Supplementary Table 1. Morphological characteristics of grapes growing soils of NDZ, Karnataka, India

Depth (cm)	Horizon	Boundary	Colour		Texture	Structure	Consistency			Roots	Pores	Calcretes	Other Features
			Dry	Moist			Dry	Moist	Wet				
P_1 (Hagaribommanahalli): Clayey over coarse-loamy, mixed, hyperthermic Typic Rhodustalfs													
Ap	0-30	a s	5YR 3/4	5YR 3/3	c	2m sbk	vh	fr	vs &vp	f m	f c	-	
A2	30-55	c s	2.5YR 3/4	2.5YR 3/3	scl	2c sbk	h	fr	ms&sp	c vf	c m	-	
AB	55-77	c s	-	2.5YR ¾	sl	2c sbk	sh	fr	s0 & p0	c vf	c c	-	
Bt1	77-110	c s	-	2.5YR 3/3	sc	2m sbk	-	fr	vs &mp	f vf	vf f	-	Cutans
Bt2	110-130	g s	-	5YR 3/3	c	1m sbk	-	fr	ms&mp	-	f vf	-	
CB	130-151+	-	-	5YR ¾	c	1m sbk	-	fr	ms&vp	-	f vf	-	
P_2 (Yelaburga): Fine, mixed, hyperthermic Aridic Paleustalfs													
Ap	0-19	a s	7.5YR 4/3	7.5YR 3/3	ls	1f sbk	h	fr	s0 & p0	c f	c c	-	
AB	19-42	c s	5YR 4/3	5YR 3/3	scl	2m sbk	vh	fr	ss &sp	c m	c m	-	
Bt1	42-66	c s	5YR 3/4	5YR 3/3	sc	2m sbk	eh	fr	ms&sp	c m, c	c f	-	Cutans
Bt2	66-84	c s	2.5YR 3/4	2.5YR 2.5/4	gsc	2m sbk	vh	fr	ms&mp	-	c f	-	Cutans
Bt3	84-101	c s	-	2.5YR ¾	sc	2m sbk	-	fr	ms&mp	-	c f	-	Cutans
Bt4	101-151+	-	-	2.5YR ¾	c	2m sbk	-	fr	ms&mp	-	c, vf	-	
P_3 (UHS farm (Bagalkote)): Clayey-skeletal, mixed, hyperthermic Typic Rhodustalfs													
Ap	0-14	a s	5 YR 4/4	5YR ¾	vgcl	1m sbk	sh	vfr	ms&sp	c f	c c	-	
BA	14-36	c s	5YR 3/3	5YR 3/3	vgcl	2m sbk	vh	vfr	ms&mp	c c, f	c m	-	
Bt1	36-51	c s	2.5YR 3/4	2.5YR ¾	egc	1m sbk	vh	vfr	ms&mp	c vf	c m	-	Cutans
Bt2	51-80	c s	-	2.5YR ¾	egsc	Massive	-	fr	ms&sp	-	f f	-	
CB	80-95	-	-	7.5YR 4/3	egsc	Massive	-	fr	ms&sp	-	f c	-	
P_4 (Jamkhandi): Fine, smectitic, hyperthermic, Vertic Haplustepts													
Ap	0-19	c s	10YR 3/3	10YR 3/2	c	1c sbk	h	fr	ss &mp	f f	c m, f	-	
Bw1	19-42	c s	10YR 3/3	10YR 3/2	c	2m sbk	vh	fr	ms&mp	c m	c f	-	
Bw2	42-68	c s	-	10YR 3/2	c	2m sbk	-	fr	ms&mp	-	c vf	-	
Bw3	68-83	a s	-	10YR 3/2	c	2m sbk	-	fr	ms&mp	-	c vf	-	
BC	83-125	a s	-	10YR 4/2	vgc	2m sbk	-	fr	ms&mp	-	c vf, m	-	
P_5 (Athani): Loamy-skeletal, smectitic, hyperthermic, calcareous, Aridic Haplustepts													
Ap	0-13	c s	7.5YR 3/2	7.5YR 2.5/2	gc	1f sbk	s	vfr	ms&sp	m vf	c m	-	
AB	13-30	a s	7.5YR 3/4	7.5YR 2.5/3	cl	1m sbk	s	vfr	ms&mp	m vf, f	c m	-	
Bw1	30-49	c s	-	7.5YR 3/3	egcl	1m sbk	-	fr	ms&mp	c m, fc	c f	f m	
Bw2	49-73	c s	-	7.5YR ¾	vgcl	1m gr	-	fr	ms&mp	f m, f	c f	f m	
Bw3	73-95	c s	-	7.5YR ¾	vgscl	1m sbk	-	fr	ss &sp	mf, fm	c f	f m	
CB	95-122+	-	-	7.5YR 2.5/3	egsc	1m sbk, gr	-	fr	ms&sp	m vf	f f	f m	

P_6 (Vijayapura): Fine, smectitic, hyperthermic, calcareous, Aridic Haplusterts												
Ap	0-11	c s	10YR 3/3	10YR 3/2	c	2f sbk	sh	fr	ms&mp	f vf	c m	-	
Bss1	11-25	g s	10YR 3/2	10YR 3/2	c	1m sbk	sh	fr	ms&sp	fm, cvf	cf, vf	-	Pressure faces
Bss2	25-41	g s	-	7.5YR 3/2	c	2m sbk	-	fi	ms&sp	f m, f	c vf	-	Slickenside
Bss3	41-62	c s	-	7.5YR 2.5/2	c	2m abk	-	vfi	ms&sp	f f	c vf	-	Slickenside
BC	62-82	a s	-	7.5YR 2.5/2	c	2m abk	-	vfi	ms&sp	f vf	c f	c f	
CB	82-104+	-	-	10YR 6/4	egc	c m	-	fr	ms&mp	-	f m, f	c m	
P_7 (B. Bagewadi *cv*. Thompson seedless): Fine, smectitic, hyperthermic, calcareous, Aridic Haplusterts												
Ap	0-17	c s	10YR 3/2	10 YR 2/2	cl	1f sbk	sh	fr	ss &sp	f vf, f	c m	f m	
AB	17-38	g s	7.5YR 3/2	7.5 YR 3/2	cl	2f sbk	h	vfi	ss &sp	f m, f	C f	f m	
BA	38-64	c s	7.5YR 2.5/2	7.5YR 2.5/2	c	2m sbk	-	fi	ms&sp	-	c f	f m	Pressure faces
Bss	64-86	c s	-	7.5YR 2.5/2	gc	2m abk	-	fi	ms&sp	f f, m	c vf	f m	Slickenside
CB	86-93	a s	-	7.5YR 3/2	vgcl	c sbk	-	fi	ms&mp	-	f m	c m	
Cr	93-145+	-	-	10YR 3/1	cl	-	-	-	-	-	-	-	
P_8 (B. Bagewadi *cv*. Manikchaman): Fine, smectitic, hyperthermic, calcareous, Ustic Haplocalcids												
Ap	0-19	a s	10 YR 3/2	10 YR 2/2	gscl	1f sbk	sh	fr	ss &sp	f vf	c c	f m	
Bwk1	19-31	c s	7.5 YR 3/3	7.5 YR 2.5/3	sc	1m sbk	vh	fr	ms&sp	f vf, fm	c m	c f	
Bwk2	31-47	c s	-	10YR ¾	gsc	1m sbk	-	fr	ms&sp	f vf, f	f c	c f	
Bwk3	47-70	c s	-	10YR 3/3	gsc	1m abk	-	fr	ms&sp	f vf	f c	c m	
Bwk4	70-87	c s	-	10YR 3/2	vgsc	Massive	-	fr	ms&sp	-	f c	m m	
BCk	87-125+	-	-	10YR 5/4	gsc	Massive	-	fr	ms&sp	-	f c	m m	
P_9 (Indi): Fine, mixed, hyperthermic, calcareous Aridic Haplustalfs												
Ap	0-17	c s	10 YR 3/3	10 YR 3/3	gscl	2f gr	l	vfr	ss &mp	m vf	c c	f m	
Btk1	17-39	c s	7.5 YR 3/3	7.5 YR ¾	gsc	2m sbk	sh	fi	ms&sp	c vf	c m	c f	
Btk2	39-54	c s	-	7.5YR 3/2	gsc	2m sbk	-	fr	ms&sp	c c, f	c m	c f	
BCk	54-72	a s	-	10YR 3/3	vgsc	2m sbk	-	fr	ms&mp	f m	c m	c f	
CBk	72-88	c s	-	7.5YR 3/3	egc	Massive	-	fr	ms&mp	-	f c	m m	
Crk	88-115+	-	-	7.5YR 3/2	egs	Massive	-	vfr	s0 & p0	-	f c	m m	

Texture:

s: sand, ls: loamy sand, sl: sandy loam, l: loam, sil: silt loam, si: silt, scl: sandy clay loam, cl: clay loam, sicl: silty clay loam, sc: sandy clay, sic: silty clay, c: clay, g: gravely, v: very; e: extremely

Structure:

Grade: 0: structureless, 1: weak, 2: moderate, 3: strong;

Size: vf: very fine, f: fine, m: medium, c: coarse, vc: very coarse

Type: gr: granular, cr: crumb, clr: columnar, pr: prismatic, pl: platy, abk: angular blocky, sbk: subangular blocky, sg: single grain, m: massive, c: cloddy

Consistency:

Dry: l: loose, s: soh, sh: slightly hard, h: hard, vh: very hard, eh: extremely hard

Moist: l: loose, vfr: very friable, fr: friable, fi: firm, vfi: very firm, efi: extremely firm

Stickyness: s0: non-sticky, ss: slightly sticky, ms: moderately sticky, vs: very sticky

Plasticity: p0: non-plastic, sp: slightly plastic, m: moderately plastic, vp: very plastic

Roots, Pores and Calcretes:

Quantity: f: few (<1 per area), c: common (1-5), m: many (>5)

Size: vf: very fine, f: fine, m: medium, c: coarse, vc: very coarse