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RESEARCH ARTICLE

COMPARATIVE ANALYSIS OF PHYSICAL AND CHEMICAL PARAMETER OF SOIL IN NON IRRIGATED AND IRRIGATED (WELL OR CANAL) FIELD AREAS AROUND BIKANER CITY RAJASTHAN

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Abstract

The most vital and essential common asset is soil. The production of the sustenance to meet the requirements of people and animals is basically reliant upon agriculture which is dependent on soil. The word 'soil' originated from Latin word 'Solum' which means 'Flour'. The soil is a dynamic natural body composed of minerals and organic material as well as living forms in which plant grow. Soil is the unconsolidated outer layer of Earth's crust. Soils consist of four major components: mineral materials, organic matter, water, and air. The physical properties of a soil are important to determine the manner in which it can be used either for agricultural and non-agricultural purposes R. S. Meena and A. K. Mathur, 2017 Properties viz. infiltration rate, water- holding capacity, permeability, aeration, plasticity and nutrient-supplying ability, are influenced by the size, proportion, arrangement and mineral composition of the soil particles.

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Introduction:-

The soils of Bikaner district are light textured, sand to sandy loam with clay content with very little chemical weathering has taken place and the development of soil is indistinct. Soils are generally desertic type with low fertility, low water retention capacity, good porosity and good permeability. (District Ground water brochure, 2013)

Table 1:- Major Types of Soils Found in Bikaner District.

Major soils	Percent (%) of total
Deep yellowish-brown sandy soils	39.3
Deep light yellowish-brown loamy soils	38.6
Medium light yellowish-brown loamy soils	13.0
Others (deep pale brown loamy, medium yellowish-brown sandy, shallow pale brown gravelly sandy soils)	08.92
total	100

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Soil is the vital source for the cultivation of all types of crops. The crops cultivation is dependent on physical and chemical properties of soil. N. P. Patel, P. L. Patel, P. H. Patel and A. Gharekhan, 2015. The optimum plant growth and crop yield depends not only on the total amount of nutrients present in the soil at a particular time but also on their availability which in turn is controlled by physical and chemical properties of soil. S. S. Kekane, R. P. Chavan, D. N. Shinde, C. L. Patil and S. S. Sagar 2015. Soil properties vary spatially from a field to larger scale influenced by both inherent and extrinsic factors. So, a comparative analysis is carried out between various soil parameters (physical and chemical properties of soil) of non-irrigated and irrigated (well and canal) agriculture fields of various areas around Bikaner R. Parihar and R. Choudhary 2017.

Study Area:

Location and Geographical Area:

Bikaner district is located in the north-western part of Rajasthan and encompassed between north latitudes 27°11' to 29°03' and east longitudes 71°52' to 74°15' covering geographical area of 30247.90 Sq. km. which is around 8.8 percent of the total area of the state and stands at second place area wise in the state after Jaisalmer. It is bounded on the north by Ganganagar District, on the east by Hanumangarh and Churu Districts, on south by Nagaur and Jodhpur Districts and on the west by Jaisalmer District and International border with Pakistan.

The district is divided into eight sub-divisions i.e. Bikaner, Kolayat, Nokha, Lunkaransar, Khajuwala, Chhattargarh, Pugal and Dungargarh and eight tehsils, i.e., Bikaner, Kolayat, Nokha, Lunkaransar, Khajuwala, Chhattargarh, Poogal and Dungargarh. There are 1498 villages and 290 Gram panchayats.

As per 2011 Census, the total population of the district is 2363937 out of which 1563553 is rural population and 800384 is urban population. The district has a population density of 78 inhabitants per square kilometer.

The vegetation of Bikaner district falls under the broad natural divisions of tropical forest. Bikaner due to extremely low rainfall and extreme of temperature there is high evaporation and loss Moisture, converting the district into a typical arid. Rainfall and Climate:

The district experiences arid type of climate in the east to extremely arid in the west. Mean annual rainfall (1991-2010) of the district is 277.55 mm whereas normal rainfall (1901-1971) is lower than average rainfall and placed at 257.8 mm. Almost 90% of the total annual rainfall is received during the southwest monsoon, which enters the district in the first week of July and withdraws in the mid of September. As the district lies in the desert area, extremes of heat in summer and cold in winter are the characteristics of the desert. Both day and night temperatures increase gradually and reach their maximum values in April, May and June. The temperature varies from 48 degree in summer to 1 degree in winter. Atmosphere is generally dry except during the monsoon period. The humidity is the highest in August with mean daily relative humidity of 71% in the morning and 52% in the evening. The western, south-western, northern and north eastern parts of the district are largely covered with dunes of different types and magnitudes with flat to undulating interdunal plains. The main Rajasthan Canal enters the area somewhere north of village Bhansar and leaves the district in the southern boundary near village Gogliala. The main canal has a number of branches and tributaries like (1) Naushera Branch, (2) Dathar Branch, (3) Birsipur Branch, and (4) Charanwala branch. Besides the main Rajasthan canal command area, there are other areas of lift canals. The Indira Gandhi Nahar Pariyoajna receives water from barrage at Hari Ka Pattan in Amritsar district of Punjab through 204 km. The IGNP canal command area is 591000 hectares in the district (Stage-I 179000 hectares and Stage-II 412000 hectares).

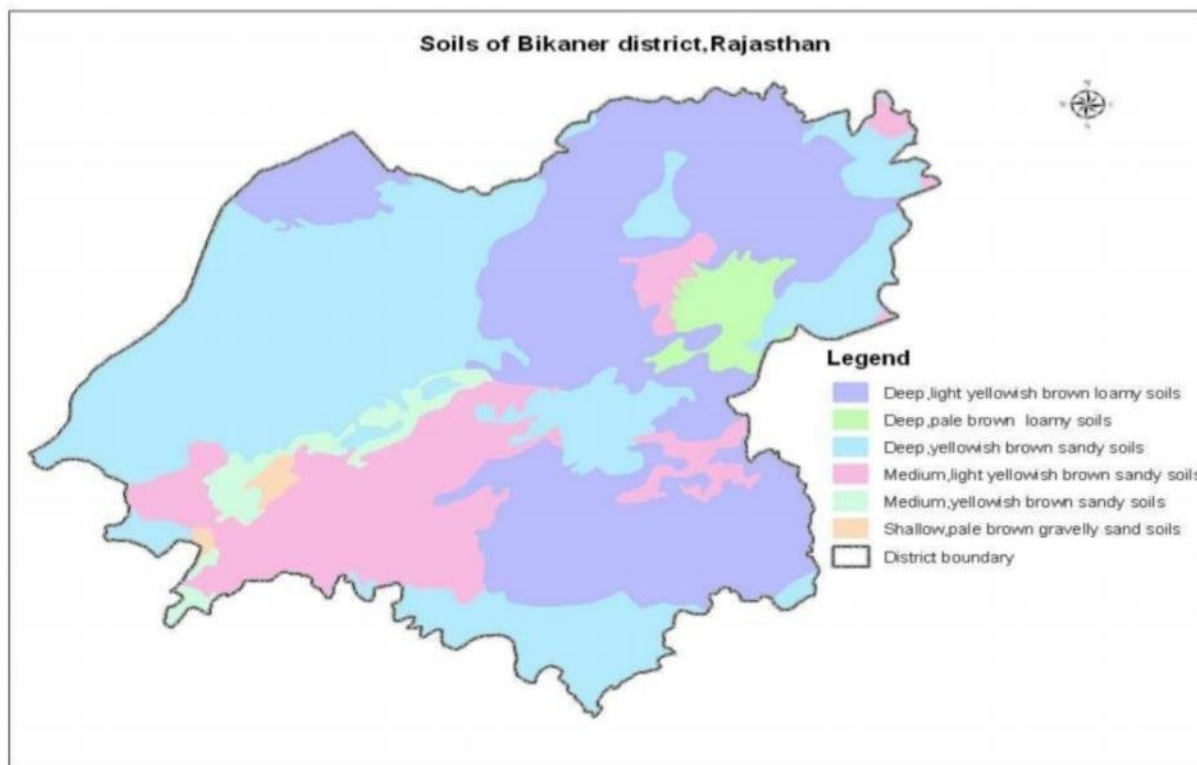


Fig. 2:- Soils of Bikaner District.

Villages Under Study Area:

- **Shobhasar Well irrigated** village is located in Bikaner tehsil of Bikaner district in Rajasthan, India. According to Census 2011 information the location code or village code for Shobhasar is 069035. It is situated 10km away from Bikaner, which is both district and sub-district headquarter of Shobhasar village.
- **Badrasar Canal irrigated and Non irrigated** village is located in Bikaner tehsil of Bikaner district in Rajasthan, India. According to Census 2011 information the location code or village code for Badrasar is 069139. It is situated 32km away from Bikaner, which is both district and sub-district headquarter of Badrasar village.
- **Nal chhoti Non Irrigated** village is located in Bikaner tehsil of Bikaner district in Rajasthan, India
- **Nalbari Non irrigated** village is located in Bikaner tehsil of Bikaner district in Rajasthan, India. According to Census 2011 information the location code or village code for Nalbari is 069037. It is situated 13km away from Bikaner, which is both district and sub-district headquarter of Nalbari village.
- **Basti Chawadan Well irrigated** village is located in Bikaner tehsil of Bikaner district in Rajasthan, India. It is situated 15km away from Bikaner, which is both district and sub-district headquarter of Basti Chawadan village. The total geographical area of village is 1172.42 hectares. Basti Chawadan has a total population of 118 peoples. There are about 18 houses in village.
- **Ridmalsar Canal irrigated** village is located in Bikaner tehsil of Bikaner district in Rajasthan, India. According to Census 2011 information the location code or village code for Ridmalsar is 069083. It is situated 8km away from Bikaner, which is both district and sub-district headquarter of Ridmalsar village.
- **Kilchoo Deodan Well irrigated & Non Irrigated** village is located in Bikaner tehsil of Bikaner district in Rajasthan, India. According to Census 2011 information the location code or village code for Kilchoo Deodan is 069107. It is situated 17km away from Bikaner, which is both district and sub-district headquarter of Kilchoo Deodan village.

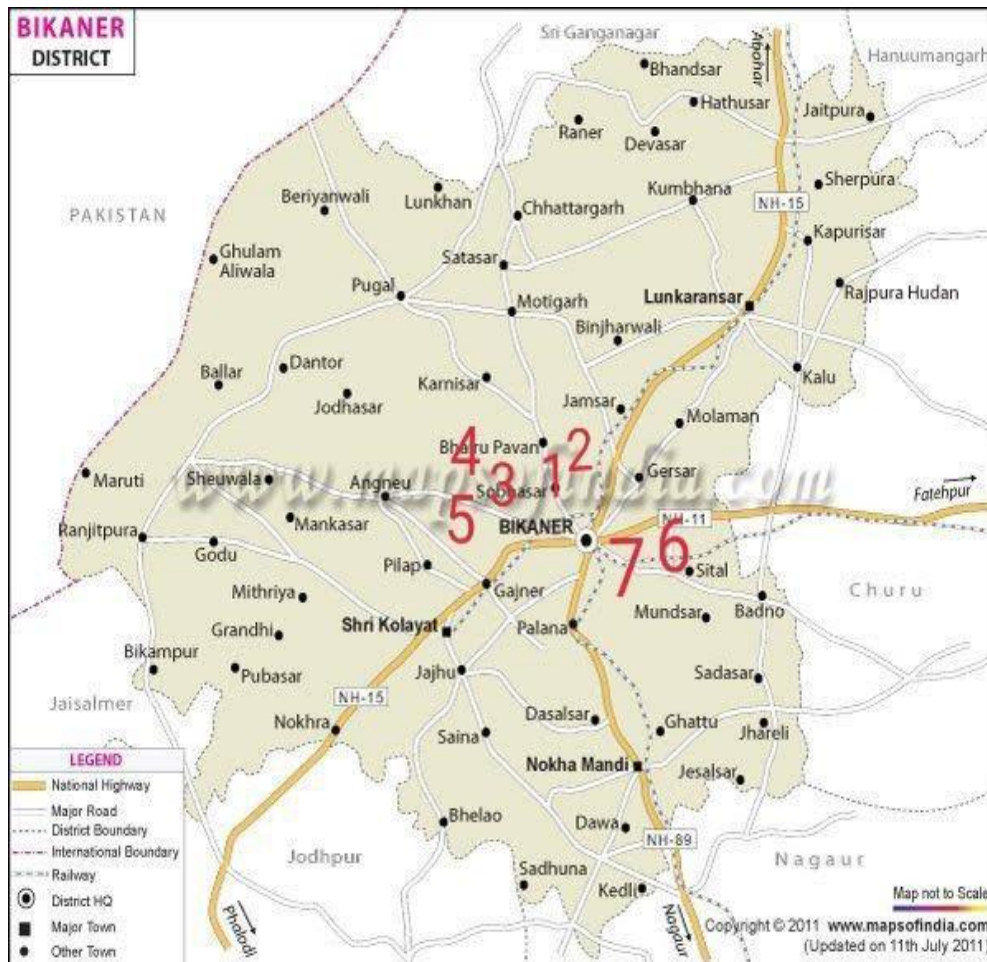




Fig. 4:- Soil Sample Collection from (A) Non-Irrigated Area from Badrasar, (B) Well Irrigated Area from Shobhasar and (C) Canal Irrigated Area from Badrasar.

Material & Methods:-

The soil sample collected is representative of the area. A field can be treated as a single sampling unit if it is uniform in all respects. Variation in slope, texture, colour, crop growth and management levels should be taken into account for soil sampling.

Samples can be drawn satisfactorily with any one of hand implements namely, soil tube auger, screw type auger, post hole auger, spade and khurpi. A sampling depth of soil sample is 0-15 cm. The soil samples collected should be thoroughly mixed by hand on a clean piece of cloth paper. Reduce the bulk sample to about 500 gm by quartering process in which entire soil mass is spread, divide into four quarters, two opposite samples are discarded and the remaining two are mixed. Repeat this process until about 500 gm soil is left. Determination of

various parameters pertaining to different soils are undertaken as their bulk density, PH, electric conductivity, organic carbon and some elements like Zinc, Iron, Copper & Manganese.

Result And Discussion:-

Soil samples are taken from the non-irrigated areas (Badrasar Kilchoo Deodan, Nalbari, Nal chhoti) in Bikaner, Rajasthan. From these soil samples physical and chemical parameters of soil are observed. The readings of these parameters are shown in following table 4.

Table 4:-

S. No.	Soil Parameters	Badrasar	Kilchoo Deodan	Nalbari	Nal chhoti
1.	Bulk Density (Mg/m ³)	1.846	1.738	1.567	1.621
2.	pH (acidity / basicity)	8.70	7.83	8.86	8.53
3.	Electrical Conductivity (dS/m)	0.44	0.14	0.23	0.17
4.	Organic Carbon (%)	0.12	0.19	0.22	0.21
5.	Available Phosphorus (Kg/ha)	21	29	22	29
6.	Available Potassium (Kg/ha)	302	269	302	302
7.	Zinc (ppm)	0.59	0.50	0.49	0.46
8.	Iron (ppm)	3.66	3.72	3.69	3.60
9.	Copper (ppm)	0.12	0.20	0.16	0.18
10.	Manganese (ppm)	2.13	2.16	2.03	2.18

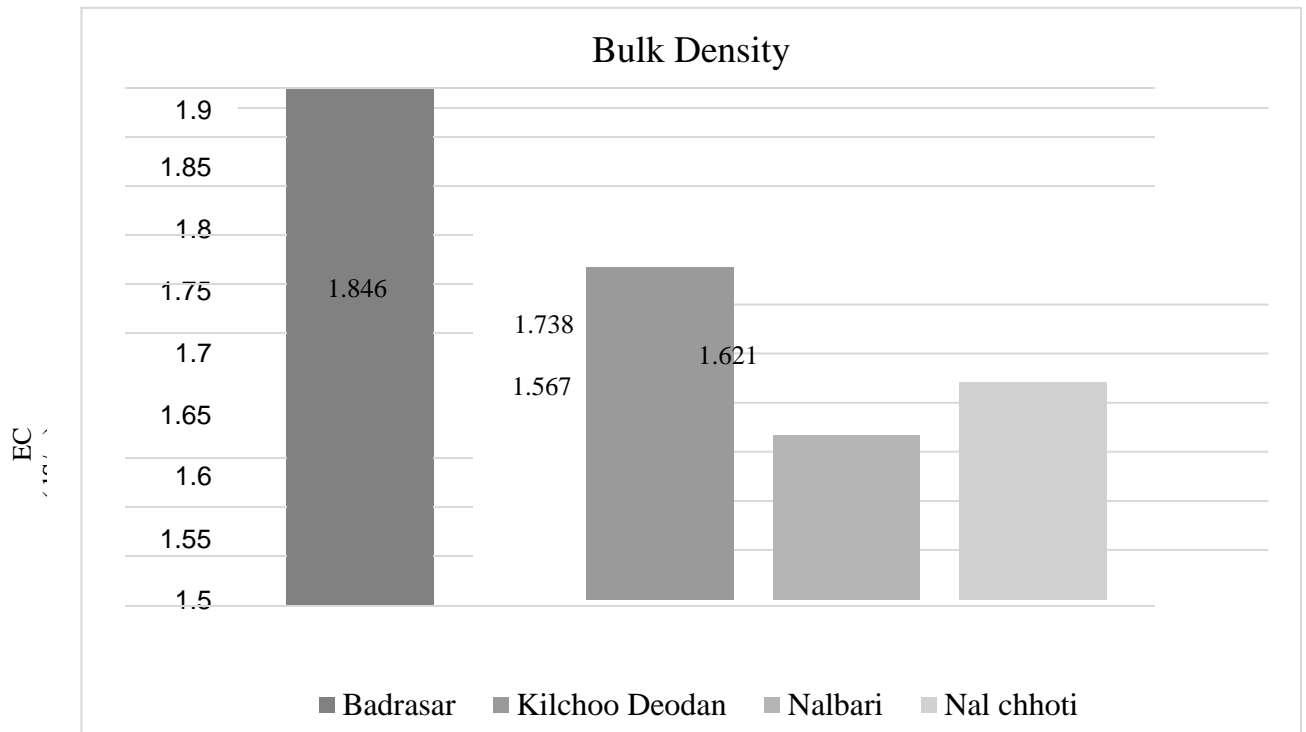


Fig. 4.1:- Bulk Density of Non-Irrigated Areas.

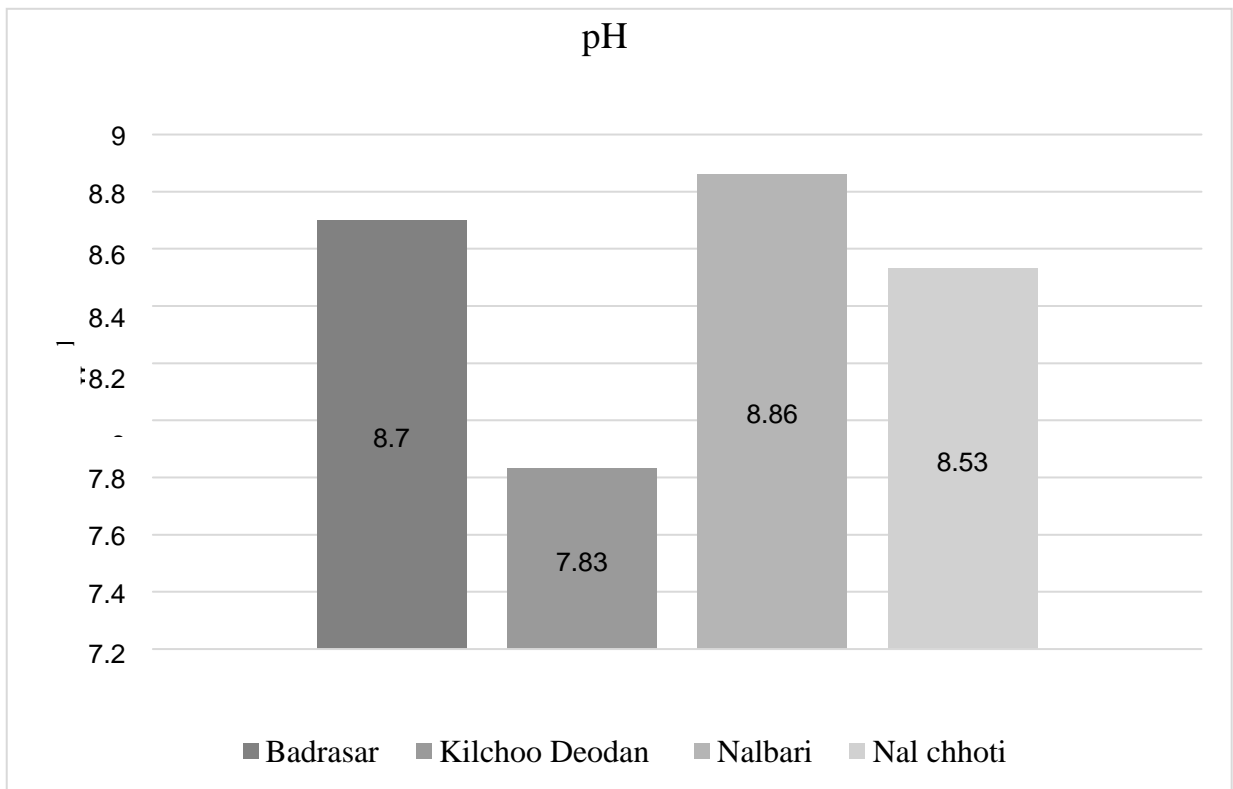


Fig. 4.2:- pH of Non-Irrigated Areas.

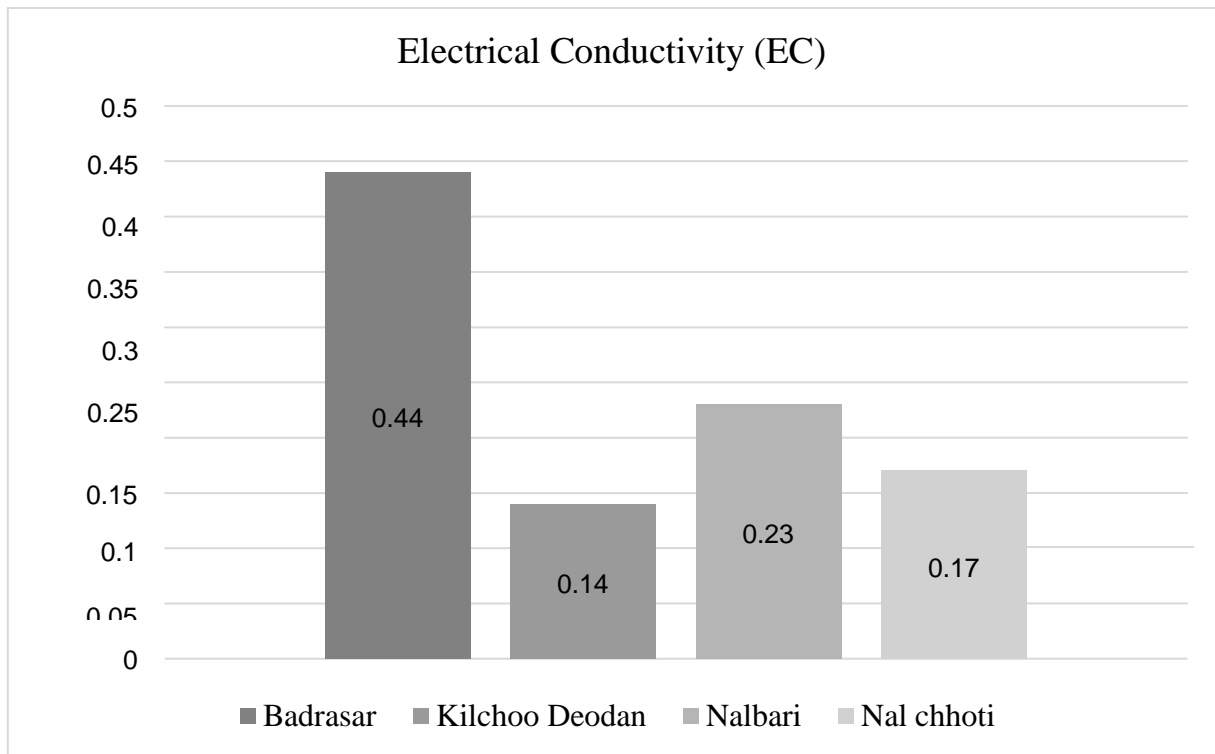


Fig. 4.3:- Electrical Conductivity of Non-Irrigated Areas

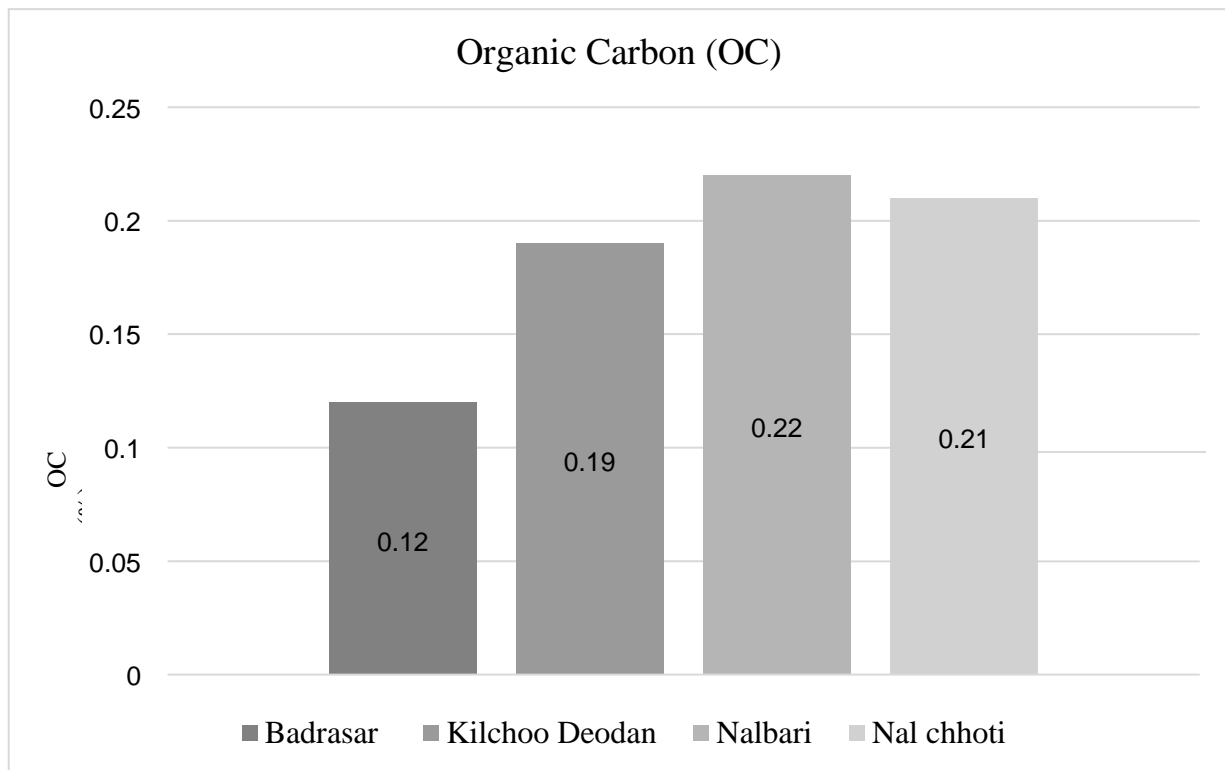


Fig. 4.4:- Organic Carbon of Non-Irrigated Areas.

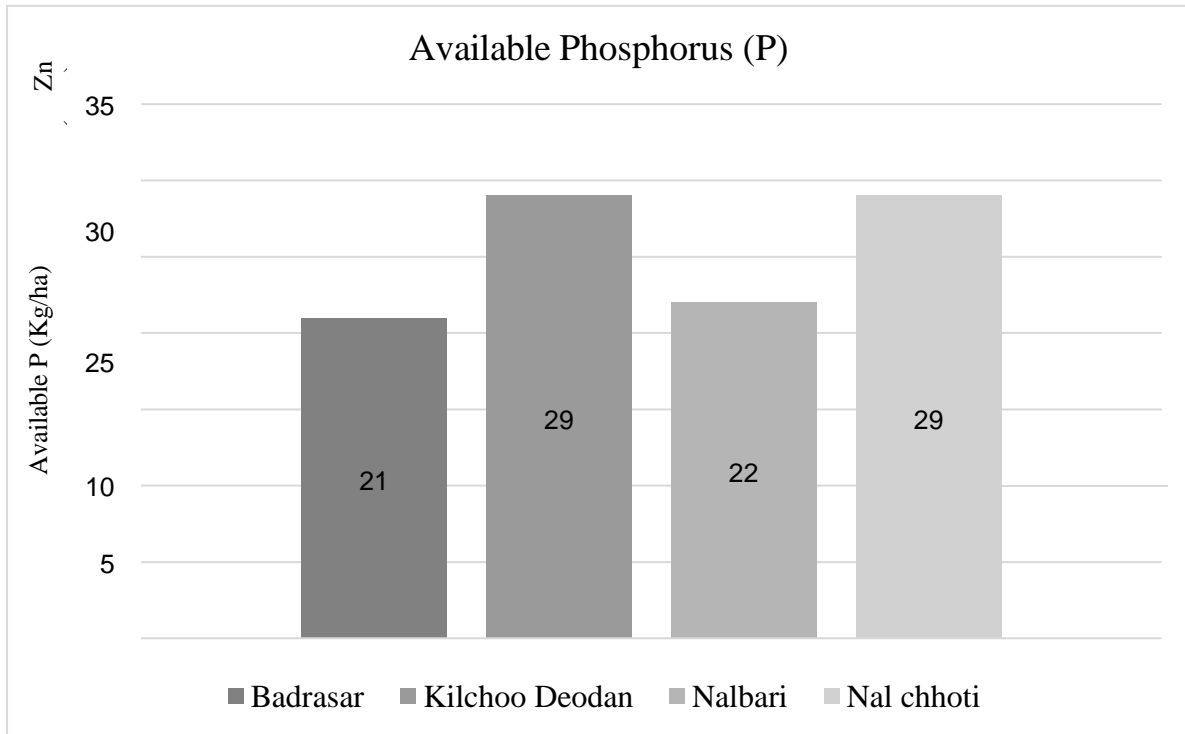


Fig. 5.5:- Available Phosphorous of Non-Irrigated Areas

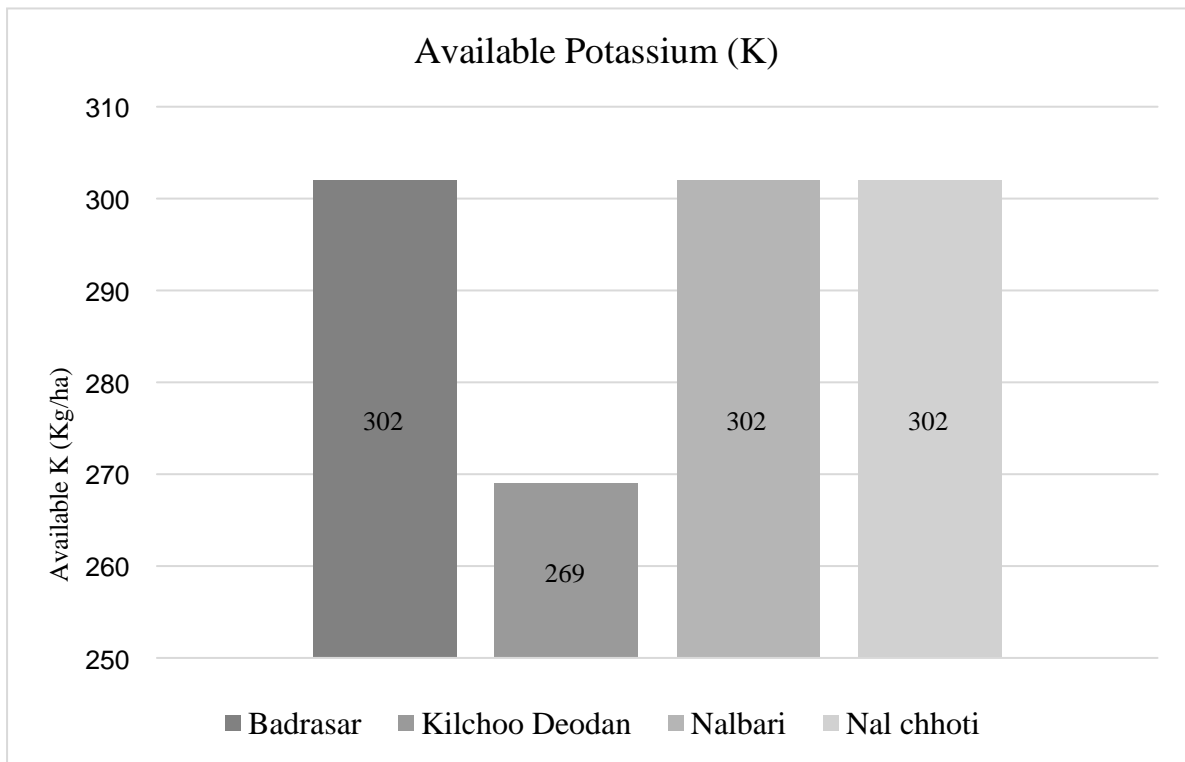


Fig. 5.6:- Available Potassium of Non-Irrigated Areas.

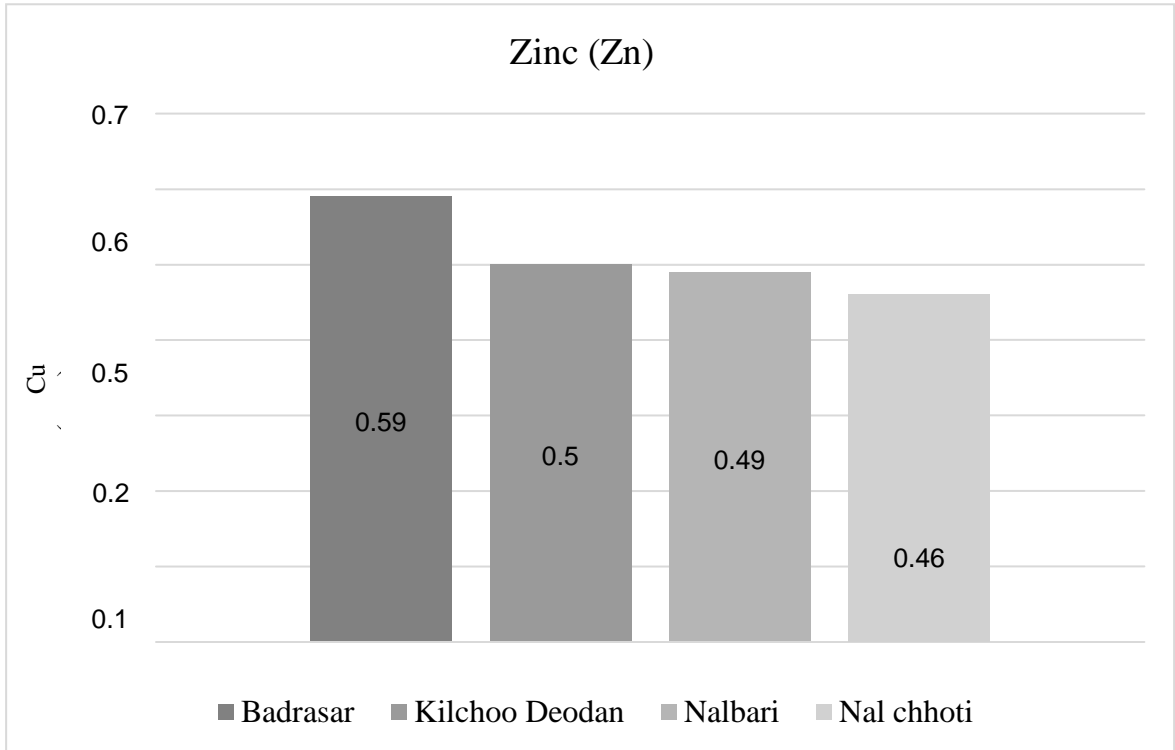


Fig. 5.7:- Zinc of Non-Irrigated Areas.

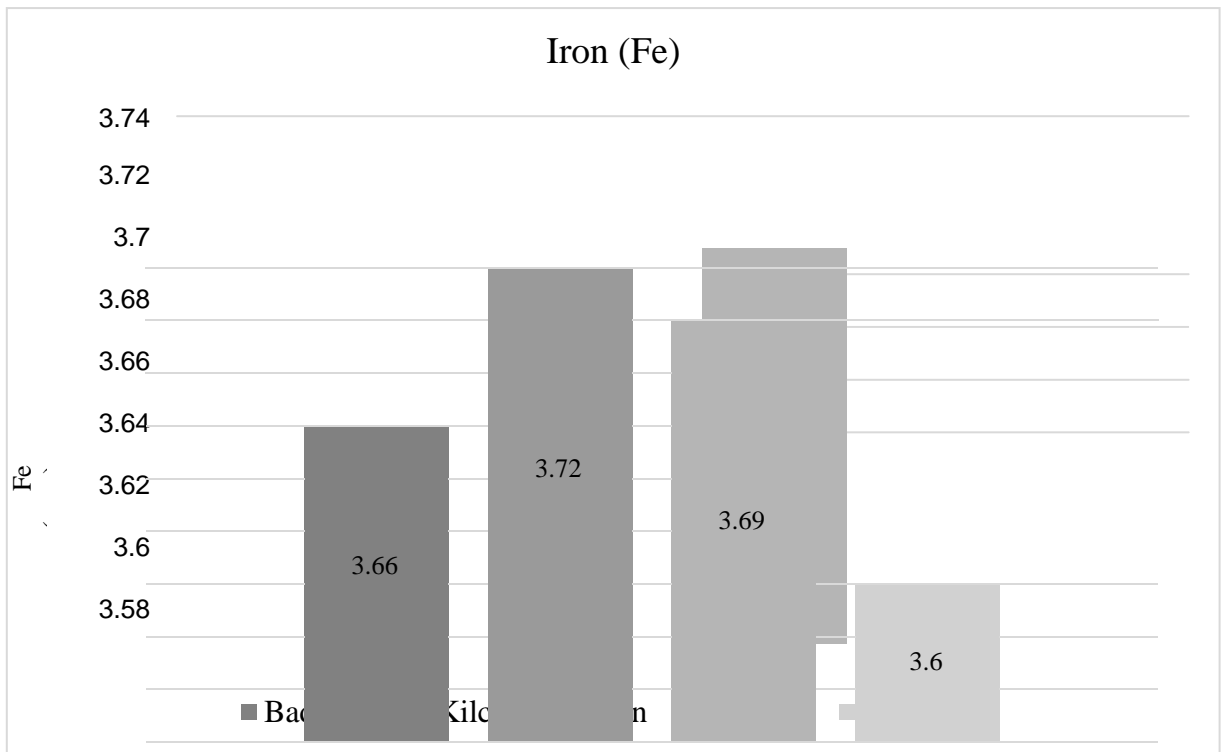


Fig. 5.8:- Iron of Non-Irrigated Areas

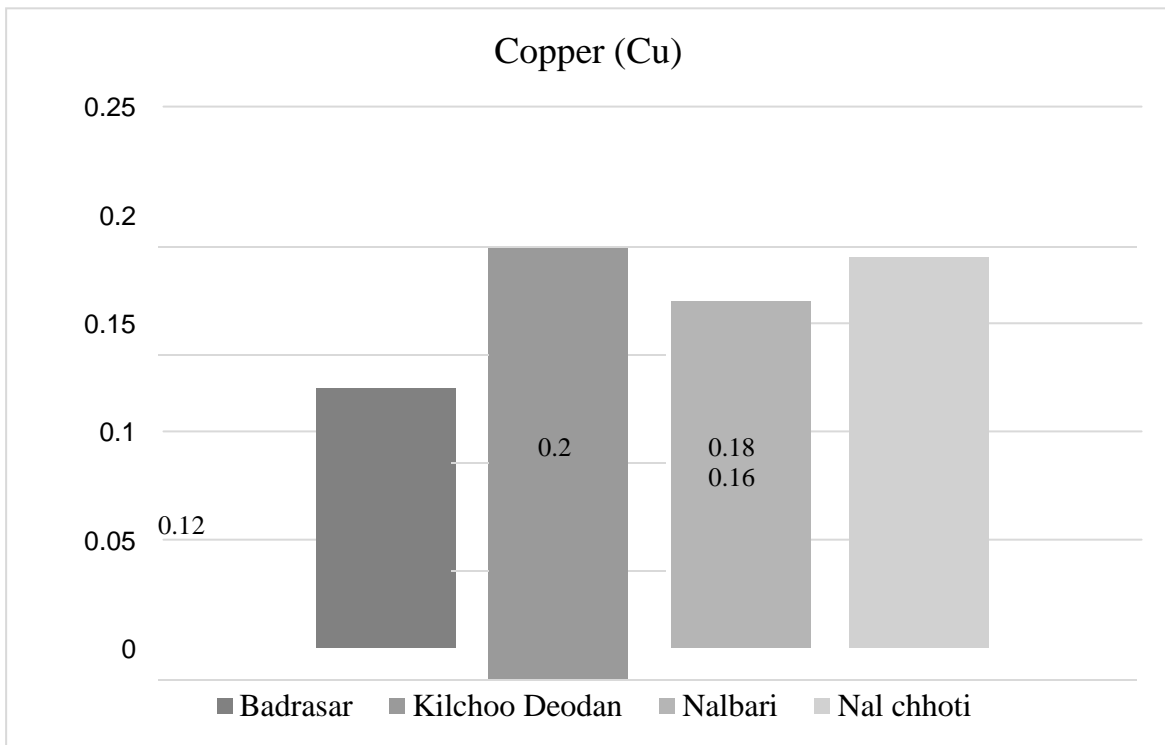


Fig. 5.9:- Copper of Non-Irrigated Areas.

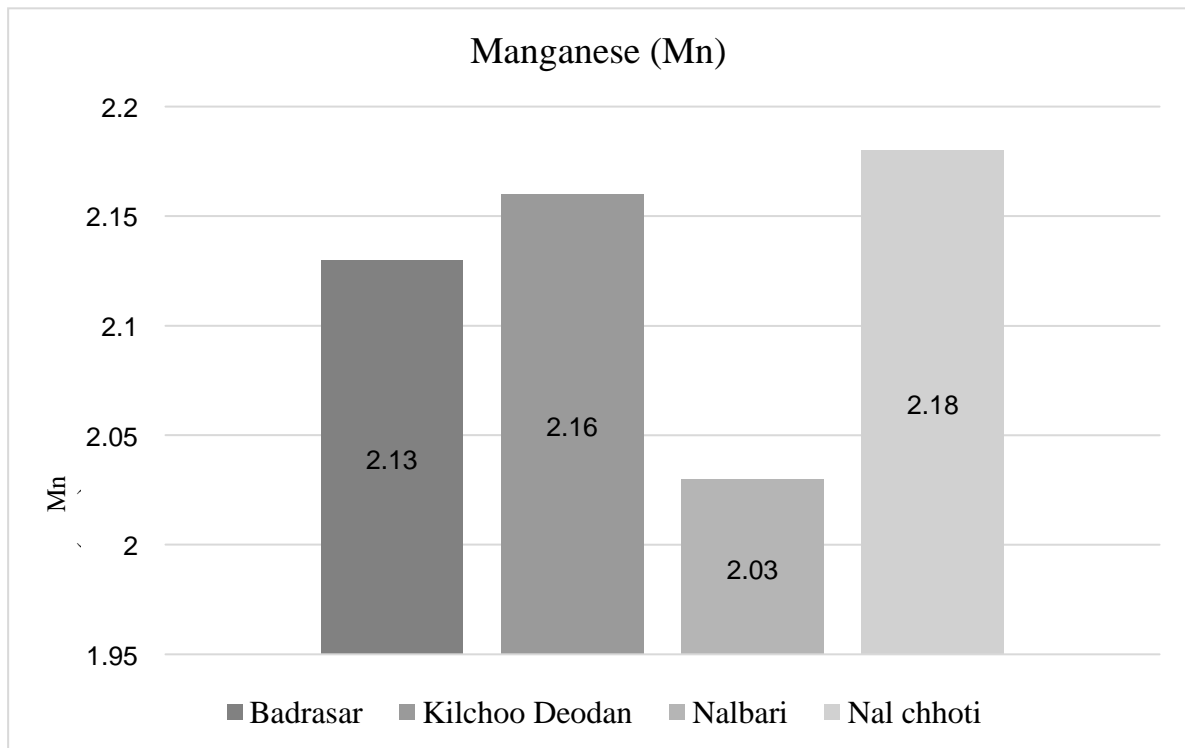


Fig. 5.10:- Manganese of Non-Irrigated Areas.

Observations of Well Irrigated Areas:

Soil samples are taken from Well Irrigated areas (Kilchoo Deodan, Shobhasar, Basti Chawadan) in Bikaner, Rajasthan. The observed physical and chemical parameters of soil of these soil samples are shown in the following table 5.2.

Observations Of Well Irrigated Areas:-**Table 5.2:-**

S. No.	Soil Parameters	Kilchoo Deodan	Shobhasar	Basti Chawadan
1.	Bulk Density (Mg/m^3)	1.814	1.763	1.654
2.	pH (acidity / basicity)	7.70	7.95	8.97
3.	Electrical Conductivity (dS/m)	0.14	0.12	0.13
4.	Organic Carbon (%)	0.11	0.17	0.17
5.	Available Phosphorus (Kg/ha)	24	24	24
6.	Available Potassium (Kg/ha)	325	269	336
7.	Zinc (ppm)	0.53	0.54	0.35
8.	Iron (ppm)	3.80	3.85	3.85
9.	Copper (ppm)	0.25	0.18	0.20
10.	Manganese (ppm)	2.19	2.00	2.20

The comparative analysis of these soil parameters regarding Well irrigated sample areas are shown in the following graphs from fig. 5.11 to fig. 5.20.

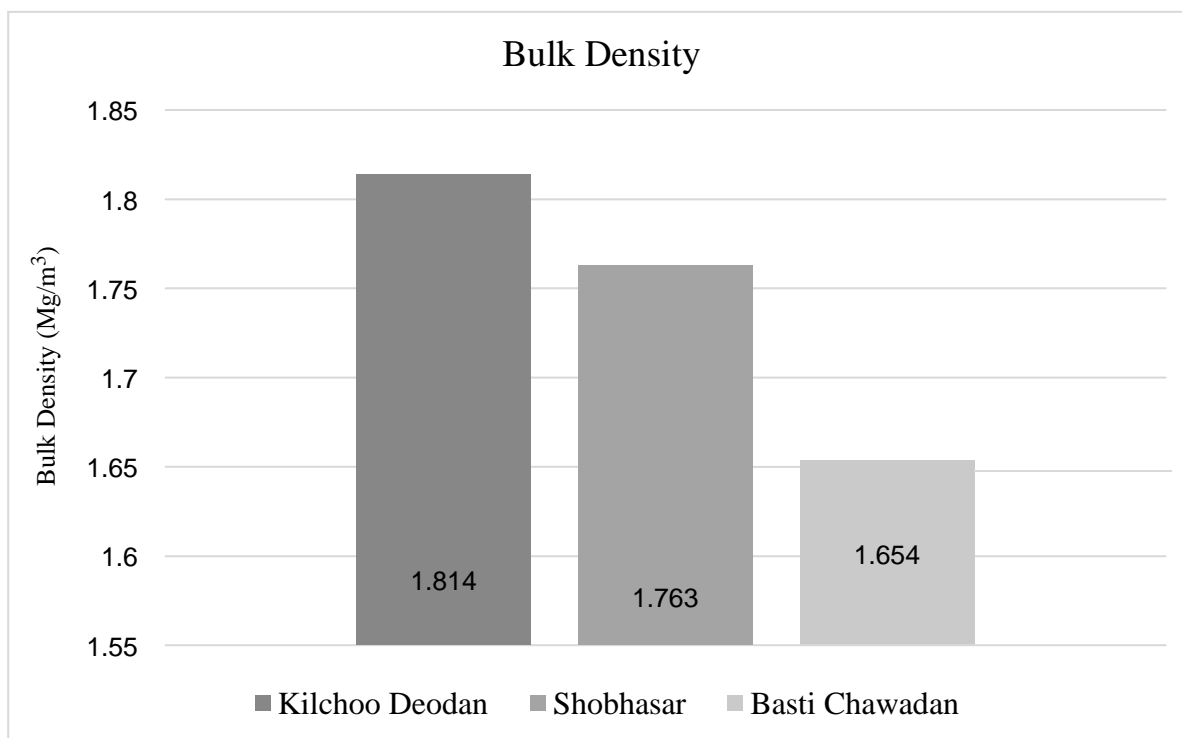


Fig. 5.11:- Bulk Density of Well Irrigated Areas.

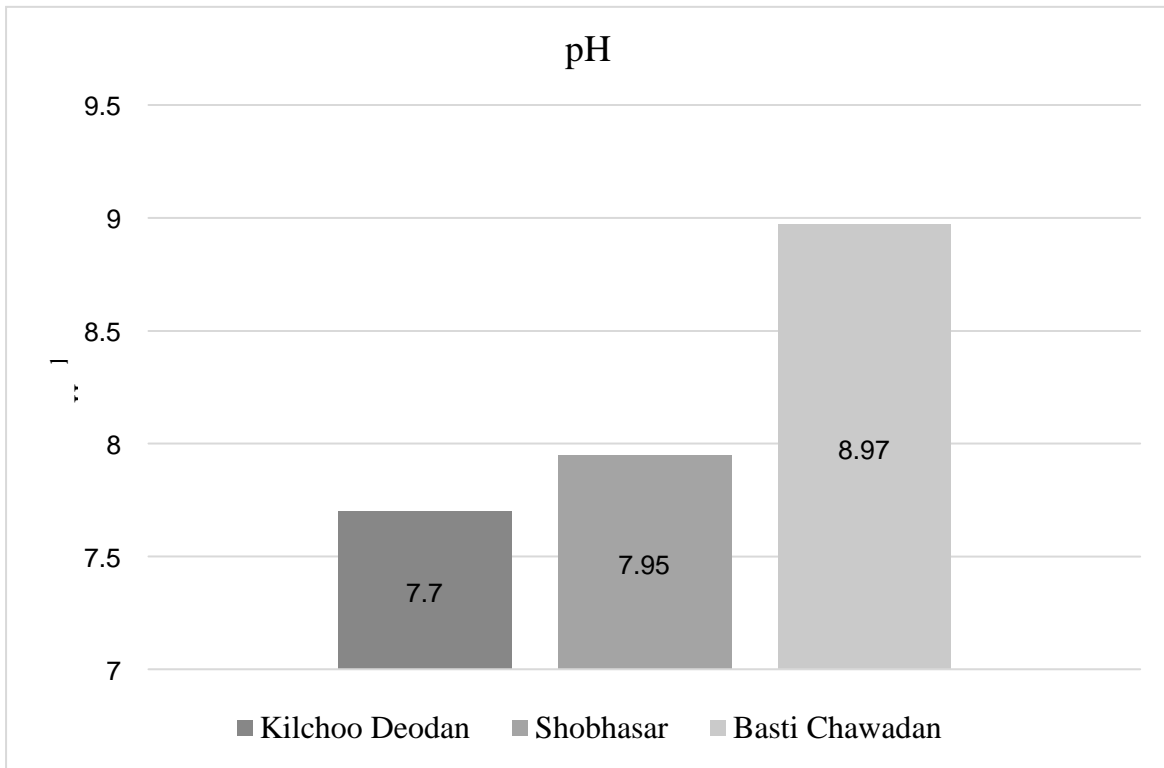


Fig. 5.12:- pH of Well Irrigated Areas.

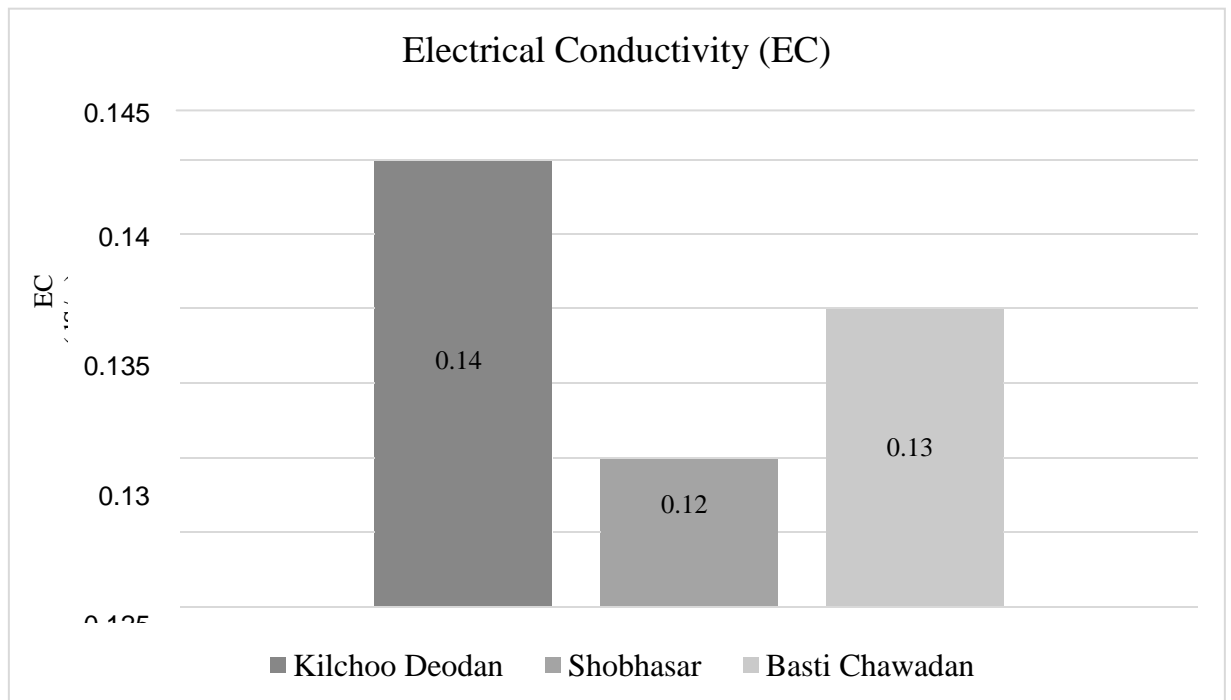


Fig. 5.13:- Electrical Conductivity of Well Irrigated Areas.

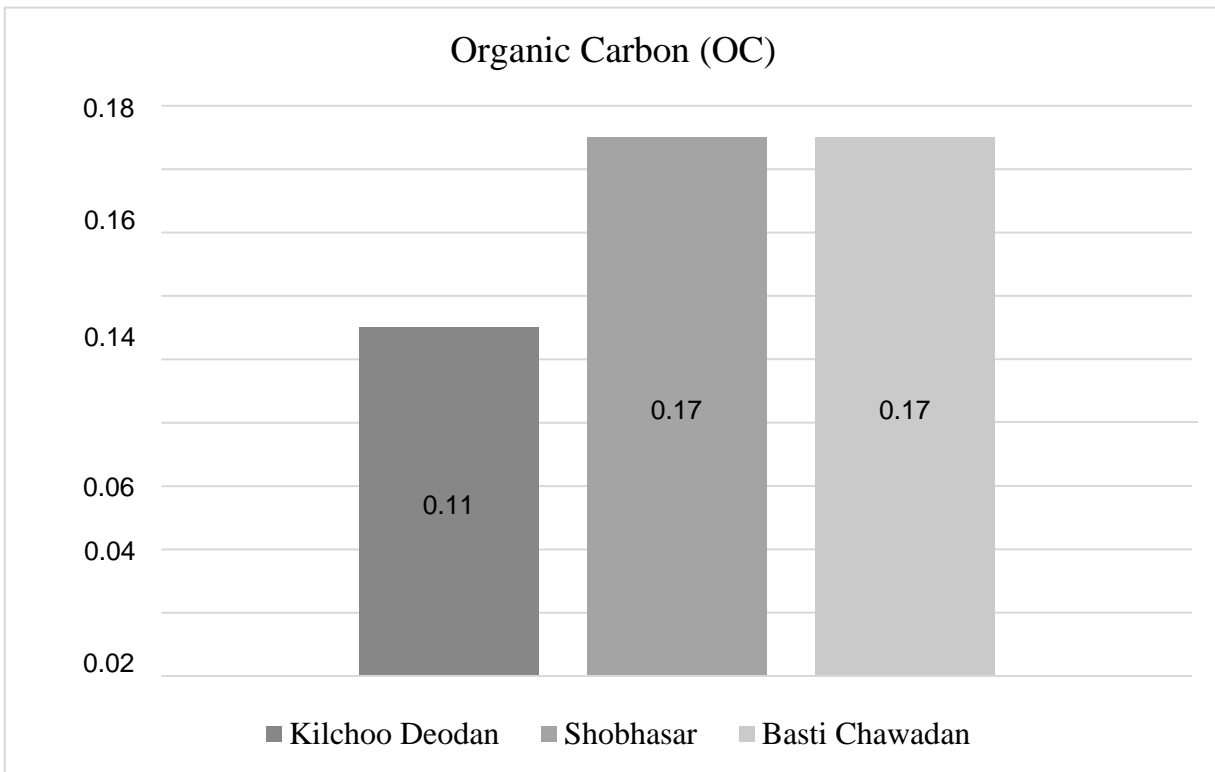


Fig. 5.14:- Organic Carbon of Well Irrigated Areas.

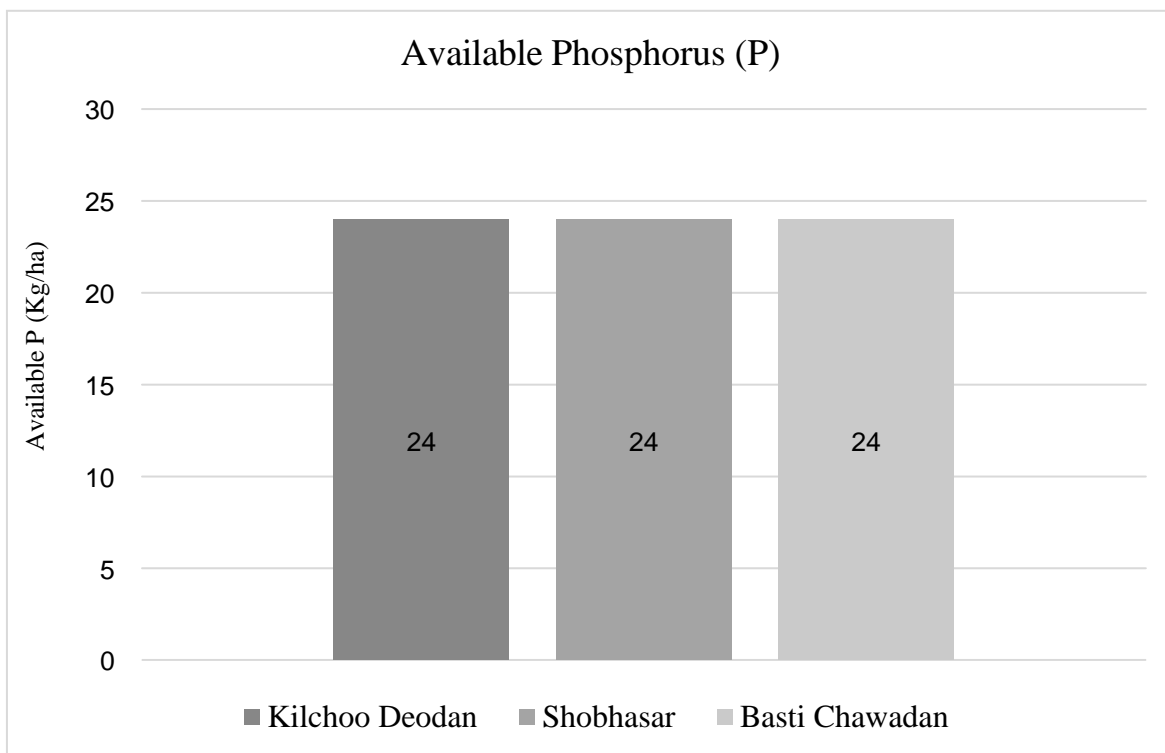


Fig. 5.15:- Available Phosphorous of Well Irrigated Areas.

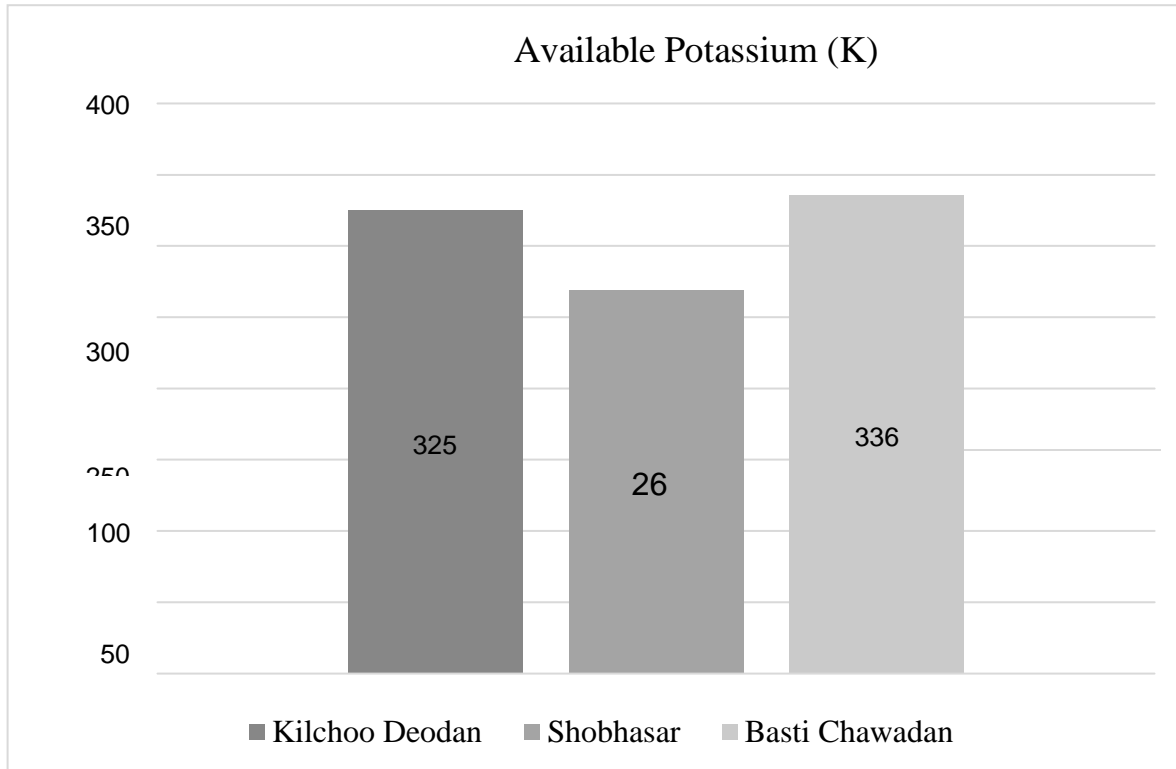


Fig. 5.16:- Available Potassium of Well Irrigated Areas.



Fig. 5.17:- Zinc of Well Irrigated Areas.

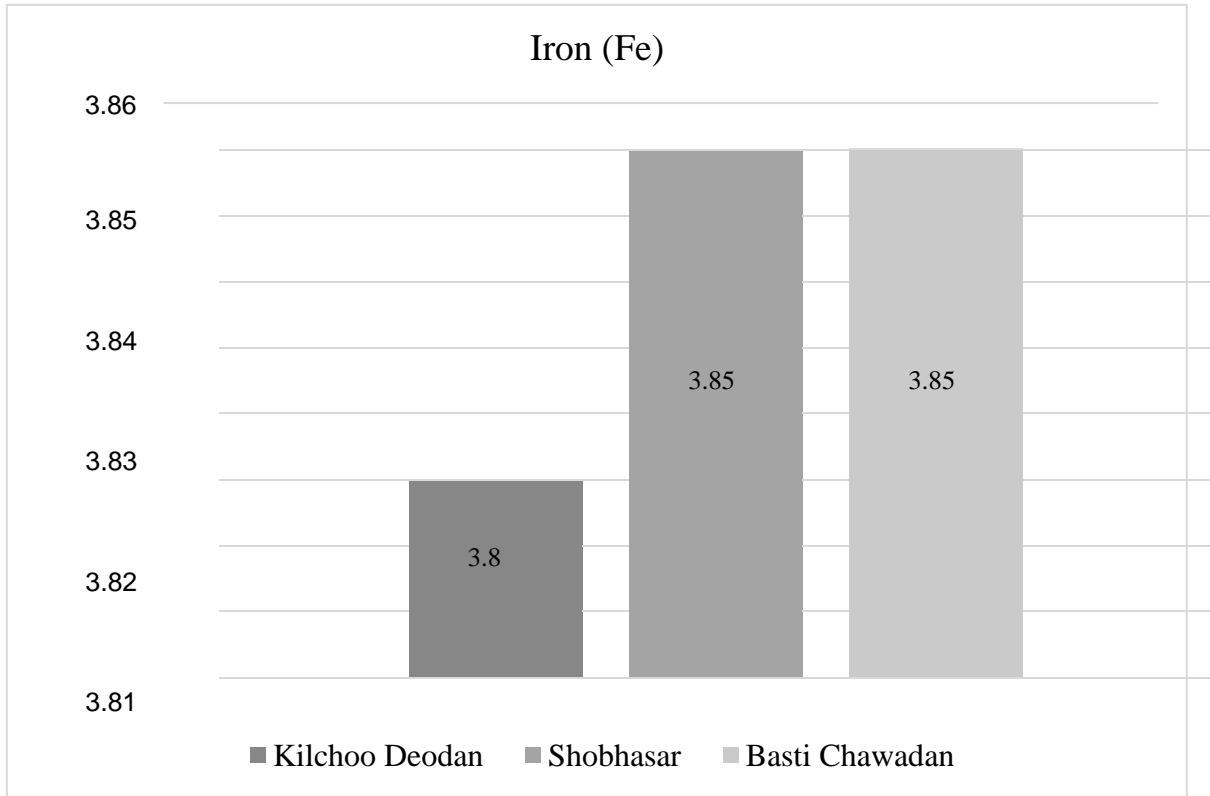


Fig. 5.18:- Iron of Well Irrigated Areas.

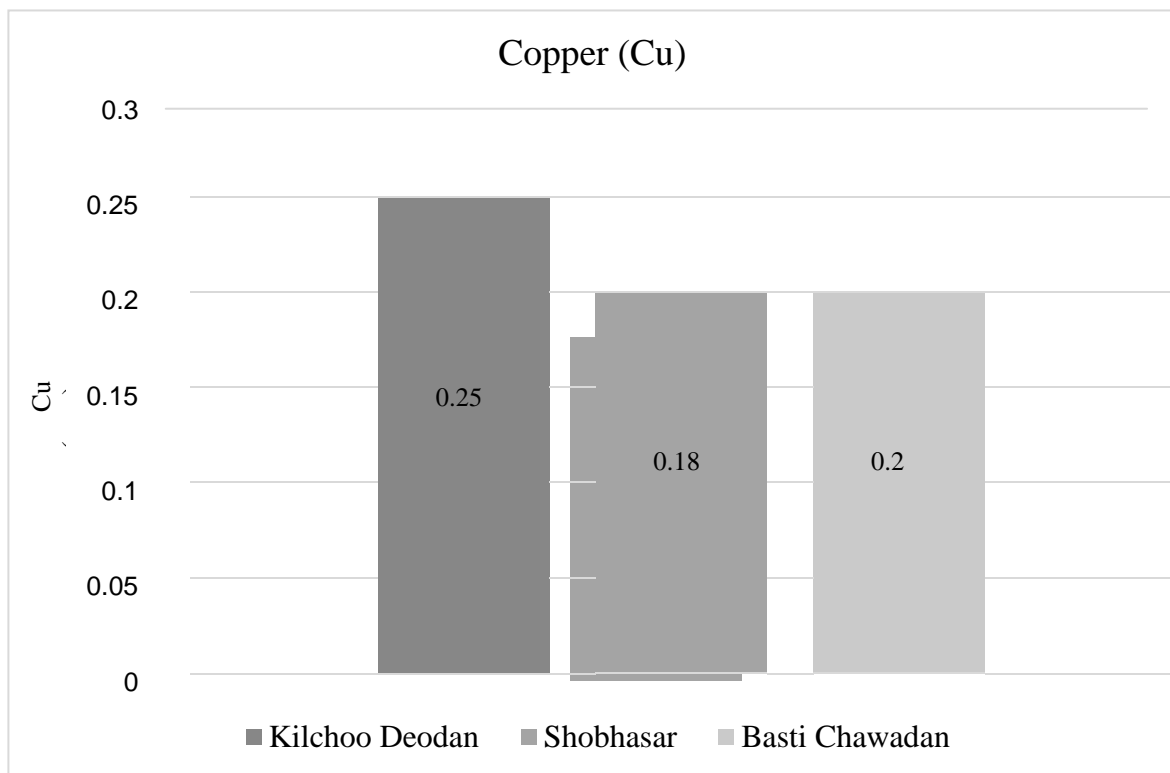


Fig. 5.19:- Copper of Well Irrigated Areas.

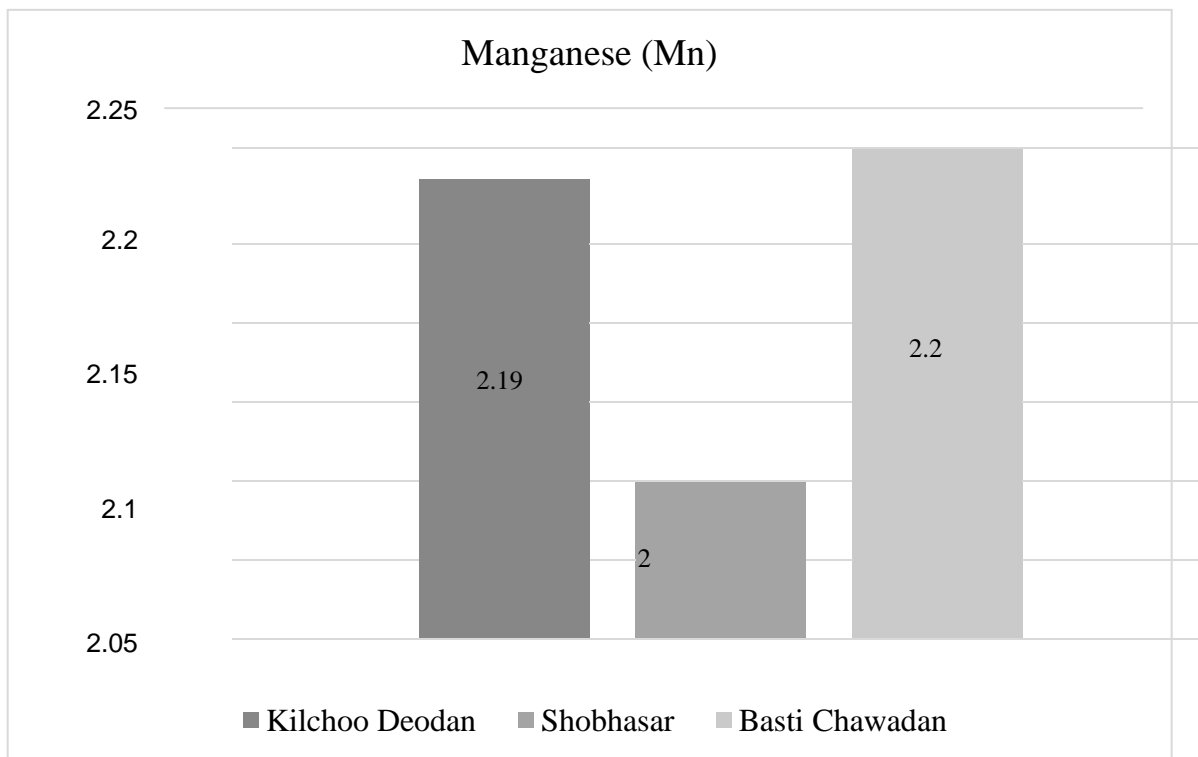


Fig. 5.20:- Manganese of Well Irrigated Areas.

Observations of Canal Irrigated Areas:

Soil samples are taken from Canal Irrigated areas (Badrasar and Ridmalsar) in Bikaner, Rajasthan. The observed physical and chemical parameters of soil of these soil samples are shown in the following table 5.3.

Observations Of Well Irrigated Areas

S. No.	Soil Parameters	Badrasar	Ridmalsar
1.	Bulk Density (Mg/m^3)	1.784	1.835
2.	pH (acidity / basicity)	8.15	8.45
3.	Electrical Conductivity (dS/m)	0.15	0.19
4.	Organic Carbon (%)	0.29	0.18
5.	Available Phosphorus (Kg/ha)	15	26
6.	Available Potassium (Kg/ha)	246	276
7.	Zinc (ppm)	0.39	0.57
8.	Iron (ppm)	3.67	3.72
9.	Copper (ppm)	0.18	0.16
10.	Manganese (ppm)	2.16	2.12

The comparative analysis of these soil parameters regarding Well irrigated sample areas are shown in the following graphs from fig. 5.21 to fig. 5.30.

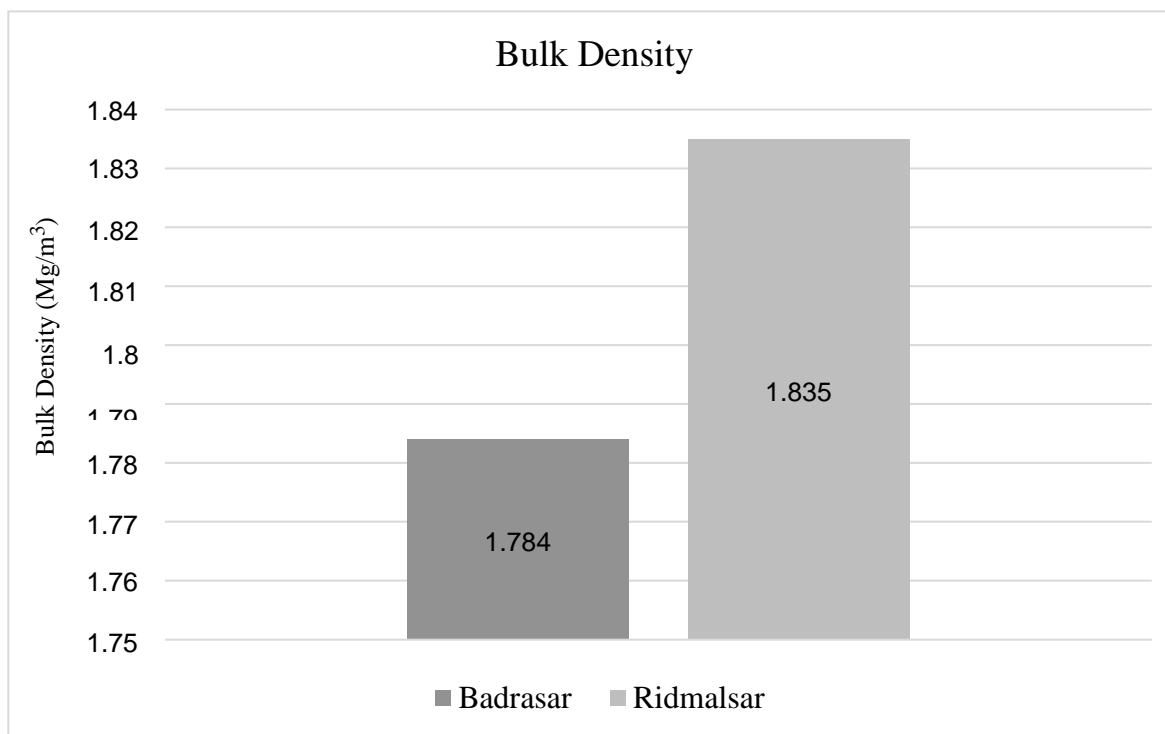


Fig. 5.21:- Bulk Density of Canal Irrigated Areas.

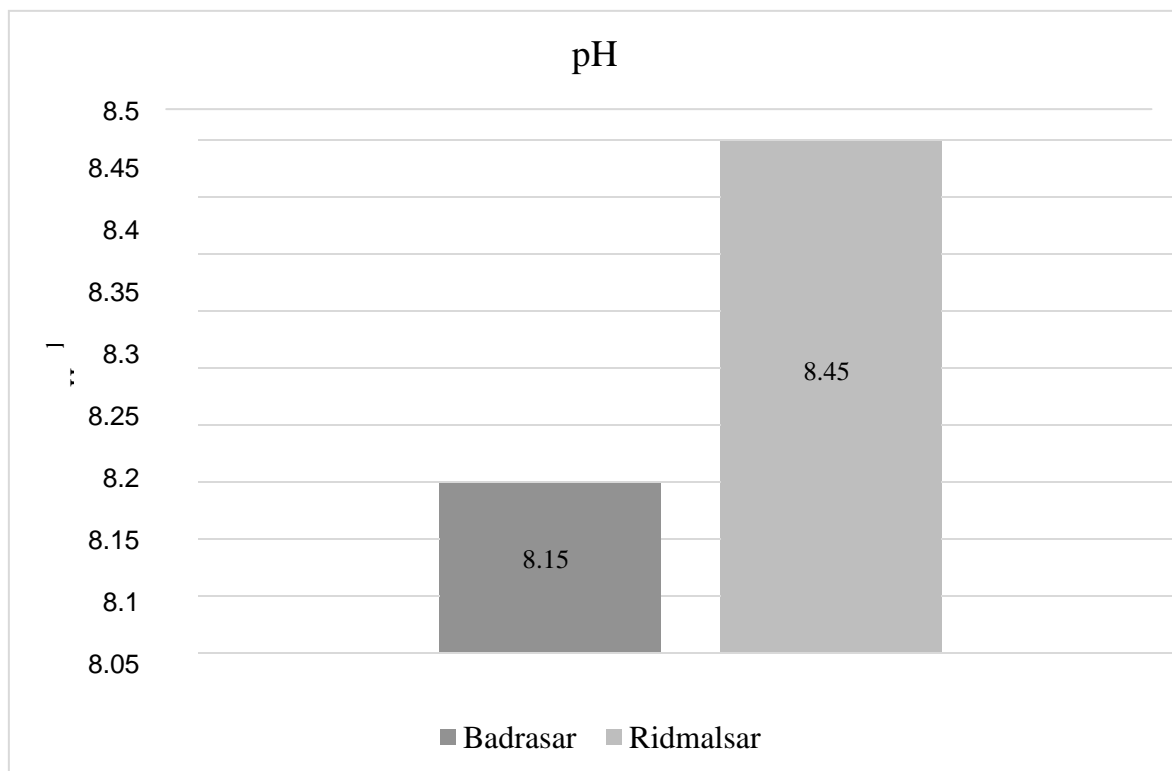


Fig. 5.22:- pH of Canal Irrigated Areas.

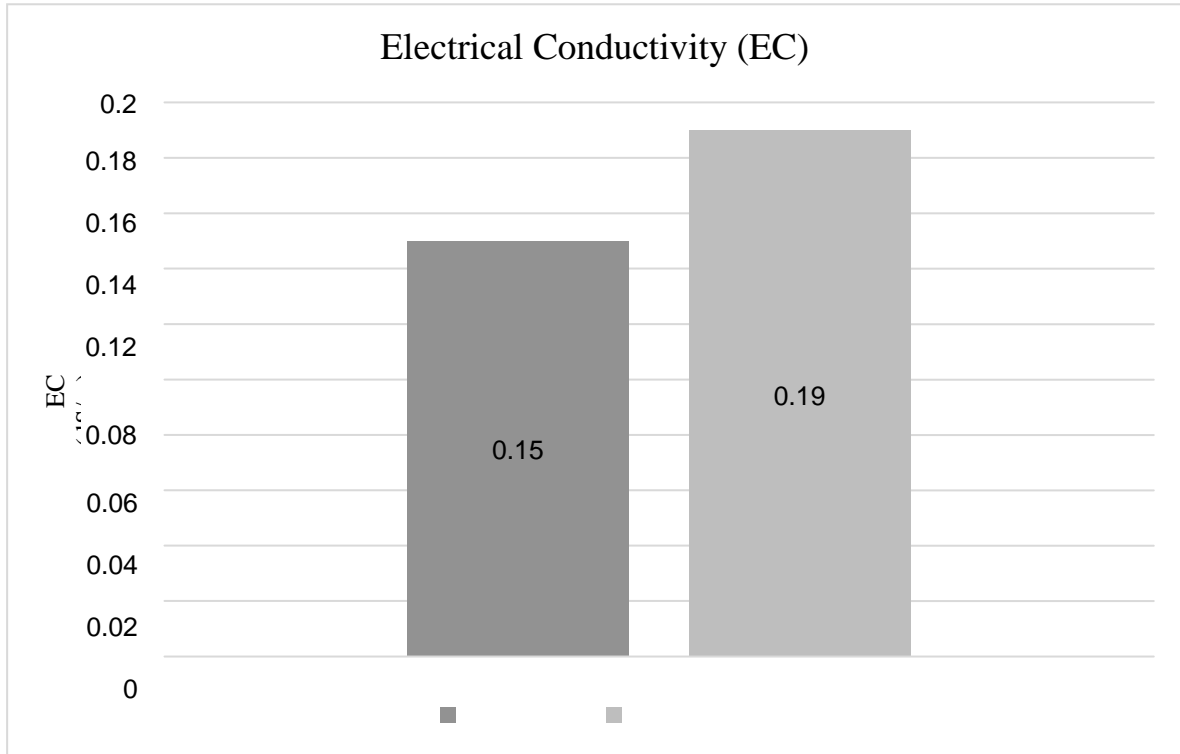


Fig. 5.23:- Electrical Conductivity of Canal Irrigated Areas.

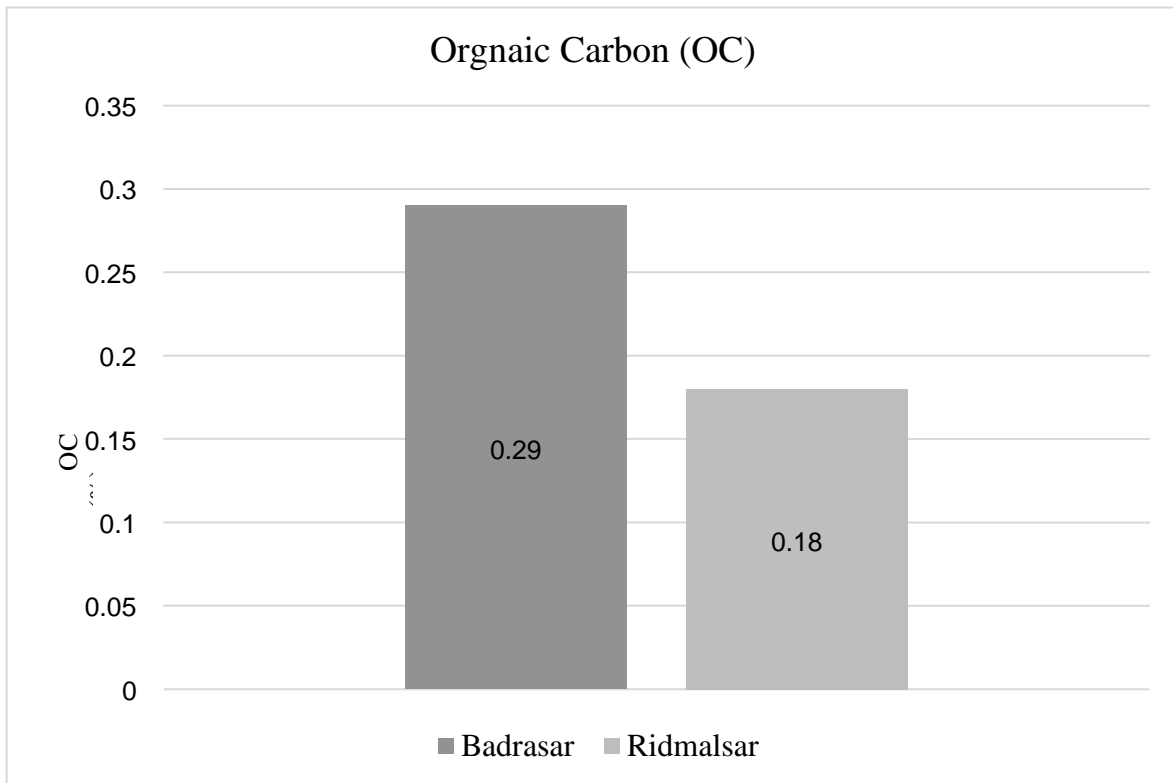


Fig. 5.24:- Organic Carbon of Canal Irrigated Areas.

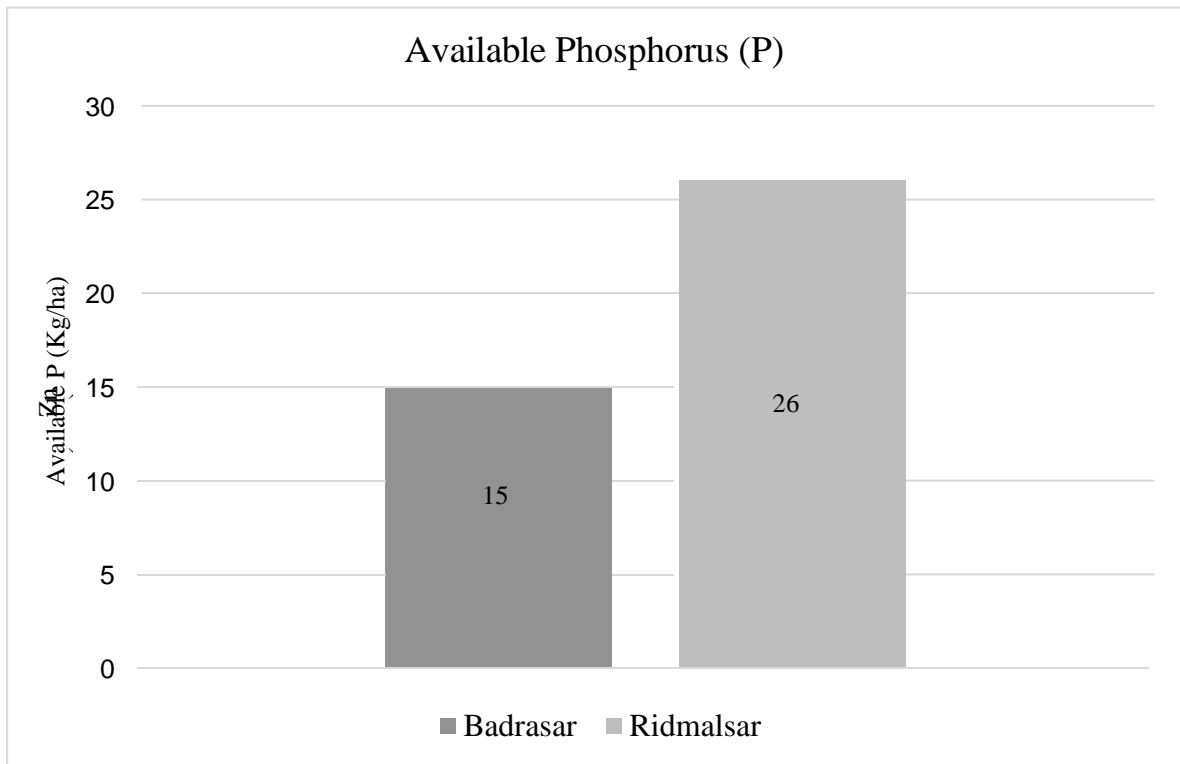


Fig. 5.25:- Available Phosphorous of Canal Irrigated Areas.

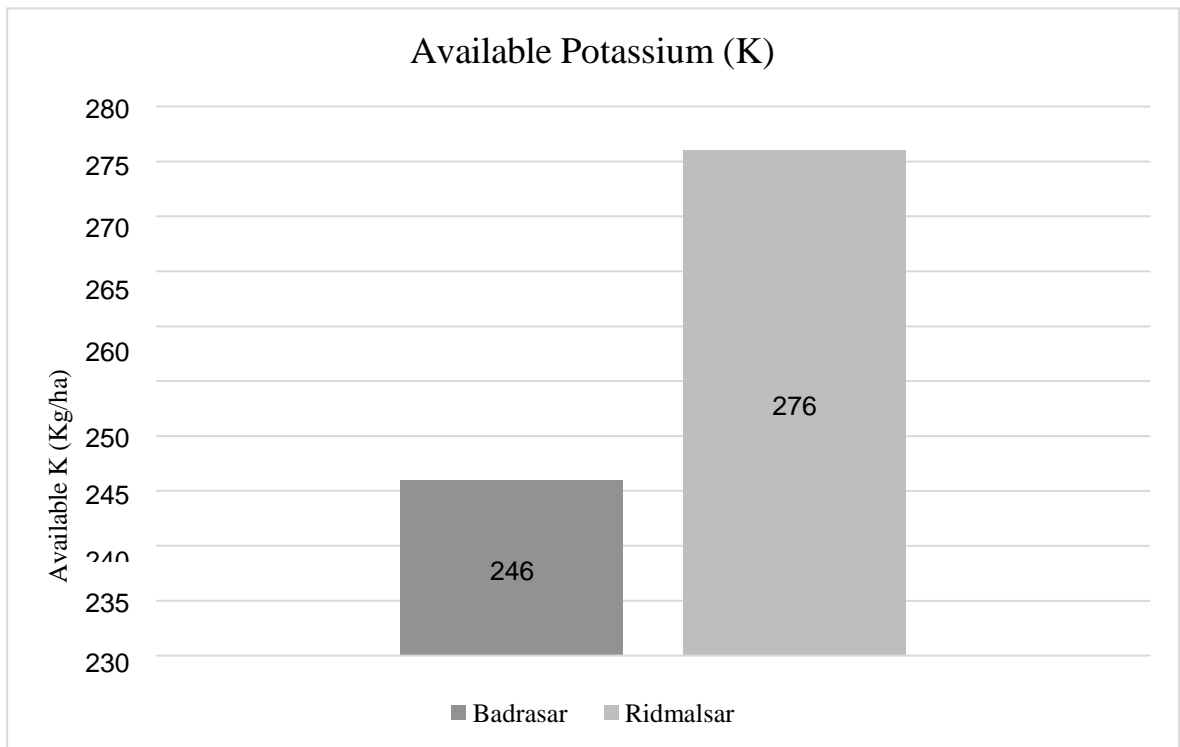


Fig. 5.26:- Available Potassium of Canal Irrigated Areas.

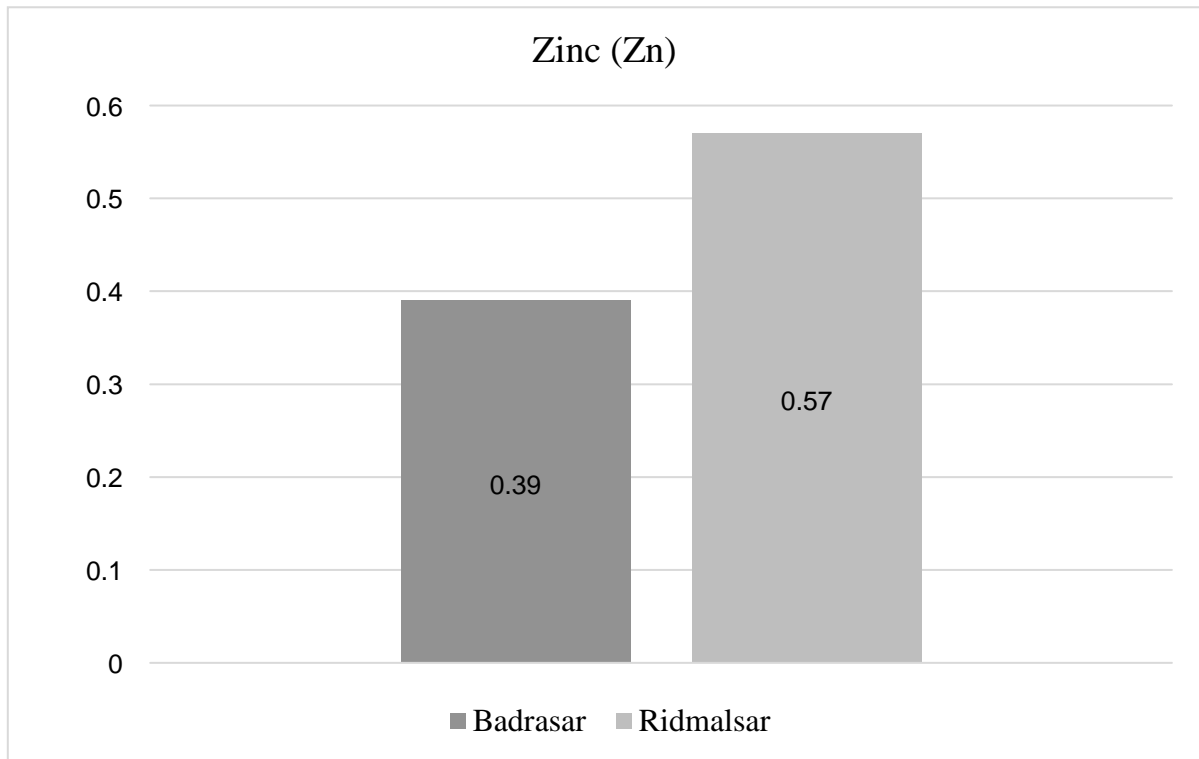


Fig. 5.27:- Zinc of Canal Irrigated Areas.

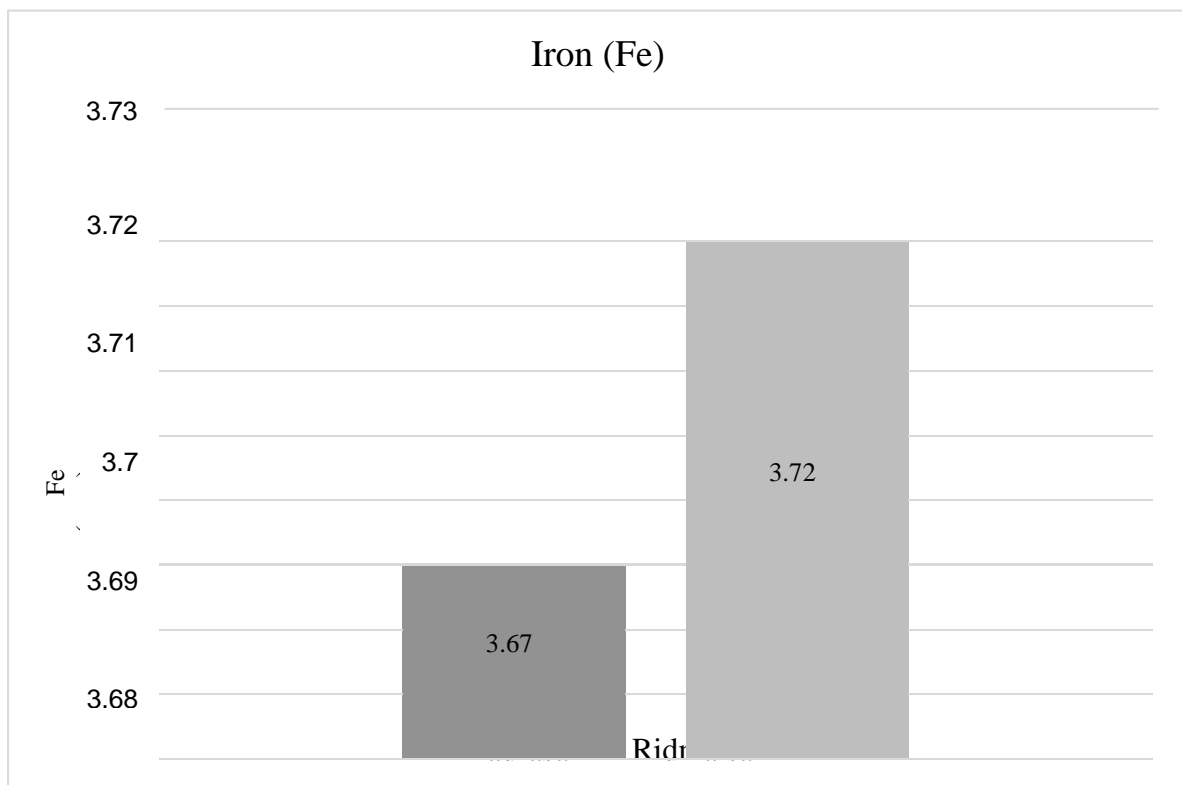


Fig. 5.28:- Iron of Canal Irrigated Areas.

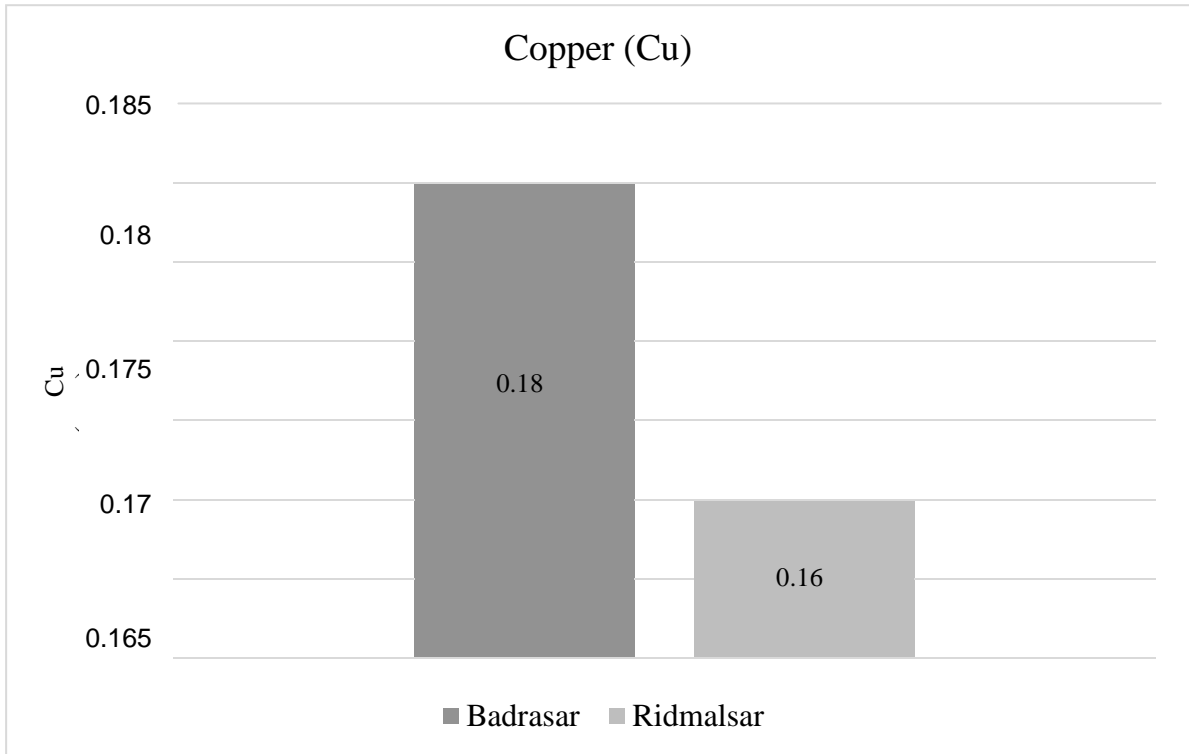


Fig. 5.29:- Copper of Canal Irrigated Areas.

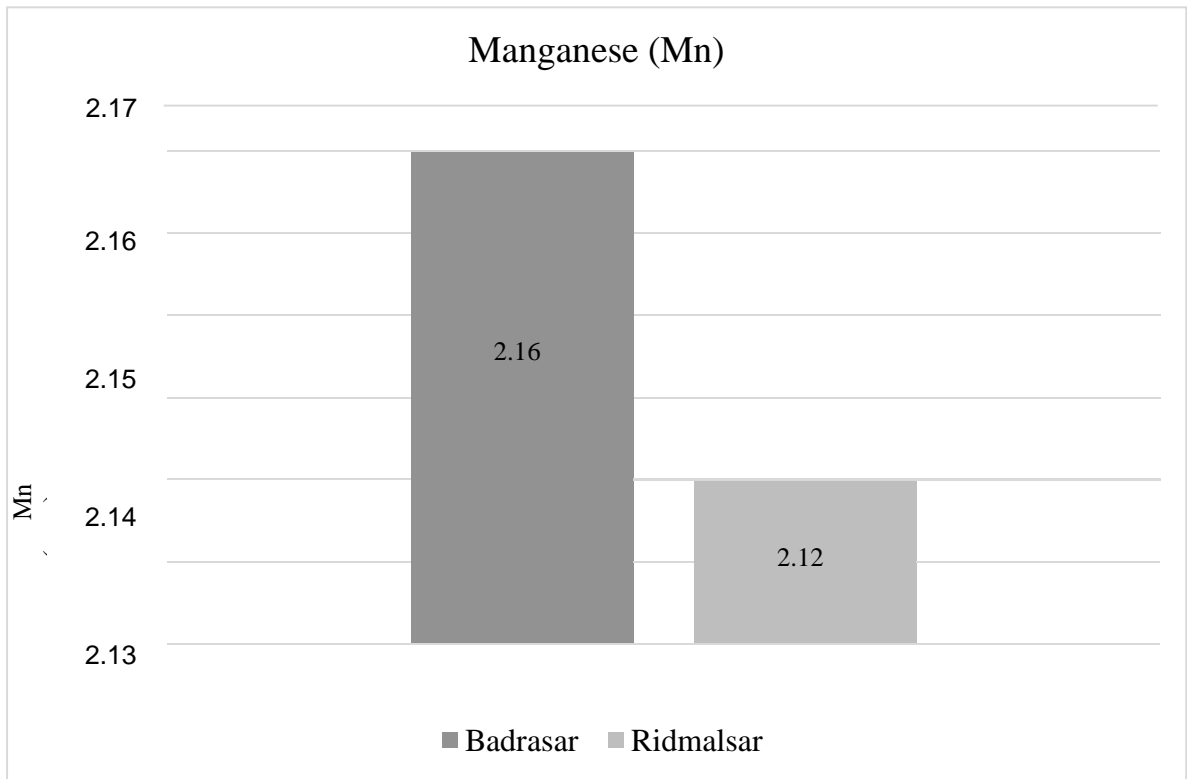


Fig. 5.30:- Manganese of Canal Irrigated Areas.

Discussion:-

Study reveals that during study period the parameters of soil for Non-Irrigated fields are found in accordance Gupta, K. (2003). to table 4.1. The Bulk density maximum in Badrasar and minimum in Nalbari. The pH of pertaining soils in different study area it was found that the pH maximum in Nalbari and minimum in Kilchoo Deodan. In the case of Electric conductivity which represents salinity of soil was found that maximum in Badrasar and minimum in Kilchoo Deodan. The Organic carbon which is directly correlate to biomass richness was found maximum in Nalbari and minimum in Badrasar. The Phosphorus content as essential nutrient in soils maximum found in Kilchoo Deodan and Nal chhoti and minimum in Badrasar. The Potassium content as essential nutrient in soil evenly found in Badrasar, Nalbari and Nal chhoti and minimum found in Kilchoo Deodan.

The micronutrients which play important role in plant growth like Zinc content was found maximum in Badrasar and minimum in Nal chhoti. The Iron content was found maximum in Kilchoo Deodan and minimum evenly in Badrasar and Nal chhoti. The Copper content was found maximum in Kilchoo Deodan and minimum in Badrasar. The Manganese content was found maximum in Nal chhoti and minimum in Nalbari.

The data of parameter pertaining to soil depicts that the areas which are categorised irrigated and non-irrigated are having dispersion of the values: as the some areas like Badrasar is very near to canal depicts more Bulk density, EC and pH due to more soluble salts come across the line of canal from north part of Rajasthan like Haryana and Punjab M. Kumar and A. L. Babel 2011. As far concern of Organic content it was depicted that non canal irrigated area have more because due to add on the supplement for production. Despite that the content of Phosphorus and Potassium are also supplement of inorganic manures. Phosphorus is maximum in Kilchoo Deodan. The micronutrients are suspect matter of the supplement of irrigated non-canal proximity area which is quite essential for the growth of the plants and the underground water has lack of such elements, so supplements of these elements as micronutrients. Non-irrigated areas have low crop productivity due to the scarcity of water. Here crop productivity depends on the amount of rainfall.

Result shows that during study period the parameters of soil for Well Irrigated fields are found in accordance to table 5.2. The Bulk density maximum in Kilchoo deodan while minimum in Basti Chawadan. The pH as the indication of acidity and alkalinity of soils in different study area it was found that the pH maximum in basti Chawadan while minimum in Kilchoo Deodan. In the case of Electric conductivity, it was found that maximum in Kilchoo Deodan and minimum in Shobhasar. The Organic carbon which is directly correlate to biomass richness was found evenly in Shobhasar and Basti Chawadan while minimum in Kilchoo Deodan. The Phosphorus content as essential nutrient in soils evenly found in Kilchoo Deodan, Shobhasar and Basti Chawadan. The Potassium content as essential nutrient in soil found maximum in Basti Chawadan while minimum in Shobhasar.

The micronutrients like Zinc content in soil was found maximum in Shobhasar and minimum in Basti Chawadan. The Iron content in soil was evenly found in Shobhasar and Basti Chawadan while minimum in Kilchoo Deodan. The Copper content in soil was found maximum in Kilchoo Deodan and minimum in Shobhasar. The Manganese content in soil was found maximum in Basti Chawadan and minimum in Shobhasar.

The data of parameter pertaining to soil depicts that the well irrigated area have underground water source. Underground water extracted salts and elements. Well covers the limited area for irrigation. Well irrigated areas have high amount of pH and EC in Kilchoo Deodan. These areas have slightly high amount of nutrients like Potassium and Phosphorus in canal proximity area like Kilchoo Deodan and Basti Chawadan. The underground water has lack of such elements, so supplements of these elements as micronutrients Mathur, G.M., Ram Deo and Yadav, B.S. (2006). The crop productivity of well irrigated area is high as compared to non-irrigated and due to availability of water.

Study reveals that during study period the parameters of soil for Canal Irrigated fields are found in accordance to table 5.3. The Bulk density, pH and Electric conductivity of soils in different study area it was found that the Bulk density, pH and Electric conductivity were high in Ridmalsar as compare to Badrasar. The Organic carbon which is directly correlate to biomass richness was found high in Badrasar as compare to Ridmalsar. The essential nutrients like Phosphorus content and Potassium content in soils were found high in Ridmalsar as compare to Badrasar.

The micronutrients like Zinc, Iron and Manganese contents in soil were found high in Ridmalsar as compare to Badrasar while the Copper content in soil was high in Badrasar as compare to Ridmalsar.

The data of parameter pertaining to soil depicts that the canal irrigated areas have easily availability of water S. A. Siddiqui and N. Fatima 2017. Canal water contains various amounts of essential nutrients and micronutrients so these areas have slightly high amount of Phosphorus, Potassium and micronutrients like Zinc, Iron, Copper and Manganese as compared to non-irrigated areas and well irrigated areas Yadav, R.L. and Meena, M.C. (2009). The crop productivity of canal irrigated area is high as compared to non-irrigated and well irrigated areas due to easily availability of water and nutrient supply from canal water.

Conclusion:-

During the study period observations are made for three categories of the soil parameters pertaining to non-irrigated, well irrigated and canal irrigated were taken for consideration. District Bikaner is blessed with all three categories.

Table 5:- Comparative Analysis of Soil Parameters with Their Respective Permissible Limits.

S. No.	Soil Parameters	Permissible Limit		Non-Irrigated Areas	Well Irrigated Areas	Canal Irrigated Areas
1.	Bulk Density (Mg/m ³)	Low	Less than 1.2	-	-	-
		Medium	1.2-1.8	Kilchoo Deodan, Nalbari and Nal chhoti	Shobhasar and Basti Chawadan	Badrasar
		High	More than 1.8	Badrasar	Kilchoo Deodan	Ridmalsar
2.	pH (acidity / basicity)	Normal	7-8.5	Kilchoo Deodan	Kilchoo Deodan and Shobhasar	Badrasar and Ridmalsar
		Alkaline	8.5-9.5	Badrasar, Nalbari and Nal chhoti	Basti Chawadan	-
		High Alkaline	More than 9.5	-	-	-
3.	Electrical Conductivity (dS/m)	Normal	0-1.5	Badrasar, Kilchoo Deodan, Nalbari and Nal chhoti	Kilchoo Deodan, Shobhasar and Basti Chawadan	Badrasar and Ridmalsar
		Salinity	1.5-3	-	-	-
		High Salinity	More than 3	-	-	-
4.	Organic Carbon (%)	Low	Less than 0.5	Badrasar, Kilchoo Deodan, Nalbari and Nal chhoti	Kilchoo Deodan, Shobhasar and Basti Chawadan	Badrasar and Ridmalsar
		Medium	0.5-7.5	-	-	-
		High	More than 7.5	-	-	-
5.		Low	Less than 23	Badrasar and Nalbari	-	Badrasar

	Available Phosphorus (Kg/ha)	Medium	23-56	Kilchoo Deodan and Nal chhoti	Kilchoo Deodan, Shobhasar and Basti Chawadan	Ridmalsar
		High	More than 56	-	-	-
6.	Available Potassium (Kg/ha)	Low	Less than 144	-	-	-
		Medium	144-336	Badrasar, Kilchoo Deodan, Nalbari and Nal chhoti	Kilchoo Deodan, Shobhasar and Basti Chawadan	Badrasar and Ridmalsar
		High	More than 336	-	-	-
7.	Zinc (ppm)	Low	Less than 0.6	Badrasar, Kilchoo Deodan, Nalbari and Nal chhoti	Kilchoo Deodan, Shobhasar and Basti Chawadan	Badrasar and Ridmalsar
		Medium	More than 0.6	-	-	-
8.	Iron (ppm)	Low	Less than 4.5	Badrasar, Kilchoo Deodan, Nalbari and Nal chhoti	Kilchoo Deodan, Shobhasar and Basti Chawadan	Badrasar and Ridmalsar
		Medium	More than 4.5	-	-	-
9.	Copper (ppm)	Low	Less than 0.2	Badrasar, Nalbari and Nal chhoti	Shobhasar	Badrasar and Ridmalsar
		Medium	More than 0.2	Kilchoo Deodan	Kilchoo Deodan and Basti Chawadan	-
10.	Manganese (ppm)	Low	Less than 2.0	-	-	-
		Medium	More than 2.0	Badrasar, Kilchoo Deodan, Nalbari and Nal chhoti	Kilchoo Deodan, Shobhasar and Basti Chawadan	Badrasar and Ridmalsar

Study revealed that in non-irrigated areas of study it was found that maximum Bulk density is for Badrasar, while the pH is maximum for Nalbari. Another parameter like EC is maximum for Badrasar. The observation shows that the Organic carbon was found maximum in Nalbari. The essential nutrients like Phosphorus found maximum for

Kilchoo Deodan and Nal chhoti while Potassium found maximum for Badrasar and Nalbari. The important micronutrients Iron and Copper were found maximum in Kilchoo Deodan and Zinc found maximum for Badrasar while Manganese maximum for Nal chhoti. These results depict that those areas which are near to the proximity of the canal has experienced of ground water recharge and having some microclimatic condition prevailing areas to the Bikaner made the results more alleged.

In well irrigation region of the Bikaner it was observed that Bulk density and EC were found maximum in Kilchoo Deodan while pH, Organic carbon and Potassium content were found maximum in Basti Chawadan. The Phosphorus content evenly found in the well irrigated study areas. The essential micronutrients like Zinc and Iron found maximum for Shobhasar while Copper and Manganese content were found maximum in Kilchoo Deodan and Basti Chawadan respectively. This shows that as the underground water is extracted more salt and elements are intermingled through the change in crop pattern and accessibility of the water due to underground water irrigation.

Simultaneously it was observed that in canal irrigation region of Bikaner district villages like Badrasar and Ridmalsar having more Bulk density, pH, EC, organic carbon, Phosphorus, Zinc, Iron and Manganese due to increment of more fertilizers in form of NPK and organic contents because water is easily accessible for these regions and they are having more outgrow the crop with their pattern and variety. More soluble salts are also adding in the canal water, essentially increase the salts and other elements which directly and indirectly effect on the crops and vegetation of the areas Sharma, S.K. and Lal, F. 1992.

The overall result is concluded with the help of soil parameters which shows that the areas like Kilchoo Deodan, Shobhasar, Basti Chawadan, Nal chhoti, Nalbari and Badrasar (canal irrigated) have medium level of desired Bulk density, while high in Ridmalsar, Badrasar (non- irrigated), and Kilchoo Deodan (well irrigated). In the case of pH normally (7-8.5) found in Kilchoo Deodan, Shobhasar, Badrasar (canal irrigated) and Ridmalsar while moderate alkaline soil found in Nalbari, Nalchhoti, Badrasar (non-irrigated) and Basti Chawadan. The medium range EC and potassium content were found in all study areas. The observations show that the low range Organic carbon found in Bikaner District. The low-range Phosphorus content was found in Badrasar and Nalbari while medium in Kilchoo Deodan, Nal chhoti, Shobhasar, Basti Chawadan and Ridmalsar. The observations for micronutrients show low range of Zinc, Iron and Copper content found in Bikaner District while medium range of Manganese Content was found.

For maintenance the soil health uses the local compost like cow dung and vermicompost for the increase of organic content in soil. To maintain the NPK ranges and micronutrients content in soil use Urea, DAP (Diammonium Phosphate), Muriate of Potash, Zinc sulphate, Ferrous Sulphate and Copper sulphate as fertilizer in limited quantity according to the requirement Singh, B.K. (2006). This helps in increase soil fertility and crop productivity.

The soil parameters give a comprehensive idea about the cropping pattern of Bikaner District as per the prevailing conditions of the variety like non-irrigated, well irrigated and canal irrigated. This study also helps to the stakeholders like farmers to their region for main crop pattern in consonance with crop productivity.

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