Journal of Pharmacognosy and Phytochemistry
Available online at www.phytojournal.com

**E-ISSN:** 2278-4136
**P-ISSN:** 2349-8234
JPP 2018; SP1: 166-170

**Chadar BR**
Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani, Dept of Soil Science and Agricultural Chemistry, College of Agriculture, Latur, Maharashtra, India

**Vaidya PH**
Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani, Dept of Soil Science and Agricultural Chemistry, College of Agriculture, Latur, Maharashtra, India

**Kachave RR**
Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani, Dept of Soil Science and Agricultural Chemistry, College of Agriculture, Latur, Maharashtra, India

**Aundhakar AV**
Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani, Dept of Soil Science and Agricultural Chemistry, College of Agriculture, Latur, Maharashtra, India

**Correspondence**
**Chadar BR**
Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani, Dept of Soil Science and Agricultural Chemistry, College of Agriculture, Latur, Maharashtra, India

# Characterizations, classifications and soil site suitability evaluation of soils of farm College of Agriculture, Latur, Maharashtra

**Chadar BR, Vaidya PH, Kachave RR and Aundhakar AV**

**Abstract**
The soils of Farm, College of Agriculture, Latur were shallow to moderately deep, very dark gray (10 YR 3/1) to dark brown (10YR 3/3) in colour, granular to sub-angular blocky in structure, silty clay loam to clay in texture. The bulk density of soils varied from 1.24 to 1.79 Mg $m^{-3}$. The Plant available water capacity of soils varied from 58.29 to 228.0 mm and it was found to increase with depth of soil. The soils are slightly to moderately alkaline in reaction (7.6 to 8.51). The electrical conductivity of the soil is < 1.0 $dSm^{-1}$. The organic carbon content in soils is low to moderate and varied from 0.12 to 0.80 per cent. The calcium carbonate content varied from 7.5 to 21.4 per cent up to 30 cm soil depth and and 12.2 to 45.6 per cent at 30 to 150 cm depth of soil indicated that soils are moderate to highly calcareous in nature. The CEC of soil varied from 31.30 to 63.30 cmol ($p^+$) $kg^{-1}$. Calcium is the dominanat cation followed by magnesium, sodium and potassium in all profiles. The base saturation per cent varied from 93.47 to 98.89 per cent. The soils of the study area classified as Typic Ustorthents, Calcic Haplustepts, Vertic Haplustepts and Calcic Haplusterts, respectively. In Typic Ustorthents soils currently not suitable (N1) for soybean and pigeon pea due to limitation of soil depth, calcium carbonate, PAWC and soil pH. Where as in Calcic Haplustepts currently not suitable (N1) to moderatly suitable (S2) due to severe limitation of calcium carbonate, soil depth and soil pH. Vertic Haplustepts soils were marginal (S3) to moderately suitable (S2) and Calcic Haplusterts soils were highly (S1) to moderately suitable (S2) for soybean and pigeon pea due to limitation of calcium carbonate, soil depth, drainage and soil pH.

**Keywords:** Morphological characteristics, Physical characteristics, Chemical characteristics, soil classification and soil site suitability.

## Introduction
Systematic inventory and characterization of soil resources in the basic need for developing the sustainable agricultural land use plan at farm level. Maintaining high productivity of soil on sustainable basis is an important for meeting the basic need of the people. The importance of soil survey and mapping for preparing an inventory of a region, the soil properties are used for evaluation of soil for different crops. The value of soil resource inventory for increasing food production and conservation of natural resources has been receiving significant importance not only for soil resource data base generated but also its quality (Eswaran and Gathrie, 1982).Various systems of land evaluation are in vogue viz. Storie index, require index. The parametric approach method developed by Sys (1985) and FAO (1976) framework are good methods for land evaluation. The FAO (1976) framework provides a set of principles from which land evaluation can be established to suit local conditions. The USDA land suitability classification are used to evaluate the soil for different crops and optimal use of available natural resources.Hence at attempt has been made to characterized soil of Farm College of Agriculture, Latur for soil resource data base and to evaluate the soil site suitability for specific kind of use.

## Materials and Methods
The study area College of Agriculture, Latur located at $18^0$ 25' 90" N latitude and $76^0$ 36' 99" E longitudes. Geographical area of college is 65 ha, 73 R. The climate of the study area is hot, dry and sub-humid with annual rainfall of 794 mm. The mean maximum and minimum temperature are $32.7^0$C and $18.1^0$C respectively. The length of growing period is 149 days and humid period 104 days. The soils have Ustic moisture regime and Hyperthermic temperature regime. Six representative pedon were finalized for characterization and classification. Morphological study of the soil was described as per procedure suggested by USDA and Soil Survey Staff (1906).The soil samples were collected horizon wise, air dried ground and sieved by using 2 mm sieve.

Particle size analysis of the sample was carried out by international pipette method (Jackson 1979). Water retention characteristics were determined by pressure plate apparatus and PAWC determined by expression suggested by Gardner *et al* (1984). Bulk density of the soil was determined by clod coating technique (Black, 1965). EC, pH, organic carbon, $CaCO_3$, exchangeable cations and cation exchange capacity (CEC) were determined by standard procedure (Jackson, 1973). The soils of the study area classified according to U.S. comprehensive system of soil classification (Soil Survey Staff 2006 and 2014). The soil site suitability for tap rooted crop (pigeon pea) and shallow rooted crop (Soybean) were determined with soil limitation basis by Sys *et al*. (1991) and NBSS & LUP (1994) and on the basis optimum yield by FAO (1983).

## Results and Discussion

### Morphological characteristics

Morphological properties of soils indicated (Table 1) Soil depth of the soils of study area varied from 28 to 92 cm which corresponds to shallow to moderately deep. The soil depth in Typic Ustorthents (P1) was shallow (28 cm), soil depth in Calcic Haplustepts (P2 and P4) was shallow to moderately shallow (32 to 55cm), soil depth of Calcic Haplusterts (P3) was moderately deep (92 cm), and in Vertic Haplustepts (P4 and P5) soil was moderately shallow to moderately deep (72 to 80 cm). This variation in soil depth might be due to the land form setting (Vadivelu 1983). The soil colour of study area are very dark gray (10 YR 3/1) to dark brown (10YR 3/3) in colour. The dark colour of soil may be attributed to humus and mineral like titaniferous magnetite (Zonn,1986). The soils structure varied from medium, weak, granular structure to medium, strong, sub-angular blocky, in pedon P3 (Calcic Haplusterts) showed well-developed intersecting slickenside and wedge shaped structural aggregates. This may be due to swell shrink properties of Vertisols in such soils resulting in the development of slickenside's (Ahmad, 1989).

### Physical characteristics

Physical properties of soils were presented in table 2. Indicated that the coarse fragment in soils was varies from 1.12 to 68.34 per cent. The soil texture of surface samples in pedon P2, P3, P4, P5, and P6 was clay in nature. The clay content varied from 15.90 to 63.20 per cent. The soil developed on lower topographic position showed higher clay content as compared to soil developed on higher topographic position; topography and slope were found to affect the particle size distribution. The coarse fragment of soils varied from 1.12 to 68.34 per cent. The bulk density of soils of Farm College of Agriculture, Latur varied from 1.24 to 1.79 Mg $m^{-3}$. The saturated hydraulic conductivity of the soils varied from 1.20 to 25.80 cm $hr^{-1}$. This variation attributed to textural difference. The soils are silty clay loam to clay in texture. The plant available water capacity of soils varied from 58.29 to 228.0 mm. It has been recorded by Gardner *et al*. (1984) that the plant available water capacity is limited by rooting depth. The capacity of soil to store moisture for plant use is largely a function of their clay content, depth of soil and mineralogy of soil. Therefore a positive correlation of soil depth with PAWC (r=0.91) and clay with PAWC (r=0.93). This suggests that the soil depth, texture and PAWC are interrelated to each other and in turn control the crop. The PAWC was found to increase with depth of soil and clay content.

### Chemical properties of soil

The chemical properties of soils presented in table 3 indicated that the soils are slightly to moderately alkaline in reaction (7.6 to 8.51). The electrical conductivity of the soil is < 1.0 $dSm^{-1}$ (0.19 to 0.63 $dSm^{-1}$). This is well within safe limit of electrical conductivity range. The organic carbon content in soils was low to moderate and varied from 0.12 to 0.80 per cent. The organic carbon content is low in murrum layer as compared to the overlying horizons. The calcium carbonate content varied from 7.5 to 45.6 per cent and which was increased with depth. The CEC of soil varied from 31.30 to 63.30 cmol($P^+$) $kg^{-1}$. The high CEC is attributed to the high amount of clay. The high cation exchange capacity of these black soils is attributed to its smectitic clay mineralogy (Pal and Deshpande 1987). The CEC is positively correlated (r=0.87) and thereby increased with increasing clay content in soil. The exchangeable cation in soils has the dominance of calcium followed by magnesium, sodium and potassium in all profiles. The base saturation per cent varied from 93.47 to 98.89 per cent. The high base saturation of both soil and murrum was attributed to basaltic parent material which is basic in nature.

### Soil classification

Based on field morphology and laboratory characterization the soils on various landforms have been classified according to U.S. comprehensive system of soil classification (Soil Survey Staff 2006 and 2014) and the soils of the study area group to three orders viz. Entisols, Inceptisols and Vertisols. The soil developed on moderately sloping at elevated area (P1) were lack of diagnostic subsurface horizons. They qualify for the order Entisol and due to presence of Ustic moisture regime; the soils are grouped into Ustorthents. At subgroup level these soils classified as Typic Ustorthents because these soils do not key out for other subgroup. The pedon P2, P4, P5 and P6 possess ochric epipedons followed by cambic subsurface diagnostic horizons and hence, grouped under Inceptisol. Due to ustic moisture regime these pedons qualify for ustepts suborder. These pedons do not have duripan horizon and hence classified as Haplustepts at great group level and subgroup level Pedon P2 and P4 were Calcic Haplustepts because these soils have a calcic horizon within 50 cm of the mineral soil. Whereas pedon P5 and P6 classified as Vertic Haplustepts at subgroup level because cracks within 125 cm of the mineral soil surface that are 5 mm wide throughout a thickness at 30 cm and wedges shaped peds in soil surface horizon were observed. Pedon $P_3$ were deep to very deep, black colour, clayey (>30%) and characterized by deep and wide cracks, well developed slickenside and pressure faces thus these soils were classified under the order Vertisols and at subgroup level Calcic Haplusterts because these soils have calcic horizon within 100 cm of mineral soil surface.

### Soil- site suitability evaluation

Soil site suitability is the fitness of given type of land for a defined use. The processes of the land suitability classification are the appraisal and grouping of specific areas of land in term of their suitability and to estimate the potential of particular soil for alternative uses. In present study of soil resource mapping of College of Agriculture, Latur, soil site suitability evaluated for soybean and pigeon pea crop with the help of FAO framework on Land Evaluation (FAO, 1976) suggests a crop specific suitability system on optimum yield basis. According this system the soils of Typic Ustorthents

(P1) marginally suitable (S3), Calcic Haplustepts (P2 and P4) and Vertic Haplustepts (P5 and P6) moderately suitable (S2) and Calcic Haplusterts (P3) was highly suitable (S1) for pigeon pea crop. Whereas the soils of Typic Ustorthents (P1 and P2) marginally suitable, Calcic Haplustepts (P4) and Vertic Haplustepts (P5 and P6) was moderately suitable (S2) and Calcic Haplusterts (P3) was highly suitable for soybean crop.

The existing soil-site conditions were compared with the criteria of soybean crop and pigeon pea and based on the number of intensity of limitation. The overall suitability was determined (Sys 1993). The method defines land classes with regard to number and intensity of limitations. The criteria of limitation method as given by Sys *et al*. (1993) and modified and refined keeping into account the local conditions by National Bureau of Soil Survey and Land Use Planning, Nagpur (NBBS and LUP, 1994). The soil site requirement given for soybean crop by Sys *et al*. (1993) and modified by NBBS and LUP, (1994) the soils of Calcic Haplusterts (P3), Calcic Haplustepts (P4) and Vertic Haplustepts (P5 and P6) moderately suitable (S2) and Calcic Haplustepts ( P2) and Typic Uatorthents (P1) currently not suitable (N1) for soybean cultivation. whereas the Calcic Haplusterts (P3), were moderately suitable (S2), Vertic Haplustepts (P5 and P6), Calcic Haplustpts (P2 and P4) were margional suitable (S3) and Typic Ustorthents (P1) soils were currently not suitable (N1) for pigeon pea crop. This is due to sever limitation of soil depth, $CaCO_3$, PAWC and soil pH in Typic Uatorthents (P1) whereas $CaCO_3$, PAWC and soil pH in Calcic Haplustepts and Vertic Haplustepts and drainage, $CaCO_3$ and soil pH in Calcic Haplusterts (P3). This indicated that a Calcic Haplusterts (Vertisols) soil was highly suitable for pigeon pea and soybean crop followed by Vertic Haplustepts, Calcic Haplustepts and Typic Ustorthents.

**Table 1:** Morphological properties of farm College of Agriculture, Latur

| Horizon | Depth (cm) | Boundary | Matrix Colour | Texture | Structure | Consistency | Pores | Roots | Effervescence |
|---|---|---|---|---|---|---|---|---|---|
| Pedon 1: Garden of College of Agriculture, Latur. ( *Typic Ustorthents*) | | | | | | | | | |
| AP | 0-15 | cs | 10YR 3/3 | sic | m1 gr | s, ns, np | vfm, fm | vfm, fm | - |
| AC | 15-28 | cs | 10YR 3/4 | sic | m1 gr | s, ns, np | fm, cm | fm | - |
| M | 28-50 | - | - | - | m1 gr | ns, np | - | - | - |
| Pedon 2: A5 Block, College of Agriculture, Latur. (*Calcic Haplustepts*) | | | | | | | | | |
| Ap | 0-17 | cs | 10YR3/1 | c | m1sbk | l,fr,sssp | vfm,fm | vfmfm | e |
| Bw | 17-32 | cs | 10YR3/3 | c | m1sbk | l,fr,sssp | vfm,fm | vfmfm | e |
| Cr | 32-42 | - | 10YR6/3 | s | m1 gr | l,fr,nsnp | ff,cf | fmcf | ev |
| Pedon 3: B6 Block, College of Agriculture, Latur. (*Calcic Haplusterts*) | | | | | | | | | |
| Ap | 0-21 | cs | 10YR3/2 | c | m2 sbk | s,fm,vsvp | vfm,fm | vfmfm | e |
| Bw | 21-40 | cs | 10YR3/2 | c | m2sbk | s,fm,vsvp | vfm,fm | vfmfm | e |
| Bss1 | 41-63 | cs | 10YR3/3 | c | m2sbk | s,fr,vsvp | fm,cf | vfm,fm | e |
| Bss2 | 63-92 | cw | 10YR3/4 | c | m2sbk | l,fr,sssp | fm,cf | vf,fm | es |
| C | 92-120 | - | 10YR6/6 | s | m1gr | l,fr,nsnp | Cf | cf | ev |
| Pedon 4: D2 Block, College of Agriculture, Latur. ( *Calcic Haplustepts*) | | | | | | | | | |
| Ap | 0-22 | cs | 10YR3/2 | c | m1sbk | l,fr,sssp | Vfmfm | vfmfm | e |
| Bw | 22-33 | cs | 10YR3/2 | cl | m1sbk | l,fr.sssp | Vfmfm | vfmfm | e |
| Cr1 | 33-55 | cs | 10YR6/4 | sc | m1gr | l,fr,nsnp | Fmcm | vfmcm | es |
| Cr2 | 55-70 | - | 10YR7/4 | sc | m1gr | l,fr,nsnp | Fmcf | cm | es |
| Pedon 5: D17 Block, College of Agriculture, Latur. (*Vertic Haplustepts)* | | | | | | | | | |
| Ap | 0-26 | cs | 10YR3/1 | cl | m1sbk | l,fr,vsvp | Vfm | vfm | e |
| Bw1 | 26-49 | cs | 10YR2.5/1 | cl | m1sbk | l,fr,sssp | vfm,fm | fm,cf | es |
| Bw2 | 49-62 | cs | 10YR3/1 | cl | m1sbk | l,fr,sssp | vfm,fm | cc | es |
| Br | 62-72 | di | 10YR4/1 | sicl | m1sbk | l,fr,sssp | vfm,fm | cc | es |
| C | 72-120 | - | 10YR5/3 | s | m1gr | l,fr,nsnp | Cf | cc | ev |
| Pedon 6: E2 Block, College of Agriculture, Latur. (*Vertic Haplustepts*) | | | | | | | | | |
| Ap | 0-18 | cs | 10YR3/2 | cl | m1sbk | l,fr,sssp | vfm,fm | vfmfm | e |
| Bw1 | 18-38 | cs | 10YR3/2 | cl | m1sbk | l,fr,sssp | vfm,fm | vfm,fm | e |
| Bw2 | 38-56 | cs | 10YR3/3 | cl | m1sbk | l,fr,sssp | vfm,fm | vfm,fm | e |
| Bw3 | 56-80 | cs | 10YR3/3 | cl | m1sbk | l,fr,sssp | fm,cm | fm,cm | e |
| Cr | 80-90 | - | 10YR5/4 | s | m1gr | l,fr,nsnp | fm,cf | fm,cf | es |

**Table 2:** Physical properties of Farm, College of Agriculture, Latur

| Horizons | Depth (cm) | Coarse fragment (%) | BD (Mg $m^{-3}$) | HC (cm $hr^{-1}$) | Particle size analysis (%) | | | Moisture retention (%) | | AWC (%) | PAWC (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Sand | Silt | Clay | 33 kPa | 1500 kPa | | |
| Pedon 1: Garden College of Agriculture, Latur. (*Typic Ustorthents*) | | | | | | | | | | | |
| AP | 0-15 | 13.26 | 1.55 | 05.10 | 9.05 | 51 | 42.92 | 19.2 | 11.7 | 7.5 | 58.29 |
| AC | 15-28 | 24.13 | 1.70 | 20.20 | 12.19 | 53.81 | 34.00 | 20.6 | 15.3 | 5.3 | |
| M | 28-50 | 68.34 | 1.79 | - | 28.53 | 34.12 | 37.35 | 16.9 | 8.1 | 14 | |
| Pedon 2: A5 Block, College of Agriculture, Latur. (*Calcic Haplustepts*) | | | | | | | | | | | |
| Ap | 0-17 | 7.6 | 1.57 | 06.36 | 9.50 | 31.18 | 59.12 | 20.1 | 12.4 | 7.7 | 59.24 |
| Bw | 17-32 | 10.1 | 1.60 | 08.58 | 12.00 | 29.94 | 58.06 | 21.3 | 16.5 | 4.8 | |
| Cr | 32-42 | 41.67 | 1.72 | 22.70 | 65.02 | 22.08 | 15.90 | 15.9 | 8.5 | 7.4 | |
| Pedon 3: B6 Block, College of Agriculture, Latur. (*Calcic Haplusterts)* | | | | | | | | | | | |
| Ap | 0-21 | 1.11 | 1.25 | 1.20 | 5.90 | 31.86 | 62.24 | 45.4 | 30.2 | 15.6 | |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Bw | 21-40 | 2.62 | 1.29 | 2.11 | 8.80 | 32.14 | 59.06 | 43.3 | 24.5 | 18.8 | 228.0 |
| Bss1 | 41-63 | 8.26 | 1.44 | 2.37 | 7.90 | 37.90 | 63.20 | 46.6 | 26.7 | 19.9 | |
| Bss2 | 63-92 | 35.88 | 1.56 | 7.60 | 8.00 | 39.71 | 55.29 | 42.9 | 26.1 | 16.7 | |
| C | 92-120 | 47.91 | 1.70 | 20.90 | 44.20 | 40.10 | 44.30 | 38.7 | 18.5 | 20.2 | |
| Pedon 4: D2 Block, College of Agriculture, Latur. (*Calcic Haplustepts*) | | | | | | | | | | | |
| Ap | 0-22 | 2.86 | 1.24 | 2.41 | 6.8 | 31.08 | 62.30 | 36.3 | 23.4 | 12.9 | 179.42 |
| Bw | 22-33 | 4.45 | 1.40 | 4.90 | 8.3 | 29.03 | 62.72 | 36.7 | 24.6 | 13.1 | |
| Cr1 | 33-55 | 38.62 | 1.45 | 13.80 | 13.3 | 48.42 | 48.28 | 26.8 | 12.6 | 14.2 | |
| Cr2 | 55-70 | 50.34 | 1.67 | 24.10 | 47.5 | 23.2 | 29.50 | 20.9 | 7.90 | 13.00 | |
| Pedon 5: D17 Block, College of Agriculture, Latur. (*Vertic Haplustepts*) | | | | | | | | | | | |
| Ap | 0-26 | 1.12 | 1.28 | 2.2 | 6.60 | 41.3 | 51.47 | 43.02 | 27.4 | 16.2 | 123.8 |
| Bw1 | 26-49 | 1.48 | 1.35 | 6.7 | 7.80 | 36.62 | 55.58 | 43.30 | 27.6 | 15.7 | |
| Bw2 | 49-62 | 2.62 | 1.56 | 8.3 | 9.86 | 30.70 | 59.50 | 46.80 | 30.2 | 16.6 | |
| Br | 62-72 | 9.76 | 1.59 | 15.6 | 14.78 | 45.30 | 39.90 | 36.00 | 23.6 | 12.4 | |
| C | 72-120 | 58.27 | 1.73 | 20.9 | 48.00 | 34.90 | 17.10 | 28.70 | 16.3 | 10.2 | |
| Pedon 6: E2 Block, College of Agriculture, Latur. (*Vertic Haplustepts*) | | | | | | | | | | | |
| Ap | 0-18 | 5.13 | 1.40 | 2.30 | 6.97 | 40.84 | 52.19 | 42.8 | 25.9 | 16.9 | 140.80 |
| Bw1 | 18-38 | 5.87 | 1.43 | 4.86 | 7.60 | 38.81 | 55.59 | 43.8 | 26.5 | 17.3 | |
| Bw2 | 38-56 | 16.4 | 1.48 | 4.61 | 8.28 | 35.68 | 58.12 | 47.1 | 29.2 | 18.9 | |
| Bw3 | 56-80 | 31.2 | 1.58 | 7.4 | 16.71 | 25.99 | 57.30 | 48.6 | 30.3 | 18.3 | |
| Cr | 80-90 | 56.31 | 1.68 | 25.8 | 45.85 | 35.21 | 18.94 | 26.8 | 16.5 | 10.3 | |

**Table 3:** Chemical properties of Farm, College of Agriculture, Latur

| Horizons | Depth (cm) | pH | EC ($dSm^{-1}$) | O.C (%) | CaCO3 (%) | CEC (Cmol $kg^{-1}$) | Cations ($cmol(P^+)kg^{-1}$) | | | | | Base Saturation (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | $Ca^{++}$ | $Mg^{++}$ | $Na^+$ | $K^+$ | Sum of Cations | |
| Pedon 1: Garden of College of Agriculture, Latur. ( *Typic Ustorthents*) | | | | | | | | | | | | |
| AP | 0-15 | 7.80 | 0.23 | 0.56 | 12.7 | 41.63 | 30.8 | 7.2 | 0.58 | 1.28 | 40.6 | 97.6 |
| AC | 15-28 | 7.60 | 0.19 | 0.36 | 21.4 | 39.24 | 29.6 | 17.2 | 0.67 | 1.17 | 38.6 | 98.4 |
| M | 28-50 | 7.80 | 0.21 | 0.29 | 35.8 | 42.30 | 29.2 | 10.4 | 0.99 | 0.75 | 41.3 | 97.7 |
| Pedon 2: A5 Block, College of Agriculture, Latur. (*Calcic Haplustepts*) | | | | | | | | | | | | |
| Ap | 0-17 | 7.93 | 0.54 | 0.67 | 11.4 | 60.23 | 45.6 | 11.7 | 1.08 | 0.42 | 58.8 | 98.1 |
| Bw | 17-32 | 7.75 | 0.57 | 0.47 | 16.5 | 51.50 | 38.8 | 10.7 | 1.09 | 0.34 | 50.9 | 98.8 |
| Cr | 32-42 | 7.88 | 0.63 | 0.12 | 35.8 | 36.00 | 20.3 | 08.1 | 0.55 | 0.32 | 35.1 | 97.6 |
| Pedon 3: B6 Block, College of Agriculture, Latur. (*Calcic Haplusterts*) | | | | | | | | | | | | |
| Ap | 0-21 | 7.96 | 0.39 | 0.78 | 6.7 | 63.30 | 36.4 | 20.8 | 1.62 | 0.41 | 58.2 | 97.6 |
| Bw | 21-40 | 7.91 | 0.31 | 0.75 | 9.5 | 60.86 | 32.8 | 22.0 | 1.60 | 0.44 | 57.6 | 93.4 |
| Bss1 | 41-63 | 8.09 | 0.29 | 0.75 | 12.2 | 59.80 | 36.4 | 21.0 | 1.20 | 0.32 | 58.9 | 96.2 |
| Bss2 | 63-92 | 8.14 | 0.23 | 0.66 | 18.1 | 58.63 | 38.9 | 17.6 | 0.18 | 0.27 | 56.7 | 94.1 |
| C | 92-120 | 8.30 | 0.23 | 0.26 | 24.0 | 49.60 | 20.0 | 10.1 | 0.17 | 0.26 | 30.3 | 97.9 |
| Pedon 4: D2 Block, College of Agriculture, Latur. (*Calcic Haplustepts*) | | | | | | | | | | | | |
| Ap | 0-22 | 7.85 | 0.50 | 0.56 | 10.0 | 51.30 | 30.0 | 19.2 | 1.06 | 0.53 | 50.7 | 97.1 |
| Bw | 22-33 | 7.96 | 0.21 | 0.52 | 15.2 | 55.92 | 36.2 | 17.7 | 1.04 | 0.42 | 55.3 | 98.5 |
| Cr1 | 33-55 | 7.84 | 0.27 | 0.48 | 22.8 | 48.76 | 26.3 | 10.2 | 0.73 | 0.28 | 37.5 | 97.2 |
| Cr2 | 55-70 | 7.82 | 0.20 | 0.13 | 33.3 | 38.86 | 25.7 | 10.5 | 0.89 | 0.11 | 37.2 | 98.2 |
| Pedon 5: D17 Block, College of Agriculture, Latur. (*Vertic Haplustepts*) | | | | | | | | | | | | |
| Ap | 0-26 | 7.72 | 0.31 | 0.80 | 08.2 | 55.00 | 34.0 | 18.3 | 1.00 | 0.74 | 54.0 | 98.2 |
| Bw1 | 26-49 | 8.04 | 0.28 | 0.76 | 09.1 | 51.90 | 37.6 | 12.2 | 1.07 | 0.55 | 51.4 | 96.6 |
| Bw2 | 49-62 | 8.10 | 0.24 | 0.56 | 18.6 | 58.50 | 37.8 | 14.8 | 1.54 | 0.79 | 56.4 | 94.6 |
| Br | 62-72 | 8.20 | 0.26 | 0.24 | 22.0 | 45.64 | 22.0 | 8.9 | 1.19 | 0.27 | 32.3 | 96.1 |
| C | 72-120 | 8.51 | 0.30 | 0.17 | 45.6 | 31.30 | 17.2 | 8.4 | 1.28 | 0.14 | 27.0 | 95.4 |
| Pedon 6: E2 Block, College of Agriculture, Latur. (*Vertic Haplustepts*) | | | | | | | | | | | | |
| Ap | 0-18 | 7.95 | 0.32 | 0.69 | 7.5 | 59.70 | 45.3 | 12.4 | 1.25 | 0.49 | 59.4 | 96.5 |
| Bw1 | 18-38 | 7.96 | 0.39 | 0.57 | 9.1 | 52.34 | 30.8 | 8.0 | 1.27 | 0.44 | 40.5 | 97.6 |
| Bw2 | 38-56 | 7.98 | 0.34 | 0.49 | 12.5 | 58.80 | 32.4 | 8.1 | 1.25 | 0.42 | 42.1 | 95.0 |
| Bw3 | 56-80 | 8.10 | 0.36 | 0.27 | 33.2 | 36.65 | 28.2 | 5.6 | 1.25 | 0.40 | 35.4 | 99.3 |
| Cr | 80-90 | 8.05 | 0.33 | 0.16 | 40.5 | 21.11 | 13.2 | 5.4 | 0.84 | 0.14 | 19.5 | 99.7 |

**Table 4:** Soil site suitability classes and yield of soybean and pigeon pea

| Pedons | Soil site suitability class (with limitation) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Sys *et al*. (1991) and NBSS & LUP (1994) | | FAO (1983) | | | | | |
| | Soybean | Pigeonpea | Soybean | | | Pigeonpea | | |
| | | | Yield (q/ha) | % yield of optimum yield (25 q/ha) | Suitability class | Yield (q/ha) | % yield of optimum yield (20q/ha) | Suitability class |
| Pedon - 1 | N1 (dt,k,w,p) | N1 (dt,k,w, p) | 8.2 | 32.8 | S3 | 7.9 | 37.6 | S3 |
| Pedon- 2 | N1 (dt,k,w) | S3 (k,dt,w,p) | 9.8 | 39.2 | S3 | 8.5 | 40.47 | S2 |
| Pedon - 3 | S2 (k,dr, p) | S2 (dr,k,p) | 23.4 | 93.6 | S1 | 18.8 | 89.52 | S1 |
| Pedon- 4 | S2 (dt,k,p) | S3 (k,dt,p) | 18.3 | 73.2 | S2 | 13.6 | 64.76 | S2 |
| Pedon- 5 | S2 (k,p,w) | S3 (k,dt,p) | 18.9 | 75.6 | S2 | 15.3 | 72.85 | S2 |
| Pedon - 6 | S2 (k,p,w) | S3 (k,dt,p) | 16.9 | 67.6 | S2 | 13.8 | 65.71 | S2 |

Latter in parentheses show limitation as s- slope, dt- soil depth, c- coarse fragment, e- erosion, t- texture, dr-Drainage, w- plant available capacity, k- $CaCO_3$ and p- pH

Suitability class: S1 – Highly suitable, S2- moderately Suitable, S3- marginally suitable, N1- currently not suitable and N2- unsuitable.

## References


1. Ahmad SR. A nutritional survey report of Anab-e-shahi grapes around Hyderabad and Secunderabad. J. South Indian Hort. 1989; 37(5):262-286.
2. Black CA. Methods of Soil Analysis, Part I. Amer. Soc. Agron. Inc. Wisconsin, 1965, 770.
3. Eswaran H, Gathrie RL. International technical assistance in soil survey and classification abstract. Valuntary paper 12th international congress of soil sciences. New Delhi. India, 1982.
4. FAO. *A Framework for Land Evaluation.* Soils Bull, 32, FAO, Rome, 1976.
5. FAO. Guidelines Land Evaluation for Rainfed Agriculture. FAO Soils Bull., 52, FAO, Rome, 1983, 237.
6. Gardner EA, Shaw RJ, Smith GD, Coughlan KJ. Plant Availability capacity concept, Measurement prediction. In *Properties and Utilization of Cracking clay soils* (J.W. Mc Garity, E.H. Hoult and H.B. Co. eds.) Univ. of new England, Armidale. 1984, 164-175.
7. Jackson ML. Soil chemical analysis Prentice hall of India Pvt. Ltd., New Delhi, 1973, 498.
8. Jackson ML. Soil Chemical Analysis – Advanced Course, 2nd Edn. Publ. by the author, Univ. of Wisconsin, Madison, USA, 1979.
9. NBSS, LUP. Soil-site suitability criteria for different crops. In: Proceedings of National meet on Soil-site suitability criteria for different crops Feb. 7-8, 1994, 31.
10. Pal DK, Deshpande SB. Characteristics and Genesis of minerals in some benchmark vertisols of India. *Pedology.* 1987; 37(3):259-275.
11. Soil Survey Staff. Key to soil taxonomy 8th edition SMSS Technical Monograph No.19 Blacksburg Virginia poeahontas Press Inc-556, 2006.
12. Soil Survey Staff. Key to soil taxonomy 12th ed. USDA-Natural Resource Conservarion Service, Washington, DC, 2014.
13. Sys C. *Land Evaluation Part I, II, III* State Univ. Ghent Publ., Belgium, 1985, 343.
14. Sys C, Van Ranst E, Debaveye J. *Land Evaluation Part I, II.* Red-edited valums of publication no. 7 of the general Administration of Cooperation Development, Brussels, Belgium, 1991, 274.
15. Vadivelu. Soil physio-graphic relationship and its impact on land use. J. Maharashtra Agric. Univ. 1983; 8(1):16-19.