly straw is removed from the field Hochmuth *et al*., 2001. The K content had invariably been reported a adequate in Pakistan soil except eroded or light texture soil Park *et al*., 2004. Potassium in satisfactory rang (80-180 mg kg^{-1}) in soil reported by Rashid *et al.*, 2008.

Table No.6 Analysis of variance soil available potassium status in different locations and cropping patterns in district Kech.

Source	DF	SS	MS	F	P
Crops	3	35381.5	11793.8	57.88	0.000***
Depth	2	434.7	217.4	1.07	0.374ns
U/C	1	33.1	33.1	0.16	0.693ns
C×D×U	6	306.3	51.0	0.25	0.921ns
Error	12	2445.3	203.8		
Total	35				

Source of Variance DF= Degree of Freedom SS= Sum of square



MS= Means sum of square *=Significant at 5% probability NS= Non- significant

Figure No. 4.5 Analysis of variance soil available potassium status in different locations and cropping patterns in district Kech.

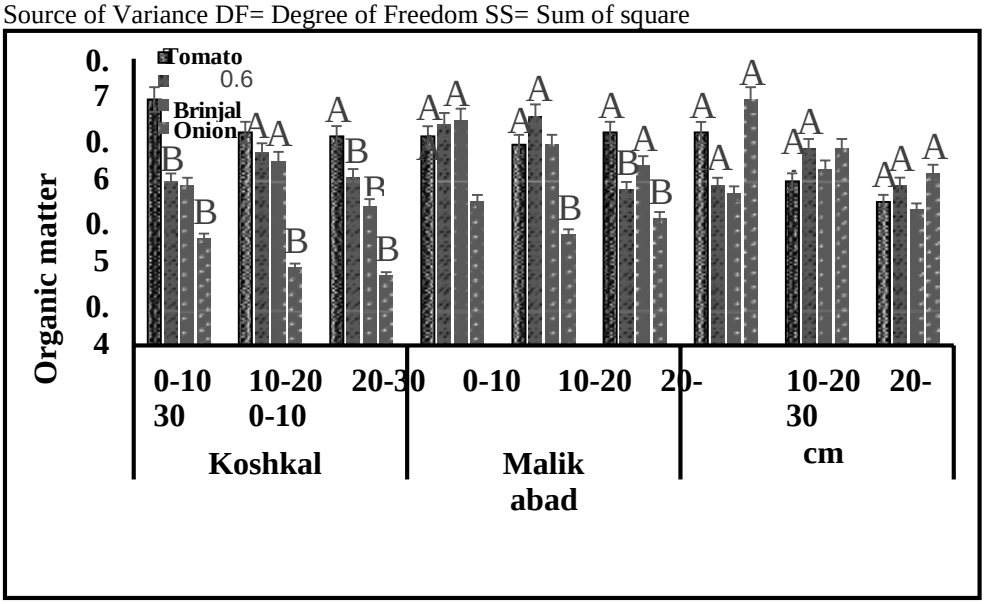
Soil organic matter status under different locations and cropping patterns

The experiment analysis data presented that (Table 4.6) the soil of organic matter in different cultivated crops as (tomato, brinjal, cabbage and onion) from various depths of soil at 0-10 cm, 10-20 cm and 20-30 cm union council Koshkalat, Malik abad and Gokdan of district Kech Balochistan. Effect of organic matter that locations on crops were significant impact depth and location they were not significant impact but their interaction between crop, depth and location were significant impact. The results were remaining statistically significant. Statistical significance of mean square from analysis of variance revealed that all the source variance i.e. crop (c), depth (d) and union council (u) and their interaction (c×d×u) were significant ($p > 0.00$ Table 4.6) and have impact on increasing fertility of soil in district Kech. It exposed that there was significant difference found between (c×d×u). Furthermore, the cultivated crops soil and three union councils in district Kech the lowest organic matter (0.017) under onion crop union council Koshkalat at 20-30 cm soil depth and the highest organic matter (0.60) was noted tomato crop union council Koshkalat at 0-10 cm soil depth. Tillage practice result higher decomposition and mineralization the more soil is tilled the more the SOM is broken tillage improve the aeration of the soil and causes flush of microbial action speeding up the decomposition of SOM and also often increase erosion the finding result were similer reported by Jagadeeswaran *et al.,* 2005,Kharal *et al*., 2018, Kannal *et al*., 2018, Bot *et al.,* 2005 and Yimer *et al*., 2007. May be attributed due to high vegetative growth, rapid root proliferation. Decomposition of organic matter and subsequently their trapping in clay complexes with in soil aggregates as evident from the highest amount of the fine soil particles. Root proliferation associated with growth could be another source of organic matter to the soil in the arid region our result corroborated the finding of other Sing *et al*., 2013, Venkatesh *et al*., 2013 and Senthil *et al.,* 2008.

Table No.7 Analysis of variance soil organic matter status in different locations and cropping patterns in district Kech.

Source	DF	SS	MS	F	P
Crops	3	0.118	0.039	3.05	0.040*
Depth	2	0.031	0.055	1.23	0.05*
U/C	1	0.012	0.0125	0.97	0.344ns
C×D×U	6	0.023	0.19	0.30	0.03*
Error	12	0.155	0.12		
Total	35				

Source of Variance DF= Degree of Freedom SS= Sum of square



MS= Means sum of square *=Significant at 5% probability NS= Non- significant

Figure No. 4.6 Analysis of variance soil organic matter status in different locations and cropping patterns in district Kech.

Correlation between considered traits of four cultivated crops

It was persuaded from (Table 4.7) that a significant and positive inter correlation was found among soil pH, EC, total nitrogen, available phosphorous, available potassium and organic manure of four cultivated crops (tomato, onion, brinjal and cabbage) positive correlation specifies that the raise in one variable caused improvement in related traits or variable. The organic matter has positive strong significant correlation with available potassium because the probability value is less than the 1% of confidence interval it means it is significant and we can say that there is positive correlation between the organic matter and available potassium among these cultivated crops.

Linear regression of soil organic matter with considered traits of four cultivated crops.

In this study soil organic matter showed a positive and correlation with available potassium (r^2 = 0.48- 0.26*). The soil organic matter showed a positive and or significant negative correlation with aromaticity index (r^2 = -0.35*) (Figure No: 4.7)

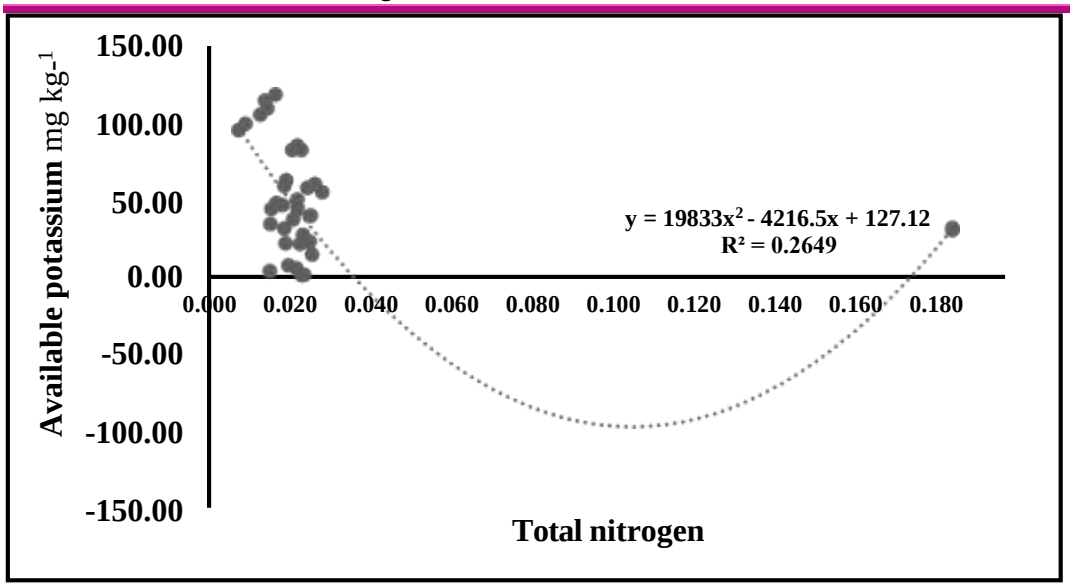
Table 4.7 Correlation between considered traits of four cultivated crops

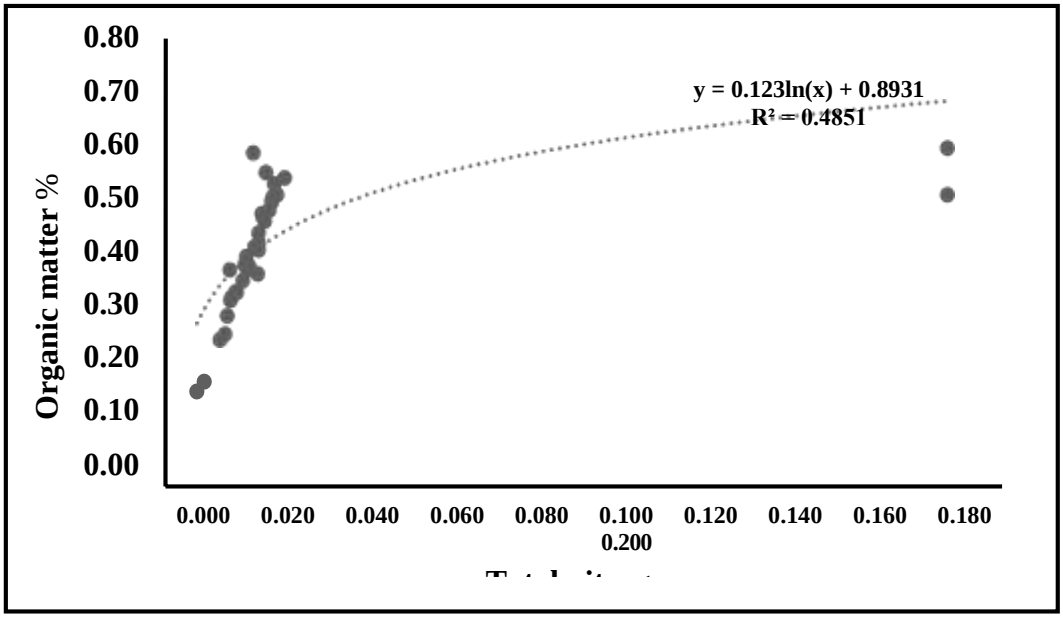
	pH	EC	TN	AVP	AVK	
EC	-0.3525*					
TN	-0.107ns	-0.081ns				
AVP	0.065ns	0.031*	-0.134ns			
AVK	0.433**	0.015ns	-0.193ns	0.128ns		
SOM	-0.339*	0.343*	0.420*	0.363*	0.363*	-0.502**

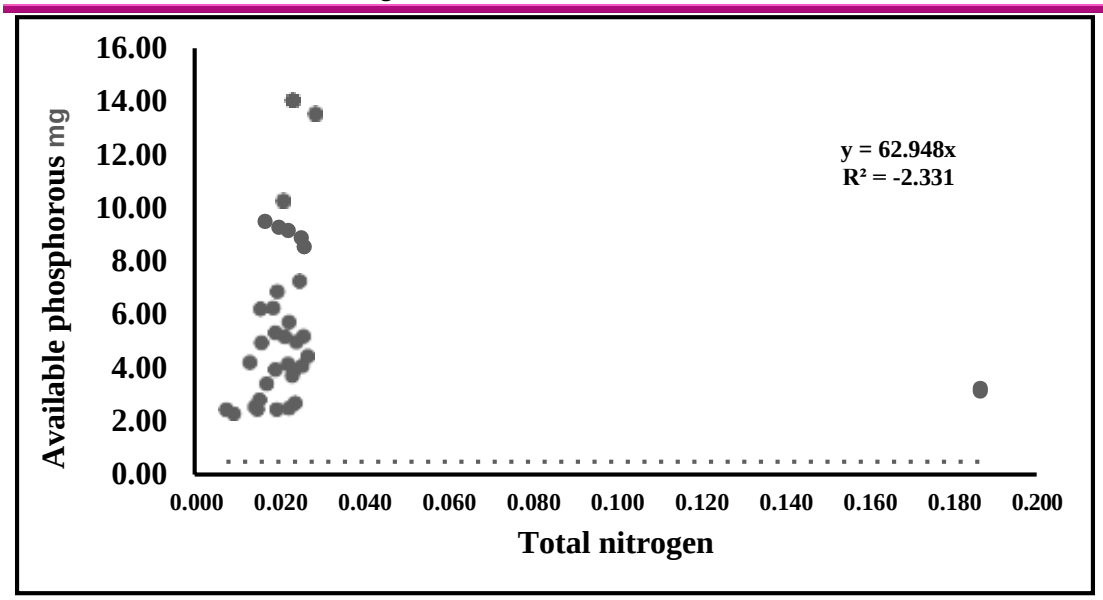
pH, Electrical conductivity, Total nitrogen, Available phosphorous, Available potassium and Organic matter

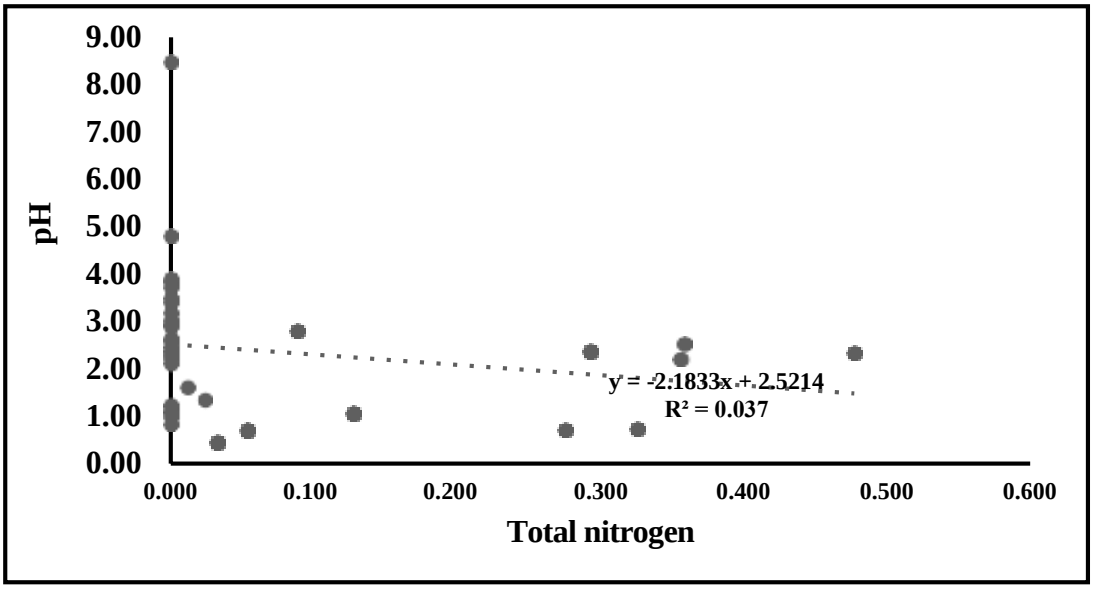
Where as
Any two means value compared statistical differ significantly at > 0.05 probability level * = significant

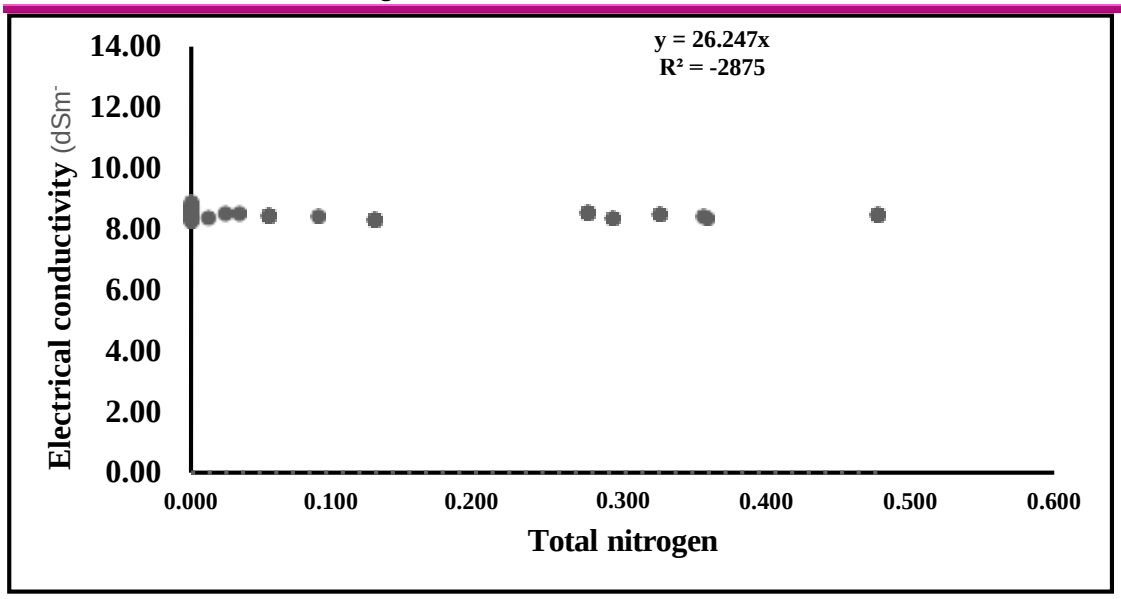
Figure No: 4.7 Regressions of soil pH, electrical conductivity, total nitrogen, available phosphorous, available potassium, and organic matter (SOM) status in different locations and cropping patterns in district Kech.


150.00
100.00
50.00
0.00
-50.00
-100.00
-150.00
Available potassium mg kg-1
y = 19833x2 - 4216.5x + 127.12
R² = 0.2649
0.000 0.020 0.040 0.060 0.080 0.100 0.120 0.140 0.160 0.180
Total nitrogen


0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
Organic matter %
y = 0.123ln(x) + 0.8931
R² = 0.4851
0.000 0.020 0.040 0.060 0.080 0.100 0.120 0.140 0.160 0.180
0.200


Available phosphorous mg
16.00
14.00
12.00
10.00
8.00
6.00
4.00
2.00
0.00
0.000
0.020
0.040
0.060
0.080
0.100
0.120
0.140
0.160
0.180
0.200
Total nitrogen
y = 62.948x
R² = -2.331


pH
9.00
8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
0.000
0.100
0.200
0.300
0.400
0.500
0.600
Total nitrogen
y = -2.1833x + 2.5214
R² = 0.037



CHAPTER 5 SUMMARY

A research study was conducted to evaluate the declining level of soil nutrients and fertility status and cropping patterns in four cultivated crops like tomato, onion, brinjal and cabbage soil field at 0-10 cm, 10-20 cm and 20-30 cm soil depth under union council Koshkalat, malik abad and Gokdan in Tehsil Turbat, District Kech, and Balochistan, Pakistan. During the time of experiment interviewed were conducted of the local communities of those union council's primary data was recorded from the local communities about their Agriculture farming system they used unbalance fertilizer and uses of nitrogen and phosphorous is not sufficient according to crop demands and soil study. Long hot summer and high temperature the annually rainfall is less than 250 millimeters. In this research four fields were selected for this purpose the field soil sampling was done on regular basis and the sampled soil were analyzed in the lab properly for each parameter separately. All the parameters observations were taken in data form, analyzed them in statistical 8.1 software. The results from all the fields and their related parameters revealed that this is due to improper field management, wrong timing for application of fertilizers and low fertilizers applications to their fields, this declination of soil fertility in the cultivated crops fields causing low yield and huge losses to farmer's economy. It is also noticed that excessive use of fertilizer and mismanagement in the field leads to soil erosion and land degradation thus creating an environmental hazard for us and other biota. However, there were significant differences found among the treatments for total nitrogen, available phosphorous, available potassium and organic matter. These were almost non-significance among the whole treatments except pH and electrical conductivity. Positive correlation specifies that the raise in one variable caused improvement in related traits or variable. The available potassium has positive strong significant with organic manure but on the basis of the experiment results under the three union councils of district Kech. The NPK availability status still remained a problem due to various types of mismanagement of field such as fertilizer application, wrong types and timing of fertilizers application, the fruits yield remained inconspicuous, its mainly due to monoculture that severely deplete the soil nutrients. The fertility status for macro nutrients should be well maintained and well managed.

In this study there were four field study sites for research. Farmers are recommended that minimum availability of total nitrogen, available phosphorous, available potassium and organic manure it need to apply 10 kg N/acre at the time of lawn establishment 10kg N/acre after two weeks of seedling. By observing all these chemical and physical characteristics of soil the research concludes its findings that these deficiencies of soil significantly affect the plants morphology and productions.

Conclusion

The purpose of the present study was to assess the available amount of soil nutrient and the fertility level of the soil district Kech. For the purpose three different union council of Kech, cultivated with four different vegetables crop, and at three different soil layers were assessed. Generally, the soil of the study sites were non saline in nature, low in organic matter, low in P and low in N nutrient. Though the soils were medium in K, this may be due to more use of Potassium fertilizer application or may be due to the effect of parent material.

Suggestion

Before cultivating any plant one must manage its soil. Soil management system is very essential for any crop and plant type for maximum yield, profitable economic conditions and for sustainable agriculture. Tomato, onion, cabbage and brinjal

production in today's environmental condition is very critical in this region because of drought in the arid region, so we must adopt some sustainable management practices to compensate the agricultural hurdles such as water scarcity, insufficient organic matter, monoculture cropping, soil moisture conservation. All these losses can be compensated through biological processes. These strategies include the principles of management of soils (SOM) as well as leaving the crop residues in soil so that this organic matter retention recycle the nutrient, addition of green manures in soil, use of mulching technique to conserve soil water that enhance fields ecological condition and productivity of field. This is good for and sustainable agricultural productions system. If the field soil is not practiced with sustainable agricultural management.

On the basis of study observation this study suggested the more use of FYM compared to chemical fertilizer this will effect on both saline and the fertility of soil, and ultimately effect on the growth and yield of the crop.

Compared to common crop and vegetable cultivations in the study sites, findings suggest the more cultivation of legumes crop compared to other crops.

Future research

In addition of this research more experiment will be conducted for basic knowledge of soil as well cropping patterns of the particular area of district Turbat of three union council Malik abad, Koshkalat and Gokdan in district Kech.

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