

Assessment of Micronutrient Status in Jasmine (*Jasminumazoricum* L.) Growing Soils of HuvinaHadagali Taluk, Vijayanagara District of Karnataka

ABSTRACT

The present study was conducted during winter (November-December, 2022) in Jasmine growing area of HuvinaHadagali Taluk, Vijayanagara District to assess the soil micronutrient status in Jasmine growing area and analysed for their fertility parameters. A total of 60 soil samples were collected, of which 30 surface (0–20 cm) and 30 subsurface (20–40 cm) soil depths covering six villages namely Huvinahadagali, Hanakanahalli, Vinobhanagara, Meerakornahalli, Devagondanahalli and Thippapura. In surface soil, available micronutrients boron, zinc, iron, copper and manganese ranged from 0.45 to 1.28, 0.24 to 0.98, 1.17 to 7.90, 0.30 to 3.76 and 2.44 to 22.52 mg kg⁻¹, respectively. Mean soil pH was 7.96, mean soluble salt was 0.27 dS m⁻¹ and soil organic carbon ranged from 2.40 to 6.80 g kg⁻¹. In subsurface soil, available micronutrients boron, zinc, iron, copper and manganese ranged from 0.36 to 1.09, 0.16 to 0.80, 0.96 to 6.76, 0.16 to 2.72 and 1.84 to 20.86 mg kg⁻¹, respectively. Mean soil pH was 8.06, mean soluble salt was 0.32 dS m⁻¹ and soil organic carbon ranged from 1.60 to 6.00 g kg⁻¹. The results showed that soil micronutrient status of Jasmine growing area of HuvinaHadagali taluk was found in the range of deficit, sufficient and excess due to improper nutrient management practices like continuous use of chemical fertilizers and less use of organics which results in poor soil fertility leading to low yield and low quality of Jasmine flowers.

Key words: Jasmine, Micronutrient, Nutrient status, Soil

1. Introduction

Floriculture is a vital sub-sector of horticulture, having potential for providing employment opportunities to farmers especially small and marginal farmers (Kaviarasan et al., 2015). Jasmine is an important flower crop cultivated for its loose flowers. The flowers is used largely in all religious, social and cultural ceremonies performed by people of all faiths and religion. Jasmine flowers are used for making garlands and Essential oils are extracted from the flowers which has vast export potential (Latha and Pichumani, 2018). HadagaliMallige (*Jasminumazoricum*) which belongs to the family *Oleaceae* is native to India or South East Asia. Locally known as “VasaneMallige”, (fragrant Jasmine), it is grown

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mainly in HuvinaHadagali taluk (Sharanabasava et al., 2023).In India total jasmine is grown in an area of 26.15 thousand hectares with production of 237.74 thousand metric tonnes. In Karnataka, jasmine is grown in an area of 3.13 thousand hectares with production of 23.18 thousand metric tonnes(Anonymous, 2021). Karnataka stands second in terms of production after Tamil Nadu (Anonymous, 2022).

Jasmine is inhaled to improve mood, reduces stress and reduce food cravings. In foods, Jasmine is used to flavour beverages, frozen dairy desserts, candy etc. Also used as an aphrodisiac, a sedative, an antiseptic, antidepressant, antispasmodic, and analgesic. In Ayurveda, Jasmine has been used as an aphrodisiac and as a means to increase immunity and fight fever. It has also been regarded as a means to treat conjunctivitis (Sudheer et al.,2018). In traditional Chinese medicine, Jasmine flowers are brewed and consumed as herbal and remedial tea. An infusion of Jasmine tea is known to be beneficial in treating fever, urinary inflammation, and other infections. In addition, Jasmine tea can be helpful in relieving stress and anxiety. It can be extremely helpful for people suffering from heat stroke or sunstroke (Anshuman and Vyas, 2018).

Soil fertility is one of the important factors that control crop yields. Soil characterization of an area in relation to their soil fertility status is important for sustainable agricultural production (Dhanve et al., 2018). Introduction of high yielding varieties in Indian agriculture encouraged the farmers to apply nutrients through fertilizers. However, production response efficiency to fertilizer nutrients declined significantly over the last few decades. Imbalanced and inadequate fertilizer use without micronutrients can affect crop productivity and soil health (Bangre et al., 2020).

The successful cultivation of jasmine is dependent on many factors such as climate, soil fertility, irrigation and other agronomic practices. Among these soil nutrients especially micronutrients have major effect on plant growth, development and yield (Sharanabasava et al., 2023).

Plants require micronutrients to complete their life cycle. Micronutrients are present in the soil in large quantities but only a small quantity is required as a nutrient. These micronutrients play an important role in enzymatic activity and regulate metabolic activities. Zinc helps in synthesizing various enzymes, chlorophyll formation and functional, structural components like protein synthesis, photosynthesis and synthesis of auxin(Zeng et al., 2021). Boron, one of the most important inorganic micronutrients, plays a vital role in normal plant growth (Vera et al., 2019), enhanced quality of crops (Souri and Hatamian, 2019).Iron is

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essential for chlorophyll formation, protein synthesis and also involved in various metabolic reactions. Magnesium is the main constituent of chlorophyll and helps in the uptake of phosphorus (Kuldeep Kumar et al., 2023).

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Imbalanced nutrient use by farmers has resulted in aggravating the multiple nutrient deficiencies which reduces the quality and yield of Jasmine (Sharanabasava et al., 2023). Keeping these considerations in view with an objective of, to assess the soil micronutrient status in jasmine growing areas.

2. Material and Methods

The present study was conducted during winter (November-December, 2022) in Jasmine growing area of HuvinaHadagali Taluk, Vijayanagara District to assess the soil micronutrient status in Jasmine growing area and analysed for their fertility parameters. Huvinahadagali taluk comes under Northern Dry agro-climatic zone-III of Karnataka state. Soils are sandy loam in texture. Study area is located at 14° 43' N latitude, 75° 39' E longitude with an altitude of 527 m above mean sea level with an average annual rainfall of 620 mm and with mean annual temperature of 33°–37°C. A study was conducted in six villages of HuvinaHadagali taluk viz., Huvinahadagali, Hanakanahalli, meerakornahalli, Vinobhanagara, Devagondanahalli and Thippapuravillage from each village five Jasmine growing farmers are selected based on highest area and more than five years of experiences in Jasmine cultivation. A total of 60 soil samples from two depth 30 surface (0–20 cm) and 30 subsurface (0–20 cm and 20–40 cm depth) soil samples were collected.

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3. Results and Discussion

3.1 Soil pH

The pH of surface soil (0–20 cm) ranged from 7.58 to 8.35 with a mean value of 7.96. The lowest pH (7.58) value was recorded in Huvinahadagali village (V_1S_3), whereas, highest pH (8.35) was recorded in Vinobhanagara village (V_3S_3). Data on soil pH revealed that soils are moderately neutral to slightly alkaline in reaction. The pH in subsurface (20–40 cm) soil samples ranged from 7.72 to 8.39 with mean value of 8.06. The lowest pH (7.72) was observed in Hanakanahalli village (V_2S_2) and highest pH (8.39) was recorded in Vinobhanagara village (V_3S_3). Data on soil pH revealed that soils are neutral to alkaline in reaction (Table 1). The pH has shown increasing trend with increase in soil depth, which may

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be due to the leaching of exchangeable bases from the surface soil to sub surface soil. Similar result were reported by Fekad et al.(2020).

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3.2 Soluble salt content ($dS m^{-1}$)

A mean value of 0.27 was found for the EC of surface soil (0–20 cm), which ranged from 0.15 to 0.45 $dS m^{-1}$. The Huvinahadagali village (V_1S_5) had the greatest EC value (0.45 $dS m^{-1}$), whereas Hanakanahalli village (V_2S_3) had the lowest EC value (0.15 $dS m^{-1}$). Data on soil EC showed that soils are non-saline. A mean value of 0.32 dSm^{-1} was found as the EC of subsurface soil (20–40 cm), with a range of 0.18–0.62 dSm^{-1} . Huvinahadagali village (V_1S_5) had the highest EC (0.62 $dS m^{-1}$) whereas Vinobhanagara village (V_3S_4) recorded the lowest EC (0.18 $dS m^{-1}$) (Table 1). Surface and subsurface soils electrical conductivity was found to be normal. It is possible that salts were leached from the upper layers to the lower layers as a result of rainfall or irrigation and then accumulated at the lower soil depths. Similar outcomes and justifications were reported by Sathish et al. (2017).

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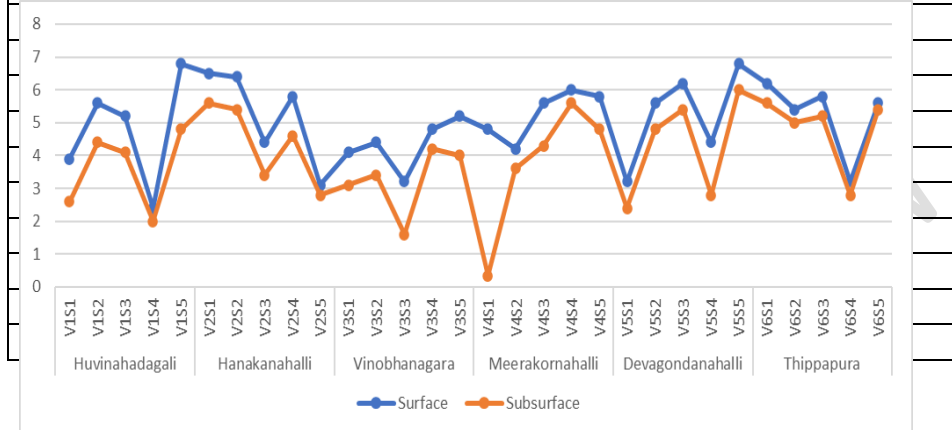
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Table 1. Status of soil reaction and soluble salt content in selected soils of Huvina Hadagali Taluk

Sl.No	Village Name	Sample Code	pH (1:2.5 soil: water)		EC ($dS m^{-1}$)	
			Surface	Subsurface	Surface	Subsurface
1	Huvinahadagali	V_1S_1	7.88	7.96	0.21	0.25
2		V_1S_2	8.32	8.36	0.20	0.28
3		V_1S_3	7.58	7.75	0.23	0.27
4		V_1S_4	8.12	8.15	0.26	0.32
5		V_1S_5	7.85	7.99	0.45	0.62
6	Hanakanahalli	V_2S_1	7.98	8.10	0.17	0.26
7		V_2S_2	7.70	7.72	0.16	0.18
8		V_2S_3	7.60	7.91	0.15	0.20
9		V_2S_4	7.94	7.98	0.26	0.38
10		V_2S_5	8.21	8.25	0.30	0.32
11	Vinobhanagara	V_3S_1	7.90	8.23	0.28	0.35
12		V_3S_2	7.95	8.10	0.24	0.30
13		V_3S_3	8.35	8.39	0.44	0.46
14		V_3S_4	7.72	7.77	0.16	0.18
15		V_3S_5	7.80	7.92	0.23	0.35
16	Meerakornahalli	V_4S_1	7.78	7.90	0.23	0.26
17		V_4S_2	7.96	8.05	0.20	0.23

18		V ₄ S ₃	7.63	7.85	0.18	0.19
19		V ₄ S ₄	7.70	7.92	0.18	0.21
20		V ₄ S ₅	8.04	8.21	0.32	0.33
21		V ₅ S ₁	8.33	8.36	0.25	0.27
22		V ₅ S ₂	7.94	8.00	0.24	0.28
23	Devagondanahalli	V ₅ S ₃	8.29	8.34	0.42	0.52



The organic carbon content in surface soil (0–20 cm) ranged from 2.40 to 6.80 g kg⁻¹ with a mean of 5.00 g kg⁻¹. Huvinahadagali village (V₁S₄) had the lowest soil organic carbon value, which was 2.40 g kg⁻¹, while Huvinahadagali village (V₁S₅) and Devagondanahalli village (V₅S₅) had the highest soil organic carbon values (6.80 g kg⁻¹). A mean value of 4.10 g kg⁻¹ was found for the soil organic carbon of subsurface soil (20–40 cm). The soil organic carbon values ranged from 1.60 to 6.00 g kg⁻¹. Soil organic carbon values ranged from 1.60 g kg⁻¹ in Vinobhanagara village (V₃S₃) to 6.00 g kg⁻¹ in Devagondanahalli village (V₅S₅). Vinobhanagara village had the lowest soil organic carbon value (Figure 1). Organic carbon content was higher in the surface soils and declined as soil depth increased. The presence of natural vegetation and addition of organic residues in surface layer results in higher organic carbon content in surface than in subsurface. Rajesh et al. (2021) provided similar evidence for these conclusions in his study.

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Figure 1: Organic carbon content in surface and subsurface soil

3.4 Available Boron (mg kg^{-1})

The available boron in surface soil (0–20 cm) ranged from 0.45 to 1.28mg kg^{-1} with a mean value of 0.91 mg kg^{-1} . The lowest available boron (0.45mg kg^{-1}) value was recorded in Huvinahadagali village (V_1S_4), whereas highest available boron (1.28mg kg^{-1}) was recorded in Hanakanahalli village (V_2S_2). The available boron in subsurface soil (20–40 cm) ranged from 0.36 to 1.09mg kg^{-1} with a mean value of 0.76mg kg^{-1} . The lowest available boron (0.36 kg ha^{-1}) value was recorded in Huvinahadagali village (V_1S_4), whereas highest available boron (1.09mg kg^{-1}) was recorded in Hanakanahalli village (V_2S_2) (Table 2). The available boron content was higher in surface soil when compared with samples of subsurface soils. This might be due to accumulation of organic matter and well drained condition in the surface soils were reported by Mamta Sahu et al. (2023).

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Sl.No.	Village Name	Sample Code	Available B (mg kg^{-1})	
			Surface	Sub-surface
1	Huvinahadagali	V_1S_1	0.51	0.43
2		V_1S_2	1.09	0.92
3		V_1S_3	0.77	0.64
4		V_1S_4	0.45	0.36
5		V_1S_5	1.15	0.83
6	Hanakanahalli	V_2S_1	1.21	1.00
7		V_2S_2	1.28	1.09
8		V_2S_3	1.02	0.64
9		V_2S_4	1.15	0.97
10		V_2S_5	0.90	1.09
11	Vinobhanagara	V_3S_1	0.77	0.71

12		V ₃ S ₂	1.02	0.90
13		V ₃ S ₃	0.64	0.58
14		V ₃ S ₄	1.15	0.61
15		V ₃ S ₅	1.22	1.09
16	Meerakornahalli	V ₄ S ₁	0.68	0.54
17		V ₄ S ₂	0.64	0.51
18		V ₄ S ₃	0.83	0.77
19		V ₄ S ₄	1.15	1.02
20		V ₄ S ₅	1.02	0.70
21	Devagondanahalli	V ₅ S ₁	0.51	0.42
22		V ₅ S ₂	0.91	0.85
23		V ₅ S ₃	0.96	0.83
24		V ₅ S ₄	0.58	0.50
25		V ₅ S ₅	1.02	0.97
26	Thippapura	V ₆ S ₁	0.98	0.84
27		V ₆ S ₂	0.93	0.74
28		V ₆ S ₃	0.96	0.81
29		V ₆ S ₄	0.77	0.61
30		V ₆ S ₅	0.94	0.81
Lowest			0.45	0.36
Highest			1.28	1.09
Mean			0.91	0.76

3.5 DTPA extractable micronutrients (mg kg⁻¹)

The result of DTPA extractable soil micronutrients, in surface (0–20 cm) and subsurface (20–40 cm) soils are presented (Table 3 & 4).

The DTPA extractable Zn in surface soil (0–20 cm) ranged from 0.24 to 0.98 mg kg⁻¹ with a mean value of 0.55 mg kg⁻¹. The lowest DTPA extractable Zn (0.24 mg kg⁻¹) value was recorded in Thippapuravillag (V₆S₄), whereas highest DTPA extractable Zn (0.98 mg kg⁻¹) was recorded in Thippapuravillage (V₆S₁). The DTPA extractable Zn in subsurface soil (20–40 cm) ranged from 0.16 to 0.80 mg kg⁻¹ with a mean value of 0.40 mg kg⁻¹. The lowest DTPA extractable Zn (0.16 mg kg⁻¹) value was recorded in Thippapura village (V₆S₄), whereas highest DTPA extractable Zn (0.80 mg kg⁻¹) was recorded in Meerakornahalli village (V₄S₄).

The DTPA extractable Fe in surface soil (0–20 cm) ranged from 1.17 to 7.90 mg kg⁻¹ with a mean value of 3.70 mg kg⁻¹. The lowest DTPA extractable Fe (1.17 mg kg⁻¹) value was

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recorded in Thippapura village (V₆S₄), whereas highest DTPA extractable Fe (7.90 mg kg⁻¹) was recorded in Vinobhanagara village (V₃S₅). The DTPA extractable Fe in subsurface soil (20-40 cm) ranged from 0.9 to 6.76 mg kg⁻¹ with a mean value of 2.6 mg kg⁻¹. The lowest DTPA extractable Fe (0.9 mg kg⁻¹) value was recorded in Huvinahadagali village (V₁S₁), whereas highest DTPA extractable Fe (6.76 mg kg⁻¹) was recorded in Vinobhanagaravillage (V₃S₅).

Table 3. Status of DTPA extractable Zn and Fe content in selected soils of Huvina Hadagali Taluk

Sl.No.	Village Name	Sample Code	DTPA extractable Zn (mg kg ⁻¹)		DTPA extractable Fe (mg kg ⁻¹)	
			Surface	Subsurface	Surface	Subsurface
1	Huvinahadagali	V ₁ S ₁	0.56	0.24	1.90	0.90
2		V ₁ S ₂	0.64	0.56	4.18	3.74
3		V ₁ S ₃	0.62	0.38	2.10	1.50
4		V ₁ S ₄	0.46	0.43	1.86	1.70
5		V ₁ S ₅	0.74	0.36	6.46	4.90
6	Hanakanahalli	V ₂ S ₁	0.56	0.48	4.72	4.14
7		V ₂ S ₂	0.88	0.52	5.40	2.28
8		V ₂ S ₃	0.41	0.36	3.90	2.28
9		V ₂ S ₄	0.54	0.33	4.42	3.92
10		V ₂ S ₅	0.36	0.24	1.82	1.12
11	Vinobhanagara	V ₃ S ₁	0.52	0.32	3.04	1.34
12		V ₃ S ₂	0.56	0.26	3.36	1.86
13		V ₃ S ₃	0.44	0.38	2.86	1.19
14		V ₃ S ₄	0.64	0.44	6.12	5.94
15		V ₃ S ₅	0.82	0.58	7.90	6.76
16	Meerakornahalli	V ₄ S ₁	0.28	0.21	2.70	2.18
17		V ₄ S ₂	0.26	0.22	2.58	1.98
18		V ₄ S ₃	0.30	0.24	3.40	2.52
19		V ₄ S ₄	0.82	0.80	5.90	4.10
20		V ₄ S ₅	0.38	0.32	3.54	2.26
21	Devagondanahalli	V ₅ S ₁	0.32	0.24	2.62	1.09
22		V ₅ S ₂	0.72	0.58	3.48	2.06
23		V ₅ S ₃	0.82	0.76	3.84	2.56
24		V ₅ S ₄	0.44	0.35	2.96	1.94
25		V ₅ S ₅	0.86	0.74	4.76	3.34
26	Thippapura	V ₆ S ₁	0.98	0.64	4.36	3.78

27		V ₆ S ₂	0.42	0.34	2.46	1.92
28		V ₆ S ₃	0.46	0.32	3.70	2.32
29		V ₆ S ₄	0.24	0.16	1.17	0.96
30		V ₆ S ₅	0.43	0.31	3.62	3.04
Lowest			0.24	0.16	1.17	0.96
Highest			0.98	0.80	7.90	6.76
Mean			0.55	0.40	3.70	2.60

The DTPA extractable Cu in surface soil (0–20 cm) ranged from 0.3 to 3.76 mg kg⁻¹ with a mean value of 1.73 mg kg⁻¹. The lowest DTPA extractable Cu (0.3 mg kg⁻¹) value was recorded in Vinobhanagara village (V₃S₃), whereas highest DTPA extractable Cu (3.76 mg kg⁻¹) was recorded in Huvinahadagalivillage (V₁S₅). The DTPA extractable Cu in subsurface soil (20–40 cm) ranged from 0.16 to 2.72 mg kg⁻¹ with a mean value of 0.89 mg kg⁻¹. The lowest DTPA extractable Cu (0.16 mg kg⁻¹) value was recorded in Hanakanahalli village (V₂S₂), whereas highest DTPA extractable Cu (2.72 mg kg⁻¹) was recorded in Huvinahadagalivillage (V₁S₅).

The DTPA extractable Mn in surface soil (0–20 cm) was ranged from 2.44 to 22.52 mg kg⁻¹ with a mean value of 9.28 mg kg⁻¹. The lowest DTPA extractable Mn (2.44 mg kg⁻¹) value was recorded in Thippapura village (V₆S₄), whereas highest DTPA extractable Mn (22.52 mg kg⁻¹) was recorded in Huvinahadagalivillage (V₁S₅). The DTPA extractable Mn in subsurface soil (20–40 cm) ranged from 1.84 to 20.86 mg kg⁻¹ with a mean value of 8.24 mg kg⁻¹. The lowest DTPA extractable Mn (1.84 mg kg⁻¹) value was recorded in Thippapura village (V₆S₅), whereas highest DTPA extractable Mn (20.86 mg kg⁻¹) was recorded in Huvinahadagalivillage (V₁S₅).

The surface soils showed higher content of DTPA extractable micronutrients than subsurface soils, which exhibited a decreasing trend with increase in soil depth. This might be due to higher organic carbon at surface soils, as organic carbon is a major contributor of DTPA zinc in soils. The low available zinc was possibly might be due to calcareousness, high pH and low organic matter which might have resulted in the formation of insoluble compounds by zinc or insoluble calcium zincate. The similar trend was reported by Bhat et al. (2017).

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Table 4. Status of DTPA extractable Cu and Mn content in selected soils of Huvinahadagalivillage

Hadagali Taluk						
Sl. No.	Village Name	Sample Code	DTPA extractable Cu (mg kg ⁻¹)		DTPA extractable Mn (mg kg ⁻¹)	
			Surface	Subsurface	Surface	Subsurface
1	Huvinahadagali	V ₁ S ₁	2.62	1.36	12.96	11.02
2		V ₁ S ₂	3.10	2.32	18.26	16.40
3		V ₁ S ₃	2.84	0.76	16.26	14.42
4		V ₁ S ₄	1.90	0.88	11.56	9.14
5		V ₁ S ₅	3.76	2.72	22.52	20.86
6	Hanakanahalli	V ₂ S ₁	2.36	0.32	17.18	16.46
7		V ₂ S ₂	2.76	0.16	19.82	18.92
8		V ₂ S ₃	1.92	0.34	10.20	8.98
9		V ₂ S ₄	2.24	0.36	12.26	11.08
10		V ₂ S ₅	1.46	0.18	9.82	8.54
11	Vinobhanagara	V ₃ S ₁	0.62	0.31	2.96	2.62
12		V ₃ S ₂	0.80	0.38	13.32	12.26
13		V ₃ S ₃	0.30	0.17	12.58	11.78
14		V ₃ S ₄	1.10	1.08	17.58	14.18
15		V ₃ S ₅	1.78	1.64	19.38	16.32
16	Meerakornahalli	V ₄ S ₁	0.44	0.30	3.10	2.60
17		V ₄ S ₂	0.42	0.34	2.90	2.16
18		V ₄ S ₃	1.34	0.96	6.96	5.06
19		V ₄ S ₄	2.64	1.84	9.54	8.12
20		V ₄ S ₅	2.04	1.36	7.14	6.34
21	Devagondanahalli	V ₅ S ₁	1.36	1.57	3.00	2.18
22		V ₅ S ₂	2.36	1.32	4.66	2.78
23		V ₅ S ₃	2.42	1.24	5.04	4.66
24		V ₅ S ₄	2.24	1.32	4.62	3.90
25		V ₅ S ₅	2.56	1.46	5.12	3.36
26	Thippapura	V ₆ S ₁	1.36	0.52	4.62	3.76
27		V ₆ S ₂	0.90	0.36	3.00	2.42
28		V ₆ S ₃	1.22	0.68	3.62	3.06
29		V ₆ S ₄	0.42	0.28	2.44	2.12
30		V ₆ S ₅	0.62	0.34	3.22	1.84
Lowest			0.30	0.16	2.44	1.84
Highest			3.76	2.72	22.52	20.86
Mean			1.73	0.89	9.51	8.24

4. Conclusion

~~It was concluded that~~, micronutrient status in Jasmine growing area of HuvinaHadagali taluk was found in the range of deficit, sufficient and excess, due to improper nutrient management practices result in low organic carbon content, poor soil fertility leading to low yield and low quality of Jasmine. On the basis of soil test report, the micronutrients are applied in proper mode. Hence it is suggested to apply organic manures with biofertilizers and judicious use of chemical fertilizers.

5. References

- Anonymous, 2021. *Indiastat focused on fact. Available from indiastat focused on fact 2021* www.indiastatmedia.com. Accessed on 13th August, 2023.
- Anonymous, 2022. Report of National Horticulture Board (NHB). Agricultural and Processed Food Products Export Development (APEDA). Available from APEDA annual report 2016 <https://agriexchange.apeda.gov.in>. Accessed on 2nd December, 2023.
- Anshuman Singh A, Bhupendra Vyas B. Night Jasmine (*Nyctanthes arbor-tristis*). *Journal of Pharmacognosy and Phytochem*. 2018;10(4): 324-330.
- Bangre J, Dwivedi AK, Mohanty M, Subhash, Dwivedi BS, Dwivedi SK. Effect of long-term fertilizer application on performance of wheat crop and soil properties in a Vertisol. *Indian Journal of Pure and Applied Biosciences*. 2020; 8: 217-227.
- Bhat ZA, Akhtar FA, Padder SA, Ganale AQ, Rehman HU, Dar NA, Gill RK. Nutrient status of grape orchard soils of Jammu and Kashmir, India. *International Journal of Ecology and Environmental Sciences*. 2017; 2(5): 12-19.
- Dhanve SS, Mane SS, Deshmukh GB. Assessment of soil fertility status of agricultural research station, Badnapur, India. *International Journal of Current Microbiology and Applied Sciences*. 2018; 6: 2424-2429.
- Fekad S, Jembere K, Fekadu E, Wasie D. Land use and land cover dynamics and properties of soils under different land uses in the Tejibara watershed Northwest Ethiopia. *The Science World Journal*. 2020; 1-12.
- Kaviarasan K, Singh DR, Arya P. An economic analysis of rose production system in Tamil Nadu. *Biotech articles*. 2015; 3311.

- Kuldeep Kumar, Vikas Kumar, Jitendra Kumar Malik. Essential nutrients for plant growth, nutrient functions and deficiency symptoms: A review. *DizhenDizhi Journal*. 2023; 15(2): 35-45.
- Latha R, Pichumani R. An economic study on jasmine cultivation in Ettarai Village in Tiruchirappalli District. *International Journal of Research and Analytical Reviews*. 2018; 5(3): 54-60.
- Mamta Sahu, Kundu, MC, Mohammed Nisab CP. Soil properties influence vertical distribution of boron fractions in lateritic soil. *International Journal of Bio-resource and Stress Management*. 2023; 14(9): 1249-1261.
- RajeshNL, Narayan Rao K, Satishkumar U, Wali VB, Basavaraj K, Rudramurthy HV, Desai BK. Variability in soil properties influencing Pigeonpea (*Cajanuscajana* L.) yield: a multivariate statistical analysis. *F1000 Research*. 2021; 10(944): 44.
- Sathish A, Ramachandrappa BK, Devaraja K, Savitha MS, Thimme Gowda MN, Prashanth KM. Assessment of spatial variability in fertility status and nutrient recommendation in Alanatha Cluster Villages, Kanakapura Taluk, Ramanagara District, Karnataka using GIS techniques. *International Journal of Current Microbiology and Applied Sciences*. 2017; 6(5): 211-224.
- Sharanabasava, ManjunathaBhanuvally, Bhat SN, Ravi S, Mahadevaswamy, Ramesh G. Identification of nutrient constraints in jasmine (*Jasminumazoricum* L.) growing soils of HuvinaHadagali Taluk, Vijayanagara district. *The Pharma Innovation Journal*. 2023; 12(10): 890-896.
- Souri MK, Hatamian M. Amino chelates in plant nutrition: A review. *Journal of Plant Nutrition*. 2019; 42(1): 67-78.
- Sudheer KumarK, Ravindra SN, Seetaram Swamy. Traditional and medicinal secrets of Bhatukamma: The floral festival of Telangana. *Journal of Pharmaceutical Advanced Research*. 2018; 1(5): 271-275.
- Vera A, Moreno JL, Garcia C, Morais D, Bastida F. Boron in soil: The impacts on the biomass, composition and activity of the soil microbial community. *Science of the Total Environment*. 2019; 685: 567-73.

Zeng H, Wu H, Yan F, Yi K, Zhu Y. Molecular regulation of zinc deficiency responses in plants. *Journal of plant physiology*. 2021; 261: 153419.

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