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EFFECT OF DIFFERENT CROPPING SYSTEMS ON PHYSICO-CHEMICAL PROPERTIES OF SALT AFFECTED SOILS OF AYODHYA

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ABSTRACT
An investigation was conducted during 2018-19 at Genetics and Plant Breeding Farm of Acharya Narendra Deva University of Agriculture and Technology, Kumarganj, Ayodhya (U.P.) to study the effect of different physico – chemical properties of soil under different cropping systems of salt affected soils of Ayodhya. Results data reveals that soil were sandy loam, loam and silty loam. The bulk density ranged from 1.14-1.62 Mgm^{-3} , particle density ranged from 2.29-2.70 Mgm^{-3} , porosity of the field ranged from 33.05 – 52.65%, available sulphur ranged from 6.50-18.78 $kgha^{-1}$ and Zinc was 0.50 – 0.89 $mgkg^{-1}$. The significant positive correlations were observed among soil sand with B.D. and soil B.D. with silt, B.D. with P.D. , porosity with Sulphur in whole GPB farm. While the significant negative correlations were observed among sand with silt and silt with clay in whole GPB farm.

KEY WORDS: Pearsons Correlation coefficient, physico- chemical properties, standard deviation, micro nutrient.

INTRODUCTION

In sustaining crop productivity of an area, soil fertility plays an important role, particularly in situations where input of nutrient application differs and the information on the nutritional status can go a long way to develop economically viable alternatives for management of deficient nutrients in the soil. The fertility capability classification was designed to group of soils having similar limitations of fertility management at 0-30 cm layer from the surface lays maximum emphasis on the component of soil fertility. The soil property pattern is of prime concern to geographers to know the relationship between man and the natural environment (Tripathi and Vishwakarma, 1988). Different farms of the university are under different land use. The farms are in developing stage and the basic information regarding the land use pattern and soil fertility status are needed for the future research and developments programmes. Keeping these facts in view, the present investigation was carried out with depth wise distribution of physico-chemical properties of soil under different cropping systems of salt affected soils of Ayodhya.

MATERIALS AND METHODS

An investigation was conducted during 2018-19 at Genetics and Plant Breending farm of A.N.D. University of Agriculture and Technology, Kumarganj, Ayodhya. Random soil sampling was done on GPS basis in each plot of the Genetics and Plant Breeding farm to evaluate the fertility status and effect of different cropping systems on soil physico-chemical characteristics and their correlation. The cropping systems were Black Gram– Pea–Green Gram, Black Gram – Lentil – Green gram, Kodo / Sawan –Rye–Fallow, Kodo/ Kakun –Kidney Bean–Fallow, Kodo/ Sawan – Mustard –Fallow, Rice –Wheat – Fallow, Rice – fodder Crops – Fallow, Rice –fodder Crops– Fallow, Green Gram –Lentil – Black Gram, Green Gram – Pea – Black Gram, Rice – Fodder Crop – Fallow, Rice – Fodder Crop – Fallow, Rice– Fodder Crop–Fallow, Fodder Crop – Oat – Fallow, Fodder Crop – Berseem – Fallow, Fallow– Mustard – Fallow, Fallow– Barley–Fallow, Fallow–Barley –Fallow, Fallow, Fallow, Fallow, Fallow two hundred sixty four representative soil samples consisting of four depths viz., 0-15, 15-30 ,30-60 and 60-90 cm from plots of GPB farm have been collected during March , 2019. The samples were collected from different spots for different physico-chemical study was brought to the laboratory and dried under the shade. The entire samples were rushed and sieved through 20 mesh sieve and stored. The soil samples were analyzed with following the standard procedures. The soil was sandy loam, loam and silty loam. Correlation between different soil parameters were calculated and regression equations were calculated and regression equations were worked out as per procedures described by chandel (1984), the correlation coffecient, r is known as pearsons correlation coefficient ,since it was developed by karl Pearson. The standard deviation is defined as the square root of the mean of the squared deviation of individual value from their mean.

RESULTS AND DISCUSSION

It is evident from the data that maximum sand percentage (52.5%) was recorded in green gram – pea – black gram at the depth of 0-15 cm and minimum (30.4%) was found in fallow – mustard – fallow at the depth of 15-30 cm . The maximum silt percentage (53.6%) was recorded from the rice–fodder crop–fallow at the depth of 15-30 cm whereas, minimum silt (30.2%) was found in fallow–barley – fallow at the depth of 0-15 cm. As the clay percentage is concerned, the maximum clay percentage (27.5%) was recorded from black gram – pea – green gram at the depth of 30-60 cm and minimum clay percentage (14.5%) was

found in rice – fodder crop – fallow with the depth of 0-15 cm .The sand, silt and clay percentage were ranged from 52.5-30.4%, 53.6-30.2% and 27.5-14.5% respectively with an average mean value of 39.64, 39.83 and 20.45%. The value of standard deviation in sand, silt and clay were 2.60, 2.12 and 1.33, respectively in 22 plots of Genetics and Plant Breeding Farm. The soils were dominant in sand and silt content but small amount of clay was also observed in the soils. Thus the soil texture ranged from sandy loam to loam. Similar results were reported by Singh et al (2011) and Swarnam *et al.* (2004).

Data showed from the Table 1 that maximum bulk density 1.62 Mgm^{-3} was recorded in Kodo/Kakun – Kidney Bean – Fallow under the depth of 60-90 cm and minimum bulk density of 1.14 Mgm^{-3} was recorded from Green Gram – Pea – Black Gram at the depth of 0-15 cm. The maximum particle density 2.70 Mgm^{-3} was found in Rice – fodder Crops – Fallow Plot no. 8 (B9) under depth of 60-90 cm and the minimum particle density 2.29 Mgm^{-3} was found in Rice – Fodder Crop – Fallow in Plot no. 12 (C8) at the depth of 0-15 cm. As regarding the porosity maximum porosity (52.65%) was found in Fallow –Mustard – Fallow cropping system under the depth of 0-15cm. The minimum porosity (33.05%) was recorded in Kodo/ Kakun – Kidney Bean – Fallow cropping system under the depth of 60-90 cm. The ranged Bulk density of ranged from 1.14 -1.62 Mgm^{-3} and Particle density ranged from 2.29 – 2.70 Mgm^{-3}.Where the porosity ranged from 33.05 – 52.65%. The average bulk density of farm was 1.34 Mgm^{-3}, particle density was 2.48 Mgm^{-3} and porosity was 45.97% of the entire GPB farm. The standard deviation of bulk density was 0.089, particle density 0.087 and the porosity 3.96 on the GPB farm under 22 plots with 264 samples. Soil bulk density could be used as an indicator of soil quality parameter. The bulk density depends on several factor such as compaction, consolidation and amount of soil organic carbon present in the soil but it is highly correlated with organic carbon content of the soil. Higher sandy texture might be due to low soil organic matter content which solid particles lies close together and the BD commonly higher than in fine textured soil. Particle density of soil did not vary much but with decrease in organic matter content of the soil, the particle density increases. The percent pore space varies indirectly with the bulk density of the soils and gives a good estimate of the porosity of soil. These finding also corroborated with the findings of Muche *et al.*, (2015), Shiva *et al.* (2017).

TABLE 1: Physico- chemical properties of soil at Genetics and Plant breeding farm (mean of different depth)

Cropping system.	Sand (%)	Silt (%)	Clay (%)	Bulk Density (Mgm^{-3})	Particle density (Mgm^{-3})	Porosity (%)	Sulphur ($Kgha^{-1}$)	Zinc ($Kgha^{-1}$)
B2	36.8- 42.5	32.04-43.50	19.7-27.5	1.23-1.29	2.45-2.66	49.79-50.38	10.44-15.11	0.74-0.88
B3	37.3-43.6	32.4-42.3	19.6-26.4	1.36-1.45	2.54-2.65	45.28-46.89	10.28-18.09	0.53-0.67
B4	31.0-38.3	36.40-52.10	16.9-24.0	1.18-1.29	2.40-2.53	49.01-50.83	10.10-18.68	0.51-0.72
B5	37.9-42.1	35.0-39.80	20.3-25.9	1.40-1.62	2.30-2.42	33.05-39.12	8.35-14.74	0.63-0.74
B6	38.8-43.8	36.70-43.3	17.9-22.2	1.40-1.45	2.58-2.65	44.65-47.16	10.88-14.33	0.70-0.78
B7	39.9-51.8	31.8-43.3	16.8-22.9	1.17-1.30	2.40-2.52	47.96-52.50	10.31-15.19	0.61-0.75
B8	35.9-41.2	39.6-44.9	19.2-21.5	1.32-1.50	2.54-2.63	42.58-48.03	10.31-14.82	0.63-0.82
B9	31.1-43.2	34.9-53.6	15.3-22.0	1.32-1.50	2.60-2.70	44.44-49.23	10.33-18.25	0.59-0.82
C5	36.6-42.3	35.5-43.2	17.6-24.6	1.23-1.38	2.35-2.48	44.22-47.65	13.45-18.78	0.56-0.87
C6	37.8-52.5	31.9-43.4	15.5-25.4	1.14-1.40	2.32-2.41	41.90-49.56	10.32-16.70	0.64-0.74
C7	36.8-42.3	35.4-43.7	18.4-22.3	1.32-1.44	2.48-2.53	41.93-47.01	8.35-14.55	0.60-0.76
C8	35.4-42.2	35.3-44.3	16.9-22.8	1.28-1.52	2.29-2.40	36.66-44.34	8.53-15.11	0.65-0.81
C9	32.4-42.9	35.3-53.1	14.5-21.8	1.38-1.50	2.51-2.58	35.65-45.01	12.36-16.30	0.55-0.78
D3	37.7-42.1	35.5-44.3	15.3-22.4	1.23-1.38	2.40-2.52	45.23-48.75	12.32-17.65	0.55-0.74
D4	38.4-42.3	36.5-40.6	17.1-25.1	1.31-1.40	2.55-2.61	46.36-48.83	10.44-12.75	0.50-0.77
D5	30.4-41.3	35.6-53.4	16.2-24.5	1.16-1.27	2.45-2.54	49.20-52.65	12.50-17.57	0.68-0.84
D6	37.5-52.3	30.2-42.3	17.5-23.4	1.29-1.35	2.35-2.50	44.89-46.00	12.08-17.09	0.66-0.78
D7	37.6-43.2	38.6-42.3	17.3-23.7	1.50-1.59	2.40-2.54	36.65-38.97	8.44-13.53	0.62-0.72
E3	34.8-42.5	36.7-44.3	20.6-23.0	1.27-1.40	2.50-2.61	46.36-49.20	8.19-13.50	0.52-0.72
E4	32.6-42.4	35.6-52.8	14.6-22.2	1.25-1.40	2.48-2.58	47.67-49.59	10.11-17.31	0.62-0.72
E5	38.3-43.6	36.4-42.3	18.6-21.1	1.21-1.40	2.31-2.44	39.39-49.15	6.50-11.42	0.74-0.83
E6	36.4-52.4	31.3-40.2	16.3-26.0	1.18-1.23	2.40-2.52	49.59-51.58	8.11-11.50	0.67-0.89
AVERAGE	39.64	39.83	20.45	1.34	2.48	45.97	12.94	0.66
S.Deviation	2.60	2.12	1.33	0.089	0.087	3.96	1.91	0.236

TABLE 2: Mean correlation among different physico-chemical properties of soil of all plots of Genetics and plant Breeding Farm of University campus.

Parameter	Sand (%)	Silt (%)	Clay (%)	Bulk Density ($Mg\ m^{-3}$)	Particle Density (Mgm^{-3})	Porosity (%)
Sand (%)	1.000					
Silt (%)	-0.584**	1.000				
Clay (%)	-0.069	-0.440**	1.000			
Bulk Density (Mgm^{-3})	+0.550**	+0.459**	+0.375	1.000		
Particle Density (Mgm^{-3})	+0.353	+0.443	+0.461	+0.870**	1.000	
Porosity (%)	-0.303	+0.184	+0.275	-0.436	+0.358	1.000

** Significant at 1% levels of significance

TABLE 3 : Mean correlation between physico-chemical properties Sulphur and Zinc

Parameter	Sand (%)	Silt (%)	Clay (%)	Bulk Density (Mgm^{-3})	Particle Density (Mgm^{-3})	Porosity (%)
Sulphur	-0.020	+0.008	+0.039	+0.021	+0.059	+0.102
Zinc	+0.524	+0.463	+0.444	+0.302	+0.333	+0.402

** Significant at 1% levels of significance

It is evident from the data that the maximum available Sulphur (18.78 $kgha^{-1}$) was recorded in Green Gram – Lentil – Black Gram with the depth of 0-15 cm, whereas, minimum available Sulphur (6.50 $kgha^{-1}$) was found in fallow at the depth of 60-90 cm. The maximum available Zinc (0.89$mgkg^{-1}$) was recorded in fallow with the depth of 30-60 cm and minimum (0.50 $mgkg^{-1}$) was found in Fodder Crop – Berseem–Fallow at the depth 60-90 cm.The available Sulphur was ranged from (6.50 - 18.78 kg ha^{-1}) and with an average value of (12.94 kg ha^{-1}), and available zinc ranged from (0.50- 0.89 mgkg-1) and with an average value (0.66 mgkg-1). The standard deviation of sulphur and zinc were 1.91 and 0.23, respectively. The majority of soil sample collected from the soil which has followed the cropping system as Black gram- lentil –green gram. This might be due to the addition of organic matter and solubilisation of the nutrients in surface soil. This is in agreement with the findings as reported by Singh *et al* (2011, Mishra *et al.* (2015).

The correlation between physico-chemical properties is represented in Table 2 and 3. The results reveals that the sand v/s bulk density, silt v/s bulk density, silt v/s E.C., B.D. v/s P.D. and P.D. v/s E.C. showed significant and positively correlation at 1% level of significance, whereas the significantly and negative correlations were found among sand v/s silt and silt v/s clay at 1% level of significance.

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