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Physicochemical Analysis of Paddy Field Soil of Warora Tehsil, District Chandrapur (M.S.), India

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Abstract: In this paper we discuss about the analysis of various Physico-chemical parameters of Paddy field Soil collected from six different selected sites such as Salori area, Mesa area, Shegaon (BK) area, Chargaon (KH) area, Jamani (BK) area, Sumthana area of Warora Tehsil, District Chandrapur, Maharashtra, India were studied during the month of May 2023 to November 2023. Soil Samples were collected from these different six sites to study the physico-chemical parameters such as pH, Electrical Conductivity (EC), Organic carbon (OC), Nitrogen (N), Phosphorus (P), Potassium (K), Calcium (Ca), Magnesium (Mg), Sodium (Na), Copper (Cu), Iron (Fe), Zinc (Zn), Manganese (Mn) were studied in the laboratory by using Standard Protocol. The minimum EC was found in Mesa and Maximum in Sumthana. The maximum nitrogen found in Shegaon and minimum in Chargaon. The low phosphorus found in Salori and high in Sumthana. The maximum value of Potassium found in Sumthana as compared to others.

Keywords: Soil, Paddy Field, Warora tehsil, Physico-chemical Parameters.

Introduction

Soil is a natural resource. The soil contains various types of living organisms and air, water, dead organic matter present in the soil. The soil contains carbon and nitrogen. It is the primary source of all plants. In soil many types of macronutrients and micronutrients are present. Every plant needs soil for standing and water for living, plants can uptake the nutrients from the soil. Maintaining the quality of soil resource base is a very important to ensure the sustainability. Rickeri and Smolika (1990) studied farming system that reduces farm agriculture inputs for crop production that retain soil productivity and farm profitability in order to be sustainable. This study determined the effect of the farming system on soil physical properties and crop yield during the establishment stage of the system (Yang et al., 2010)

Material and Method

Study area:

Warora taluka is situated in the western part of Chandrapur District of Maharashtra State lying between the latitude 20° of and 23° west and longitudinal

of 79° and 00 south and it extended over an area 22.50 km². average rainfall of the taluka is 1200 mm with maximum temperature is 48°C in summer and it is about 10°C in winter. I have selected six different sites for study. Site A–Salori area, Site B- Mesa area, Site C- Shegaon (BK), Site D- Chargaon (KH), Site E- Jamani (BK) and Site F- Sumthana.

Site area	Site name	Away from warora tehsil	Latitude	Longitude
Salori	Site A- Salori	11 km	20.3030 ° N	79.0702 ° E
Mesa	Site B- Mesa	14 km	20.3181 ° N	79.1178 ° E
Shegaon(BK)	Site C- Shegaon (BK)	17 km	20.3299 ° N	79.1478 ° E
Chargaon (KH)	Site D – Chargaon (KH)	23 km	20.3608 ° N	79.1838 ° E
Jamani (BK)	Site E- Jamani (BK)	16 km	20.3580 ° N	78.9815 ° E
Sumthana	Site F - Sumthana	23 km	20.4143 ° N	79.0765 ° E

Plate No. 1- Showing Selected Paddy Field Sites For Physicochemical Analysis Of Soil Of Warora Tehsil

❑ **Collection of Paddy Field Soil Sample**

- Soil samples for Physico-chemical analysis were collected from six different selected sites in the month of May 2023 to October 2023 of Warora taluka.
- Soil samples were collected in zipzap polythene bag.
- The soil sample were collected in criss-cross manner by using Iron Crowbar (Sabbal) from the depth 15 to 20 cm in 15 to 20 spots of paddy field area, after scraping off the surface litter, if any, without removing soil.
- 500gm soil was taken for analysis.

Observation and Result

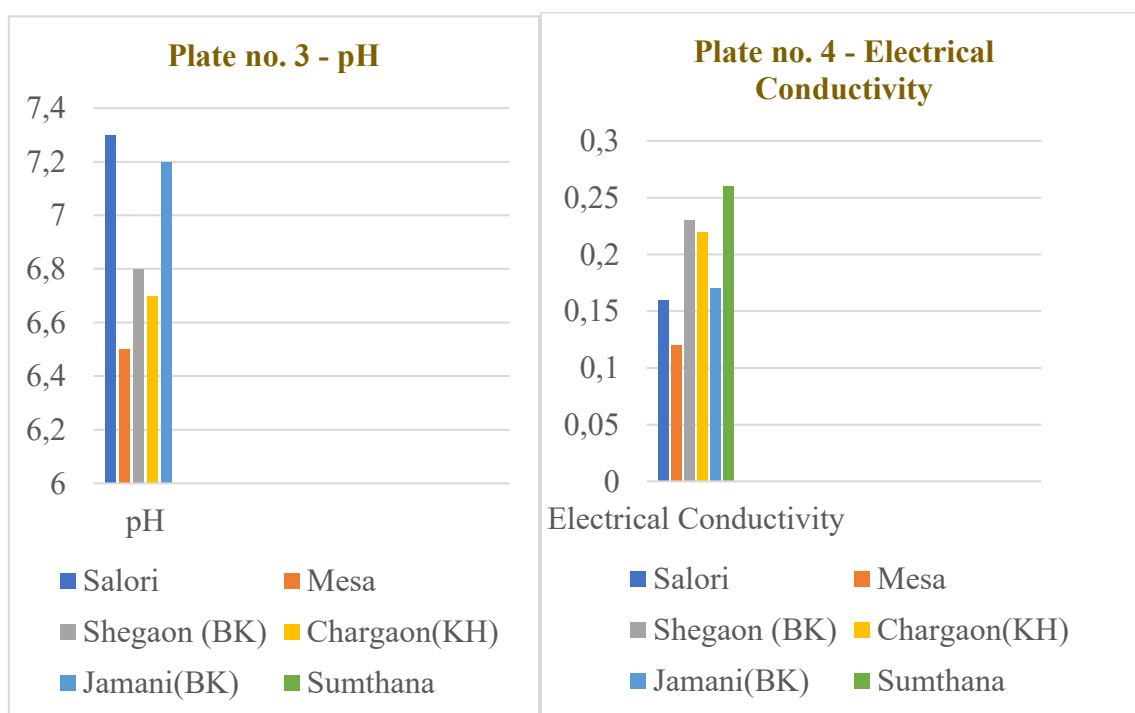
Sr .n o	Parameter of Soil	Unit	Salori	MES A	SHEG AON (BK)	CHAR GAON (KH)	JAMANI (BK)	SUM-THANA
1	pH	-	7.3 ± 0.40	6.5 ± 0.14	6.8 ± 0.30	6.7 ± 0.54	7.2 ± 0.45	7.4 ± 0.77
2	Electrical Conductivity (EC)	milliSiemens per meter (mS/cm)	0.16 ± 0.01	0.12 ± 0.05	0.23 ± 0.07	0.22 ± 0.12	0.17 ± 0.10	0.26 ± 0.09
3	Organic Carbon(O C)	%	0.78 ± 0.04	0.72 ± 0.04	0.76 ± 0.09	0.85 ± 0.09	0.85 ± 0.13	0.66 ± 0.14
4	Nitrogen (N)	Kilo/hector	106.22 ± 6.71	102.8 5 ± 3.30	140.73 ± 9.83	86.95 ± 6.54	95.46 ± 16.04	101.66 ± 16.70
5	Phosphorus (P)	Kilo/hector	12.80 ± 0.85	15.72 ± 3.15	16.30 ± 3.64	20.05 ± 5.33	23.56 ± 6.15	29.65 ± 7.34
6	Potassium (K)	Kilo/hector	244.51 ± 1.84	145.2 0 ± 9.12	176.15 ± 4.83	180.18 ± 10.07	183.96 ± 8.35	287.68 ± 10.06
7	Calcium (Ca)	Milli equivalent s per 100 grams (meq/100g)	10.38 ± 1.01	15.30 ± 4.39	15.60 ± 3.33	16.12 ± 4.76	9.32 ± 0.66	15.1 ± 2.89
8	Magnesium (Mg)	meq/100g	6.75 ± 0.80	8.45 ± 2.40	6.22 ± 0.92	8.02 ± 1.56	4.18 ± 0.73	5.38 ± 0.30
9	Sodium (Na)	meq/100g	1.92 ± 0.41	1.55 ± 0.65	1.53 ± 0.59	1.68 ± 0.75	1.79 ± 0.57	1.17 ± 0.31

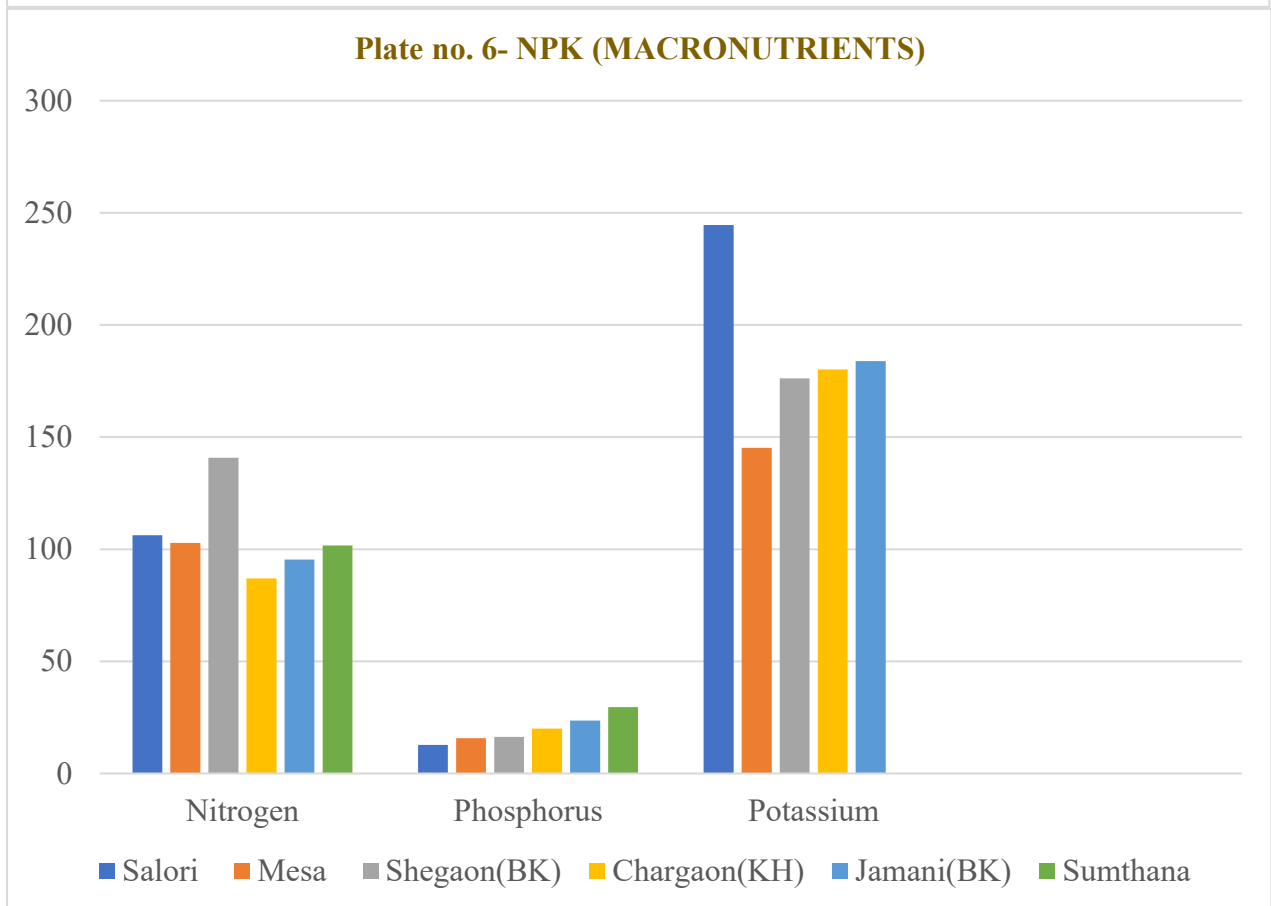
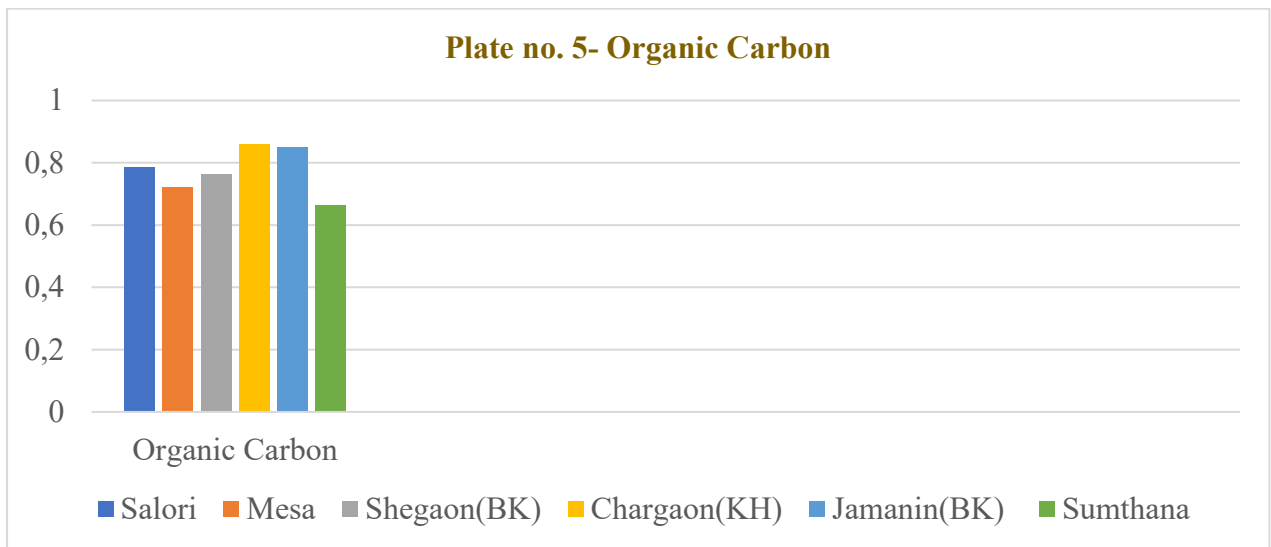
10	Copper (Cu)	Parts per million (ppm)	0.60 ± 0.04	0.76 ± 0.14	0.69 ± 0.17	0.81 ± 0.17	0.70 ± 0.16	0.82 ± 0.12
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Sr. no	Parameter of Soil	Unit	SALORI	MESA	SHEGAON (BK)	CHARGAON (KH)	JAMANI (BK)	SUM-THANA
11	Iron (Fe)	ppm	4.57 ± 0.81	3.78 ± 1.00	4.55 ± 1.02	5.07 ± 1.05	4.60 ± 0.39	3.29 ± 0.22
12	Zinc (Zn)	ppm	0.28 ± 0.05	0.28 ± 0.06	0.35 ± 0.12	0.24 ± 0.09	1.25 ± 0.23	0.53 ± 0.32
13	Manganese (Mn)	ppm	0.59 ± 0.06	5.86 ± 0.91	0.30 ± 0.14	0.79 ± 0.09	3.55 ± 0.11	1.11 ± 0.44

Plate No. 2 Showing Physicochemical Parameters Of Paddy Field Soil Analysis Of Warora Taluka

PLATE NO. 3,4,5,6,7,8,9, 10 Showing Graphical representation of pH, Electrical Conductivity, Organic Carbon NPK, Calcium, Magnesium, sodium, Copper, Iron, Zinc, Manganese of Paddy field Soil of Warora taluka





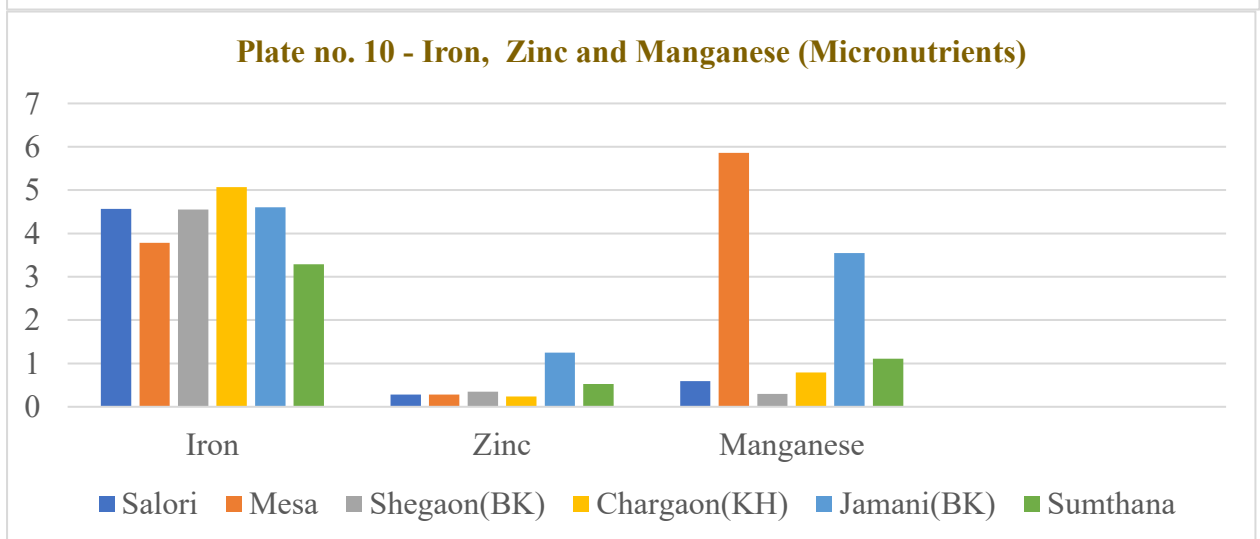
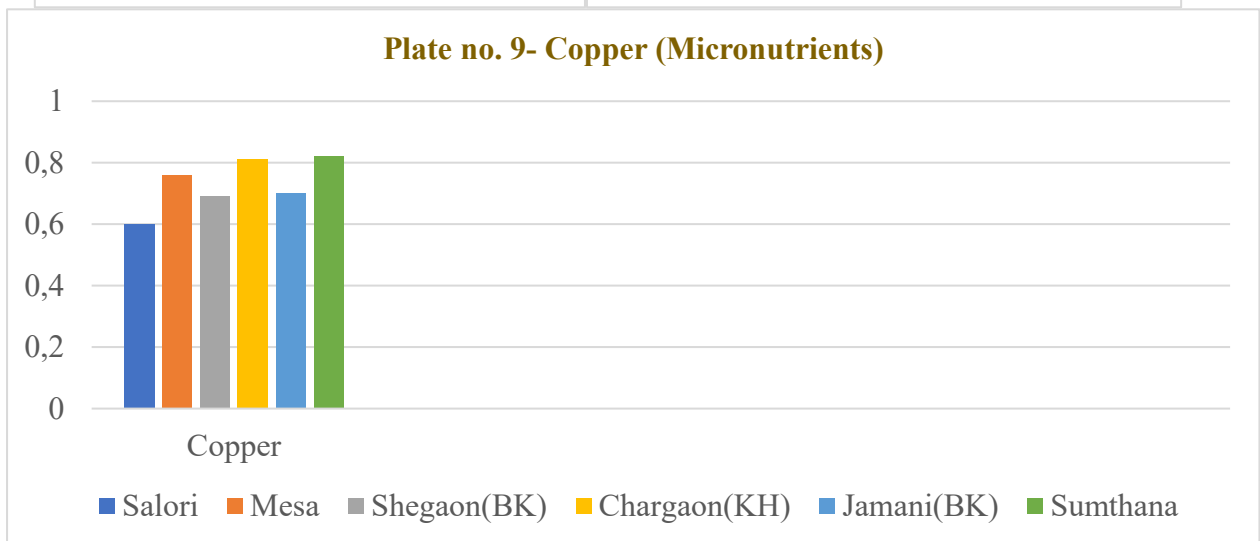
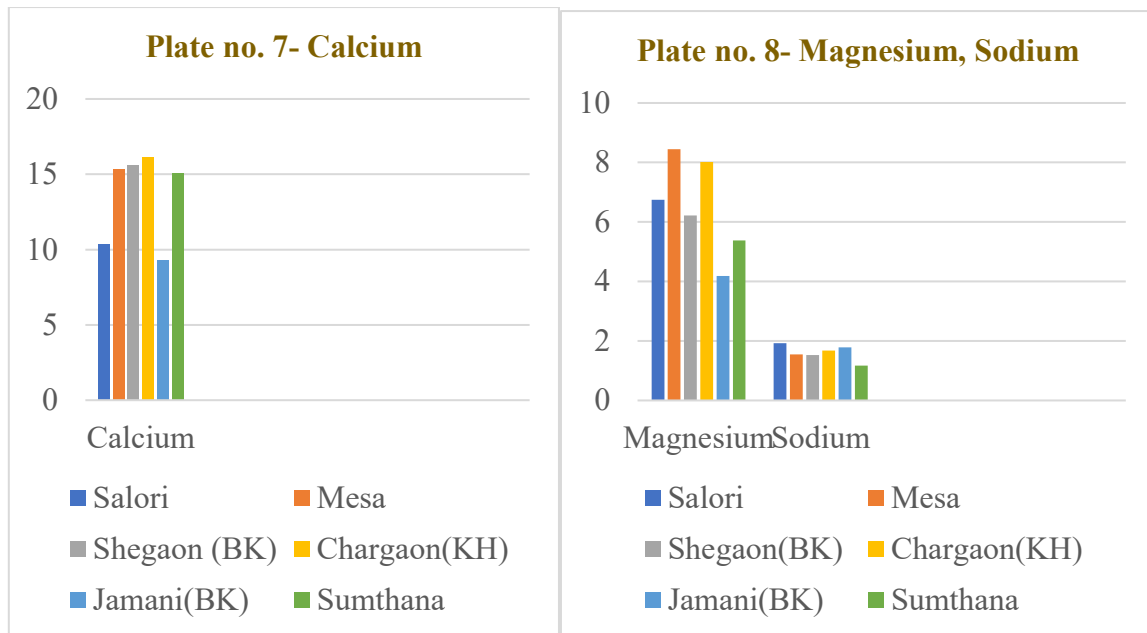


Plate no. 11- Methods Used for the Estimation of Paddy Field Soil

Sr. no	Parameter of Soil	METHOD
1	pH	Soil water suspension
2	Electrical Conductivity (EC)	Soil water suspension
3	Organic Carbon (OC)	Walkan and Rapid Titration
4	Nitrogen (N)	Geldar method
5	Phosphorus (P)	Spectrophotometric method
6	Potassium (K)	Flame Photo metric method
7	Calcium (Ca)	Titration method
8	Magnesium (Mg)	Titration method
9	Sodium (Na)	Flame Photometer
10	Copper (Cu)	DTPA Method (Diphynyl triamine pentaacidic acid)
11	Iron (Fe)	DTPA Method (Diphynyl triamine pentaacidic acid)
12	Zinc (Zn)	DTPA Method (Diphynyl triamine pentaacidic acid)
13	Manganese (Mn)	DTPA Method (Diphynyl triamine pentaacidic acid)

Discussion

- pH:-**The average pH of paddy field soil was ranges between 6.5 to 7.4. Due to the phosphorus level of the soil the pH is varies. The maximum pH was recorded in site F Sumthana area and the minimum pH in site B Mesa area. The pH ranges from 6to 8.5 was observed. S.S. Kekane, etal. (2015) from A review

on physicochemical properties of soil. Chandak et al. (2017) reported soil of Kadi city Gujrat having PH 7.4. V. Rajesh et al. (2019) who recorded the value of pH was 6.2 to 7.5 from Soil fertility status of Paddy-Growing soils in Andhra Pradesh, India. Which is similar to our result.

2. **Electrical conductivity (EC):-** The Electrical conductivity (EC) of soil were found to be in between 0.12 mS/cm to 0.26 mS/cm. The minimum EC was found in site B Mesa and maximum in site F Sumthana. The concentration of soluble salts in the soil at any particular temperature is measured by EC. Due to the higher concentration of ions in solution and is directly related to soluble salt concentration the variation of EC were recorded. S. Sunil et al. (2020) who recorded the value of EC was 0.12 to 0.28 mS/m from Soil fertility status and Electrical Conductivity of Paddy Soils in Kerala, India.
3. **Organic carbon (OC):-** The organic carbon (OC) of paddy soil was ranges between 0.66% to 0.85%. The low OC in site F Sumthana and High OC in site D Chargaon and site E Jamani were found. Due to the environmental changes and wet soil the OC was increases in soil samples. A. Tamil Vendhan et al. (2018) who recorded the value of OC was 0.60 to 0.88 % from Evaluation of Soil Organic Carbon and nutrient status in Paddy soils of Tamil Nadu, India.
4. **Nitrogen:-** The average value of nitrogen of paddy soil ranges between 86.95 Kilo/hector to 140.73 Kilo/hector was found. The minimum nitrogen found in site D Chargaon and maximum in site C Shegaon. The transfer of energy and the synthesis of proteins, enzymes required Nitrogen to the plant. These result are similar with R. Suresh et al. (2018) the value of Nitrogen was 85 to 145 Kg/ha from Evaluation of soil fertility status in Paddy -Growing Areas of Tamil Nadu, India.
5. **Phosphorus:-** The phosphorus ranges between 12.80 Kilo/hector to 29.65 Kilo/hector. The low phosphorus found in site A Salori and high phosphorus in site F Sumthana. In the process of photosynthesis plants required phosphorus. It is the major elements of soil. These result are similar with R. Suresh et al. (2018) the value of Phosphorus was 11 kg/ha to 29 Kg/ha from Evaluation of soil fertility status in Paddy -Growing Areas of Tamil Nadu, India. Phosphorus present in soils vary from 11.4 Kilo/hector to 29.6 Kilo/hector are result finding by (Olsen et al., 1954).
6. **Potassium:-** In paddy soil the potassium ranges between 145.20 Kilo/hector to 287.68 Kilo/hector was found. The minimum value found in site B Mesa and maximum in site F Sumthana. Larger amount of potassium is absorbed by plants. These result is similar with R. Suresh et al. (2018) who recorded the potassium was 130 kg/ha to 290 kg/ha. From Evaluation of soil fertility status in Paddy -Growing Areas of Tamil Nadu, India.
7. **Calcium:-** The Calcium value of soil ranges between 9.32 meq/100g to 16.12 meq/100g. The lowest calcium found in site E Jamani and highest in site C Shegaon. The calcium is one of the major mineral present in the soil in the form

of cation. These result is similar with R. Suresh et al. (2018) who recorded the Calcium was 8.5 to 17 meq/100g From Evaluation of soil fertility status in Paddy -Growing Areas of Tamil Nadu, India.

8. **Magnesium(Mg)**:-The magnesium(Mg) of paddy soil was ranges between 4.18 meq/100g to 8.45 meq/100g The low value of Mg found in site E Jamani and high in site B Mesa..These result is similar with R. Suresh et al. (2018) who recorded the Magnesium was 3.8 to 8.5 meq/100g From Evaluation of soil fertility status in Paddy -Growing Areas of Tamil Nadu, India.
9. **Sodium(Na)**:- The sodium ranges between in paddy field soil is 1.17meq/100g to 1.92 meq/100g. The minimum value found in site F Sumthana and maximum in site A Salori.V. Rajesh et al. (2019) who recorded the value of sodium was 1.05 to 2.05 meq/100g from Soil fertility status of Paddy – growing soils in Andhra Pradesh, India.
10. **Copper(Cu)**:- The copper(Cu) ranges between 0.60 ppm to 0.82 ppm was found. The lowest copper was found in site A Salori and highest in site F Sumthana. In this soils under study the concentration of Cu range from 0.25 ppm and 0.72 ppm (Lindsay and Norwell, 1978)
11. **Iron (Fe)**:- The Iron (Fe) value ranges between 3.29 ppm to 5.07 ppm. The minimum Iron was found in site F Sumthana and maximum in site D Chargaon.The iron is result finding by(Lindsay and Norwell, 1978). From the analyzed samples ranges from 0.59 ppm to 0.86 ppm results finding by (Lindsay and Norwell, 1978). Similar result was found by R. B. Manzireetal. (2020) Iron range 0.91 to 8.06 ppm from Physicochemical analysis of soil from Northen Part of Pune district.
12. **Zinc(Zn)**:- In the paddy soil the zinc was ranges between 0.245 ppm to 1.25 ppm. The minimum value found in site D Chargaon and maximum in site F Jamani were found. Zinc plays active participation in protein synthesis.Wagh et al.(2013) who recorded the zinc was 0.32 to 5.62 ppm from soil of eastern part of Pune city.
13. **Maganese(Mn)**:- The Manganese was found to be in between 0.306 ppm to 5.86 ppm. The low manganese were found in site C Shegaon and high in site B Mesa. R. B. Manzire et al. (2020) they find the 0.59 ppm to 0.86 ppm from Physicochemical analysis of soil from Northen Part of Pune district.

Conclusion

- The physicochemical parameter ofpaddy field soil in site A Salori, site B Mesa, site C Shegaon, site D Chargaon, site E Jamani and site F Sumthana area was studied.
- For plant growth and soil management the physicochemical study of soil is most important for better result.

- The Variation of the pH of the soil is depend on phosphorus level of soil.
- In overall study of paddy field soil the NPK is most important for the plant growth.
- The monthly variation in physicochemical parameter of soil was changes due to the weather, temperature, rainfall, human activity in local side etc.

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