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Fertility status of soils under pomegranate cultivation in Challakere taluk of Chitradurga district, Karnataka

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Abstract

A study was carried out to assess the fertility status of soils under pomegranate orchards of Challakere taluk of Chitradurga district, Karnataka during the year 2023-24. A total of 100 soil samples at two depths (0-20 and 20-40 cm) were collected from different pomegranate growing orchards across Challakere taluk. The soil samples were analysed for various soil fertility parameters. The results indicated that at 0-20 cm depth, soil reaction was found to be slightly acidic to alkali (5.90 to 9.20), electrical conductivity (EC) ranged from 0.45 to 3.50 dS m⁻¹ and soil organic carbon (SOC) was low to medium in these soils and ranged between 1.50 to 7.20 g kg⁻¹. Available N (319.88 ± 65.84 kg ha⁻¹) and P (16.19 ± 6.18 kg ha⁻¹) were in the range of low to medium and available K (194.00 ± 82.28 kg ha⁻¹) ranged from low to high. Further, DTPA-extractable Fe, Mn, Zn and Cu was found to be sufficient in majority of the soil samples. Whilst, available boron ranged from 0.10 to 0.57 mg kg⁻¹ and was found to be deficient in majority of the samples. In majority of the samples exchangeable calcium and magnesium were found to be sufficient at both surface and surface, and the available sulphur was found deficient. At 20-40 cm depth, soil reaction was found to be slightly acidic to alkali, EC varied from 0.41 to 2.80 dS m⁻¹ and SOC was low in status. Majority of the samples were low in available N and P. Available K ranged from low to high. Majority of the samples were sufficient for exchangeable Ca and Mg, while available sulphur was found to be deficient. Soil samples were sufficient in DTPA-extractable micronutrients Fe, Mn, Zn and Cu. Deficient in available boron.

Keywords: Available, DTPA= Diethylene triamine penta acetic acid

Introduction

Pomegranate (*Punica granatum* L.) is an important fruit crop in arid and semiarid regions of the world. Pomegranate is a light-loving plant and reacts negatively to excessive shading. However, direct sunlight and considerable heating often have harmful effects on fruits, leading to sunburns. The optimal conditions for pomegranate cultivation include annual 18-55 cm precipitation and mild winters. However, the best quality fruits are produced in arid regions with long, hot, dry summers. It is well known that arid regions have vast potential for intensive cultivation and quality fruit production with assured irrigation. It can easily withstand temperatures up to 45-48 °C in combination with dry, hot winds. They are cultivated across three main flowering seasons: Ambe bahar, Mirg bahar and Hasta bahar, ensuring continuous production throughout the year under suitable climatic conditions. Pomegranate cultivation provides higher cash incomes per unit of land compared to cereals and supports human health, environmental quality, and aesthetic value, making it a valuable crop in agricultural and nutritional contexts.

Karnataka stands as the second largest pomegranate-producing state in the country with an area of 27,693 ha, production of about 3.02 lakh tons and productivity of 10.92 tons per hectare. The major producing districts are Chitradurga, Vijayapura, Tumkuru, Dharwad, Bagalkote and Koppal. In the Chitradurga district of Karnataka, pomegranate is being grown on a commercial scale. The area under pomegranate in the Chitradurga district is 4,629 ha as per 2021-22 data. The Challakere taluk consists of a 1.384 ha area with a production of 1.38 thousand tons and a productivity of around 10.92 tons ha⁻¹.

Materials and Methods

The present study was carried out to characterize the pomegranate-growing soils of Challakere taluk, Karnataka. The soil samples were collected from major pomegranate-growing soils of Challakere taluk, which include four hobli's of Challakere taluk, particularly Challakere, Nayakanahatti, Parasurampura, and Thalaku.

Geology of Study Area

The geology of Chitradurga district in Karnataka is characterized by its ancient Precambrian rock formations, predominantly belonging to the Dharwar Craton. This craton features a variety of metamorphic and igneous rocks, including granites, gneisses, and schists. These rocks are notable for their age, with some dating back over 2.5 billion years. The district's geological structure is marked by a series of complex folds, faults, and fractures, which contribute to its varied topography. Economically, Chitradurga is significant for its mineral resources, particularly iron ore, manganese, and bauxite, which have historically supported mining activities. The region also exhibits a range of soil types, including red soils that are well-suited for agriculture. Mineral resources found here are Iron ore, Manganese ore, Limestone ore and also non-metallic minerals like Kyanite, Feldspathoids, Fuchsite, quartzite and many more.

Methodology

The available nitrogen in soils was determined by the alkaline potassium permanganate method as described by Subbiah and Asija (1956) ^[18]. Available phosphorus in soil samples was extracted using Brays and Olsen's extractants depending on the pH of the soil (Jackson, 1973) ^[11] and determined by the reduced molybdophosphoric acid blue color method using a

spectrophotometer at 660 nm. Available potassium was extracted from the soil samples using neutral N ammonium acetate in a 1:5 soil-to-extractant ratio and the concentration of potassium present in the extract was estimated by a flame photometer (Jackson, 1973) ^[11] and results were expressed as kg ha⁻¹. The exchangeable calcium and magnesium were determined by extracting the soils with neutral normal ammonium acetate solution and from the extract, calcium and magnesium were determined by versenate titration method (Jackson, 1973) ^[11]. Available sulphur was extracted from soil using 0.15% calcium chloride solution at a 1:5, soil-to-extractant ratio. The concentration of sulphur was determined by the turbidometric method using a spectrophotometer at 420 nm as described by Black (1965) ^[8]. The DTPA extracting solution consists of 0.05 M diethylene triamine penta acetic acid + 0.01 M CaCl₂ 2.H₂O + 0.1 N tri-ethanolamine buffered at pH 7.3 (Lindsay and Norvell, 1978) ^[13]. Twenty grams of soil sample was shaken with 40 ml extracting solution for 2 hours. The soil was filtered through the Whatman No.42 filter paper. Zinc, Fe, Mn and Cu in the extract were determined by using an atomic absorption spectrophotometer (Perkin's Elmer, Analyst 400) fitted with appropriate hollow cathode lamps under specific measuring conditions. Available boron in soils were determined by the hot water soluble (HWS-B) method developed by Berger and Troug (1939) ^[7].

Results

Fertility status of pomegranate growing soils

Available N, P₂O₅ and K₂O

Result from Table 1. represents that the available nitrogen (N), phosphorus (P₂O₅), and potassium (K₂O) status in pomegranate orchard soils in Challakere taluk.

Table 1: Available N, P₂O₅ and K₂O of pomegranate growing orchards of Challakere taluk.

Hobli		Depth (cm)	Available N (kg ha ⁻¹)	Available P ₂ O ₅ (kg ha ⁻¹)	Available K ₂ O (kg ha ⁻¹)
Challakere	Range	0-20	188.16-438.90	8.73-19.45	103.76-618.51
	Mean	0-20	291.63 ± 65.18	14.53 ± 2.80	265.32 ± 129.23
	Range	20-40	125.40-313.50	5.64-21.25	88.03-473.22
	Mean	20-40	222.29 ± 47.67	11.72 ± 3.61	189.15 ± 91.96
Parasurampura	Range	0-20	188.16-489.06	2.80-26.24	94.75-256.71
	Mean	0-20	320.01 ± 65.08	14.47 ± 5.85	163.38 ± 38.94
	Range	20-40	131.71-432.63	3.19-22.97	61.29-194.88
	Mean	20-40	251.90 ± 64.26	11.45 ± 5.14	128.42 ± 29.98
Nayakanahatti	Range	0-20	232.06-507.87	9.51-34.33	102.82-293.00
	Mean	0-20	341.87 ± 64.45	19.48 ± 6.95	183.39 ± 38.71
	Range	20-40	188.10-438.90	5.64-25.34	72.57-251.06
	Mean	20-40	280.46 ± 61.92	15.43 ± 5.10	152.43 ± 39.05
Thalaku	Range	0-20	206.68-413.82	8.99-30.24	115.45-427.39
	Mean	0-20	314.08 ± 59.10	15.59 ± 5.88	191.51 ± 84.51
	Range	20-40	175.62-376.20	4.25-23.87	95.42-412.74
	Mean	20-40	265.02 ± 58.66	12.16 ± 5.46	154.83 ± 67.58

4.3.2 Exchangeable Calcium (Ca), Magnesium (Mg) and available Sulphur (S)

The analysis of exchangeable calcium (Ca), magnesium (Mg),

and available sulphur (S) in soils under pomegranate orchards of Challakere taluk are presented in table 2.

Table 2: Exchangeable calcium (Ca), magnesium (Mg) and available sulphur (S) status in pomegranate growing soils of Challakere taluk

Hobli		Depth (cm)	Ca [cmol (p ⁺) kg ⁻¹]	Mg [cmol (p ⁺) kg ⁻¹]	S (mg kg ⁻¹)
Challakere	Range	0-20	4.20-16.00	1.00-8.90	3.50-11.07
	Mean	0-20	9.12 ± 3.61	4.12 ± 1.91	7.09 ± 1.94
	Range	20-40	3.50-24.00	0.90-10.60	2.83-13.56
	Mean	20-40	11.71 ± 5.82	3.98 ± 1.92	6.66 ± 2.61
Parasurampura	Range	0-20	3.80-16.80	0.90-10.50	3.16-10.96
	Mean	0-20	8.20 ± 3.05	3.34 ± 2.09	6.66 ± 2.03
	Range	20-40	4.10-16.40	1.10-7.10	1.92-10.51
	Mean	20-40	7.96 ± 3.09	3.25 ± 1.64	6.00 ± 2.23
Nayakanahatti	Range	0-20	3.70-15.40	0.90-10.10	4.29-19.21
	Mean	0-20	6.80 ± 3.29	2.43 ± 2.35	8.41 ± 3.58
	Range	20-40	3.40-17.10	0.90-7.80	3.50-18.40
	Mean	20-40	7.00 ± 3.46	2.40 ± 1.90	6.91 ± 2.72
Thalaku	Range	0-20	3.30-21.40	1.00-12.40	2.60-13.67
	Mean	0-20	8.16 ± 3.71	3.30 ± 2.76	6.64 ± 2.39
	Range	20-40	3.10-24.00	1.00-17.90	3.50-11.41
	Mean	20-40	8.20 ± 4.61	4.17 ± 4.22	6.13 ± 1.90

Table 3: Micronutrient [DTPA extractable iron (Fe), manganese (Mn), zinc (Zn), copper (Cu) and available boron (B)] status of pomegranate growing soils of Challakere taluk

Hobli		Depth (cm)	Fe (mg kg ⁻¹)	Mn (mg kg ⁻¹)	Zn (mg kg ⁻¹)	Cu (mg kg ⁻¹)	B (mg kg ⁻¹)
Challakere	Range	0-20	3.04-12.32	5.63-26.20	0.65-3.08	0.66-3.42	0.18-0.55
	Mean	0-20	6.90±2.76	18.28±5.10	1.51±0.66	1.78±0.72	0.41±0.11
	Range	20-40	2.60-9.53	4.88-20.32	0.20-2.16	0.25-2.11	0.1-0.52
	Mean	20-40	5.27±1.95	15.52±4.55	1.19±0.60	1.16±0.40	0.30±0.14
Parasurampura	Range	0-20	2.15-12.56	9.10-31.46	0.16-6.60	0.65-4.47	0.16-0.54
	Mean	0-20	6.44±2.86	19.87±6.43	2.08±1.96	1.65±0.70	0.35±0.11
	Range	20-40	2.03-10.12	5.02-27.30	0.11-2.16	0.21-2.43	0.08-0.54
	Mean	20-40	4.91±1.90	16.00±5.57	0.92±0.69	1.09±0.47	0.27±0.10
Nayakanahatti	Range	0-20	1.24-17.52	8.45-32.48	0.64-20.70	0.65-3.22	0.14-0.72
	Mean	0-20	7.61±4.43	18.24±6.76	3.11±4.84	1.68±0.64	0.37±0.14
	Range	20-40	1.02-12.98	7.28-29.36	0.42-17.24	0.32-2.82	0.13-0.56
	Mean	20-40	6.11±3.48	13.89±4.57	1.97±3.13	1.26±0.63	0.30±0.10
Thalaku	Range	0-20	2.28-18.98	2.49-28.41	0.42-3.86	0.49-2.93	0.1-0.63
	Mean	0-20	6.00±4.36	13.68±5.56	1.45±0.74	1.52±0.59	0.34±0.17
	Range	20-40	2.10-16.54	1.71-27.92	0.37-2.12	0.36-1.91	0.10-0.52
	Mean	20-40	4.91±3.74	11.74±5.37	1.01±0.49	1.05±0.45	0.26±0.14

The assessment of DTPA-extractable micronutrients iron (Fe), manganese (Mn), zinc (Zn), copper (Cu) and available boron (B) in the soils of pomegranate orchards in Challakere taluk were presented in table 3.

Discussion

Available N, P₂O₅ and K₂O

Available nitrogen

The pomegranate orchard soils in Challakere, Parasurampura, Nayakanahatti, and Thalaku hobli of Challakere taluk exhibit varying levels of available nitrogen. In Challakere hobli, the mean available N was 291.63±65.18 kg ha⁻¹ at 0-20 cm depth and 222.29±47.67 kg ha⁻¹ at 20-40 cm depth, which ranged from 188.16 to 438.90 kg ha⁻¹ and 125.40 to 313.50 kg ha⁻¹ respectively. In Parasurampura Hobli, the mean N content was higher at 320.01±65.08 kg ha⁻¹ for the top layer and 251.90±64.26 kg ha⁻¹ for the lower layer. Nayakanahatti hobli showed a mean available N of 341.87±64.45 kg ha⁻¹ at 0-20 cm and 280.46±61.92 kg ha⁻¹ at 20-40 cm, which ranged from 232.06 to 507.87 kg ha⁻¹ in surface and 188.1 to 438.9 kg ha⁻¹ in subsurface. In Thalaku hobli, available N ranged from 206.8 to 413.82 kg ha⁻¹ (mean 314.08±59.10 kg ha⁻¹) at 0-20 cm and from 175.62 to 376.2 kg ha⁻¹ (mean 265.02±58.66 kg ha⁻¹) at 20-40 cm. These results suggested that the pomegranate orchard soils in these regions have low to medium available nitrogen status, about 26 per cent of the surface and 67 per cent of subsurface samples were found to be low in N status, whereas 74 percent of the surface and 33 per cent of subsurface samples

were found to be medium in N status. The available N was decreased with the depth this might be influenced by the decrease in organic matter content with depth as well as low precipitation which is not sufficient to leach the nutrients down. Nitrogen is critical for the growth and productivity of pomegranate crops. Regular soil testing and balanced fertilization, based on crop requirements were essential for maintaining soil fertility and optimizing pomegranate yields in the region.

The observed medium levels of available nitrogen in surface soil samples might be attributed to a low organic matter content, as noted in previous studies by Prasuna Rani *et al.* (1992) [14] and Rajeshwar and Khan (2007) [16]. Additionally, salt-affected soils often exhibit poor nitrogen availability, which can be linked to inadequate vegetative cover and a faster rate of organic matter decomposition. The decline in nitrogen levels is further exacerbated by the low organic matter content in the surface soils, coupled with semi-arid climatic conditions that promote rapid oxidation and hinder the accumulation of organic matter. This combination of factors contributes to the reduced nitrogen content in these soils, as highlighted by Bandopadhyay *et al.* (2004) [6]. These results were in line with the results of Shivakumar *et al.*, 2017 [20].

Available phosphorous

The analysis of available phosphorus (P₂O₅) in the pomegranate orchard soils across different hobli's in Challakere taluk revealed significant variability and trends that are crucial for

agricultural management. Nayakanahatti hobli has, the highest mean value for available P_2O_5 content *i.e.*, 19.48 kg ha⁻¹ in the 0-20 cm depth and Challakere hobli recorded the lowest mean value of available P_2O_5 *i.e.*, 14.53 kg ha⁻¹. As depth increases the available phosphorous content decreased and recorded the lowest value of 3.19 kg ha⁻¹. From the results, it was found that 83 per cent of surface soils were found to be low in available P and 93 per cent of the subsurface soil samples were found to be deficient which indicated that these soils are low in P_2O_5 . Arid soils frequently exhibit high phosphorus-fixing capacities, particularly in clay-rich and calcareous soils, which bind phosphorus and make it less accessible to plants. This phenomenon was accelerated by the low organic matter content typically found in these soils, which further limits the release of phosphorus into the soil solution. The higher pH levels common in arid soils can lead to the precipitation of phosphorus as insoluble compounds, reducing its availability for plant uptake. The nutrient dynamics in these regions were also influenced by the seasonal fluctuations in moisture, which can affect the solubility and mobility of phosphorus. These results were in line with the results of Dinesh *et al.*, 2018 [9].

Available potassium

The potassium (K_2O) status in the pomegranate orchard soils across the various hoblis of Challakere taluk revealed significant variations, that can impact the health and productivity of the crops. In Challakere hobli, the mean available potassium content was recorded at 265.3±129.23 kg ha⁻¹ in the 0-20 cm depth and 189.15±91.96 kg ha⁻¹ in the 20-40 cm depth. This indicated that a substantial presence of potassium, which is crucial for various physiological processes in plants, including photosynthesis, enzyme activation and osmo-regulation. In contrast, the potassium levels in Parasurampura hobli were lower, with means of 163.40±38.94 kg ha⁻¹ and 128.42±29.98 kg ha⁻¹ for the 0-20 cm and 20-40 cm depths, respectively. The range for available K across the taluk varied from 94.75 to 618.51 kg ha⁻¹ for surface samples and in subsurface it ranged between 61.29 to 473.22 kg ha⁻¹. The available K_2O status in these soils were found to be low to high in status. This discrepancy suggested that soil management practices and the inherent soil characteristics in these regions might influence nutrient availability. The variability in potassium levels can be attributed to several factors, including soil type, organic matter content and previous crop management practices. Higher potassium levels in soils were typically linked to the presence of potassium-bearing minerals, which improve nutrient availability. The increased potassium content can primarily be attributed to these minerals, as well as the application of potassic fertilizers. Similar findings were reported by Roy and Landey in 1962 [17].

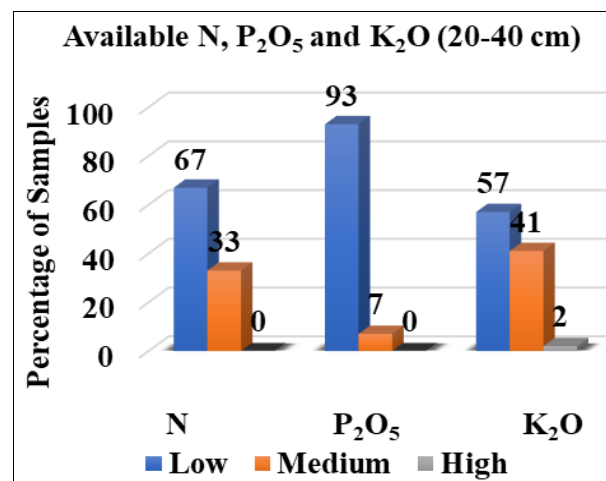
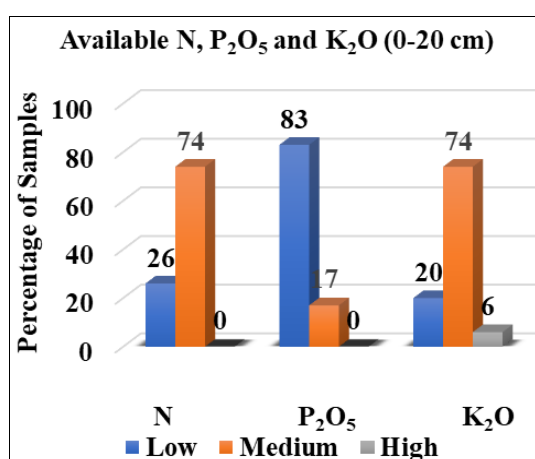


Fig 1: Available N, P_2O_5 and K_2O status of pomegranate growing soils of Challakere taluk at 0-20 cm and 20-40 cm depth

Exchangeable calcium (Ca), magnesium (Mg) and available sulphur (S)

The exchangeable calcium in the top 0-20 cm layer ranged between 3.30 to 21.40 cmol (p^+) kg⁻¹, for the 20-40 cm layer it ranged from 3.10 to 24 cmol (p^+) kg⁻¹ across the taluk. The calcium content in these soils was found to be sufficient in all the samples. In general high exchangeable calcium content in these soils which might be due to the calcareous nature of parental material may also be responsible for the high exchangeable calcium content of these soils or the limited precipitation in arid and semi-arid regions results in minimal leaching of calcium from the soil profile, this allows calcium to accumulate over time, leading to the formation of calcareous soils or in arid regions and high evaporation rates can lead to the upward movement of calcium-rich groundwater through capillary action. The observations were supported by the findings of Dar *et al.* (2017) [10] and Yogeeshappa *et al.* (2013) [22].

The exchangeable magnesium in the top 0-20 cm layer ranged between 0.9 to 12.40 cmol (p^+) kg⁻¹, for the 20-40 cm layer it ranged from 0.9 to 17.90 cmol (p^+) kg⁻¹ across the taluk. The magnesium content in these soils was found to be sufficient for 96 percent of the samples. In general high exchangeable magnesium content in these soils might be due to the presence of illite and chlorite type of minerals and these findings are similar to Dar *et al.*, (2017) [10].

The analysis of available sulphur (S) in the soils of pomegranate orchards across various hobli's in Challakere taluk indicated notable variations in nutrient levels. The available sulphur ranged from 2.60 to 19.21 mg kg⁻¹ for the top 0-20 cm layer and 1.92 to 18.4 mg kg⁻¹ for the 20-40 cm layer across the four different hobli's. From the samples, it was found that 88 percent of surface soils and 96 per cent of subsurface soils were found to be deficient. The sulphur deficiency might be due to low organic matter content due to the limited growth of vegetation. Organic matter is an important source of sulphur in soils, so its deficiency leads to low sulphur levels. These results were in line with the findings of Veeranagappa *et al.*, 2013 [21].

Available Fe, Mn, Zn, Cu and B

Iron (Fe)

The mean concentrations of DTPA-extractable iron (Fe) in the topsoil (0-20 cm) of pomegranate orchards ranged from 6.00±4.36 mg kg⁻¹ in Thalaku hobli to 7.61±4.43 mg kg⁻¹ in

Nayakanahatti hobli. These values were generally lower in the subsoil (20-40 cm), with concentrations ranged from 4.91 ± 3.74 mg kg⁻¹ in Thalaku hobli to 6.11 ± 3.48 mg kg⁻¹ in Nayakanahatti hobli. The wide range of Fe concentrations, from 1.24 to 18.98 mg kg⁻¹ in the topsoil, indicates considerable variations in its availability across the orchards and its availability decreased with depth. This variation might be due to factors such as soil type, organic matter content, mineral weathering and management practices. Arid region soils typically have low organic matter content, generally less than 1 per cent. The reduced organic matter can result in lower complexation and leaching of Fe, leading to higher availability in the soil or the presence of Fe-bearing parent material in these soils. These results are in line with the findings of Ravikumar 2003^[15] and Shiva Kumar 2017.

Manganese (Mn)

The mean concentrations of DTPA-extractable manganese (Mn) in the topsoil (0-20 cm) ranged from 13.68 ± 5.56 mg kg⁻¹ in Thalaku hobli to 19.87 ± 6.43 mg kg⁻¹ in Parasurampura hobli. Similar to Fe, Mn concentrations were lower in the subsoil (20-40 cm), ranging from 11.74 ± 5.37 mg kg⁻¹ in Thalaku hobli to 16.00 ± 5.57 mg kg⁻¹ in Parasurampura hobli. The wide range of Mn concentrations, from 2.49 to 28.41 mg kg⁻¹ in the topsoil, suggests significant variability in its availability across the pomegranate fields. This variability can be influenced by factors such as soil pH, organic matter content, redox conditions, Farmer practices, presence of Mn bearing parent material. These results were in line with the findings of Ravikumar 2003^[15], Shivakumara 2015^[19] and Shiva Kumar 2017.

Zinc (Zn)

The mean concentrations of DTPA-extractable zinc (Zn) in the topsoil (0-20 cm) ranged from 1.45 ± 0.74 mg kg⁻¹ in Thalaku hobli to 3.11 ± 4.84 mg kg⁻¹ in Nayakanahatti hobli. In the subsoil (20-40 cm), Zn concentrations were sufficient in status and ranged from 0.92 ± 0.69 mg kg⁻¹ in Parasurampura hobli to

1.97 ± 3.13 mg kg⁻¹ in Nayakanahatti hobli. The variations in Zn concentrations were less pronounced compared to Fe and Mn, but still notable, which ranged from 0.16 to 20.70 mg kg⁻¹ in the topsoil. Factors such as soil pH, organic matter content, Farmer practice of soil and foliar application of micronutrients, and the presence of other cations can influence Zn availability in the soil. These results were in line with the findings of Gathala *et al.* (2004)^[11].

Copper (Cu)

The mean concentrations of DTPA-extractable copper (Cu) in the topsoil (0-20 cm) ranged from 1.52 ± 0.59 mg kg⁻¹ in Thalaku hobli to 1.78 ± 0.72 mg kg⁻¹ in Challakere hobli. In the subsoil (20-40 cm), Cu concentrations were sufficient and ranged from 1.05 ± 0.45 mg kg⁻¹ in Thalaku hobli to 1.26 ± 0.63 mg kg⁻¹ in Nayakanahatti hobli. The variability in Cu concentrations was relatively low compared to other micronutrients and ranged from 0.49 to 4.47 mg kg⁻¹ in the top soil of the taluk. Factors such as soil organic matter content, pH, plant uptake, and the presence of other cations can influence Cu availability in the soil. These results were in line with the findings of Ravikumar 2003^[15], Shivakumara 2015^[19] and Shiva Kumar 2017.

Boron (B)

The mean concentrations of available boron (B) in the topsoil (0-20 cm) ranged from 0.34 ± 0.17 mg kg⁻¹ in Thalaku hobli to 0.41 ± 0.11 mg kg⁻¹ in Challakere hobli. In the subsoil (20-40 cm), B concentrations were lower and ranged from 0.26 ± 0.14 mg kg⁻¹ in Thalaku hobli to 0.30 ± 0.14 mg kg⁻¹ in Challakere hobli. The variability in B concentrations was relatively low and ranged from 0.14 to 0.72 mg kg⁻¹ in the top soils of the taluk. The available boron content decreased with depth which might be due to crop uptake or reduction in organic matter content with depth. Low boron in these soils might be due to low organic matter content, and plant uptake. The results of the study were in line with the findings of Ravikumar 2003^[15] and Shivakumara 2015^[19].

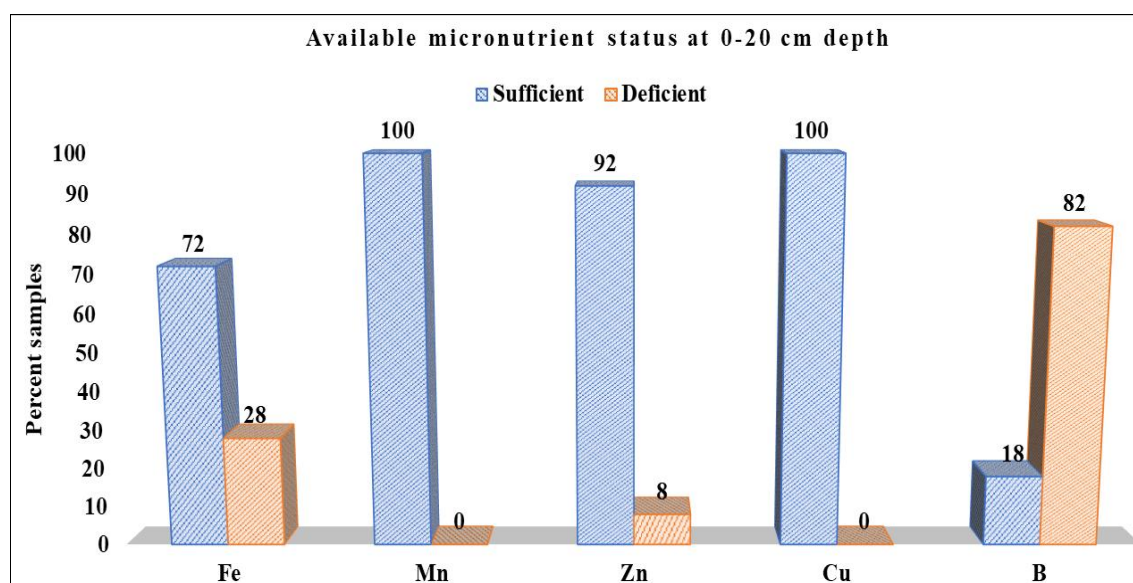


Fig 2: Available micronutrient status in surface soils of pomegranate growing soils of Challakere taluk

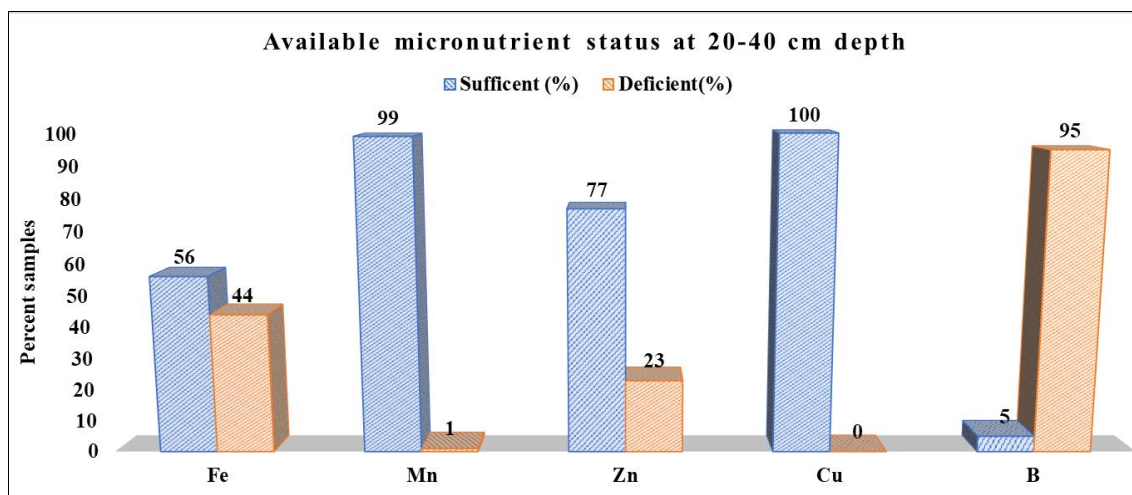


Fig 3: Available micronutrient status in subsurface soils of pomegranate growing soils of Challakere taluk

Conclusion

The study of soil properties in various hoblis of Challakere taluk has shed light on important soil characteristics for pomegranate cultivation. It revealed the status of macro and micronutrients. The findings indicate significant variations in nutrient availability across the region's soils, with certain areas exhibiting deficiencies that could impact agricultural productivity. Addressing these deficiencies through targeted soil management and appropriate fertilization strategies is essential for optimizing crop performance. Regular soil testing will be crucial to monitor nutrient levels and adjust practices as needed, ensuring that farmers can effectively enhance soil health and crop yields. To enhance soil health, incorporating organic fertilizers is essential, as the soils are currently lacking in this area. Additionally, practices like green manuring and stubble mulching should be adopted to conserve moisture and reduce salt accumulation near the surface.

Application of research: Study of soil fertility status in pomegranate growing areas of Challakere taluk, Karnataka.

Research Category: Soil fertility assessment macro and micronutrients (Fe, Mn, Zn, Cu and B)

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Study area / Sample Collection: Challakere taluk.

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Appendix 1: Nutrients ratings of available N, P₂O₅ and K₂O

Sl. No.	Nutrient	Ratings		
		Low (L)	Medium (M)	High (H)
1.	Available N (kg ha ⁻¹)	<280	280-560	>560
2.	Available P ₂ O ₅ (kg ha ⁻¹)	<22.9	22.9-56.3	>56.3
3.	Available K ₂ O (kg ha ⁻¹)	<141	141-336	>336

Critical limits of secondary and micronutrients in soils

Sl. No.	Elements	Critical limits
1	Ca	2 [cmol (p ⁺) kg ⁻¹]
2	Mg	1 [cmol (p ⁺) kg ⁻¹]
3	S	10.0 (mg kg ⁻¹)
4	Fe	4.5 (mg kg ⁻¹)
5	Mn	2.0 (mg kg ⁻¹)
6	Cu	0.2 (mg kg ⁻¹)
7	Zn	0.6 (mg kg ⁻¹)
8	B	0.5 (mg kg ⁻¹)

Appendix 2: Hobli wise village name and number of soil samples collected from each village

Challakere taluk			
Hobli	Village	Sample No.	Total number of samples
Challakere	Challakere	1, 2	18
	Lakshmipura	3, 4, 5, 6	
	Chikkenahalli	7, 8, 9, 14, 15	
	Kannenahalli	10, 11	
	Sanikere	12, 13	
	Durgavara	16, 17, 18	
Parasurampura	Chawluru	1, 2, 3, 4	30
	Obanahalli	5, 6, 7, 8, 9	
	Obalapura	10, 11, 12, 13	
	Kallaramahalli	14, 15, 16, 17	
	Parasurampura	18, 19, 20, 21, 30	
	Devarahalli	22, 23, 24, 25	
Nayakanahatti	Chawluru kavalu	26, 27, 28, 29	29
	Naikanahatti	1, 2, 3, 14, 15	
	Nerlkunte	4, 5, 6, 7, 8	
	Mallarahalli	9, 10, 11, 12, 13	
	Chawlkere	16, 17, 18, 19	
	Channabasanahatti	20, 21	
	Narayanpura	22, 23, 24, 25	
	Dasaramuttalli	26, 27	
Thalaku	Mahadevpura	28, 29	23
	Henjemuttalli	1, 2, 3, 4, 5	
	Devreddihalli	6, 7, 8, 9, 20	
	Banjigere	10, 11, 12, 13, 14	
	Doddaullarathi	15, 16, 17, 18, 19	
	Hirehalli	21, 22, 23	