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# Characterization, classification and soil site suitability of pomegranate (*Punica granatum* L.) growing soil of Latur district Maharashtra

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**Abstract**
The soil of the study area under pomegranate were very shallow to very deep, reddish brown (5 YR 4/4) to dark grayish brown in colour (10 YR 4/2), clay to sandy loam in texture and granular to angular blocky in structure. The bulk density of the studied soils varied from 1.55 to 1.88 $Mgm^{-3}$. Plant available water capacity (PAWC) varied from 68.34 to 380.52 mm. The saturated hydraulic conductivity of soil varied from 3.27 to 23.71 cm $hr^{-1}$. Soil reaction under study area was slightly to strongly alkaline (pH ranged from 7.58 to 8.92) in nature, electrical conductivity of the soil is < 1.0 $dSm^{-1}$, organic carbon content very low to high (0.37 to 0.84 percent) and calcareous in nature (4.2 to 15.26%). The maximum CEC was recorded in Typic Haplusterts was 53.26 to 69.78 cmol ($P^{+}$) $kg^{-1}$ as compared to Typic Haplusteps and Typic Ustorthent. Taxonomically, these soils of study area classified into Typic Haplusterts, Typic Haplusteps and Calcic Haplusteps. The yield of the pomegranates ranged between 10.86 to 27.10 t $ha^{-1}$ in the study area. The highest yield was recorded in soils of Typic Haplusteps (Inceptisols) with soil depth less than 30 cm (P5). The fruit quality was increased with increasing amount of CaCO3 in these soils. Soil site suitability according to FAO 1983, the suitability of pomegranate on the basis of optimum yield level the soils of Typic Haplustepts were highly suitable whereas Calcic Haplustepts and Typic Ustorthents were moderately suitable and Typic Haplusterts were marginally suitable for pomegranate. This indicated that the Typic Haplustepts (Inceptisol) and Typic Ustorthents (Entisols) soils underlined by loose weathered basalt below 30 cm soil depth were found to be highly suitable (S1) for pomegranate cultivation followed by Calcic Haplustepts and Typic Haplusterts (Vertisols).

**Keywords:** Characterization and classification of soil, soil site suitability, pomegranate

## Introduction
Pomegranate (*Punica granatum* L.) is an ancient favorite table fruit of tropical and sub tropical regions of the world. Horticulture is fast and exports comparatively lower requirements of water and easy adaptability to adverse soil and waste land situations. The Pomegranate fruit are a good source of sugars (14-16%), minerals (0.7-1.0%) and a fair source of iron (0.3-0.7mg/100g.) and also contains considerable amount of acids, vitamins, polysaccharides, polyphenols and important minerals. Pomegranate fruits are consumed fresh or processed as juice, jellies and syrup for industrial production. Among all forms, canned slices and juice are in much demand in India, constituting about 70% of the production. It is proved to have high antioxidant activity and good potency of cancer prevention. Judicious use of this vital natural resource influences the survival of life systems and there by socio- economic development of any country. Land suitability evaluation is the process of estimating the potential of land for land use planning (Sys et al. 1991) [18, 19]. However, each plant species requires specific soil and climatic conditions for its optimum growth. The pomegranate sector has immense potential of generating employment. Government and private sectors are coming together and supporting the growers. Area under pomegranate is increasing day by day and becoming an important crop in cropping system of Latur district in particular and Marathwada region in general of Maharashtra state. With the increase in area under pomegranate cultivation without sufficient knowledge, experience and meticulous planning, crop is facing several issues with respect to its cultivation, obtaining good yield and quality and produce as well as marketing.

To overcome these type of problems and to increase productivity. Hence, a study has been taken up to evaluate the soil suitability for pomegranate growing soils of Latur district

## Materials and Methods

The present investigation carried on the topic characterization and classification of pomegranate growing of soils latur district is the south western part of Marathwada region of Maharashtra state. Annual rainfall is 794 mm. Maximum and minimum temperature of this district is 32.72 $^0$C and 18.11$^0$C, respectively. The elevation is 631 m from mean sea level and which comes under central Maharashtra plateau and semi-arid region. Most of soils in Latur district are shallow soil generally underlined by murrum layer. Murrum layer developed from Deccan basalt is found to be rich in smectite mineral. Smectite is the important clay mineral for availability of nutrients in soil. Nine (09) soil profiles were finalized for profile examination and horizon wise soil samples were collected for laboratory analysis. Morphological properties of soil were described in the field and profile description was made as per the procedure suggested by USDA Soil Survey Staff (1975) [17]. The Particle size distribution was carried out by international pipette method (Jackson, 1979) [8]. The bulk density was determined by clod coating method (Black, 1965) [1]. Available water capacity (AWC) and plant available water capacity (PAWC) were determined using the equation suggested by Gardner *et al*. (1984) [5] and latter modified by Coughlam *et al*. (1986) [2]. 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) [15] and Ca and Mg were determined by as per Piper (1966) [13]. Soil pH and EC were determined in soil water suspension 1:2.5 (Jackson, 1967) [6]. Soil organic carbon was determined by Walkley and Black methods (Jackson, 1973) [7]. $CaCO_3$ was determined by rapid titration methods (Piper, 1950). The weighted means of several land characters were computed by multiplying the depth of each horizon to its respective value (Sys *et al*., 1993). The Soils were evaluated for their suitability of pomegranates, using the framework of land evaluation proposed by FAO (1976) [3].

## Results and Discussion

### Morphological properties of soils

Morphological properties of the pomegranate growing soils of Latur district of different pedons are presented in table 1 indicated that soil depth varied from 22 to 120 cm which is correspond to shallow to very deep. The variation in soil depth might be due to the land form setting (Vadivelu et al. 1983) [20]. The colour of horizon varies reddish brown (5 YR 4/4) to light grey (10 YR 7/2) and granular to angular blocky in structure, loam to clay in texture and consistency was soft to slightly hard in dry condition, friable to firm in moist condition and very sticky, very plastic to non sticky non plastic in wet condition. The coarse fragment varied from 2.12 to 43.94 percent.

### Physical properties of soils

Physical properties the pomegranate growing soils of Latur district of different pedons are presented in table 2 indicated that the bulk density of the soils of Latur district varied from 1.55 to 1.88 Mgm$^{-3}$. The bulk density of Typic Ustorthents varied from 1.66 to 1.88 Mgm$^{-3}$, Typic and Calcic Haplustepts varied from 1.55 to 1.87 Mgm$^{-3}$ and in Typic Haplusterts varied from 1.65 to 1.88 Mgm$^{-3}$. The lower bulk density in surface soils may be due to higher organic matter and less compactness. The bulk density of Typic Haplustert increases with depth, which is highly correlated with clay content of soil. The saturated hydraulic conductivity of the study area varied from 3.27 to 23.71 cm hr$^{-1}$. The saturated hydraulic conductivity of soils of Typic Ustorthents is ranged from 5.29 to 22.39 cm hr$^{-1}$, Typic Haplustepts varied from 4.31 to 23.44 cm hr$^{-1}$, Calcic Haplustepts varied from 3.27 to 15.26 cm hr$^{-1}$ and Typic Haplusterts are ranged from 5.52 to 6.47 cm hr$^{-1}$ .The highest clay content (70.21 percent) was found in Typic Haplusterts. The soils at high topography Typic Ustorthents clay content varied from 13.4 to 59.23 per cent in Typic Haplustepts clay content ranged between 39.95 to 64.80 per cent and in Calcic Haplustepts clay content ranged between 48.14 to 58.02 per cent. The available water capacity of the soils of Typic Ustorthents ranged from 8.3 to 14.5 per cent and PAWC value varies from 68.34 to 93.33 mm. The available water capacity of the soils of Typic Haplustepts ranged from 5.6 to 19.5 per cent and PAWC value is varies from 69.98 to 124.65 mm. The available water capacity of soils of Calcic Haplustepts is a 10.3 to 16.2 percent and PAWC value from 69.44 mm. Typic Haplusterts ranged from 14.6 to 21.9 per cent and PAWC value from was 380.62 mm. This indicates that the maximum available water content at soils of Typic Haplusterts followed by Typic Haplustepts and Typic Ustorthents. However murum layer recorded low PAWC compared to their respective soil. PAWC was found to increase with depth. It has been recorded by Gardner et.al. (1984) [5]. Significant positive correlation of soil depth with PAWC (r=0.97*) and clay (r=0.64). This suggests that soil depth, clay and PAWC are interrelated to each other

### Chemical properties of soils

Chemical properties the pomegranate growing soils of Latur district of different pedons are presented in table 3 indicated the pH is slightly to strongly alkaline (6.70 to 8.45) and low in electrical conductivity is (<1.0 dS/m). The organic carbon content in pomegranate growing soils of Latur district varied from 0.37 to 0.84 per cent, shown that OC is low in murrum layer as to compare to the overlaying horizon. The calcium carbonate of soils ranged from 6.0 to 15.26 per cent indicating the soils were calcareous in nature. The calcium carbonate content in soils of Typic Ustorthents (P2, P3 and P8) was high varied from 8.6 to 12.85 as compared to both Typic Haplustepts (P1, P4, P5 and P6) ranged from 6.0 to 12.2 per cent and Calcic Haplustepts (P7) is ranged from 9.8 to 15.26 and in Typic Haplusterts (P9) ranged from 4.2 to 8.18 per cent, it may be attributed to the leaching of $(HCO_3)_2$ which get precipitate down to the slope as well as at lower horizon. The high calcium carbonate in soil affects the available water capacity of soil which has a great influence on crop production under rainfed conditions. High calcium carbonate affects the physical and chemical properties of soil and may prevent the root penetration (Sys, 1985) [18]. Moreover, correlation between the $CaCO_3$ content in soil and fruit quality TSS (r=0.60**) and reducing sugar (r=0.58**). This indicates that the fruit quality increased with decrease in $CaCO_3$ content in soil. (Fig. No. 4.3 and 4.4). Similar results were reported by Pawar (2015) [12] in pomegranate and Mane (2015) [10] in grape and Rakesh (2017) [14] in custard apple. The cation exchange capacity of soil of the study area ranged from 25.13 to 69.78 cmol(P+) kg$^{-1}$. High CEC was observed in Typic Haplusterts (P9) followed by Calcic Haplustepts, Typic Haplustepts and Typic Ustorthents. The high CEC is attributed to the high amount of clay. The relationship of CEC

and clay content was significant positively correlated (r = 0.67). The exchangeable cation in pomegranate growing soils has the dominance of calcium followed by magnesium, sodium and potassium in all profiles. The base saturation per cent varied from 91.16 to 99.48 per cent. Clay fraction appears to influence largely the cation exchange capacity values. The high cation exchange capacity of these black soils is attributed to its smectite clay mineralogy (Pal and Durge, 1987).

**Soil Classification**

Based on field morphology physical and chemical characteristics of the soils on various landforms were classified according to U.S. comprehensive system of soil classification (Soil Survey Staff, 2015) [16]. The soils of the study area belonging to three order viz. Entisols, Inceptisols and Vertisols. The soil developed on moderately sloping nearly level plain in study area (P2, P3 and P8) were lack of diagnostic subsurface horizons. Therefore, these soils qualify for the order Entisol and due to presence of Ustic moisture regime. The soils are grouped into Ustorthents and subgroup is Typic Ustorthents. The soils having ochric epipedon under lined by cambic horizon have been classified as Ustert within the order Inceptisols. These soils were located at sloping landscape in study area (P1, P4, P5, P6 and P7) and belonging to Ustic moisture regime therefore, these soils qualify for the great group Haplustepts and at subgroup level these soils classified as Typic Haplustepts because these soil do not key out of other sub group. These soils were developed at lower Topography position in study area. The soil 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 the subgroup Typic Haplusterts

**Soil Site Suitability**

The suitability classes were derived based on the actual yield as suggested by FAO (1983), Kadu (1997) [9] and Vaidya (2001) [21]. This was based on the yield level of suitability classes as S1>80%, S2 40 to 80%, S3 20% to 40% and N< 20%. The yield reduction levels have been decided on the optimum yield was calculated with the crop. The optimum yield was calculated with the help of data collected from 10 farmer's field with similar management practices in the soils of study area and obtaining maximum yield of the last five years. The optimum yield of pomegranate in the study area is 25.4 t $ha^{-1}$. According to FAO (1983), the suitability of pomegranate on the basis of optimum yield level the soils of Typic Haplustepts were highly suitable whereas Calcic Haplustepts and Typic Ustorthents were moderately suitable and Typic Haplusterts were marginally suitable for pomegranate. This indicated that the Typic Haplustepts (Inceptisol) and Typic Ustorthents (Entisols) soils underlined by loose weathered basalt below 30 cm soil depth were found to be highly suitable (S1) for pomegranate cultivation followed by Calcic Haplustepts, and Typic Haplusterts (Vertisols).

**Table 1:** Morphological characteristics of soils under pomegranate orchards in Latur district

| Horizons | Depth (cm) | Bound-ary | Matrix colour | Text-ure | Structure | Consiste-ncy | Pores | Roots | Effervescence |
|---|---|---|---|---|---|---|---|---|---|
| Pedon-P1 Balaji Auchitrao Jadhav Village-Gharola Tal. Chakur (Typic Haplustepts) | | | | | | | | | |
| Ap | 0-22 | Cc s | 10 YR3/2 | C | m 1 sbk | 1 fr sssp | vfm fm | vfm fm | es |
| Bw1 | 22-45 | wi | 10YR.3/3 | C | m 1 sbk | 1 fr nsnp | ff cm | vfm fm | es |
| Cr | 45-60 | - | 10 YR 5/3 | S | gr | sh fi nsnp | - | cm cf | es |
| Pedon- P2 Balakrushna Dnyba Vellahare Village-Janawala Tal.Chakur (Typic Ustorthents) | | | | | | | | | |
| Ap | 0-25 | cs | 5 YR 4/4 | Sl | gr | 1 fr sssp | cm fm | fm vfm | e |
| Ac | 25-40 | - | 5 YR 5/3 | S | gr | 1 fr nsnp | cm | cf fm | es |
| Pedon-P3 Manhor gamaji Alapure Village-Dapkyal Tal. Chakur (Typic Ustorthents) | | | | | | | | | |
| Ap | 0-22 | wi | 10 YR 5/3 | L | m 1 sbk | s fr sssp | vfm fm | vfm fm | e |
| Ac | 22.-40 | wi | 10 YR 6/3 | S | gr | s fr sssp | vfm fm | vfm fm | es |
| Cr | 40-60 | - | 10 YR 6/4 | S | gr | nsnp | cm | Cm | es |
| Pedon –P4 Amar Devaji Patil Village-Nalegaon Tal. Chakur (Typic Haplustepts) | | | | | | | | | |
| Ap | 0-24 | cs | 10 YR 4/1 | C | m 1 sbk | 1 fr sssp | vfm fm | vfm fm | es |
| Bw1 | 24-40 | ai | 10 YR4/2 | C | m 1 sbk | 1fr sssp | vfm fm | vfm fm | es |
| Cr | 40-50 | - | 10 YR 3/3 | S | gr | sh nsnp | Ffcf | cf | ev |
| Pedon-P5 Amit Umaji Patil Village-Ukachiwdi Tal. Chakur (Typic Haplustepts) | | | | | | | | | |
| Ap | 0-22 | cs | 10 YR 4/2 | C | m 2 sbk | sh fi vsvp | vfm fm | vfm fm | e |
| Bw1 | 22-40 | cs | 10 YR 3/2 | C | m 1 sbk | sh fi vsvp | vfm fm | vfm fm | es |
| Cr | 40-52 | - | 10 YR 3/2 | s | gr | sh fr nsnp | cm | cm fr | es |
| Pedon-P6 Niranjan Shivanad Swami Village-Dautpur Tal. Ausa (Typic Haplustepts) | | | | | | | | | |
| Ap | 0-18 | cs | 10 YR 3/3 | c | m 2 sbk | sh fr vsvp | vfm fm | vfm fm | e |
| Bw1 | 18-32 | cs | 10 YR 3/2 | c | m 2 sbk | sh fr vsvp | vfm fm | fm | e |
| Cr | 32-42 | - | 10 YR 5/6 | s | gr | sh fr nsnp | cm | cf | es |
| Pedon-P7 Trimbakdas Nana Zavar Village-Ausa Tal. Ausa (Calcic Haplustepts) | | | | | | | | | |
| Ap | 0-19 | wi | 10 YR 4/2 | cl | m 1 sbk | sh fr sssp | vfm fm | vfm fr | es |
| Bw1 | 19-27 | cs | 10 YR 6/2 | cl | m 1 sbk | sh fr sssp | vfm fm | vfm fm | es |
| Ck | 27-41 | ai | 10 YR 7/2 | l | gr | l fr nsnp | cm | cf | ev |
| Pedon-P8 Suresh Dnyaba Pawar Village-Yaktpur Tal. Ausa (Typic Ustorthents) | | | | | | | | | |
| Ap | 0-22 | wi | 10 YR 5/2 | l | m 1 sbk | 1fr sssp | vfm fm | vf | e |
| Ac | 22-35 | wi | 10 YR 5/3 | l | m 1 sbk | l fr sssp | vfm fm | cm | es |
| Cr | 35-48 | - | 10 YR 4/2 | l | gr | sh fi nsnp | cm | cm | es |
| Pedon-P9 Govind Haribhau Dhotre Village-Sugaon Tal. Latur (Typic Haplusterts) | | | | | | | | | |
| Ap | 0-21 | cs | 10 YR 3/2 | c | m 2 sbk | sh fr vsvp | vfm fm | vfm fm | e |
| Bw1 | 21-37 | cs | 10 YR 3/1 | c | m 2 sbk | sh fr vsvp | vfm fm | vfm fm | e |
| Bw2 | 37-57 | cs | 10 YR 3/1 | c | m 2 abk | sh fr vsvp | vfm fm | vfm fm | es |
| Bss1 | 57-70 | cs | 10 YR 3/1 | c | m 2 abk | h fi vsvp | vfm fm | vfm ff | es |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Bss2 | 70-82 | cs | 10 YR 3/1 | c | m 2 abk | h fi vsvp | vfm fm | cf | es |
| Bss3 | 82-120 | - | 10 YR 3/1 | c | m 2 abk | h fi vsvp | vfm fm | cf | es |

**Table 2:** Physical properties of soils under pomegranate orchards in Latur district

| Horizons | Depth (cm) | Course of Fragment (%) | BD ($Mg/m^3$) | HC (cm/hr) | Partical size Analysis (%) | | | Moisture Retention (%) | | AWC (%) | PAWC (mm) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Sand | Silt | Clay | 33 kPa | 1500 kPa | | |
| Pedon-P1 Balaji Auchitrao Jadhav Village-Gharola Tal. Chakur (Typic Haplustepts) | | | | | | | | | | | |
| Ap | 0-22 | 6.71 | 1.61 | 4.31 | 10.47 | 37.2 | 52.32 | 33.9 | 21.5 | 12.4 | 72.41 |
| Bw1 | 22-45 | 4.21 | 1.72 | 5.29 | 16.97 | 26.01 | 57.02 | 20.7 | 12.5 | 8.2 | |
| Cr | 45-60 | 28.43 | 1.76 | 21.44 | 25.02 | 32.49 | 42.48 | 29.1 | 23.5 | 5.6 | |
| Pedon- P2 Balakrushna Dnyba Vellahare Village-Janawala Tal.Chakur (Typic Ustorthents) | | | | | | | | | | | |
| Ap | 0-25 | 18.84 | 1.66 | 5.35 | 9.81 | 30.95 | 59.23 | 29.1 | 13.5 | 13.3 | 93.33 |
| Ac | 25-40 | 43.94 | 1.71 | 23.71 | 37.95 | 27.95 | 40.09 | 34.4 | 13.8 | 13.6 | |
| Pedon-P3 Manhor gamaji Alapure Village-Dapkyal Tal. Chakur (Typic Ustorthents) | | | | | | | | | | | |
| Ap | 0-22 | 18.77 | 1.68 | 5.29 | 12.73 | 34.9 | 52.37 | 26.4 | 13.5 | 13.3 | 90.08 |
| Ac | 22-40 | 28.87 | 1.75 | 6.73 | 29.85 | 25.96 | 44.18 | 27.2 | 13.7 | 13.5 | |
| Cr | 40-60 | 36.06 | 1.88 | 19.33 | 62.14 | 24.45 | 13.4 | 26.1 | 16.4 | 9.7 | |
| Pedon –P4 Amar Devaji Patil Village-Nalegaon Tal. Chakur (Typic Haplustepts) | | | | | | | | | | | |
| Ap | 0-24 | 18.23 | 1.55 | 4.39 | 9.55 | 41.12 | 49.32 | 20.8 | 8.4 | 12.4 | 69.98 |
| Bw1 | 24-40 | 22.36 | 1.73 | 12.41 | 8.54 | 51.15 | 54.51 | 18.7 | 10.4 | 8.4 | |
| Cr | 40-50 | 34.84 | 1.75 | 23.19 | 29.11 | 28.70 | 42.18 | 17.4 | 9.4 | 8.0 | |
| Pedon-P5 Amit Umaji Patil Village-Ukachiwdi Tal. Chakur (Typic Haplustepts) | | | | | | | | | | | |
| Ap | 0-22 | 8.08 | 1.6 | 6.37 | 10.46 | 37.2 | 52.32 | 38.9 | 19.4 | 19.5 | 124.65 |
| Bw1 | 22-40- | 15.23 | 1.7 | 5.17 | 13.32 | 24.96 | 57.02 | 36.3 | 18.9 | 17.4 | |
| Cr | 40-52 | 23.11 | 1.8 | 21.46 | 20.65 | 37.71 | 41.63 | 26.4 | 15.4 | 11.3 | |
| Pedon-P6 Niranjan Shivanad Swami Village-Dautpur Tal. Ausa (Typic Haplustepts) | | | | | | | | | | | |
| Ap | 0-18 | 19.07 | 1.5 | 6.68 | 10.48 | 28.8 | 60.72 | 29.4 | 13.4 | 16 | 78.87 |
| Bw1 | 18-32 | 9.26 | 1.7 | 10.74 | 9.61 | 26.19 | 64.80 | 27.6 | 13.8 | 13.8 | |
| Cr | 32-42 | 23.50 | 1.7 | 23.44 | 24.17 | 35.87 | 39.95 | 28.2 | 13.7 | 14.5 | |
| Pedon-P7 Trimbakdas Nana Zavar Village-Ausa Tal. Ausa (Calcic Haplustepts) | | | | | | | | | | | |
| Ap | 0-19 | 7.36 | 1.6 | 3.27 | 11.75 | 32.12 | 56.12 | 27.4 | 11.2 | 16.2 | 69.44 |
| Bw1 | 19-27 | 16.17 | 1.7 | 6.75 | 15.43 | 26.54 | 58.02 | 26.7 | 13.5 | 13.2 | |
| Cr | 27-41 | 22.74 | 1.7 | 15.26 | 20.12 | 31.65 | 48.14 | 21.9 | 11.6 | 10.3 | |
| Pedon-P8 Suresh Dnyaba Pawar Village-Yaktpur Tal. Ausa (Typic Ustorthents) | | | | | | | | | | | |
| Ap | 0-22 | 2.12 | 1.6 | 6.68 | 09.00 | 37.00 | 53.32 | 28.4 | 13.9 | 14.5 | 68.34 |
| Ac | 22-35 | 19.28 | 1.7 | 10.74 | 19.17 | 26.7 | 54.12 | 27.3 | 17.7 | 9.6 | |
| Cr | 35-48 | 31.18 | 1.7 | 22.39 | 39.02 | 27.85 | 38.48 | 20.7 | 12.4 | 8.3 | |
| Pedon-P9 Govind Haribhau Dhotre Village-Sugaon Tal. Latur (Typic Haplusterts) | | | | | | | | | | | |
| Ap | 0-21 | 10.31 | 1.6 | 5,62 | 7.54 | 33.8 | 59.65 | 40.6 | 24.7 | 15.9 | 380.62 |
| Bw1 | 21-37 | 04.93 | 1.7 | 6.47 | 5.85 | 31.50 | 62.64 | 38.4 | 20.9 | 17.5 | |
| Bw2 | 37-57 | 10.64 | 1.7 | 5.52 | 6.78 | 29.20 | 64.01 | 41.7 | 23.4 | 18.3 | |
| Bss1 | 57-70 | 9.19 | 1.7 | 5.85 | 4.21 | 29.30 | 66.48 | 43.5 | 28.9 | 14.6 | |
| Bss2 | 70-82 | 11.02 | 1.8 | 6.47 | 5.85 | 27.00 | 67.39 | 42.7 | 20.8 | 21.9 | |
| Bss3 | 82-120 | 13.29 | 1.8 | 5.79 | 6.21 | 23.58 | 70.21 | 39.4 | 20.5 | 18.9 | |

**Table 3:** Chemical properties of soils under pomegranate orchards in Latur district

| Horizons | Depth (cm) | pH | EC (dSm-1) | OC (%) | Ca CO3 (%) | CEC (cmol (P+) kg-1) | Cations (cmol (P+) kg-1) | | | | | Base Saturation (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Ca++ | Mg++ | Na+ | K+ | Sum of cations | |
| Pedon-P1 Balaji Auchitrao Jadhav Village-Gharola Tal. Chakur (Typic Haplustepts) | | | | | | | | | | | | |
| Ap | 0-22 | 8.26 | 0.18 | 0.77 | 6.0 | 43.26 | 23.6 | 17.31 | 0.22 | 1.18 | 42.2 | 97.57 |
| Bw1 | 22-45 | 8.12 | 0.15 | 0.68 | 8.4 | 39.14 | 21.2 | 15.26 | 0.21 | 1.51 | 38.18 | 97.54 |
| Cr | 45-60 | 8.42 | 0.12 | 0.51 | 10.0 | 27.19 | 16.32 | 9.21 | 0.17 | 0.98 | 26.68 | 98.12 |
| Pedon- P2 Balakrushna Dnyba Vellahare Village-Janawala Tal.Chakur (Typic Ustorthents) | | | | | | | | | | | | |
| Ap | 0-25 | 7.74 | 0.13 | 0.70 | 10.4 | 58.51 | 26.40 | 28.00 | 1.68 | 1.43 | 57.51 | 98.29 |
| Ac | 25-40 | 7.58 | 017 | 0.51 | 12.0 | 45.25 | 27.20 | 12.00 | 1.28 | 0.77 | 41.25 | 91.16 |
| Pedon-P3 Manhor Gamaji Alapure Village-Dapkyal Tal. Chakur (Typic Ustorthents) | | | | | | | | | | | | |
| Ap | 0-22 | 8.45 | 0.29 | 0.71 | 8.8 | 47.31 | 27.08 | 16.34 | 1.41 | 1.13 | 45.96 | 97.14 |
| Ac | 22-40 | 8.69 | 0.22 | 0.66 | 8.6 | 39.17 | 21.33 | 14.41 | 2.32 | 0.91 | 38.97 | 99.48 |
| Cr | 40-50 | 8.92 | 0.18 | 0.56 | 10.8 | 25.13 | 14.03 | 7.85 | 2.17 | 0.67 | 24.72 | 98.40 |
| Pedon –P4 Amar Devaji Patil Village-Nalegaon Tal. Chakur (Typic Haplustepts) | | | | | | | | | | | | |
| Ap | 0-24 | 8.40 | 0.37 | 0.75 | 7.6 | 54.13 | 30.40 | 20.40 | 1.35 | 1.34 | 53.49 | 98.81 |
| Bw1 | 24-40 | 8.30 | 0.19 | 0.66 | 8.4 | 53.18 | 30.00 | 20.00 | 1.19 | 1.18 | 52.37 | 98.47 |
| Cr | 40-45 | 8.70 | 0.10 | 0.56 | 11.0 | 42.22 | 29.60 | 10.40 | 0.85 | 0.79 | 41.64 | 98.62 |
| Pedon-P5 Amit Umaji Patil Village-Ukachiwdi Tal. Chakur (Typic Haplustepts) | | | | | | | | | | | | |
| Ap | 0-22 | 8.39 | 0.36 | 0.76 | 9.8 | 60.23 | 45.60 | 11.7 | 1.08 | 0.42 | 58.80 | 97.62 |
| Bw1 | 22-40 | 8.55 | 0.39 | 0.66 | 8.4 | 52.50 | 38.08 | 10.7 | 1.09 | 0.34 | 50.93 | 97.00 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Cr | 40-52 | 8.64 | 0.33 | 0.46 | 9.4 | 37.00 | 20.3 | 0.81 | 0.55 | 0.32 | 35.17 | 95.05 |
| Pedon-P6 Niranjan Shivanad Swami Village-Dautpur Tal. Ausa (Typic Haplustepts) | | | | | | | | | | | | |
| Ap | 0-18 | 8.31 | 0.40 | 0.61 | 7.2 | 58.41 | 25.89 | 24.19 | 2.92 | 2.78 | 57.71 | 98.80 |
| Bw1 | 18-32 | 8.53 | 0.38 | 0.49 | 8.4 | 61.18 | 27.41 | 26.71 | 2.14 | 1.89 | 59.16 | 96.69 |
| Cr | 32-42 | 8.50 | 0.34 | 0.42 | 12.2 | 46.77 | 23.60 | 18.00 | 2.52 | 0.54 | 45.21 | 96.66 |
| Pedon-P7 Trimbakdas Nana Zavar Village-Ausa Tal. Ausa (Calcic Haplustepts) | | | | | | | | | | | | |
| Ap | 0-19 | 8.05 | 0.38 | 0.62 | 9.8 | 54.71 | 23.20 | 24.80 | 2.28 | 2.96 | 53.24 | 97.31 |
| Bw1 | 19-27 | 8.48 | 0.34 | 0.52 | 12.85 | 51.16 | 26.40 | 20.80 | 2.13 | 1.08 | 50.41 | 98.53 |
| Ck | 27-41 | 8.74 | 0.27 | 0.39 | 15.26 | 46.14 | 23.60 | 18.00 | 2.52 | 1.00 | 45.12 | 97.78 |
| Pedon-P8 Suresh Dnyaba Pawar Village-Yaktpur Tal. Ausa (Typic Ustorthents) | | | | | | | | | | | | |
| Ap | 0-22 | 7.80 | 0.33 | 0.84 | 9.8 | 49.26 | 21.66 | 22.70 | 1.77 | 1.85 | 48.04 | 97.52 |
| Ac | 22-35 | 8.21 | 0.27 | 0.62 | 11.95 | 51.12 | 28.48 | 19.77 | 1.11 | 1.49 | 50.85 | 99.47 |
| Cr | 35-48 | 8.16 | 0.42 | 0.51 | 12.85 | 45.76 | 25.77 | 17.26 | 0.85 | 0.91 | 44.79 | 97.88 |
| Pedon-P9 Govind Haribhau Dhotre Village-Sugaon Tal. Latur (Typic Haplusterts) | | | | | | | | | | | | |
| Ap | 0-21 | 8.43 | 0.40 | 0.78 | 5.12 | 53.26 | 36.09 | 14.74 | 0.86 | 0.89 | 52.58 | 98.72 |
| Bw1 | 21-37 | 8.57 | 0.30 | 0.71 | 4.4 | 57.77 | 35.85 | 18.81 | 1.14 | 0.81 | 56.61 | 97.99 |
| Bw2 | 37-57 | 8.77 | 0.39 | 0.69 | 4.2 | 66.28 | 40.33 | 21.75 | 1.41 | 0.75 | 64.24 | 96.92 |
| Bss1 | 57-70 | 8.83 | 0.31 | 0.56 | 5.6 | 65.29 | 31.11 | 31.19 | 1.14 | 0.61 | 64.05 | 98.10 |
| Bss2 | 70-82 | 8.35 | 0.38 | 0.49 | 7.4 | 69.78 | 37.09 | 30.21 | 1.09 | 0.55 | 68.94 | 98.79 |
| Bss3 | 82-120 | 8.86 | 0.34 | 0.37 | 8.18 | 66.03 | 47.07 | 16.51 | 1.03 | 0.49 | 65.1 | 98.59 |

**Table 4:** Soil site suitability classification as per FAO (1983)

| Pedons | Yield (t ha$^{-1}$) | % of optimum yield | Suitability class FAO (1983) |
|---|---|---|---|
| Pedon-1 | 21.16 | 83.30 | S1 |
| Pedon-2 | 19.18 | 75.51 | S2 |
| Pedon-3 | 17.29 | 68.07 | S2 |
| Pedon-4 | 20.64 | 81.25 | S1 |
| Pedon-5 | 22.17 | 87.28 | S1 |
| Pedon-6 | 16.72 | 65.82 | S2 |
| Pedon-7 | 14.65 | 57.67 | S2 |
| Pedon-8 | 20.76 | 81.73 | S2 |
| Pedon-9 | 12.85 | 50.59 | S2 |

- SIR: Classes

Very poor- (10-19), Poor- (20-39), Fair-(40-59), Good (60-69), Excellent (80-100)

- FAO: Optimum yield of pomegranate in study area – 25.4 t ha-1
- Suitability classes:

S1- Highly suitable, S2- Moderatly suitable, S3- Marginally suitable, N1- currently not suitable, N2 - unsuitable

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