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Morphological Characteristics in Representative Soil Series of Western Maharashtra

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ABSTRACT: The soil survey experiment was conducted on "Morphological characteristics in representative soil series of Western Maharashtra region". Total nine representative soil series (Thejoda, Kolyachiwadi, Masala, Sonawadi, Ranjani, Jaipur, Valwa, Manjra and Bodla) were selected for soil profile study in different nine district of Western Maharashtra region *viz.*, Nashik, Ahmednagar, Solapur, Satara, Pune, Jalgaon, Sangli, Kolhapur and Dhule, respectively. These were studied at the original sites where the soil series first studied as per technical bulletin of soil series of Maharashtra published by National Bureau of Soil Survey and Land Use Planning. The soil profiles of Thejoda, Kolyachiwadi, Masala, and Sonawadi soil series classified under Typic, Fluventic, Vertic Haplustept (Inceptisols), The soil profile of Jaipur and Valwa soil series were classified under Typic Haplustert (Vertisol), Ranjni and Bodla soil series were classified under Lithic and Typic Ustorthent (Entisol) and Manjra soil series was classified under Udic Haplustalf (Alfisols). As per soil order various soil series representing soil profile differ in their morphological properties with depth in soil profile. Clayey texture was observed in Typic/Vertic Inceptisols and Vertisol and clay loam to sandy clay loam in Alfisol and Entisols. Colour of soil ranged from 10YR 3/2 to 6/4 in all the soil profile except 2.5 to 5YR 3/2 to 3/3 in Alfisol and 7.5YR 4/4 in Entisol (pedons). Soil structure subangular at surface of all the pedons and angular blocky at subsurface were found in Vertic Inceptisol (soil profile of Masala and Sonawadi soil series) and Vertisol in soil profile of Jaipur and Valwa soil series. The soil consistency (dry condition) was hard to very hard in all the soil profiles except dry slight hard in Alfisols and Entisols of soil profile of Manjra and Bodla soil series, respectively. The soil consistency under wet condition was slight to very sticky and plastic to very plastic in all the soil profiles. The effervesce was ranged from slight to violent in all the soil profiles except nil in Manjra soil series of Alfisols.

Keywords: Sulphur, Morphology, Soil colour, Soil depth, Soil structure, Soil texture and Soil consistency.

INTRODUCTION

Soil morphology is the study of physical property of soil such as soil structure, soil texture, soil colour, soil consistency, soil plasticity etc. This is basis for understanding identification, classification and mapping of soil Sowjanya *et al*. (2023). It's also for how soil changes over time, how land use affect soil quality Kurmi *et al*. (2023). Soil is the life supporting system of human being as well as social and economic development of people depends on this soil. More than ever before, a renewed attention is being given to soils due to rapidly deceasing area for Agriculture, deceasing fertility and increasing soil degradation due to wrong land use of policies and irrational and imbalanced use of inputs (Kanwar, 2004). All the above factors call for paradigm shift in research away from maximum crop production so sustainability of crop production system without degradation of soil health and environmental quality. The study of soil morphology and taxonomy supply information for nature and soil type, their constraints, potentials, capabilities and their suitability for different uses (Sehgal, 1996). Soil resource inventory through characterization of the resources provides an insight into the potentials and limitations of soils Shilpa Mohanty *et al*. (2023). This is use for soil resources management, protect water quality and sustained vegetation (Manchanda *et al*., 2002).

The objective of soil survey is to identify, describe and interpret soil types, land management, soil capability classification, soil age, studies of ecosystem and other relationship and to develop guidelines for soil resources management. In large and intermediate soil studies, the soil series is taken as basic taxonomic unit to study the soils. As the taxonomic class soil series is most homogeneous category in soil taxonomy (Soil Survey Staff, 1995; Kumar *et al*., 2021). The soils of Maharashtra states, their kinds, distribution, characterization and interpretation for optimizing land use given by Challa (1995). This soil survey is most useful for the land use planning and other purpose in the Western Maharashtra region. Therefore, this

experiment was conducted to generate comprehensive information about the morphological characteristics of the soils.

MATERIAL AND METHODS

The present investigation was conducted on "Morphological characteristics in representative soil series of Western Maharashtra region" for profile study. The study area is located between 21° 43′00″ N 74°13′00″ E to 15° 52′ 02″ N 74° 09′12″ E ten district of Western Maharashtra. The Western Maharashtra is located between Konkan and Marathwada region of Maharashtra. The entire area of Western Maharashtra is occupied by basaltic lava which is popularly known as deccan trap. The predominant rock formation of an area consisting origin of basalt (deccan trap) and alluvium of basaltic. These basalt contain Feldspars (plagioclase), Augite and small amount of Titaniferrous minerals. Sometimes presence of olivine is noticed. The rocks exhibit spheroidal weathering and round boulders and pebbles are found on the surface in eroded areas. The major crops cultivated are wheat, pearl millet, rice, maize, sugarcane, chickpea, and soybean. The natural vegetation consisting dry deciduous tree species and few grasses. The dominant tree species are *Acacia arabica*, *Azadirchta indica*, *Zizyphus jujuba*, *Bambusa* spp.

Total nine representative soil series *viz.*, Thejoda, Kolyachiwadi, Masala, Sonawadi, Ranjani, Jaipur, Valwa, Manjra and Bodla were selected for depthwise soil sample collection and profile study in nine district of Western Maharashtra region *viz.*, Nashik, Ahmednagar, Solapur, Satara, Pune, Jalgaon, Sangli, Kolhapur and Dhule district, respectively, were studied at the original sites where the soil series were first studied as per technical bulletin of soil series of Maharashtra published by National Bureau of Soil Survey and Land Use Planning (Challa *et al.*, 1999). The important morphological features *viz.*, soil colour, soil depth (cm), soil structure, soil texture, soil consistency and effervesces of the soil profile were studied and profile description was recorded (Soil Survey Staff, 2005).

RESULT AND DISCUSSION

Morphological characteristics of representative pedons. The morphological characteristics and details of pedons are presented in table 1 and 2, which revealed that the pedons number 1, 2, 3 and 4 classified under Typic, Fluventic, Vertic Haplustept (Inceptisols), The pedons of 6 and 7 were classified under Typic Haplustert (Vertisol), The pedons of 5 and 9 were classified under Lithic and Typic Ustorthent (Entisol) and pedon 8 was classified under Udic Haplustalf (Alfisols). As per soil order different soil series representating pedons differ in their morphological properties with depth in pedons. Clayey texture was observed in Typic/Vertic Inceptisols and Vertisol and clay loam to sandy clay loam in Alfisol and Entisols. Colour of soil ranged from 10YR 3/2 to 6/4 in all the soil profile except 2.5 to 5YR 3/2 to 3/3 in Alfisol and 7.5YR 4/4 in Entisol (pedons). Structure of soil generally subangular at surface of all the pedons and angular blocky structure at subsurface was found in Vertic Inceptisol (pedon 3 and 4) and Vertisol pedons 6 and 7 under study. The consistency of soil under dry condition was hard to very hard in all the pedons except dry slight hard in Alfisols and Entisols of pedon 8 and 9 respectively. The consistency under wet condition was slight to very sticky and plastic to very plastic in all the pedons under study. The effervence was ranged from slight to violent in all the pedons except nil in pedon 8 of Alfisols.

Soil depth. The lowest depth (20 cm) was noticed in Bodla soil series, followed by Ranjni (40 cm) soil series of Entisols. In case of Inceptisols medium to deep depth was found in Masala (70 cm) soil series, followed by Thejoda (90 cm), Kolyachiwadi (105 cm) and Sonawadi (110 cm). Vertisols soil series were very deep 120 cm in Valwa soil series and 145 cm in Jaipur soil series. Bodla and Ranjni soil series was categorized in to very shallow whereas, Masala and Thejoda soil series categorized as medium deep and Kolyachiwadi, Sonawadi, Valwa and Jaipur were categorized in to very deep soil. The shallowness might be due to mass washing (erosion) of weathered material from hill top and escarpment to lower topographic position. Deep soil formed due to deposition of basaltic material and in situ development in case of Vertisols and vertic Inceptisols. The depth variation in soil solum also the association of characteristics in relation to variability reflects the geographic position. Silmilar observations were also reported for Indian Entisols, Inceptisols and Vertisols (Bhattacharjee *et al.*, 1977; Bhattachayya *et al.*, 1992, Gajbhiye and Deshmukh 1992; Challa, 1995). Gangopadhyay *et al.* (2001) studied that the Inceptisols and Vertisols soils of Tripura were deep to very deep.

Soil colour. The surface and subsurface colour of Entisols was brown (7.5 YR 4/4 D), dark brown (7.5 YR 3/4 M) in case of Bodla soil series and brown (10 YR 4/3 D), dark brown (10 YR 3/3 D) in case of Ranjni soil series of Entisols. The Entisols were dark brown in colour Bhattacharyya *et al.* (1992) studied the Entisols (Lithic Ustorthents) pedon of pune district, Maharashtra and reported that the surface horizon were reddish colour (10 YR 4/4) to reddish brown (7.5 YR 4/4) in colour.

The colour of Inceptisols ranged from brown (10 YR 4/3 D), dark brown (10 YR 3/3 M) in case of Thejoda and Kolyachiwadi soil series profile, dark grayish brown (10 YR 4/3 D), dark brown (10 YR 3/3 M), very dark grayish brown (10 YR 3/2 M) in Masala soil series profile and dark brown (10 YR 3/3 D), dark brown (7.5 YR 3/2 M) in Sonawadi soil series profile. The Inceptisols were dark brown in colour. Bhattacharyya *et al.* (1992) studied the Inceptisols pedons of Pune district of Maharashtra and reported that the Inceptisols had hue 10 YR, value around 4/3 and chroma 4 or less.

In case of Vertisols surface and subsurface colour of soil profile was dark brown (10 YR 3/3 D), very dark grayish brown (10 YR 3/2 M) in Jaipur soil series and very dark grayish brown (10 YR 3/2 M) in Valwa soil series. The Vertisols were very dark brown in colour. Sowjanya *et al*. (2023) studied the pedons of deccan

plateau of Nagpur district of Maharashtra and indicated Vertisols had hue 10 YR, value around 3 and chroma varies 1 to 3.

Soil structure. The structure of Entisols soil series are moderately weak subangular blocky in case of Bodla and Ranjni soil series. Mostly Inceptisols showed medium subangular blocky structure at surface horizon and weak subangular blocky structure at subsurface horizon. Vertisols also showed the same result as Inceptisols in Valwa soil series except Jaipur soil series, it showed medium sub angular blocky structure at surface horizon and coarse moderate angular blocky structure at subsurface horizon. In case of Alfisols showed fine weak granular structure in Bodla soil series also reported by Patil and Mukhopadhyay (2010); Rajesh *et al.* (2023).

Soil texture. The soil texture of all Vertisols series (Valwa and Jaipur) had clay texture throughout the soil profile. Manjra soil series of Alfisols showed clay loam texture. Shallow soil series of Entisols soil series (Bodla and Ranjani) showed clay loam texture, sandy clay loam and gravely sandy loam texture, respectively. Inceptisols soil series showed clay texture throughout the profile in Thejoda, Masala and Sonawadi soil series except Kolyachiwadi soil series showed gravely sandy clay loam and gravely clay loam texture. The soil texture of Alfisols soil series had clay loam. Clay nature of Vertisols and Inceptisols soil series could be due to pedogenic development of basaltic alluvium weathering.

Soil consistence. The soil consistency under dry condition was hard to very hard in all the soil series except dry slight hard in soil series of Alfisols and Entisols of pedon 8 and 9, respectively. The consistency under wet condition was slight to very sticky and plastic to very plastic in all the soil pedon under study.

Effervescence. The effervenscece was ranged from slight to violent in all the pedon except trace in pedon 8 of Alfisols soil series.

Table 1: Morphological properties of representative soil profiles of Western Maharashtra region.

Soil profile	Horizon depth (cm)	Horizon Name	Boundary width	Colour	Soil texture	Soil structure	Consistency				Effevences	Forms of sulphur (mg kg^{-1})				
							Dry	Moist	Wet	Plasticity		TS	OS	WSS	AS	NSS
Pedon 1: Thejoda soil series : Nashik : Fine, montmorillonitic (calcareous), isohyperthermic, Typic Haplustepts																
	0-18	Ap	cs	10 YR 4/3D	c	2m sbk	dh	-	ws	wp	es	435	278	24.29	22.90	134
	18-40	B_{K1}	gs	10 YR 3/3M	c	2m sbk	dvh	-	wvs	wvp	es	393	252	25.65	22.32	121
	40-60	B_{K2}	gs	10 YR 4/4M	c	1m sbk	dvh	-	wvs	wvp	es	368	239	26.04	21.25	112
	60-90	B_{K2}	gw	10 YR 4/4M	c	1m sbk	dvh	-	wvs	wvp	ev	321	207	26.54	20.14	103
	90 +	C_r	----------Weathered basalt----------													
Pedon 2: Kolyachiwadi soil series : Ahmednagar : Fine mixed, isohyperthermic, Fluventic Haplustepts																
	0-20	Ap	cs	10 YR 4/3D	gscl	2m sbk	dh	-	ws	wp	e	717	327	18.49	17.50	372
	20-36	B_1	cw	10 YR 3/3M	gcl	2m sbk	dh	-	ws	wp	e	694	293	19.13	16.98	312
	36-70	B_2	cw	10 YR 3/3M	gc	1m sbk	dh	-	ws	wp	e	654	266	19.32	15.46	286
	70-105	B_3	cs	10 YR 3/3M	gc	1f sbk	dh	-	ws	wp	em	587	214	20.54	14.52	213
	105 +	C_r	----------Weathered basalt----------													
Pedon 3: Masala soil series : Solapur : Fine montmorillonitic (calcareous.), isohyperthermic, Vertic Haplustepts																
	0-12	Ap	ab	10 YR 4/2D	c	1m sbk	dvh	msr	wvs	wp	es	618	239	18.23	17.80	361
	12-40	B_1	gs	10 YR 3/3M	c	2m abk	dh	mfr	ws	wvp	es	542	197	19.24	16.84	326
	40-70	B_w	as	10 YR 3/2M	c	2m sbk	dvh	mfr	ws	wvp	ev	465	168	20.39	15.62	254
	70+	C_{kr}	----------Weathered basalt----------													
Pedon 4: Sonawadi soil series : Satara : Fine, montmorillonitic, isohyperthermic, Vertic Haplustepts																
	0-22	Ap	cw	10 YR 3/3D	c	2m sbk	dh	msr	ws	wp	em	673	288	22.32	21.30	364
	22-48	B_{w1}	cs	10 YR 3/4M	c	3c abk	dvh	mfi	wvs	wps	em	589	245	23.14	19.57	324
	48-110+	B_{w2}	aw	7.5 YR 3/2M	gc	2m sbk	dh	mvfi	ws	wp	em	456	206	24.44	18.95	289
Pedon 5: Ranjani soil series : Pune : Loamy, mixed, isohyperthermic, Lithic Ustorthents																
	0-20	Ap	cs	10 YR 4/3D	gsl	2m sbk	dh	Vfr	ss	wps	e	588	264	10.24	9.10	316
	20-40	A_{12}	cw	10 YR 3/3D	gsl	2m sbk	dh	Vfr	ss	wps	em	476	207	12.02	8.42	275
		40+	C_r	-	-	-	-	-	-	-	-	-	-	-	-	-
Pedon 6: Jaipur soil series : Jalgaon: Fine, montmorillonitic, isohyperthermic, Typic Haplustert																
	0-12	Ap	cs	10 YR 3/3D	c	2m sbk	dsh	fr	ws	-	e	464	232	10.42	9.80	222
	12-36	B_w	cs	10 YR 3/2M	c	2c abk	dh	fr	ws	-	e	442	225	11.35	8.21	217
	36-70	B_{SS1}	gw	10 YR 3/2M	c	2c abk	dvh	fi	wvs	-	e	376	194	12.75	7.56	167
	70-110	B_{SS2}	gw	10 YR 3/2M	c	2c abk	dvh	Vfi	wvs	-	em	357	176	12.54	7.24	154
	110-145+	B_{S12}	-	10 YR 3/2M	c	2c abk	dvh	Vfi	wvs	-	em	309	152	14.89	6.34	128

Pedon 7: Valwa soil series : Sangli: Fine, montmorillonitic, isohyperthermic, Typic Haplustert																
	0-28	Ap	cs	10 YR 3/2M	c	2m sbk	dh	Vfr	ws	wp	em	674	320	29.40	27.40	326
	28-40	B_w	gs	10 YR 3/3M	c	2m abk	dvh	mfi	wvs	wvp	em	587	289	29.46	25.75	285
	40-80	Bss	gs	10 YR 3/3M	c	3c abk	dh	mfr	wvs	wvp	es	524	267	30.85	24.86	269
	80-120+	B_2	as	10 YR 6/4M	c	2m sbk	dh	mvfi	ws	wp	es	463	237	32.78	22.95	215
Pedon 8: Manjra soil series : Kolhapur: Loamy-skeletal, mixed, isohyperthermic, Udic Haplustalfs																
	0-12	Ap	cs	5 YR 3/2M	cl	1f gr	dsh	Vfr	ss	-	-	185	73	14.37	13.70	90
	12-40	Bt	cs	2.5 YR 3/3M	gcl	1f gr	dsh	Vfr	ss	-	e	126	57	16.19	10.14	74
	40+	Cr	-	Weathered basalt	-	1f gr	-	-	-	-	-					
Pedon 9: Bodla soil series : Dhule: Loamy-skeletal, mixed, isohyperthermic,Typic Ustorthents																
	0-10	Ap	cs	7.5 YR 4/4D	scl	1m sbk	dsh	vfr	wss	wpo	e	340	139	14.20	12.30	189
	10-20	Cr	-	5 YR 3/4M	----------Weathered basalt----------											

Symbols are used according to Soil Survey Manual (Soil Survey Staff, 1995)

Table 2: Details of representative soil profiles of Western Maharashtra region.

Soil profile	Horizon depth (cm)	Horizon Name	Descriptions
Pedon 1: Thejoda soil series : Location – 20°00′32′N 74°14′00°E			
	0-18	Ap	Brown (10 YR 4/3 D) clay, moderate subangular blocky, clayey, hard, friable, sticky and plastic, fine few lime concretions, strong effervescence, clear smooth boundary.
	18-40	B_{K1}	Dark brown (10 YR 3/3 M) clay, moderate subangular blocky, clayey, slightly hard, firm, sticky and plastic, fine common lime concretions, strong effervescence, gradual smooth boundary.
	40-60	B_{K2}	Dark yellow brown (10 YR 4/4 M), dark brown (10 YR 4/3 M) clay, weak subangular blocky, clayey, slightly hard, firm, sticky and plastic, fine common lime concretions, strong effervescence, gradual smooth boundary.
	60-90	B_{K2}	Dark yellow brown (10 YR 4/4 M), dark brown (10 YR 4/3 M) clay, weak subangular blocky, clayey, slightly hard, firm, sticky and plastic, fine common lime concretions, strong effervescence, pH 8.52, wavy smooth boundary.
	90 +	C_r	Weathered basalt
Pedon 2: Kolyachiwadi soil series : Ahmednagar : Location – 19°23′00″N 74°27′00″E			
	0-20	Ap	Brown (10 YR 4/3 D), moderate subangular blocky, sandy clay loam, hard, friable, slightly sticky, and slightly plastic, very fine few lime concretions, slight effervescence, clear smooth boundary.
	20-36	B_1	Brown (10 YR 3/3 M), moderate subangular blocky, clay loam, hard, friable, sticky, and plastic, very fine few lime concretions, slight effervescence, clear wavy boundary.
	36-70	B_2	Dark brown (10 YR 3/3 M), weak subangular blocky, gravely clay, hard, very friable, slightly sticky, and slightly plastic, fine common lime concretions, slight effervescence, clear wavy boundary.
	70-105	B_3	Dark brown (10 YR 3/3 M), fine weak subangular blocky, gravely clay, slightly hard, very friable, slightly sticky and slightly plastic, medium few lime concretions, medium effervescence, clear smooth boundary.
	105 +	C_r	-
Pedon 3: Masala soil series : Solapur : Location – 17°51′ 28″N 74°14′ 00″ E			
	0-12	Ap	Dark greyish brown (10 YR 4/2 D) clay, medium weak subangular blocky, Clayey, slightly hard, friable, sticky and plastic, fine common lime concretions, strong effervescence, clear abrupt boundary.
	12-40	B_1	Dark brown (10 YR 3/3 M) clay, medium moderate subangular blocky, Clayey, hard, friable, sticky and plastic, fine few lime concretions, strong effervescence, pH 8.82, gradual Smooth boundary.
	40-70	B_w	Very dark greyish brown (10 YR 3/2 M) clay, medium moderate subangular blocky, Clayey, very hard, firm, very sticky and very plastic, fine few lime concretions, violent effervescence, abrupt smooth boundary.
	70+	C_{kr}	Weathered basalt
Pedon 4: Sonawadi soil series : Satara : Location – 17°23′07″N 74° 19′01″E			
	0-22	Ap	Dark brown (10 YR 3/3 D) clay, medium moderate subangular blocky, Clayey, hard, friable, sticky and plastic, fine few lime concretions, medium effervescence, clear wavy boundary.
	22-48	B_{w1}	Dark brown (10 YR 3/4 M) clay, strong coarse subangular blocky, Clayey, hard, firm, sticky and plastic, fine few lime concretions, medium effervescence, clear wavy boundary.
	48-110+	B_{w2}	Dark brown (7.5 YR 3/2 M) clay, medium moderate subangular blocky, gravely clayey, hard, very firm, sticky and plastic, fine common lime concretions, medium effervescence, abrupt wavy boundary.
Pedon 5: Ranjani soil series : Pune : Location – 17° 00′ 58″N 74° 30′00″E			
	0-20	Ap	Brown (10 YR 4/3 D), moderate subangular blocky, gravely sandy loam, hard, very friable, slightly sticky and slightly plastic, slightly effervescence, clear smooth boundary.
	20-40	A_{12}	Brown (10 YR 4/3 D), moderate subangular blocky, gravely sandy loam, hard, very friable, slightly sticky and slightly plastic, medium effervescence, clear wavy boundary.
	40+	C_r	Weathered basalt
Pedon 6: Jaipur soil series : Jalgaon: Location – 20° 35′ 08″N 73°54′21″E			
	0-12	Ap	Dark brown (10 YR 3/3 D), moderate subangular blocky, clayey, slightly hard, friable, sticky and plastic, clear smooth boundary.
	12-36	B_w	Dery dark grayish brown (10 YR 3/2 M), coarse moderate angular blocky, clayey, hard, friable, sticky and plastic, clear smooth boundary.
	36-70	B_{ss1}	Very dark grayish brown (10 YR 3/2 M), coarse moderate angular blocky structure with intersecting slickensides, clayey, very hard, firm, very sticky and plastic, gradual wavy boundary.
	70-110	B_{ss2}	Very dark grayish brown (10 YR 3/2 M), coarse moderate angular blocky structure with intersecting slickensides, clayey, very hard, very firm, very sticky and plastic, gradual wavy boundary.
	110-145+	B_{s12}	Very dark grayish brown (10 YR 3/2 M), coarse moderate angular blocky structure with intersecting slickensides, clayey, very hard, very firm, very sticky and plastic,

Pedon 7: Valwa soil series : Sangli: Location – 17° 17′ 70″N 74° 56′00″E			
	0-28	Ap	Very dark grayish brown (10 YR 3/2 M), medium moderate subangular blocky, clayey, slightly hard, very friable, sticky and plastic, clear smooth boundary.
	28-40	B_w	Dark brown (10 YR 3/3 M), medium moderate subangular blocky, clayey, slightly very hard, firm, very sticky and plastic, gradual smooth boundary.
	40-80	Bss	Dark brown (10 YR 3/3 M), moderate subangular blocky structure with intersecting slickensides, clayey, hard, friable, very sticky and plastic, gradual smooth boundary.
	80-120+	B_2	Light yellow brown (10 YR 6/4 M), moderate subangular blocky, clayey, slightly hard, very firm, sticky and plastic, abrupt smooth boundary.
Pedon 8: Manjra soil series : Kolhapur: Location – 16° 49′54″N 73° 48′00″E			
	0-12	Ap	Yellowish red (5 YR 3/2 M), fine weak granular, clay loam, slightly hard, very friable, clear smooth boundary.
	12-40	Bt	Dark red (2.5 YR 3/3 M), fine weak granular, gravely clay loam, slightly hard, very friable, clear smooth boundary.
	40+	Cr	Weathered basalt
Pedon 9: Bodla soil series : Dhule: Location – 19° 41′ 00″ N 78° 6′00″ E			
	0-10	Ap	Brown (7.5 YR 4/4 D), medium weak subangular blocky, sandy clay loam, slightly hard, friable, non sticky and non plastic, clear smooth boundary.
	10-20	Cr	Reddish brown (5 YR 3/4 M), Weathered basaltic material.

CONCLUSIONS

Bodla and Ranjni soil series was categorized in to very shallow whereas, Masala and Thejoda soil series categorized as medium deep and Kolyachiwadi, Sonawadi, Valwa and Jaipur were categorized in to very deep soil. Structure of all the soil series generally subangular at surface and angular blocky structure at subsurface was found in Masala and Sonawadi soil series. Most of soil series found clayey texture and clay loam to sandy clay loam in Majra and Bodla soil series. Colour of soil ranged from 10YR 3/2 to 6/4 in all soil series except 2.5 to 5YR 3/2 to 3/3 in Manjra and 7.5YR 4/4 in Bodla soil series. The consistency under wet condition was slight to very sticky and plastic to very plastic in all the soil series under study. The effervesce was ranged from slight to violent in all the soil profiles except nil in Manjra soil series.

FUTURE SCOPE

This research helpful for to classify soils, behavior prediction of soil, study their relationship to crop production and productivity. This information can help with land management and agriculture and also for future planning of researchers.

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