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Sharanabasava
M.Sc. (Agri.), Department of Soil Science and Agricultural Chemistry, University of Agricultural Sciences, Raichur, Karnataka, India

Manjunatha Bhanuvally
Assistant Professor, Department of Soil Science and Agricultural Chemistry, Agriculture Extension Education Centre, Hadagali, Karnataka, India

SN Bhat
Scientist (Soil Science), ICAR – KVK, Raichur, Karnataka, India

Ravi S
Scientist (Soil Science), ICAR – KVK, Hagari, Karnataka, India

Mahadevaswamy
Professor and Head, Department of Agricultural Microbiology, University of Agricultural Sciences, Raichur, Karnataka, India

Ramesh G
Scientist (Horticulture), CAE, University of Agricultural Sciences, Raichur, Karnataka, India

Corresponding Author:
Sharanabasava
M.Sc. (Agri.), Department of Soil Science and Agricultural Chemistry, University of Agricultural Sciences, Raichur, Karnataka, India

Identification of nutrient constraints in jasmine (*Jasminum azoricum* L.) growing soils of Huvina Hadagali Taluk, Vijayanagara district

Sharanabasava, Manjunatha Bhanuvally, SN Bhat, Ravi S, Mahadevaswamy and Ramesh G

Abstract
A study was conducted to identify nutrient constraints in Jasmine growing soils. A total of 30 surface (0-20 cm) and 30 subsurface soil samples were collected from Jasmine growing area covering six villages of Huvina Hadagali taluk. Average soil available N was found low (238.34 kg ha^{-1}), available P_2O_5, K_2O and Sulphur was found medium (30.97, 258.81, 12.74 kg ha^{-1}, respectively) and available boron was sufficient (0.91 mg kg^{-1}). The mean soil pH was moderately alkaline (7.96), low soluble salt (0.27 dS m^{-1}) and low in organic carbon (5.00 g kg^{-1}). Population of bacterial, fungi and actinomycetes in jasmine growing soils were (40.70 CFU×10^6 g^{-1}, 18.63 CFU×10^4 g^{-1} and 39.16 CFU×10^3 g^{-1}, respectively). The correlation study showed that organic carbon, available P_2O_5, boron, bacteria, and actinomycetes (0.646**, 0.599**, 0.488**, 0.521**, and 0.516**, respectively) has significantly positive correlation with jasmine yield at one per cent level. The results showed that soil nutrient status of jasmine growing area of Huvina Hadagali taluk was found to be low to medium range. It is due to improper nutrient management practices like continuous use of chemical fertilizers and non-use of organics which results in poor soil fertility leading to low yield of jasmine.

Keywords: Correlation, jasmine, soil available nutrients, yield

Introduction
Floriculture is a vital sub-sector of horticulture, having potential for providing employment opportunities to farmers especially small and marginal farmers. The floriculture termed as "Golden Revolution" fast emerged as an income generating source. Hadagali Mallige (*Jasminum azoricum)* which belongs to the family *Oleaceae* is native to India or South East Asia. Locally known as "Vasane Mallige", (fragrant Jasmine), it is grown mainly in Huvina Hadagali taluk. 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 (Anon., 2021) [2]. Karnataka stands second in terms of production after Tamil Nadu (Anon., 2016) [1]. 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 macro and micro nutrients have major effect on plant growth, development and yield. Imbalanced nutrient use by farmers has resulted in aggravating the multiple nutrient deficiencies which reduces the quality and yield of Jasmine. Keeping these considerations in view with an objective of to assess the soil nutrient status in jasmine growing areas.

Materials and Methods
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 Huvina Hadagali taluk *viz.*, Huvinahadagali, Hanakanahalli, Markonahalli, Vinobhanagara, Devagondanahalli and Thippapura village 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.

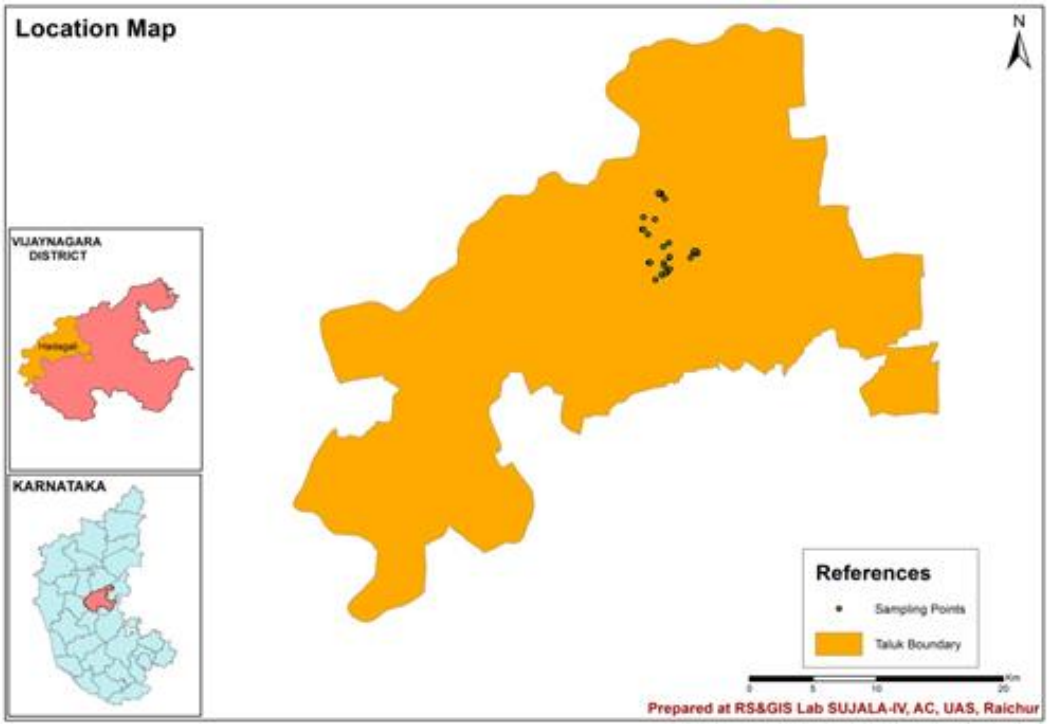

Fig 1: Location of study area

Results and Discussion

Soil pH

The results of soil pH in surface (0-20 cm) and sub-surface (20-40 cm) are presented. (Table 1)

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.

The overall observation about soil pH showed the neutral to alkaline nature of soil and the pH has shown increasing trend with increase in soil depth, which may be due to the leaching of exchangeable bases from the surface soil to sub surface soil. Similar result were reported by Sabi *et al.* (2003) [4].

Soluble salt content

The soluble salt content in surface (0-20 cm) and sub-surface (20-40 cm) soils are presented. (Table 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}).

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.* (2018) [6] as well.

Soil organic carbon

The data on soil organic carbon, in surface (0-20 cm) and sub-surface (20-40) soils are presented. (Table 1)

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 (V_1S_4) had the lowest soil organic carbon value, which was 2.40 g kg^{-1}, while Huvinahadagali village (V_1S_5) and Devagondanahalli village (V_5S_5) 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 (V_3S_3) to 6.00 g kg^{-1} in Devagondanahalli village (V_5S_5). Vinobhanagara village had the lowest soil organic carbon value.

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) [3] provided similar evidence for these conclusions in his study.

Available Nitrogen

The results of available soil nitrogen, in surface (0-20 cm) and sub-surface (20-40 cm) soils are presented. (Table 2)

With a mean value of 238.34 kg ha^{-1}, the available nitrogen in surface soil (0-20 cm) ranged from 131.71 to 312.69 kg ha^{-1}. Thippapura village (V_6S_4) had the lowest available nitrogen value (131.71 kg ha^{-1}), whereas Huvinahadagali village (V_1S_5) had the highest available nitrogen value (312.69 kg ha^{-1}). In surface soil, there is little nitrogen that is generally available. The range of the subsurface soils (20-40 cm) available

nitrogen was 106.62–275.97 kg ha^{-1}, with a mean of 207.12 kg ha^{-1}. Vinobhanagara village (V_3S_5) had the highest available nitrogen value (275.95 kg ha^{-1}), whilst Thippapura village (V_6S_4) had the lowest available nitrogen value (106.62 kg ha^{-1}).

The general observation of nitrogen availability was low to medium. The subsurface soils had comparatively lesser values of available N than surface layer which might be due to the less accumulation of organic matter in this layer. The decrease in available N content with increase in soil depth has also been reported by Sammy *et al*. (2003) [5].

Available Phosphorus

The result of available soil phosphorus, in surface (0-20 cm) and sub-surface (20-40) soils are presented. (Table 2)

The available phosphorus of surface soil (0-20 cm) ranged from 21.18 to 41.76 kg ha^{-1} with a mean value of 30.97 kg ha^{-1}. The lowest available phosphorus (21.18 kg ha^{-1}) value was recorded in Huvinahadagali village (V_1S_4), whereas highest available phosphorus (41.76 kg ha^{-1}) was recorded in Devagondanahalli village (V_5S_5). The overall observation of available phosphorous was found to be in a range of low to medium in surface soil. The available phosphorus of subsurface soil (20-40 cm) ranged from 17.55 to 38.25 kg ha^{-1} with a mean value of 25.12 kg ha^{-1}. The lowest available phosphorus (17.55 kg ha^{-1}) value was recorded in Thippapura village (V_6S_4), whereas highest available phosphorus (38.25 kg ha^{-1}) was recorded in Huvinahadagali village (V_1S_5). The overall observation of available phosphorus found was to be in a range of low to medium in sub surface soil.

High dose of fertilizers are added to the surface soil than to subsurface soil which might be reason for high level phosphorus in surface than that of subsurface soil and small quantity of added organic matter also increases phosphorus content in soil (Verma, 2002) [9].

Available K

The result of soil available potassium in surface (0-20 cm) and sub-surface (20-40) samples are presented. (Table 2)

The available K of surface soil (0-20 cm) ranged from 143.02 to 403.42 kg ha^{-1} with a mean value of 258.81 kg ha^{-1}. The lowest available K (143.02 kg ha^{-1}) value was recorded in Markonahalli village (V_4S_2), whereas the highest available K (403.42 kg ha^{-1}) was recorded in Vinobhanagara village (V_3S_5). The available K of subsurface soil (20-40 cm) ranged from 114.91 to 351.23 kg ha^{-1} with a mean value of 218.18 kg ha^{-1}. The lowest available K (114.91 kg ha^{-1}) value was recorded in Markonahalli village (V_4S_2), whereas highest available K (351.23 kg ha^{-1}) was recorded in Huvinahadagali village (V_1S_5).

The overall observation of available K was found to be in a range of low to high. The highest available K content was noticed in the surface soil and showed decreasing trend with depth. This could be attributed to more intensive weathering, release of labile K from organic residues, low amounts of rainfall and application of K fertilizers (Srinivasan *et al*., 2013) [8].

Available sulphur

The result of available soil sulphur, in surface (0-20 cm) and sub-surface (20-40) soils are presented. (Table 3)

The available sulphur of surface soil (0-20 cm) ranged from 9.34 to 17.97 kg ha^{-1} with a mean value of 12.74. The lowest available sulphur (9.34 kg ha^{-1}) value was recorded in Thippapura village (V_6S_4), whereas highest available sulphur (17.97 kg ha^{-1}) was recorded in Huvinahadagali village (V_1S_5). The available sulphur of subsurface soil (20-40 cm) ranged from 7.56 to 15.81 kg ha^{-1} with a mean value of 10.69 kg ha^{-1}. The lowest available sulphur (7.56 kg ha^{-1}) value was recorded in Markonahalli village (V_4S_5), whereas highest available sulphur (15.81 kg ha^{-1}) was recorded in Thippapura village (V_6S_1).

The available sulphur content was higher in surface soil when compared with samples of subsurface soils. This might be due to the higher organic carbon content in surface soil. The results obtained are in conformity with findings of Satish *et al*. (2018) [3].

Available Boron

The result of available soil boron, in surface (0-20 cm) and sub-surface (20-40) soils are presented. (Table 3)

The available boron in surface soil (0-20 cm) ranged from 0.45 to 1.28 mg kg^{-1} with a mean value of 0.91 mg kg^{-1}. The lowest available boron (0.45 mg kg^{-1}) value was recorded in Huvinahadagali village (V_1S_4), whereas highest available boron (1.28 mg kg^{-1}) was recorded in Hanakanahalli village (V_2S_2). The available boron in subsurface soil (20-40 cm) ranged from 0.36 to 1.09 mg kg^{-1}with a mean value of 0.76 mg kg^{-1}. The lowest available boron (0.36 mg kg^{-1}) value was recorded in Huvinahadagali village (V_1S_4), whereas highest available boron (1.09 mg kg^{-1}) was recorded in Hanakanahalli village (V_2S_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.

Bacterial count

The result of soil bacterial count, in surface (0-20 cm) and sub-surface (20-40) soils are presented. (Table 4)

The bacterial count in surface soil (0-20 cm) ranged from 35.05 to 45.33 cfu $\times 10^6$ g^{-1} with a mean value of 40.70 cfu $\times 10^6$ g^{-1}. The lowest bacterial count (35.05 cfu$\times 10^6$ g^{-1}) value was recorded in Huvinahadagali village (V_1S_4), whereas highest bacterial count (45.33 cfu $\times 10^6$ g^{-1}) was recorded in Huvinahadagali village (V_1S_5). The bacterial count in sub surface soil (20-40 cm) ranged from 30.12 to 40.80 cfu $\times 10^6$ g^{-1} with a mean value of 36.06 cfu $\times 10^6$ g^{-1}. The lowest bacterial count (30.12 cfu$\times 10^6$ g^{-1}) value was recorded in Thippapura village (V_6S_4), whereas highest bacterial count (40.80 cfu $\times 10^6$ g^{-1}) was recorded in Huvinahadagali village (V_1S_5).

High organic carbon content, sufficient moisture, low pH and narrow C/N ratio favors the bacterial population. Similar result reported by Sabi Gogoi *et al.* (2003) [4].

Fungi count

The result of soil fungal count, in surface (0-20 cm) and in sub surface (20-45) soils are presented. (Table 4)

The fungi count in surface soil ranged from 12.20 to 24.10 cfu $\times 10^4$ g^{-1} with an mean value of 18.63 cfu $\times 10^4$ g^{-1}. The lowest fungi count (12.20 cfu $\times 10^4$ g^{-1}) value was recorded in Huvinahadagali village (V_1S_1), whereas highest fungi count (24.10 cfu $\times 10^4$ g^{-1}) was recorded in Huvinahadagali village (V_1S_5). The fungicount in sub surface soil (20-40 cm) ranged from 8.82 to 20.90 cfu $\times 10^4$ g^{-1} with a mean value of 14.00 cfu

$\times 10^4$ g^{-1}. The lowest fungi count (8.82 cfu $\times 10^4$ g^{-1}) value was recorded in Vinobhanagara village (V_3S_1), whereas highest fungi count (20.90 cfu $\times 10^4$ g^{-1}) was recorded in Huvinahadagali village (V_1S_5).

The fungal population was affected due to increase in the pH in soil. The reduction in organic carbon also reflected in the consistent reduction of fungal population. In addition, toxicities of Na and other ions along with very high pH inhibit the microbial growth (Zahran, 1997) [10].

Actinomycetes count

The result of soil actinomycetes count, in surface (0-20 cm) and in subsurface (20-40) soils are presented. (Table 4)

The actinomycetes count of surface soil ranged from 32.40 to 44.10 cfu $\times 10^3$ g^{-1} with a mean value of 39.16 cfu $\times 10^3$ g^{-1}. The lowest actinomycetes count (32.40 cfu $\times 10^3$ g^{-1}) value was recorded in Huvinahadagali village (V_1S_4), whereas highest actinomycetes count (44.1 cfu $\times 10^3$ g^{-1}) was recorded in Huvinahadagali village (V_1S_5). The actinomycetes count in sub surface soil (20-40 cm) ranged from 28.34 to 38.18 cfu $\times 10^3$ g^{-1} with a mean value of 33.70 cfu $\times 10^3$ g^{-1}. The lowest actinomycetes count (28.34 cfu $\times 10^3$ g^{-1}) value was recorded in Huvinahadagali village (V_1S_1), whereas highest actinomycetes count (38.18 cfu $\times 10^3$ g^{-1}) was recorded in Devagondanahalli village (V_5S_3). High organic carbon content favors the actinomycetes population. Similar result reported by Sharma *et al.* (2013) [7].

Correlation between soil nutrient status and Jasmine yield

The data indicated that the Yield was significantly positively correlated with organic carbon (0.646**), Phosphorus (0.599**), Boron (0.488**), Bacteria (0.521**) and Actinomycetes (0.516**) at 1% level. It may be due to the application of organic and inorganic fertilizer which provided sufficient nutrition to support development process of jasmine and increase in flower yield. High availability of organic carbon, increases the availability of other nutrients. The soil microbe's favours the mineralization processes and increases availability of nutrients that can plant will uptake easily results increase in jasmine yield (Table 5 and 6).

Table 1: Chemical properties of selected soils of Huvina Hadagali Taluk

Sl. No	Village Name	Sample Code	pH (1:2.5 soil: water)		EC (dS m^{-1})		OC (g kg^{-1})	
			Surface	Sub-surface	Surface	Sub-surface	Surface	Sub-surface
1	Huvinahadagali	V_1S_1	7.88	7.96	0.21	0.25	3.90	2.60
2		V_1S_2	8.32	8.36	0.20	0.28	5.60	4.40
3		V_1S_3	7.58	7.75	0.23	0.27	5.20	4.10
4		V_1S_4	8.12	8.15	0.26	0.32	2.40	2.00
5		V_1S_5	7.85	7.99	0.45	0.62	6.80	4.80
6	Hanakanahalli	V_2S_1	7.98	8.10	0.17	0.26	6.50	5.60
7		V_2S_2	7.70	7.72	0.16	0.18	6.40	5.40
8		V_2S_3	7.60	7.91	0.15	0.20	4.40	3.40
9		V_2S_4	7.94	7.98	0.26	0.38	5.80	4.60
10		V_2S_5	8.21	8.25	0.30	0.32	3.10	2.80
11	Vinobhanagara	V_3S_1	7.90	8.23	0.28	0.35	4.10	3.10
12		V_3S_2	7.95	8.10	0.24	0.30	4.40	3.40
13		V_3S_3	8.35	8.39	0.44	0.46	3.20	1.60
14		V_3S_4	7.72	7.77	0.16	0.18	4.80	4.20
15		V_3S_5	7.80	7.92	0.23	0.35	5.20	4.00
16	Markonahalli	V_4S_1	7.78	7.90	0.23	0.26	4.80	0.34
17		V_4S_2	7.96	8.05	0.20	0.23	4.20	3.60
18		V_4S_3	7.63	7.85	0.18	0.19	5.60	4.30
19		V_4S_4	7.70	7.92	0.18	0.21	6.00	5.60
20		V_4S_5	8.04	8.21	0.32	0.33	5.80	4.80
21	Devagondanahalli	V_5S_1	8.33	8.36	0.25	0.27	3.20	2.40
22		V_5S_2	7.94	8.00	0.24	0.28	5.60	4.80
23		V_5S_3	8.29	8.34	0.42	0.52	6.20	5.40
24		V_5S_4	8.30	8.38	0.28	0.29	4.40	2.80
25		V_5S_5	8.22	8.30	0.34	0.37	6.80	6.00
26	Thippapura	V_6S_1	7.92	8.10	0.36	0.37	6.20	5.60
27		V_6S_2	7.79	7.82	0.22	0.24	5.40	5.00
28		V_6S_3	7.68	7.76	0.38	0.40	5.80	5.20
29		V_6S_4	8.10	8.21	0.28	0.30	3.20	2.80
30		V_6S_5	7.96	7.98	0.43	0.52	5.60	5.40
Mean			7.96	8.06	0.27	0.32	5.00	4.10

Table 2: Status of major nutrients in selected soils of Huvina Hadagali Taluk

Sl. No	Village Name	Sample Code	Available N (kg ha^{-1})		Available P_2O_5 (kg ha^{-1})		Available K_2O (kg ha^{-1})	
			Surface	Sub-surface	Surface	Sub-surface	Surface	Sub-surface
1	Huvinahadagali	V_1S_1	225.79	200.7	24.21	23.61	207.31	181.44
2		V_1S_2	263.42	222.9	25.42	23.91	249.76	215.7
3		V_1S_3	238.33	206.97	24.82	24.21	225.12	189.26
4		V_1S_4	169.34	144.26	21.18	18.76	200.59	168.8
5		V_1S_5	312.69	262.06	40.86	38.25	389.31	351.23
6	Hanakanahalli	V_2S_1	250.88	225.79	36.62	32.99	244.72	122.3
7		V_2S_2	288.51	238.34	38.13	22.39	260.29	230.05
8		V_2S_3	244.33	194.43	24.82	21.39	211.68	179.87
9		V_2S_4	244.61	213.25	25.42	23.3	240.8	138.77
10		V_2S_5	218.25	175.62	23.3	21.18	210.56	172.93
11	Vinobhanagara	V_3S_1	188.16	169.34	26.63	21.49	220.19	182.9
12		V_3S_2	213.25	181.71	31.78	24.51	233.97	190.62
13		V_3S_3	163.07	142.04	25.42	23.91	158.37	155.9
14		V_3S_4	250.88	226.62	34.8	27.26	347.76	238.56
15		V_3S_5	294.43	275.97	37.22	25.12	403.42	214.14
16	Markonahalli	V_4S_1	232.06	169.34	29.66	24.21	162.51	139.66
17		V_4S_2	181.89	125.44	25.42	23.1	143.02	114.91
18		V_4S_3	257.15	275.62	31.17	26.63	205.63	186.64
19		V_4S_4	301.06	200.7	35.71	26.02	250.54	231.78
20		V_4S_5	269.70	244.61	32.99	26.63	234.42	207.31
21	Devagondanahalli	V_5S_1	200.70	213.34	26.03	22.7	297.96	275.25
22		V_5S_2	250.88	232.06	33.29	26.33	330.74	296.3
23		V_5S_3	270.05	237.98	38.13	29.05	359.52	321.9
24		V_5S_4	228.34	194.43	29.05	23.3	327.34	310.8
25		V_5S_5	294.78	258.34	41.76	37.63	365.68	334.58
26	Thippapura	V_6S_1	263.42	250.88	37.83	27.54	316.06	297.9
27		V_6S_2	219.52	181.89	29.66	20.58	215.38	197.04
28		V_6S_3	257.15	232.06	35.71	25.42	313.31	302.66
29		V_6S_4	131.71	106.62	28.75	17.55	208.99	181.55
30		V_6S_5	225.79	210.20	33.29	24.51	229.38	211.9
Mean			238.34	207.12	30.97	25.12	258.81	218.18

Table 3: Status of available sulphur and boron in selected soils of Huvina Hadagali Taluk

Sl. No.	Village Name	Sample Code	Available S (kg ha^{-1})		Available B (mg kg^{-1})	
			Surface	Sub-surface	Surface	Sub-surface
1	Huvinahadagali	V_1S_1	12.81	8.21	0.51	0.43
2		V_1S_2	14.49	12.84	1.09	0.92
3		V_1S_3	14.07	12.49	0.77	0.64
4		V_1S_4	12.28	9.98	0.45	0.36
5		V_1S_5	17.95	14.55	1.15	0.83
6	Hanakanahalli	V_2S_1	12.60	11.34	1.21	1.00
7		V_2S_2	14.07	13.02	1.28	1.09
8		V_2S_3	11.76	11.02	1.02	0.64
9		V_2S_4	11.97	10.50	1.15	0.97
10		V_2S_5	10.92	9.13	0.90	1.09
11	Vinobhanagara	V_3S_1	12.39	11.13	0.77	0.71
12		V_3S_2	12.60	11.86	1.02	0.90
13		V_3S_3	10.60	7.87	0.64	0.58
14		V_3S_4	13.12	9.34	1.15	0.61
15		V_3S_5	16.80	13.02	1.22	1.09
16	Markonahalli	V_4S_1	11.44	8.71	0.68	0.54
17		V_4S_2	11.13	10.81	0.64	0.51
18		V_4S_3	12.60	10.39	0.83	0.77
19		V_4S_4	15.64	10.60	1.15	1.02
20		V_4S_5	12.70	7.56	1.02	0.70
21	Devagondanahalli	V_5S_1	9.86	9.24	0.51	0.42
22		V_5S_2	11.23	10.71	0.91	0.85
23		V_5S_3	12.81	10.81	0.96	0.83
24		V_5S_4	10.60	8.19	0.58	0.50
25		V_5S_5	13.75	9.55	1.02	0.97
26	Thippapura	V_6S_1	17.53	15.81	0.98	0.84
27		V_6S_2	10.71	10.18	0.93	0.74
28		V_6S_3	12.70	11.92	0.96	0.81
29		V_6S_4	9.34	8.50	0.77	0.61
30		V_6S_5	11.78	11.34	0.94	0.81
Mean			12.74	10.69	0.91	0.76

Table 4: Total bacterial, fungal and actinomycetes count in selected soils of Huvina Hadagali Taluk

Sl. No	Village Name	Sample Code	Bacterial count ($CFU \times 10^6\ g^{-1}$)		Fungi count ($CFU \times 10^4\ g^{-1}$)		Actinomycetes count ($CFU \times 10^3\ g^{-1}$)	
			Surface	Sub-surface	Surface	Sub-surface	Surface	Sub-surface
1	Huvinahadagali	V_1S_1	35.82	31.04	12.20	9.31	34.20	28.34
2		V_1S_2	43.08	38.32	23.40	17.84	42.30	36.10
3		V_1S_3	38.24	32.65	14.20	10.42	37.20	29.56
4		V_1S_4	35.05	33.20	17.70	10.42	32.40	28.58
5		V_1S_5	45.33	40.80	24.10	20.9	44.10	37.20
6	Hanakanahalli	V_2S_1	44.25	39.24	22.80	19.43	42.70	36.66
7		V_2S_2	44.88	38.52	23.10	18.02	43.80	37.10
8		V_2S_3	43.81	36.45	19.40	14.2	40.80	32.82
9		V_2S_4	43.86	38.36	22.30	18.9	42.10	36.85
10		V_2S_5	38.03	32.70	16.60	12.38	37.40	30.75
11	Vinobhanagara	V_3S_1	38.74	33.74	13.40	8.82	36.60	31.57
12		V_3S_2	40.87	35.88	17.70	12.18	38.60	33.26
13		V_3S_3	36.54	30.38	22.80	17.68	34.20	28.63
14		V_3S_4	41.08	38.61	15.20	10.45	38.90	33.82
15		V_3S_5	43.62	37.72	18.70	12.62	43.10	35.82
16	Markonahalli	V_4S_1	38.29	33.55	20.40	14.15	36.40	31.44
17		V_4S_2	37.60	35.10	16.80	12.6	36.20	30.81
18		V_4S_3	39.80	35.76	15.90	11.42	38.80	32.86
19		V_4S_4	42.80	38.23	20.50	15.27	41.80	36.88
20		V_4S_5	41.56	37.82	18.60	14.38	41.10	36.43
21	Devagondanahalli	V_5S_1	37.70	32.46	20.10	16.4	36.70	30.36
22		V_5S_2	42.50	38.54	15.20	11.65	40.20	37.72
23		V_5S_3	43.10	39.46	17.30	12.34	40.70	38.18
24		V_5S_4	39.40	35.62	19.40	14.36	37.50	33.20
25		V_5S_5	43.60	39.10	18.80	13.83	40.80	37.66
26	Thippapura	V_6S_1	43.60	38.50	13.60	9.48	42.80	36.90
27		V_6S_2	39.50	34.90	18.20	13.82	38.10	32.76
28		V_6S_3	42.70	38.21	22.20	17.1	42.10	35.85
29		V_6S_4	35.40	30.12	16.30	12.22	33.80	28.42
30		V_6S_5	40.20	36.86	22.10	17.62	39.30	34.56
Mean			**40.70**	**36.06**	**18.63**	**14.00**	**39.16**	**33.70**

Table 5: Correlation between soil nutrient status and Jasmine yield

	pH	EC	OC	N	P	K	S	B	Bac	Fun	Act	Yield
pH	1											
EC	0.454*	1										
OC	-0.315	0.066	1									
N	-0.330	-0.015	0.835**	1								
P	-0.164	0.267	0.788**	0.714**	1							
K	0.058	0.264	0.481**	0.641**	0.707**	1						
S	-0.332	0.102	0.579**	0.742**	0.573**	0.528**	1					
B	-0.337	-0.098	0.742**	0.713**	0.654**	0.446*	0.556**	1				
Bac	-0.247	0.018	0.850**	0.846**	0.718**	0.611**	0.616**	0.871**	1			
Fun	-0.247	0.018	0.850**	0.846**	0.718**	0.611**	0.616**	0.871**	1.00**	1		
Act	-0.275	0.027	0.857**	0.864**	0.710**	0.591**	0.655**	0.876**	0.974**	0.974**	1	
Yield	0.047	0.210	0.646**	0.439*	0.599**	0.276	0.339	0.488**	0.521**	0.521**	0.516**	1

**Correlation is significant at the 0.01 level. *Correlation is significant at the 0.05 level.

Table 6: Yield of Jasmine crop from different regions of Huvina Hadagali Taluk Vijayanagara District

Sl. No.	Village	Sample Code	Jasmine yield (q ha^{-1})
1	Huvinahadagali	V_1S_1	64.50
2		V_1S_2	67.35
3		V_1S_3	64.79
4		V_1S_4	70.06
5		V_1S_5	74.22
6	Hanakanahalli	V_2S_1	74.80
7		V_2S_2	76.59
8		V_2S_3	64.84
9		V_2S_4	72.41
10		V_2S_5	66.52
11	Vinobhanagara	V_3S_1	64.33
12		V_3S_2	65.02
13		V_3S_3	64.72
14		V_3S_4	65.93
15		V_3S_5	67.44
16	Markonahalli	V_4S_1	66.24
17		V_4S_2	68.62
18		V_4S_3	71.14
19		V_4S_4	70.31
20		V_4S_5	72.50
21	Devagondanahalli	V_5S_1	65.46
22		V_5S_2	70.64
23		V_5S_3	78.41
24		V_5S_4	63.64
25		V_5S_5	72.23
26	Thippapura	V_6S_1	74.21
27		V_6S_2	70.55
28		V_6S_3	64.70
29		V_6S_4	69.53
30		V_6S_5	71.94
Mean			69.12

Conclusion

- The results showed that soil fertility status of Jasmine growing area of Huvina Hadagali taluk was found to be low to medium in available nitrogen, phosphorus, sulphur and low to high in potassium. Plants responded to applied fertilizer in terms of growth and development.
- The microbial population decreases with increasing soil depth. It might be due to high organic carbon content in surface soil compared to sub surface soil.
- The soil properties get adversely affected due to improper nutrient management practices like continuous use of chemical fertilizers that result in low organic carbon content and poor soil fertility leading to low yield of jasmine. Hence it is suggested to apply organic manures, biofertilizers along with judicious use of chemical fertilizers. Subsequently soil test based integrated nutrient management for jasmine is a viable option for getting profitable yields without affecting the soil fertility.

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