

Assessment of Seasonal Variations in Chemical Fertilizer Residues and Soil Characteristics of Agricultural Soil Samples of T.Narasipura Taluk, Mysore District.

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ABSTRACT: The physico-chemical characteristics of soil samples from agricultural fields of T.Narasipura near Mysore were analyzed for seasonal variations in agro ecosystems. The seasonal variations of main soil chemical characteristics were studied in some representative sampling sites from agricultural lands of T.Narasipurataluk. The soil samples were collected during rainy, winter and summer seasons from 15 different agricultural lands and were analyzed for different physico-chemical characteristics. From the study, it was concluded that, in all the soil samples, urea and DAP residues were detected. In case of cations and anions, concentrations were found to be higher during rainy season, which indicates that, the amount of fertilizers applied was not completely taken up by the crops. As the study area is having good irrigation facilities, throughout the year, the nitrate and phosphate entry into water resources through surface run-off was expected to be more.

KEYWORDS: Urea, DAP, Paddy, Soil Properties. Black soil.Seasons.

I.INTRODUCTION

Soil is a complex system comprised of various minerals, soil organic matter water and air. Soil quality includes mutually interactive elements of physical, chemical and biological properties, which affect many processes in the soil that make it suitable for agricultural practices Adeeba et.al 2006 [1]. The composition and proportion of these components greatly influence on soil physical properties, such as, texture, porosity and the fraction of pore space in a soil. In turn, these properties affect air and water movement in the soil Belay et.al. 2002[2].

Soil degradation is considered as one of the most serious crisis facing the agricultural industry in the long term. The success of soil management to maintain soil quality depends on an understanding of how soils respond to agricultural use and practices over a period of time Canan et.al 2010 [8]. As a result, the important physico-chemical parameters of soils were studied under different land use systems is considered as important Culvert et.al 1675 [9]. A change in certain physical and chemical characteristics of soils can have either a positive or negative effects. Keeping in view of all the information, the present study has been carried out with an objective to; study the effect of seasonal variations on changes in various characteristics of agro ecological zones of T. Narasipurataluk (Mysore district).

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II. RELATED WORK

Many literature reviews shows, physico-chemical properties of soils play important roles in quality of crops as well as good yield. Among the soil properties, pH and soil pores play a dynamic equilibrium with the predominantly charged surfaces of soil particles Bremner et al 1978[5]. pH value of soil is affected by the type of parent materials from which, the soil was formed and is affected by various environmental factors such as, temperature and rainfall [6,7,8]. The leaching of basic cations from the soil greatly affects the trace metal complexation, either through solubility equilibrium or due to complexation by soluble and surface ligands [9, 10]. Soil is an essential element for agriculture and various agricultural operations, climatic conditions and topographic features play important role in variations in soil properties, e.g. porosity, structure and aeration. Another important factor which determines soil properties are the agricultural operations such as, soil tillage, cultivation and fertilizer applications [12].

III. MATERIALS AND METHODS

Description of the Study area: T.Narasipura is one of the taluks in Mysore district, The total geographical area of T.Narasipurataluk covers around 58,672 hectares, out of which, 40,900 hectares of land is used for agricultural purpose. The annual rain fall of 712.0 mm. The agricultural lands cover most of the area in T.Narasipurataluk. The main cropping season is from September to January. During this period, Paddy and sugar cane are grown. These crops mainly depend on rivers and channel water sources used for irrigation throughout all the seasons. The second cropping season is from February to May when paddy, sugarcane, vegetables, pulses and tomato, chilly, green leafy vegetables are grown. These crops are mainly dependent on channel water. Paddy is the major crop grown in majority of the area throughout the year. The most commonly used fertilizers for paddy and sugarcane in this study are urea, diammonium phosphate during farming season. The recommended rate of nitrogen fertilizer application is 100-120 kg for paddy, 160 kg N/ha for sugarcane (per year) and 40– 100 kg N/ha for other crops. The amount of chemical fertilizers used varies within the study area, depending on the type of crop and the actual rate of application varies, depending on the farmers practice which may exceed the prescribed rate.

Collection of the soil samples: 15 soil samples were collected from selected agricultural areas from different farm lands during rainy, winter and summer seasons respectively. From each of the farm lands, composite soil samples were collected along with one sample from non-agricultural land. The soil samples were collected at 0-15 cm depth, air dried, ground and sieved through 2 mm sieve and stored in polythene bags until analysis. The physico-chemical analysis was carried out as per standard methodology of Arun Kumar Saha (2008), GKVK manual (1999).

Experimental work: The soil samples were analyzed for various physico-chemical parameters. The soil moisture content was assessed by gravimetric method. The bulk density and particle density were determined by core sampler method and volumetric flask method. The urea residues were quantified by reaction of urea with diacetylmonoxime under acidic condition using spectrophotometer. The diammonium phosphate residues were calculated by using amount of phosphate (taking difference between agricultural and non-agricultural soil samples) present in soil samples, considering the molecular weight of DAP and weight of phosphate group of DAP. The soil pH was measured in 1:5 soil/water suspensions using the glass electrode pH meter. The electrical conductivity of the soil extract was determined by using conductivity meter. The organic carbon was determined by using potassium dichromate wet oxidation method. The total nitrogen was determined by Kjeldhal distillation method, while the phosphate was determined by o-dianisidinmolybdate method. The sodium and potassium concentrations were determined by flame photometry. Estimation of calcium and magnesium was done by EDTA titration method and the ammoniacal nitrogen by Nessler's reagent method.

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Table-1: Sampling Points with sampling codes, crop types and types of Fertilizers applied for agricultural fields of T.Narasipura Taluks

Sl. No	Sampling stations of soil, water	Types of crops cultivated	Types of fertilizers used	Land type
1	Alasthikattehundi	Leguminous plants	Urea, DAP	Rain fed
2	Bannahallihundi	Horse gram, paddy	Urea, DAP	Rain fed
3	Alagudu	Paddy	Urea, DAP	Irrigated land
4	Kharuvatti	Coconut, tomato	Urea, DAP	Garden land
5	Kuruburu	Paddy	Urea, DAP	Irrigated land
6	Madralli	Paddy	Urea, DAP	Irrigated land
7	Chuhalli	Paddy	Urea, DAP	Irrigated land
8	Nilsogae	Paddy	Urea, DAP	Irrigated land
9	Hosapura	Paddy	Urea, DAP	Irrigated land
10	T.Narasipura	Paddy	Urea, DAP	Irrigated land
11	Gargeshwari	Paddy	Urea, DAP	Irrigated land
12	Hindvalu	Banana, papaya	Urea, DAP	Garden land
13	Kempayanahundi	Coconut, leafy vegetables	Urea, DAP	Garden land
14	Bilagalehundi	Coconut, vegetables	Urea, DAP	Garden land
15	Hampapura	Banana, legumes	Urea, DAP	Garden land

Table-2: Physico-chemical characteristics of soil samples collected around agricultural areas of T.Narasipura Taluks during rainy season 2011-2012.

parameters	Normal range	S-1	S-2	S-3	S-4	S-5	S-6	S-7	S-8	S-9	S-10	S-11	S-12	S-13	S-14	S-15
Urea residues ppm		8.71	7.6	6.4	3.4	1.4	2.6	2.1	1.9	2.9	4.7	3.8	3.1	4.1	6.3	6.4
DAP residues ppm		12.65	13.90	10.56	31.8	20.99	22.10	15.45	9.87	14.59	18.2	15.2	57.9	15.45	15.43	11.40
Moisture content %	-	27.51	28.91	37.83	22.5	10.18	13.8	10.18	20.91	22.34	25.1	27.8	12.1	25.3	32.1	28.25
Bulk density mg/m ³	1-1.65	1.24	1.34	1.32	1.48	1.16	1.20	1.34	1.20	1.20	1.30	1.28	1.12	1.36	1.25	1.29
Particle density mg/m ³	2-2.65	2.0	2.5	2.5	2.0	2.0	2.0	3.33	5.0	5.0	2.0	5.0	2.0	2.26	3.33	5.0
Porosity %	30-55	38	46.7	47.2	25	42	42	59.7	74.4	74	50	74.8	44	39.8	63.2	74.2
pH	6.5-7.5	6.54	6.07	7.59	6.34	7.22	6.71	7.43	7.36	7.28	7.16	6.40	6.34	6.98	7.54	5.28
Conductivity dS/m	0-2	0.21	0.12	0.59	0.18	0.31	0.33	0.24	0.25	0.38	0.29	0.15	0.21	0.52	0.45	0.39
Calcium meq/l	10-30	5.6	7.2	4.9	5.8	4.9	4.8	6.3	7.2	6.9	6.5	4.1	5.8	8.2	4.2	5.2
Magnesium meq/l	5-10	2.6	3.1	2.5	2.2	2.1	2.9	3.5	3.4	3.0	2.7	1.8	3.2	4.1	1.9	2.3
OC %	0.50-0.75	1.98	1.83	1.91	1.77	0.68	0.592	0.652	1.20	1.83	1.77	1.50	1.59	1.56	0.98	1.41
Chloride %	0.020-0.120	0.166	0.108	0.051	0.12	0.127	0.121	0.083	0.051	0.044	0.21	0.07	0.15	0.035	0.05	0.124
TN Kg/ha	200-500	865.4	816.9	852.6	790	303.5	264.2	293.7	535.7	816.9	790	669	937	696.	438	629.4
Nitrate-nitrogen kg/ha	-	41.7	48.9	54.7	61.3	29.7	43.1	28.8	62.1	67.3	74.7	38.8	41.9	31.8	24.7	31.4
Sodium kg/ha	-	39.2	49.1	50.2	32.9	29.5	68.2	60.8	53.2	39.1	55.1	72.5	43.2	41.2	36.1	46.8
Potassium kg/ha	50-125	15.6	21.5	29.8	15.2	13.7	31.2	24.3	21.7	17.5	23.9	36.2	24.1	20.9	14.7	22.6
Phosphate in ppm	5-10	18.2	19.1	16.7	32.0	21.2	25.0	20.2	16.2	19.6	22.2	20.1	50.8	20.2	20.0	17.3

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Table-3: Physico-chemical characteristics of soil samples collected around agricultural areas of T.Narasipura Taluks during winter season 2011-2012

parameters	Normal range	S-1	S-2	S-3	S-4	S-5	S-6	S-7	S-8	S-9	S-10	S-11	S-12	S-13	S-14	S-15
Urea residues ppm		10.7	6.6	10.4	8.6	9.1	6.1	3.1	8.1	6.2	4.6	3.9	3.8	2.7	1.6	4.3
DAP residues ppm		27.2	32.1	23.2	43.9	29.6	23.3	26.5	25.5	34.2	36.2	32.9	43.9	30.3	27.2	39.0
Moisture content %	-	20.4	20.1	30.8	13.4	11.12	14.7	11.2	15.98	19.71	21.8	25.7	10.7	20.4	28.6	24.5
Bulk density mg/m ³	1-1.65	1.34	1.46	1.36	1.51	1.13	1.31	1.36	1.26	1.38	1.42	1.20	1.26	1.32	1.30	1.32
Particle density mg/m ³	2-2.65	2.0	2.5	2.5	2.0	2.0	2.0	3.33	5.0	5.0	2.0	5.0	2.0	2.26	3.33	5.0
Porosity %	30-55	33	71.6	45.6	24.5	43.5	34.2	59.9	74.8	72.4	29	24	37	58.4	60.9	73.6
pH	6.5-7.5	6.51	6.17	7.41	6.91	7.20	7.00	7.23	7.35	7.28	7.10	6.51	6.40	7.03	7.49	6.13
Conductivity dS/m	0-2	0.18	0.11	0.46	0.12	0.21	0.31	0.20	0.21	0.38	0.22	0.12	0.18	0.47	0.41	0.34
Calcium meq/l	10-30	5.1	5.6	3.7	4.1	3.9	4.6	5.1	7.0	6.4	5.9	3.8	5.9	6.9	4.5	5.9
Magnesium meq/l	5-10	2.3	2.8	2.3	2.0	1.9	2.1	2.9	3.1	2.8	2.3	1.9	3.0	3.6	1.3	2.0
OC %	0.50-0.75	1.71	1.81	1.68	1.52	0.97	0.51	0.60	1.12	1.51	1.62	1.40	1.31	1.26	0.76	1.18
Chloride %	0.020-0.120	0.13	0.091	0.032	0.10	0.116	0.09	0.06	0.042	0.031	0.18	0.06	0.098	0.031	0.046	0.10
TN Kg/ha	200-500	763	936	915	834	453	318	301	556	798	818	714	918	789	549	703
Nitrate-nitrogen kg/ha	-	47.1	61.9	65.3	73.9	33.8	52.9	39.7	78.3	82.6	89.1	49.6	53.2	52.1	29.3	35.6
Sodium kg/ha	-	41.6	38.8	61.3	31.9	18.5	73.1	78.3	67.2	41.6	72.6	68.5	32.1	26.8	31.9	27.5
Potassium kg/ha	50-125	21.8	19.7	29.1	18.3	15.6	27.6	21.7	17.6	15.3	20.9	31.7	22.8	52.3	14.9	21.6
Phosphate in ppm	5-10	19.6	23.1	16.7	31.6	21.3	16.8	19.1	18.4	24.6	26.1	23.7	31.6	21.8	19.6	23.1

Table-4:-Physico-chemical characteristics of soil samples collected around agricultural areas of T.Narasipura Taluks during summer season.2012

Parameters	Normal range	S-1	S-2	S-3	S-4	S-5	S-6	S-7	S-8	S-9	S-10	S-11	S-12	S-13	S-14	S-15
Urea residues ppm		11.8	7.8	ND	8.1	6.0	3.8	4.1	3.9	ND	4.9	5.6	5.1	ND	2.0	3.7
DAP residues ppm		15.5	22.5	12.6	40.0	19.7	12.2	23.9	24.4	33.6	22.5	33.6	34.2	14.0	26.1	27.8
Moisture content %		12.7	14.1	21.6	20.3	21.3	13.9	14.6	11.4	36.4	24.3	26.1	27.4	28.3	29.1	31.6
Bulk density mg/m ³	1-1.65	1.34	1.24	1.38	1.5	1.16	1.5	1.26	1.20	1.24	1.14	1.14	1.18	0.92	1.48	1.08
Particle density mg/m ³	2-2.65	3.33	2.0	5.0	3.33	3.33	1.66	3.33	2.5	1.42	2.0	5.0	3.33	5.0	1.66	3.33
Porosity %	30-55	53.76	38	72.4	54.9	65.1	32.8	62.1	52	12.68	43	77.2	64.5	81.6	22.9	67.5
pH	6.5-7.5	6.66	6.71	7.41	7.03	7.21	7.01	7.24	7.40	7.28	7.12	6.51	6.48	7.06	7.53	6.31
Conductivity ds/m	0-2	0.26	0.14	0.46	0.18	0.26	0.31	0.21	0.22	0.34	0.23	0.14	0.21	0.46	0.47	0.36
Calcium meq/l	10-30	5.3	6.1	4.7	4.8	3.4	4.9	5.4	7.3	6.8	6.1	2.9	3.9	2.8	5.2	6.1
Magnesium meq/l	5-10	2.4	3.0	2.8	2.6	2.2	3.0	3.1	4.1	3.2	3.1	0.9	2.9	2.1	0.9	1.3
OC %	0.50-0.75	0.99	0.96	0.93	1.65	1.62	1.56	0.51	1.02	1.8	1.65	0.75	1.2	1.12	1.11	1.14
Chloride %	0.020-0.120	0.134	0.17	0.153	0.229	0.149	0.205	0.284	0.205	0.220	0.153	0.234	0.22	0.22	0.24	0.25
TN Kg/ha	200-500	308	276.	2540	1246	2610	2701	1610	851.2	1282	794.5	783	2860	753	926	2610
Nitrate-nitrogen Kg/ha		64	78	84	106	57	64	58	94	104	116	69	78	69	34	58
Sodium Kg/ha		122	130	112	128	134	126	213	144	108	104	39	50	47	39	60
Potassium Kg/ha	50-125	41	36	16	16	19	21	20	28	17	16	10	19	14	16	19
Phosphate in ppm	5-10	11.2	16.2	9.1	28.8	14.2	8.8	17.2	17.6	33.6	16.2	24	24.6	10.1	18.8	20.0

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IV. DISCUSSION

The results obtained from the seasonal analysis of soil samples of T.Narasipurataluks are shown in Tables 2, 3 and 4. Standard methods have been employed for the analysis of chemical fertilizer residues, along with physico-chemical characteristics of soil samples. A comparison of the physico-chemical characteristics has been made with soil quality standards. Following observations were made from different characteristics with respect to different seasons.

Moisture content: During the present investigation, the moisture content values in T.Narasipurataluk ranged from 10.18 to 37.83 % in rainy season, 10.7 to 30.8 % in winter season and during summer season, the values ranged from 11.4 to 36.4 %. In case of non-agricultural soil samples, the moisture content was found to be 12.36 %. Highest value was recorded in rainy season. The variation in moisture content depends on the amount of pore space present in soil, which is related to soil texture.

Bulk density: Bulk density is defined as the mass of soil material present per unit volume of moist soil under naturally undisturbed condition. The bulk density of clay and clay loam soil normally ranges from 1 to 1.65 mg/m³. During the present study, the variation of bulk density in T.Narasipurataluk ranged from 1.12 to 1.48 mg/m³ in rainy season, 1.13 to 1.51 mg/m³ in winter season and during summer season, the values ranged from 1.08 to 1.38 mg/m³. In case of non-agricultural soil samples, the bulk density was found to be 1.08 mg/m³. Bulk density is related to total porosity or pore space present in the soil for air and water movement (Mini et al, 2003; Tester, 1993). Lower bulk density implies greater pore space and improved aeration, developing a suitable environment for biological activity (Werner, 1997).

Particle density: Particle density is the density of solid particles in a particular sample. During the present study, in T.Narasipurataluk, the particle density of soil samples in all the seasons ranged from 2 to 5 mg/m³. Normally the particle density range from 2 to 2.65 mg/m³, which indicates the presence of clay and quartz minerals in the soil matrix. High particle density indicates the presence of rich iron in soils ex: ferromagnesian mineral density range from 2.9 to 3.5 mg/m³ and the density of iron oxides and other heavy minerals can exceed 5 mg/m³.

Porosity or pore space: Porosity or pore space of a soil is that portion of the total soil volume, which is not occupied by solid particles but occupied by air or water. During present investigation, the porosity values in T.Narasipurataluk ranged from 25 to 74.8 % in rainy season. 29 to 74.8 % in winter season and during summer season, the values ranged from 22.9 to 77.2 %. In case of non-agricultural land soil samples, the porosity value was found to be 78.4 %. The pore space of a soil varies with respect to soil texture, shape of individual soil particles, organic carbon content and nature of crop soil management.

Urea: During the present study, in T.Narasipurataluk soil samples, the urea residues ranged from 5.1 to 26.8 ppm in rainy season. 6.3 to 19.8 ppm in winter season and during summer season, the values ranged from 9.1 to 20.2 ppm. Generally, when urea is applied to soil, it is hydrolyzed rapidly to ammonia and carbon dioxide by soil Urease enzyme. The rate of degradation depends on soil pH, temperature, moisture content, organic carbon, quantity of urea applied which will varies with respect to seasons (Bremner and Mulvaney, 1978).

Diammonium phosphate residues: During the present study, the DAP residues in T.Narasipurataluk soil samples, ranged from 4.86 to 51.86 ppm in rainy season. 16.7 to 26.1 ppm in winter season and during summer season, the values ranged from 8.62 to 43.3 ppm. Highest concentration was reported during rainy season. High concentration of DAP residues indicates that, the quantity of fertilizer applied to the soil has not been completely utilized by the crops.

pH: During the present study, variation of pH was noticed in T.Narasipurataluk, from a minimum of 5.08 to a maximum of 7.59 in rainy season. 6.13 to 7.14 in winter season and during summer season, the values ranged from 6.31 to 7.53. For non-agricultural soil sample, the pH was found to be 7.4. As per the present investigation, Long term fertilizer application of nitrogenous and phosphorous fertilizers results in low soil pH, which confirms the findings of Aref and Wander *et al* (1998). During the present study, a slight variation in pH was observed in all the seasons. In some of the soil samples, acidic pH was noticed, which may occur due to decomposition of organic matter, or

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application of acid-forming fertilizers. Rainfall also affects soil pH, it decreases during rainy season (De S, 2009) as water passing through the soil leaches basic nutrients such as calcium and magnesium from the soil (Bernstein L. 1975)

Electrical conductivity: Electrical conductivity determines the amount of salts present in soil suspension. During the present investigation, the EC of T.Narasipurataluk ranged from 0.12 to 0.59 dS/m in rainy season. 0.11 to 0.46 dS/m in winter season and during summer season, the values ranged from 0.14 to 0.47 dS/m. For non-agricultural soil sample, the EC was found to be 0.18 dS/m. The value of electrical conductivity was from zero to 2 dS/m, which is safe for all the crops. During the present investigation, the values of conductivity showed strong variations in different seasons. Highest values was observed during rainy season, which implies that, in rainy season salts were dissolved, which will get leached through soil profile during raining (Nazrul- Islam 1995). The EC values for all the soil samples were found to be within the normal range, reflecting that, all the soil samples have safe range of electrical conductivity.

Calcium and magnesium: The calcium and magnesium concentrations in T.Narasipurataluk ranged from 4.1 to 8.2 meq/l and 1.8 to 4.1 meq/l in rainy season. 3.7 to 7.0 meq/l and 1.3 to 3.6 respectively in winter season and during summer season, the values ranged from 2.8 to 7.3 meq/l and 0.9 to 4.1 meq/l respectively. In case of non-agricultural soil samples, calcium and magnesium were found to be from 15.3 and 8.1 meq/l. In comparison with the non-agricultural soil samples, the calcium and magnesium concentrations were found to be very less. Highest values were recorded during rainy season. For urea applied soils, nitrate ions were formed as an end product after hydrolysis of urea which is not strongly adsorbed by the soil particles which will move down through the soil profile. The negatively charged nitrate ions carry positively charged basic cations, such as calcium, magnesium, sodium, potassium in order to maintain the electrical charge on the soil particles. The depletion of these basic cations will accelerate the acidification process in soil which is another reason for decrease in soil pH and confirms the findings of Nelet *et al* (1996).

Organic carbon: Organic carbon is an index of soil productivity. During the present investigation, the organic carbon in T.Narasipurataluk ranged from 0.592 to 1.98 % in rainy season. 0.518 to 1.68 % in winter season and during summer season, the values ranged from 0.93 to 1.65 %. In non-agricultural soil samples, the organic carbon was found to be 1.52 %. For all the soil samples, the organic carbon was found to be higher compared to the normal range. The high organic carbon is due to accumulation of crop residues on soil surface (Ashok, 1998).

Total nitrogen: The total nitrogen content for all the soil samples in all the seasons was found to be higher in range. The total nitrogen values in T.Narasipurataluk ranged from 264.28 to 937.39 kg/ha in rainy season. 301 to 936 kg/ha in winter season and during summer season, the values ranged from 276.9 to 2860 kg/ha. Highest values were recorded during summer and rainy season. Similarly, in case of non-agricultural soil, the value was found to be 136.2 kg/ha. Except, non-agricultural soil samples, total nitrogen in all the agricultural soil samples in all the seasons was found to be high, which is due to excessive application of nitrogenous fertilizers and also through leguminous crop rotation (Nelet *et al*, 1996), apart from which, Soil chemistry greatly varies with seasonal changes, the C or N contents of soil varied seasonally, due to differential microbial activities for decomposing biomass accumulation and thereby nutrient recycling within the soil environment.

Nitrate-nitrogen: The nitrate concentration in T.Narasipurataluk, varied from 24.7 to 74.7 kg/ha in rainy season. Similarly, 33.8 to 89.1 kg/ha in winter season and during summer season, the values ranged from 34 to 116 kg/ha. In case of non-agricultural soil samples, the nitrate was found to be 27.68 kg/ha. In comparison with the non-agricultural soil sample, the nitrate concentrations in all the agricultural soil samples were found to be higher, which mainly depend on moisture content and enzymatic activity of soil system which may vary from one place to another with different seasons (Bremner *et al*, 1978).

Sodium and potassium: Sodium and potassium are important basic cations, which are considered as indicators of nutritional imbalance. During the present study, the sodium and potassium concentrations in the T.Narasipurataluk, ranged from 29.5 to 72.5 kg/ha and 13.7 to 36.2 kg/ha respectively in rainy season. 81.5 to 78.3 Kg/ha and 14.9 to 52.3 Kg/ha respectively in post-rainy season and during summer season, the values ranged from 39 to 213 and 14 to 41

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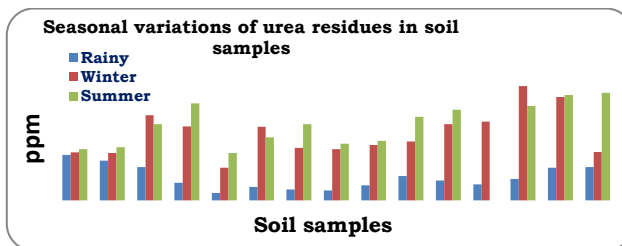
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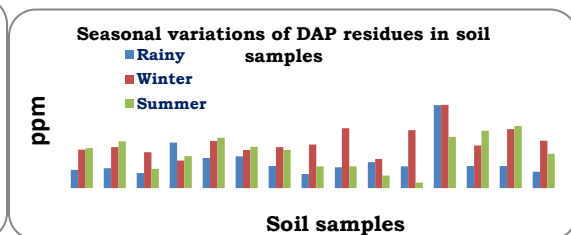
Kg/ha. In case of non- agricultural soil samples, the sodium and potassium concentrations were found to be 23.1 and 14.8 kg/ha respectively. In comparison with concentrations of non-agricultural soil samples, the sodium and potassium concentrations were found to be very less in some of the soil samples in different seasons. This confirms the findings of Nelet *al* (1996) that, his experiments on long term application of different types of chemical fertilizers on soil, resulted in the decline of basic cations.

Phosphate: During the present investigation, the phosphate concentrations of T.Narasipurataluk soil samples, ranged from 16.2 to 50.8 ppm in rainy season. 16.7 to 31.6 ppm in winter and during summer season, the values ranged from 8.8 to 28.8 ppm. In non-agricultural soil samples, the phosphate concentration was found to be 9.1 ppm. The high phosphate levels in all the sampling areas were found to be higher than the normal range, which is due to excessive application of phosphate fertilizers. This was confirmed from the report of McCollum (1991), that long term phosphate fertilizer application in excess quantity than the crop requirement, results in a large build up of phosphorous reserves, which may persist for many years.

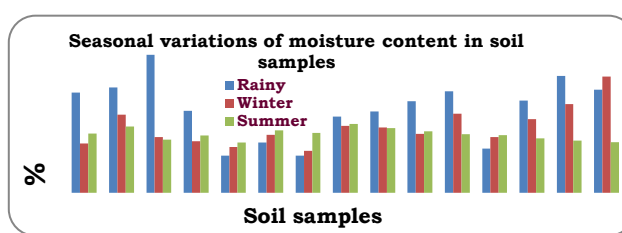
V. GRAPHICAL REPRESENTATION OF SEASONAL VARIATIONS IN PHYSICO-CHEMICAL CHARACTERISTICS OF SOIL SAMPLES



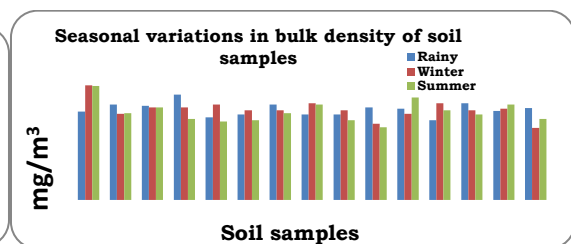
Graph-1



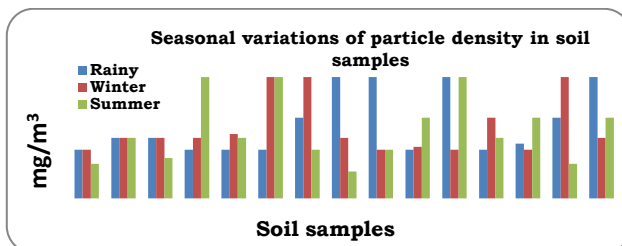
Graph-2



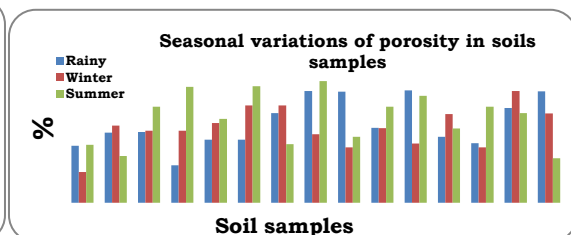
Graph-3



Graph-4



Graph-5



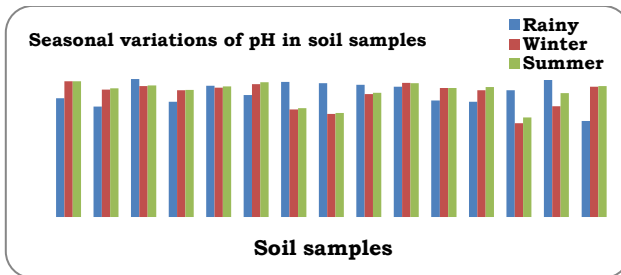
Graph-6

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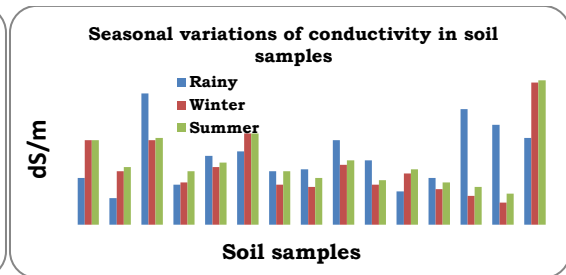
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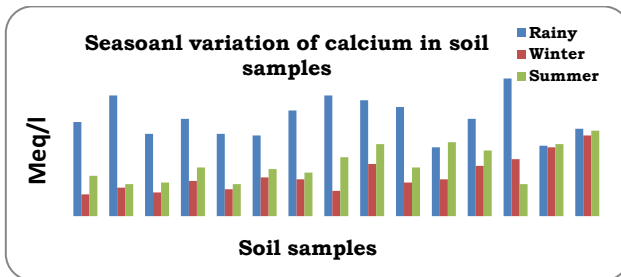
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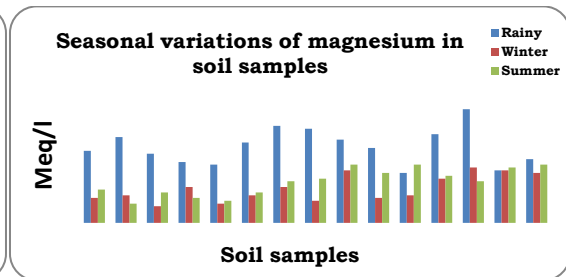
Graph-7



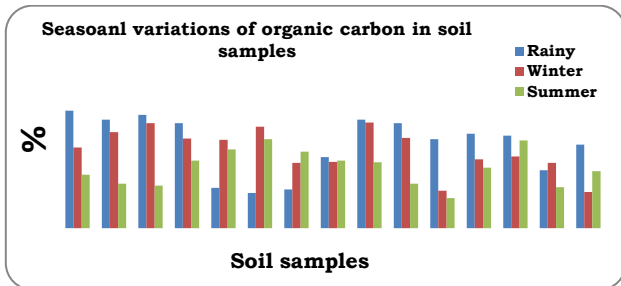
Graph-8



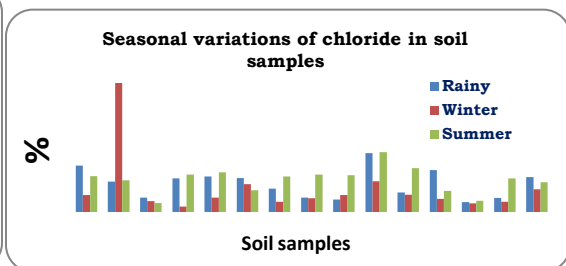
Graph-9



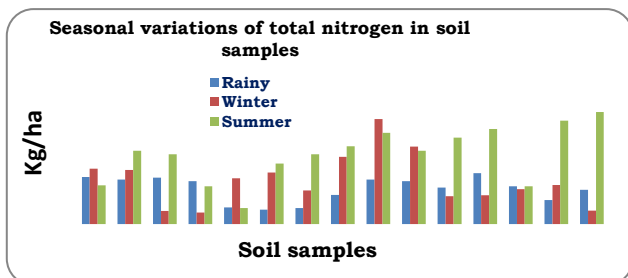
Graph-10



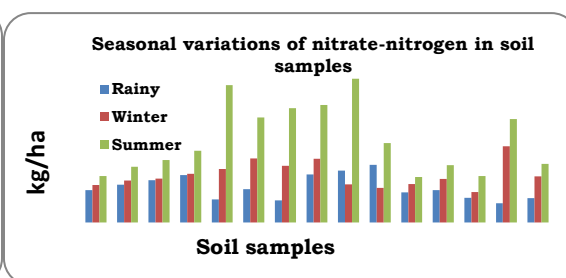
Graph-11



Graph-12



Graph-13



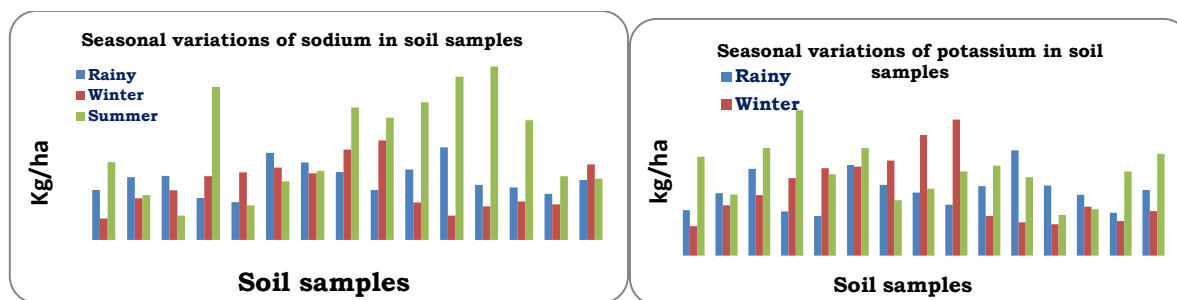
Graph-14

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Graph-15

Graph-16

VI. CONCLUSIONS

From the present study, it confirms that, the application of chemical fertilizers has greater influence on soil. Most of the soil samples were found to be slightly acidic in nature and the ions like calcium, magnesium, sodium and potassium were found to be varied during all the seasons. Phosphate level was found to be higher in all the sampling areas, which was due to over-use of phosphate fertilizers. The total nitrogen, ammoniacal-nitrogen and nitrate concentrations were found to be higher in all the seasons, From the results of seasonal variations of soil characteristics, it was found that, majority of all the cations and anions in soil were found to higher during monsoon season followed by post-monsoon and lesser during summer, The different sources of flooding water and the fertilization habits can be responsible to some extent, for the soil chemical characteristics variability along with seasons. One can also state that, judicious application of chemical fertilizers may help to maintain soil quality and productivity. However, it is necessary to apply liming material to reduce the acidifying effect on agricultural lands in order to maintain basic cation levels in soil.

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