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Evaluation of tank silt hybridized soil and its impact on yield of soybean and pigeon pea in Latur district Maharashtra

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Abstract
The tank silt hybridized soils of the study area are very shallow to shallow in depth, very dark grayish brown (10 YR 3/2) to very pale brown (10YR 7/4) in colour, granular to angular blocky in structure, non sticky non plastic to very sticky, very plastic in nature, silty clay loam to clay in texture. The bulk density of these soils varies from 1.20 to 1.99 M gm^{-3}. The moisture content and PAWC was increased with tank silt hybridization. The saturated hydraulic conductivity of tank silt hybridized soils varies from 2.70 to 27.10 cm hr^{-1}. These soils are slightly to moderately alkaline in reaction (6.70 to 8.45) and low in electrical conductivity (< 1.0 $dSm^{-1)}$, calcareous in nature, low to medium organic carbon content (0.43 to 0.87%). The cation exchange capacity of tank silt hybridized soil varied from 2.0 to 25.20 cmol(P^+) kg^{-1}. The tank silt hybridized soil have Ca^{++}, Mg^{++}, Na^+ and K^+ varied from 10.28 to 33.83, 6.94 to 24.72, 0.36 to 2.54 and 0.18 to 1.61 cmol(p^+) kg^{-1} respectively and Ca is dominant cation followed by Mg, Na and K. Base saturation of tank silt hybridized varies from 92.18 to 98.11 per cent. According U.S. Comprehensive of soil classification (Soil Survey Staff, 2015) these soils were classified as Typic Ustorthents and Lithic Ustorthants. The fertility Status of these soils was low to high. The NPK status was increased with application of tank silt. The maximum yield of soybean was found with 27 cm depth of tank silt hybridized layer soil whereas and pigeon pea 45 cm depth of tank silt hybridized layer soil. The yield of soybean and pigeon pea was found positively correlated with Clay content (r = 0.30, r = 0.42), depth (r = 0.40, r = 0.69) and PAWC (r = 0.52, r = 0.71). This indicated that tank silt hybridization increased the soil depth, clay content and PAWC of the soil which is increases the yield of crop. However, also concluded that shallower the depth of tank silt hybridized layer support to shallow rooted and short duration crop like soybean and deeper (> 45 cm) depth of tank silt hybridized layer support to deep rooted and long duration crop like pigeon pea.

Keywords: Tank silt hybridized soil, very shallow soil

Introduction

The tank silt application in agricultural land is a traditional activity for the benefit of better crop growth. Addition of tank sediments to cultivated fields improves the physico-chemical properties of the soil which results in good crop growth and higher yields. Kabir *et al.* (1991) [10], Keshavamurthy and Kotur (1996) [11], Shankaranarayana (2001) [17], Ramesh (2001) [15] and Anonymous (2012) [1] observed higher crop yield with the addition of tank sediments to the soil. Tank silt invariably is available free of cost to the farmers, except the cost for its transport. This practice also minimizes cost on the other external inputs such as manure, fertilizers etc. Addition of tank silt to cultivated land also improves the physical properties which results in good crop growth and higher yield (Keshavamurthy and Kotur 1996; Kabir *et al.*, 1991; Vaidya and Dhawan, 2011) [11, 10]. Soil hybridization with tank silt improve the soil quality and productivity of very shallow soil underlined by murrum layer in basaltic area of Osmanabad district (Vaidya and Dhawan 2011) [21]. They also reported that very shallow soil hybridized with tank silt @1500-2000 cum ha^{-1} improves two to three fold soil quality and productivity of marginal land and hasten the process weathering of saprallite. The disiltation process was started by government of Maharasthra since from 2004. In this context farmer's of Latur district have used these tank silt for application in the cultivated field and its become popular practice in this district .With this in a view, present investigation was carried out to understand characterization of tank silt hybridized soils of Latur district.

Materials and Methods

The present investigation on the very shallow soil hydrids with tank silt under basaltic area of Latur district was carried out to study the morphological, physical and chemical characteristics of these soils and their impact on yield of soybean and pigeon pea. The study area is located exactly in between 17° 52' to 18° 50' N Latitude and 76° 18 to 79° 12' E Longitude. The geographical area of the district is 7157 sq. km. The climate of the area is hot, dry and sub-humid with annual rainfall is 794 mm. Tank silt hybridized soils of Latur district was surveyed and representative tank silt hybridized field (tank silt hybridized before 10 year) were selected and 9 (nine) soil profile were finalized for profile examination. However, horizon wise soil samples were collected for laboratory analysis and classified as per Soil Taxonomy (2015). The Particle size distribution was carried out by international pipette method according to the procedure given by Jackson, 1979 [9]. The bulk density was determined by clod coating method (Black, 1965) [3]. Available water capacity (AWC) and plant available water capacity (PAWC) were determined using the equation suggested by Gardner *et al*. (1984) [6] and latter modified by Coughlam *et al*. (1986) [4]. The water retained between 33 kPa and 1500 kPa, saturated hydraulic conductivity, CEC and exchangeable bases Na and K were determined by standard procedure (Richards, 1954) [16] and Ca and Mg were determined by as per Piper (1966). Soil pH and EC were determined in soil water suspension 1:2.5 (Jackson, 1967) [7]. Soil organic carbon was determined by Walkley and Black methods (Jackson, 1973) [8]. CaCO3 was determined by rapid titration methods (Piper, 1950). The available nitrogen was determined by alkaline potassium permanganate method (Subbaiah and Asija, 1956) [19]. Available phosphorous was determined by Olsen's methods (Jackson, 1967) [7]. Available potassium was determined by using neutral ammonium acetate solution methods (Jackson, 1973) [8]. DTPA (0.005M) extractable Fe, Mn, Zn and Cu was determined as the procedure outlined by Lindsay and Norvell (1978) using atomic absorption spectrophotometer. The yield data was recorded and express in term of q ha^{-1} from farmers field of soil profile. The weighted means of several land characters was computed by multiplying the depth of each horizon to it respective value (Sys *et al*. 1991).

Results and Discussion

Morphological properties of soils

The soil depth is an important factor in the crop production which influences the crop yield. In general, for some crops increase yield with increase in soil depth (De La Rosa 1981; Bhaskar *et al.* 1987) [5, 2]. Soil depth is a central characteristic in land evaluation as it partly control the available water capacity, storage of nutrients and providing volume for the production of root biomass in the root zone. Data presented in (Table1) indicated that application of tank silt increased depth of soil which was varied from 23 to 45 cm and which correspond to very shallow to shallow depth. This variation was attributed to tank silt application at different rate (Vaidya and Dhawan, 2014) [20]. The soil colour was mainly influenced by relief, drainage time, weathering intensity and parent material. The colour of tank silt hybridized soil varies from very dark grayish brown (10 YR 3/2) to Very pale brown (10YR 7/4) in colour. The soil structure of surface (Ap) horizon of tank silt hybridized soils varies from weak, medium, sub angular blocky to strong, medium, angular blocky. soil consistency of Ap horizon varies from soft to slightly hard in dry condition and friable to firm in moist condition, non sticky non plastic to very sticky, very plastic in wet condition.

Physical properties of soils

Physical properties of tank silt hybridized soils presented in table 2 indicated that the clay content in the tank silt applied soil ranged from 18.89 to 58.74 per cent. The maximum clay content at tank silt hybridized soil in pedon P_5 43.26 per cent (weighted mean). This indicated that the more amount of tank silt application increase the clay content, similar observation also noticed by Vaidya and Dhawan (2013) [22]. This fact is further evident from positive correlation obtained between clay content and depth of tank silt applied layer (r= 0.54). The bulk density of tank silt hybridized soil varies from 1.20 to 1.99 Mgm^{-3} and higher bulk density values in sub surface horizons may be due to presence of weathered murrum layer. PAWC was found to increase with clay content and soil depth. The capacity of soil to store moisture for plant use is largely a function their clay content, depth of soil and mineralogy of soil (Gardner *et.al*. 1984) [6] that the plant available water capacity is limited by rooting depth. Moreover also found that the significant positive correlation with yield of soybean (r = 0.69) and pigeon pea (r = 0.71). This indicated that the PAWC of tank silt hybridized soil increases the yield of soybean and pigeon pea increased. The saturated hydraulic conductivity of tank silt hybridized soils varies from 2.70 to 27.10 cm hr^{-1} whereas, without tank silt applied soil was ranged from 2.70 to 4.41 cm hr^{-1}. This showed that the application of tank silt five to six times decreased the hydraulic conductivity of surface layer of these soils. This variation is due to application of tank silt which content high amount of clay (>60 per cent). Similar observation was reported by Vaidya and Dhawan (2014 and 2015) [20, 23].

Chemical properties of soils

Physical properties of tank silt hybridized soils presented in table 3 indicated that the pH of tank silt hybridized soils are slightly to moderately alkaline in reaction (6.70 to 8.45) and low in electrical conductivity is (< 1.0 dS/m). The organic carbon content of Typic Ustorthents and Lithic Ustorthents varies from 0.43 to 0.87% and 0.54 to 0.70% respectively, comparison shown that OC in very shallow soil increased with application of tank silt. The concentration of a $CaCO_3$ was increases with application of tank silt. This is due to application of highly calcareous tank silt. The high cation exchange capacity of tank silt hybridized soil varied from 19.10 to 58.17 cmol(P+)/kg^{-1}. This indicated that the application of tank silt two to threefold increase the CEC of very shallow soil and which was increased with increasing clay content in soil. The relationship of CEC and clay content was significant positively correlated (r = 0.69). The tank silt hybridized soil clay complex has dominated by Ca followed by Mg, Na and K. The base saturation in tank silt hybridized soils varies from 92.48 to 98.11%.

The available nitrogen content in the tank silt hybridized soil varied from 115.8 to 208.2 kg ha^{-1} indicating that these soils were very low to low in available nitrogen content. The available phosphorus and potassium status of the tank silt hybridized soil were varied from 5.40 to 20.16 kg ha^{-1} and 159.94 to 660.58 kg ha^{-1} respectively. The available micronutrients, Fe, Mn, Zn and Cu varies from, 1.06 to 3.82, 1.67 to 6.26, 0.32 to 2.36 and 1.08 to 5.11mg kg^{-1}, respectively. This indicated that the soils are high in Mn followed by Fe, Cu and Zn and found to be above critical limit (Table 4). The relationship between available NPK and yield of soybean (r = 0.70, r = 0.69, r = 0.35) and pigeon pea (r = 0.89, r = 0.81, r = 0.63) respectively, was found to be positively correlated. This indicated that the yield of soybean and pigeon pea increased with increases the availability of N, P and K content in soil.

Yield of soybean and pigeon pea

The yield of soybean and pigeon pea under tank silt hybridized soils was varied from 22.6 to 32.5 and 19.37 to 28.40 q ha^{-1} respectively. The maximum yield of soybean (32.5 q ha^{-1}) was observed in 27 cm depth of tank silt hybridized layer soil (P_8) and in pigeon pea the maximum yield (28.40 q ha^{-1}) was observed in 45 cm depth of tank silt hybridized layer (P_5) soil. Moreover the correlation between yield and depth of hybridized layer of soil was found positively correlated with soybean (r = 0.40) and pigeon pea (r = 0.52). This clearly indicated that the < 27 cm tank silt hybridized layer favors to shallow rooted and short duration crop like soybean and > 45 cm depth of tank silt hybridized layer favors to deep rooted and long duration crop like pigeon. The yield of soybean and pigeon pea was found positively correlated with Clay content (r = 0.30, r = 0.42), depth (r = 0.40, r = 0.69) and PAWC (r = 0.52, r = 0.71). This indicated that tank silt hybridization increased the depth, clay content and PAWC of the soil which is increases the yield of crop similar observation also reported by Vaidya and Dhawan (2015) [23].

From the above results indicated that the tank silt hybridization with very shallow soil increased the clay content, CEC, AWC, PAWC and five to six times reduced the hydraulic conductivity whereas, availability of nutrients increased with the tank silt hybridization with very shallow soils. However, concluded that that shallow the depth of tank silt hybridized layer support to shallow rooted and short duration crop and deeper (> 45 cm) depth of tank silt hybridized layer support to deep rooted and long duration crop.

Table 1: Morphological properties of tank silt hybridized soils of Latur district

Horizon	Depth (cm)	Boundary	Matrix colour	Structure	Texture	Roots	Pores	Consistency	Effervescence
Pedon 1: Shri. Kisanprasad Dope; Village- Bhadgaon; Tq-Latur ; Dist-Latur (*Typic Haplustepts*)									
Ap	0-18	cs	10YR 3/3	m1sbk	C	vfm, fm	vfm, fm	s, fr, ss, sp	Es
A1	18-27	cs	10YR 3/4	m1sbk	C	vfm, fm	vfm, fm	s, fr, ss, sp	Es
Ac	27-35	cs	10YR 3/4	m2sbk	Cl	vff, ff	Fm	s, fr, ns, np	Ev
Cr	35-44	--Weathered basalt -------------------------------------							
Pedon 2: Shri. Rajabhau Yelgate; Villege- Chata; Tq-Latur ; Dist-Latur (*Typic Haplustepts*)									
Ap	0-16	cs	10YR 3/3	m1sbk	C	vfm, fm	vfm, mf	s, fr, ss, sp	Es
A1	16-28	cs	10YR 4/3	m1sbk	C	vfm, fm	vfm, fm	s, fr, ss, sp	Es
Cr	28-41	--Weathered basalt -------------------------------------							
Pedon 3: Shri. Balaji Rodge; Villege - Madansuri; Tq- Nilanga ; Dist-Latur (*Typic Haplustepts*)									
Ap	0-16	cs	10YR 4/3	m1sbk	c	vfm, fm	vfm, fm	s, fr, ss, sp	Es
A1	16-25	cs	10YR 4/3	m1sbk	slc	vfm, fm	vfm, fm	s, fr, ss, sp	Es
Ac	25-32	cs	10YR 5/6	m1sbk	cl	fm, vff	fm, vff	s, fr, ss, sp	E
Cr	32-49	--Weathered basalt --------------------------------------							
Pedon 4: Shri. Dattu Musande; Village- Kharosa; Tq-Ausa ; Dist-Latur (*Lithic Haplustepts*)									
Ap	0-14	cs	10YR 3/3	m1sbk	c	vfm, fm	vfm, fm	s, ss, sp	E
A1	14-29	cs	10YR 3/3	m1sbk	c	vff, fm	vff, fm	sh, ss, sp	E
Cr	29-41	--Weathered basalt --------------------------------------							
Pedon 5: Shri. Bidve Narsing; Village- Murud Akola; Tq-Latur ; Dist-Latur (*Typic Haplustepts*)									
Ap	0-18	cs	10YR 3/2	m1sbk	c	vfm, fm	vfm, fm	s, fr, ss, sp	Es
A1	18-35	cs	10YR 3/3	m1sbk	c	vfm, fm	vfm, fm	s, fr, ss, sp	Es
Ac	35-45	cs	10YR 3/3	m2sbk	scl	fm,ff	fm, ff	s, fr, ss, sp	Es
Ck	45-62	--Weathered basalt --------------------------------------							
Pedon 6: Shri. Ambekar G.V.; Village- Belkund; Tq-Ausa ; Dist-Latur (*Typic Haplustepts*)									
Ap	0-13	cs	10YR 4/3	m1abk	c	vfm, fm	vfm, fm	sh, fi, ss, sp	E
A1	13-25	cs	10YR 4/4	m1sbk	c	vfm, fm	vfm, cm	s, ss, sp	E
Cr	25-36	--Weathered basalt --------------------------------------							
Pedon 7: Shri. Shinde V.A.; Village- Talkalgaon; Tq-Latur ; Dist-Latur (*Typic Haplustepts*)									
Ap	0-18	cs	10YR 3/4	m1 sbk	c	vfm, fm	vfm, fm	s, fr, ss, sp	Es
A1	18-36	cs	10YR 4/1	m1 sbk	cl	fm, fm	fm, fm	s, fr, ss, sp	Es
Cr	36-52	--Weathered basalt --------------------------------------							
Pedon 8: Shri. Kadam G.; Village- Gadvad; Tq-Latur ; Dist-Latur (*Typic Ustorthents*)									
Ap	0-27	cw	10YR 3/2	m1 sbk	c	fm, vfm	fm, vfm	s, fr, ss, sp	Es
Ac	27-40	cw	10YR 4/4	m2 sbk	cl	mf,ff	mf, ff	sh, ns, np	E
Cr	40-50	--Weathered basalt --------------------------------------							
Pedon-9: Shri. Pote Subhash; Village- Gharni; Tq-Chakur ; Dist-Latur (*Lithic Haplustepts*)									
Ap	0-12	cs	10YR 3/3	m1sbk	c	vfm, fm	vfm, fm	s, fr, vs, vp	Es
A1	12-22	cs	10YR 4/2	m1sbk	c	vfm, fm	vfm, fm	s, fr,ss, sp	Es
A2	22-33	cs	10YR 4/2	m1sbk	c	fm,cf	fm, cf	s, fr, ss, sp	Es
Cr	33-45	--Weathered basalt --------------------------------------							

Table 2: Physical characteristic of tank silt hybridized soils of Latur district

Horizons	Depth (cm)	Coarse fragment (%)	BD (Mg m^{-3})	Partial size analysis %			HC cm/hr	Moisture retention kPa		AWC (%)	PAWC (mm)
				Sand	Silt	Clay		33 kPa	1500 kPa		
Pedon 1: Shri Kisanprasad Dope; Villege -Bhadgaon; Tq-Latur ; Dist-Latur (*Typic Ustorthents*)											
Ap	0-18	11.37	1.33	12.28	33.65	54.07	2.70	33.50	17.89	15.61	
A1	18-27	6.23	1.42	14.39	32.89	52.72	3.30	30.96	16.34	14.62	74.97
Ac	27-35	20.01	1.73	38.32	32.5	29.18	14.72	26.67	14.52	12.15	
Cr	35-44	62.15	1.79	57.26	23.24	19.50	20.4	19.20	10.60	8.60	
Pedon 2 : Shri Rajabhau Yelgate ; Villege- Chata; Tq-Latur ; Dist-Latur (*Typic Ustorthents*)											
Ap	0-16	10.25	1.38	14.82	33.28	51.9	4.12	46.50	21.59	24.91	99.75
A1	16-28	10.80	1.20	23.41	35.04	41.55	5.10	42.90	20.0	22.90	
Cr	28-41	61.53	1.87	49.20	21.56	29.24	21.2	18.66	08.31	10.35	
Pedon 3 : Shri Balaji Rodge ; Villege- Madansuri; Tq- Nilanga ; Dist-Latur (*Typic Ustorthents*)											
Ap	0-16	12.53	1.30	8.50	33.15	58.35	3.9	30.31	14.71	15.60	
A1	16-25	6.03	1.48	11.32	40.28	48.40	8.2	28.70	16.36	12.34	61.42
Ac	25-32	9.53	1.84	41.82	32.61	25.57	11.3	22.21	12.30	09.90	
Cr	32-49	62.51	1.99	54.96	26.15	18.89	23.2	19.63	12.15	07.48	
Pedon 4 : Shri Dattu Musande ; Village- kharosa; Tq-Ausa ; Dist-Latur (*Lithic Ustorthents*)											
Ap	0-14	14.77	1.38	16.25	26.58	57.17	3.23	43.79	25.25	18.54	74.73
A1	14-29	17.71	1.46	27.79	31.01	41.20	8.1	37.96	20.19	17.77	
Cr	29-41	78.04	1.92	47.19	23.20	29.61	18.9	19.21	13.11	06.09	
Pedon 5 :Shri Narsing Bidve; Villege - Murud-Akola; Tq-Latur ; Dist-Latur (*Typic Ustorthents*)											
Ap	0-18	8.32	1.42	10.82	35.87	53.31	4.41	43.59	24.43	19.16	
A1	18-35	19.09	1.62	12.02	39.26	48.72	8.10	35.17	22.09	13.08	96.43
Ac	35-45	25.05	1.67	46.32	25.5	28.18	14.16	26.71	19.56	07.15	
Ck	45-62	73.44	1.71	57.21	23.29	19.5	27.10	16.57	10.23	06.34	
Pedon 6 : Shri Ambekar G.V.; Village-Belkund ; Tq-Ausa ; Dist-Latur (*Typic Ustorthents*)											
Ap	0-13	11.97	1.49	10.21	33.15	56.64	4.16	40.63	21.42	19.21	
A1	13-25	10.86	1.86	34.36	24.29	41.35	8.60	31.02	13.83	17.19	75.53
Cr	25-36	78.34	1.92	51.82	20.34	27.84	18.20	19.35	12.42	06.93	
Pedon 7 : Shri Shinde V.A.; Villege -Talkalgaon ; Tq-Latur ; Dist-Latur (*Typic Ustorthents*)											
Ap	0-18	13.33	1.52	11.02	35.53	53.45	3.23	38.3	20.90	17.4	
A1	18-36	19.21	1.59	28.92	32.19	38.89	8.45	26.2	14.70	11.5	61.64
Cr	36-52	69.27	1.80	45.12	30.41	24.47	19.10	18.52	08.31	10.21	
Pedon 8: Shri Kadam G.; Village- Gadvad ; Tq-Latur ; Dist-Latur (*Typic Ustorthents*)											
Ap	0-27	16.98	1.43	13.11	32.37	54.52	3.67	39.49	20.70	18.79	
Ac	27-40	20.08	1.79	30.41	36.29	33.30	8.45	22.82	14.60	08.22	91.67
Cr	40-50	69.02	1.80	45.29	30.74	23.97	19.80	19.30	11.40	07.90	
Pedon-9: Shri Pote Subhash ; Village- Gharni ; Tq-Chakur ; Dist-Latur (*Lithic Ustorthents*)											
Ap	0-12	9.22	1.31	11.50	29.76	58.74	3.65	37.35	17.89	19.46	
A1	12-22	15.59	1.60	18.84	38.97	42.19	8.25	35.49	19.40	16.09	78.43
A2	22-33	09.78	1.42	34.32	29.35	36.33	9.60	28.67	14.52	14.15	
Cr	33-45	78.77	1.95	52.01	25.37	22.62	20.20	19.20	10.60	08.60	

Table 3: Chemical properties of tank silt hybridized soils of Latur distrct

Horizons	Depth (cm)	pH	EC (dSm^{-1})	O.C. %	$CaCO_3$ %	CEC (cmol (P$^+$) kg^{-1})	Cations (cmol (P$^+$) kg^{-1})					Base saturation (%)
							Ca^{++}	Mg^{++}	Na^+	K^+	Sum of cations	
Pedon-1 Kisanprasad Dope, Village-Bhadgaon, Tq-Latur, Dist-Latur (*Typic Ustorthents*)												
Ap	0-18	7.99	0.20	0.82	6.8	52.73	32.69	16.01	2.08	0.52	51.30	97.29
A1	18-27	7.98	0.13	0.72	7.4	50.81	29.25	15.2	1.05	0.49	45.99	90.51
Ac	27-35	7.70	0.16	0.54	11.9	30.20	18.21	9.69	1.01	0.37	29.28	96.95
Ck	35-44	7.95	0.13	0.45	12.5	20.60	10.28	8.23	0.55	0.28	19.34	93.88
Pedon-2 Rajabhau Yelgate, Village-Chata, Tq-Latur, Dist-Latur (*Typic Ustorthents*)												
Ap	0-16	8.12	0.12	0.75	4.0	52.12	29.23	18.18	1.67	1.60	50.68	97.24
A1	16-28	7.57	0.18	0.63	6.0	41.51	23.12	15.08	1.65	0.54	40.39	97.30
Cr	28-41	7.40	0.15	0.57	3.2	30.50	16.85	10.59	1.38	0.50	29.32	96.13
Pedon-3 Balaji Rodge, Village-Madansuri, Tq-Nilanga, Dist-Latur (*Typic Ustorthents*)												
Ap	0-16	7.83	0.12	0.71	11.4	57.43	28.53	24.72	1.66	0.58	55.49	96.62
A1	16-25	7.70	0.20	0.62	13.3	42.73	21.40	18.4	1.57	0.36	41.73	97.66
Ac	25-32	7.63	0.14	0.58	3.1	31.15	19.31	9.59	1.35	0.31	30.56	98.11
Cr	32-49	7.64	0.10	0.51	3.4	26.50	13.80	9.90	0.89	0.28	24.87	93.85
Pedon-4 Dattu Musande, Village-Kharosa, Tq-Ausa, Dist-Latur (*Lithic Ustorthents*)												
Ap	0-14	7.81	0.13	0.70	3.9	55.10	30.52	20.27	1.23	0.52	52.54	95.35
A1	14-29	7.46	0.13	0.66	3.2	39.48	22.00	15.20	0.71	0.26	38.17	96.69
Cr	29-41	7.32	0.13	0.61	2.0	30.20	19.21	8.19	0.63	0.18	28.21	93.41
Pedon-5 Narsing Bidve, Village-Murud-akola, Tq-Latur, Dist-Latur (*Typic Ustorthents*)												
Ap	0-18	8.45	0.16	0.78	11.9	49.16	26.23	17.42	2.54	1.59	47.78	97.19
A1	18-35	8.32	0.13	0.70	12.0	47.70	24.40	19.0	1.36	0.54	45.30	94.97

Ac	35-45	8.41	0.15	0.60	9.7	28.65	17.29	14.31	1.47	0.50	27.57	96.23
Ck	45-62	7.98	0.14	0.54	13.5	19.10	10.45	6.94	0.36	0.41	18.16	95.08
Pedon-6 Ambekar G.V., Village-Belkund, Tq-Ausa, Dist-Latur (*Typic Ustorthents*)												
Ap	0-13	7.87	0.11	0.76	4.7	54.10	28.02	21.08	1.61	1.61	52.32	96.71
A1	13-25	7.82	0.17	0.64	6.2	45.32	25.0	17.0	1.56	0.49	44.05	97.20
Cr	25-36	7.79	0.12	0.57	3.2	29.60	14.11	13.23	1.09	0.36	28.20	95.26
Pedon-7 Shinde V.A., Village-Takalgaon, Tq-Latur, Dist-Latur (*Typic Ustorthents*)												
Ap	0-18	7.75	0.09	0.87	9.0	52.73	29.16	19.84	1.49	0.66	51.15	97.00
A1	18-35	7.16	0.10	0.55	8.0	36.52	17.0	15.20	1.48	0.66	34.34	94.03
Cr	35-52	6.70	0.10	0.43	25.2	25.78	13.41	9.39	1.48	0.42	24.70	95.81
Pedon-8 Kadam G., Village-Gadwad, Tq-Latur, Dist-Latur (*Typic Ustorthents*)												
Ap	0-27	7.97	0.12	0.82	10.0	52.90	29.25	20.25	1.54	0.50	51.54	97.42
Ac	27-40	7.49	0.10	0.63	8.0	37.74	23.0	11.83	1.48	0.29	36.60	96.98
Cr	40-50	7.68	0.12	0.51	3.6	26.72	14.41	8.99	1.30	0.30	25.00	93.56
Pedon-9 Pote Subhash, Village-Gharni, Tq-Chakur, Dist-Latur (*Lithic Ustorthents*)												
Ap	0-12	7.58	0.17	0.66	11.0	58.17	33.83	20.87	0.96	0.41	56.07	96.39
A1	12-22	7.46	0.17	0.60	10.8	46.10	28.20	15.10	0.94	0.34	44.58	96.70
A2	22-33	7.68	0.17	0.67	14.7	39.32	25.21	9.19	0.89	0.31	35.60	90.54
Cr	33-45	7.60	0.20	0.54	5.5	23.93	11.56	9.65	0.66	0.26	22.13	92.48

Table 4: Available nutrients in tank silt hybridized soil in typifying pedon under Soybean and pigeon pea (weighted means)

Pedon	N ($kgha^{-1}$)	P ($kgha^{-1}$)	K ($kgha^{-1}$)	Fe ($mgkg^{-1}$)	Mn ($mgkg^{-1}$)	Zn ($mgkg^{-1}$)	Cu ($mgkg^{-1}$)	Soybean Yield (qha^{-1})	Pigeon Pea Yield (qha^{-1})
P_1	180	14.68	422.45	1.72	4.06	0.87	3.03	30.5	24.75
P_2	185.6	14.07	574.08	2.35	4.14	1.40	2.79	31.8	25.50
P_3	153.6	9.33	410.26	1.53	3.36	1.13	3.61	24.4	21.11
P_4	153.13	11.91	251.02	2.42	3.39	0.67	2.14	26.3	22.58
P_5	192.58	17.78	591.88	3.87	7.71	1.82	4.24	29.5	28.40
P_6	156.00	15.18	466.67	2.72	3.74	0.57	3.83	28.1	22.84
P_7	158.70	11.47	333.78	2.37	3.71	0.83	1.92	29	20.10
P_8	178.76	18.28	380.53	1.47	5.19	1.37	3.15	32.5	25.55
P_9	159.94	12.24	399.06	1.89	3.85	0.83	1.04	22.6	19.37

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