

MANDYA DISTRICT



FIG.21 MANDYA DISTRICT

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1. Location

Mandya district is located in the southeastern portion of Karnataka State with geographical area of 4961 sq. km. It is bounded by Hassan district on the northwestern side, Mysore district on the southwestern side, Chamarajanagara district on the southeastern side, Tumkur district on the northern side and Bangalore (Rural) district on the eastern side. It lies between 12° 13' to 13° 03' N Latitude and 76° 19' to 77° 20' E Longitude.

2. Demography

As per the 1991 census, Mandya district has a population of 1,644,374. The total number of villages / habitations in the district are 1,873. Mandya district has 7 taluks viz., Krishnarajpet, Maddur, Malavalli, Mandya, Nagamangala, Pandavapura and Srirangapatna

3. Climate, Drainage and Soil

Mandya district forms part of the southern maidan area, which comprises of broad undulating plateau with elevations ranging between 600 to 1000 m. Mandya district experiences temperature variation between 19.2° C to 29° C. The district is drained by Shimsha and Cauvery rivers. The average annual rainfall reported is 691.2 mm (Ref: Climate of Karnataka State, Published by India Meteorological Department, 1984). This district is grouped under the southern dry zone of ten fold Agro-climatic classification of Karnataka. Major portion of the district is covered by red sandy soil.

4. Geology and Groundwater occurrence

The Peninsular Gneisses cover almost 80 % of the areal extent of Mandya district. Small patches of porphyritic granite of Closepet age are also exposed. From the groundwater point of view, these rocks are classified as crystalline formations. The fracture / fissure system developed along with joints and faults traversing the rocks facilitate groundwater circulation and hold moderate quantity of water. The quality of groundwater is governed by the mineralogical composition of the rocks. The conglomerate, amphibolite, pelitic schist, quartzite, iron formation, minor carbonate bodies and volcanic rocks belonging to Nagamangala schist belt are also exposed. In the metasediments, bedding planes and the fractures facilitate water movement and accumulation. The schistose rocks are poor aquifers and yield water of poorer quality in very less quantity. Groundwater generally occurs in the water table conditions in the weathered and decomposed mantle and also under semi-confined conditions in the deeper fractures.

5. Groundwater quality characterization

To understand and gather information on groundwater quality, 8467 groundwater samples collected from 1794 villages / habitations in Mandya district have been analysed by RDED.

The water samples have been analysed for only 14 parameters such as Turbidity, Colour, Conductivity, Hydrogen ion concentration (pH), Total Dissolved Salts (TDS), Total Hardness (TH), Calcium Hardness (CaH), Chloride (Cl), Sulphate (SO₄), Fluoride (F), Nitrate (NO₃), Alkalinity (Alk), Iron (Fe) and Bacteria and the data is presented in the Table.

5.1 Physical characters

Turbidity

Only 24 samples from 24 villages/ habitations have shown higher Turbidity ranging between 10.3 and 50 JTU. They are from, Krishnarajpet (3 out of 1205 samples), Maddur (the lone sample), Malavalli (4 out of 1441 samples), Mandya (the lone sample), Nagamangala (8 out of 1422 samples), Pandavapura (5 out of 767 samples) and Srirangapatna (2 out of 580 samples) taluks.

Colour

In the district, 356 samples from 281 villages/habitations have shown higher colour intensity, which ranges between 30-301 HU. The higher colour intensity recorded in the other taluks are: Krishnarajpet 30-100 HU (10 out of 1205 samples), Maddur 30-150 HU (60 out of 1424 samples), Malavalli 30-301 HU (59 out of 1441 samples), Mandya 30-200 HU (82 out of 1628 samples), Nagamangala 30-150 HU (63 out of 1422 samples), Pandavapura 30-250 HU (34 out of 767 samples) and Srirangapatna 30-75 HU (48 out of 580 samples). The highest colour intensity is from the village Konnapura in Malavalli taluk.

Electrical Conductivity (EC)

The EC values in the different taluks are: Krishnarajpet 27-6885 m mhos/cm, Maddur 72-9650 m mhos/cm, Malavalli 7.3-9407 m mhos/cm, Mandya 7-6495 m mhos/cm, Nagamangala 5-5395 m mhos/cm, Pandavapura 194-3070 m mhos/cm and Srirangapatna 5-4675 m mhos/cm.

Hydrogen Ion Concentration (pH)

There are 207 samples covering 161 villages / habitations having the variation in pH value from acidic to basic in the range of 0.29-11.42. The ranges of pH value recorded in the other taluks are: Krishnarajpet 4.4-9.85 (36 samples), Maddur 2.4-9.94 (43 samples), Malavalli 0.29-11.42 (43 samples), Mandya 0.70-9.86 (39 samples), Nagamangala 2.28-8.71 (19 samples), Pandavapura 1.75-9.48 (17 samples) and Srirangapatna 4.94-8.66 (10 samples)

5.2 Chemical Characters

Total Dissolved Salts (TDS)

About 466 samples covering 256 villages / habitations have higher TDS content in the range of 2001-12425 ppm. The ranges of abnormal TDS content in different taluks are: Krishnarajpet 2006-4439 ppm (43 samples), Maddur 2001-4809 ppm (114 samples), Malavalli 2010-12425 ppm (108 samples), Mandya 2006-3900 ppm (90 samples), Nagamangala 2010-3370 ppm (63 samples), Pandavapura 2002-3285 ppm (15 samples) and Srirangapatna 2014-3964 ppm (33 samples). The highest value of 12,425 ppm is reported from Hanavadi village in Malavalli taluk.

Total Hardness (TH)

In the entire district, 2508 samples spread across 987 villages have indicated TH value beyond the permissible limit ranging from 604 to 8600 ppm. The ranges of TH values in different taluks are Krishnarajpet 604-4110 ppm (368 samples), Maddur 604-1976 ppm (478 samples), Malavalli 604-2280 ppm (345 samples), Mandya 610-5430 ppm (530 samples), Nagamangala 604-3508 ppm (292 samples), Pandavapura 610-2460 ppm (252 samples) and Srirangapatna 610-8600 ppm (243 samples). The highest TH content (8600-ppm) is reported from Garakahalli village in Srirangapatna taluk.

Calcium Hardness (CaH)

In total, 1975 samples spread across 832 villages have indicated higher CaH values range from 201 to 3800 ppm. The ranges of CaH value in different taluks are Krishnarajpet 201-1318 ppm (162 samples), Maddur 201-918 ppm (385 samples), Malavalli 201-912 ppm (259 samples), Mandya 201-990 ppm (509 samples), Nagamangala 201-965 ppm (278 samples), Pandavapura 205-990 ppm (160 samples) and Srirangapatna 202-3800 ppm (222 samples). The maximum CaH content (3800 ppm) is reported from Thadagavadi village in Srirangapatna taluk.

Chloride (Cl)

Only 45 samples covering 35 villages in the entire district have analysed Chloride content in the range of 1005 to 1899 ppm. The abnormal Chloride content in different taluks are: Krishnarajpet 1110-1115 ppm (2 samples), Maddur 1090-1899 ppm (8 samples), Malavalli 1018-1807 ppm (20 samples), Mandya 1025-1700 ppm (8 samples), Nagamangala 1022-1046 ppm (4 samples), Pandavapura 1005-1785 ppm (2 samples) and Srirangapatna 1250 ppm (the lone sample). The highest Chloride content (1899 ppm) is reported from Bharathinagara village in Maddur taluk.

Sulphate (SO₄)

In the entire district, only 4 samples covering 4 villages / habitations have more SO₄ content in the range of 444-889 ppm. The variations in Sulphate content reported in different taluks are: Maddur 573 ppm (lone sample) and Malavalli 444-889 ppm (3 samples). The samples collected from Nagamangala, Pandavapura, Srirangapatna, Krishnarajpet and Mandya taluks have not reported abnormal concentration of SO₄.

Fluoride (F)

The analytical data has revealed that 326 samples from 170 villages / habitations have shown an abnormal Fluoride content in the range of 1.51-21.93 ppm. The concentrational variation reported in different taluks are: Krishnarajpet 1.52-7.05 ppm (42 samples), Maddur 1.51-3.2 ppm (88 samples), Malavalli 1.52-6.25 ppm (49 samples), Mandya 1.53-21.93 ppm (107 samples), Nagamangala 1.52-5.2 ppm (8 samples), Pandavapura 2.27-7.25 ppm (9 samples) and Srirangapatna 1.52-10.6 ppm (23 samples). Highest concentration of Fluoride (21.93 ppm) is reported from Thangalagere village in Mandya taluk.

Nitrate (NO₃)

There are 153 samples covering 89 villages / habitations analysing higher NO₃ content in the range of 101-987 ppm. These samples are from: Krishnarajpet 137 ppm (the lone sample), Maddur 101-987 ppm (70 samples), Malavalli 101-977 ppm (22 samples), Mandya 101-798 ppm (34 samples), Nagamangala 103-118 ppm (5 samples) and Srirangapatna 105-274 ppm (21 samples) taluks. The samples analysed from Pandavapura taluk have not recorded abnormal concentration of Nitrate.

Alkalinity (Alk)

In the entire district, 353 samples from 200 villages have analysed excess Alkalinity ranging from 604 to 6000 ppm. The range of Alkalinity values in different taluks are Krishnarajpet 610-970 ppm (34 samples), Maddur 608-1030 ppm (54 samples), Malavalli 604-884 ppm (27 samples), Mandya 610-950 ppm (142 samples), Nagamangala 604-6000 ppm (12 samples), Pandavapura 610-1530 ppm (42 samples) and Srirangapatna 610-990 ppm (42 samples). The highest Alkalinity (6000-ppm) is reported from Jodichikkanahalli village in Nagamangala Taluk.

Iron (Fe)

A good number of samples, 3530 from 1176 villages/ habitations have analysed iron in the range of 1.004 to 1221.6 ppm. The concentration variations in different taluks are: Krishnarajpet 1.004-36 ppm (227 samples), Maddur 1.01-1221.6 ppm (775 samples), Malavalli 1.02-812 ppm (1125 samples), Mandya 1.004-20 ppm (443 samples), Nagamangala 1.006-9.36 ppm (505 samples), Pandavapura 1.01-17.27 ppm (233 samples) and Srirangapatna 1.004-11.84 ppm

(222 samples). The highest Fe value of 1221.6 ppm is recorded from Hosakoppal village from Maddur taluk.

The samples analysed in the district have shown the concentration of iron much higher than the permissible limit. The possible reasons for the high concentrations are:

- Higher concentration can be due to rusting of the iron piping due to improper maintenance.
- There may be an error in the estimation of iron concentration in the analysis.
- It can be a recording error.
- Leaching of iron due to weathering and chemical disintegration.

Bacteria (*E.coli*)

In the entire district, 5249 samples covering 1607 villages/habitations have shown the presence of the Bacteria, the count of which generally varies from 1 to 624 No.s/100 ml of water. The bacterial counts reported in different taluks are: Krishnarajpet 1-400 No.s/100 ml (844 samples), Maddur 1-360 No.s/100 ml (743 samples), Malavalli 1-624 No.s/100 ml (692 samples), Mandya 1-364 No.s/100 ml (989 samples), Nagamangala 1-364 No.s/100 ml (1034 samples), Pandavapura 1-224 No.s/100 ml (601 samples) and Srirangapatna 1-228 No.s/100 ml (346 samples).

5.3 Spatial Variation

Bacteria (*E.coli*)

The map depicting bacterial incidence indicates that, bacteria are more common in the water samples in the district and Bacterial contamination is point specific, varying considerably.

Fluoride (F)

The isoconcentration map (Fig. 21A) reveals that, small isolated patches of higher average Fluoride concentration are seen in Mandya, Malavalli, Maddur and Krishnarajpet taluks.

Total Dissolved Salts (TDS)

The isoconcentration map (Fig. 21B) depicts that; slightly higher average concentration of TDS is seen along the northeastern border of the district and in the southern portion around Malavalli taluk.

Total Hardness (TH)

The map (Fig. 21C) reveals that, higher average concentration is seen as isolated patches in the entire district.

Iron (Fe)

Isoconcentration map (Fig. 21D) shows that, higher average concentration of iron is common. In the areas covering Nagamanagala, Krishnarajpet, Pandavapura and Mandya taluks, iron concentration is in lower range, whereas in the eastern half of the district covering Maddur, Malavalli taluk, patches of extremely high concentration are seen.

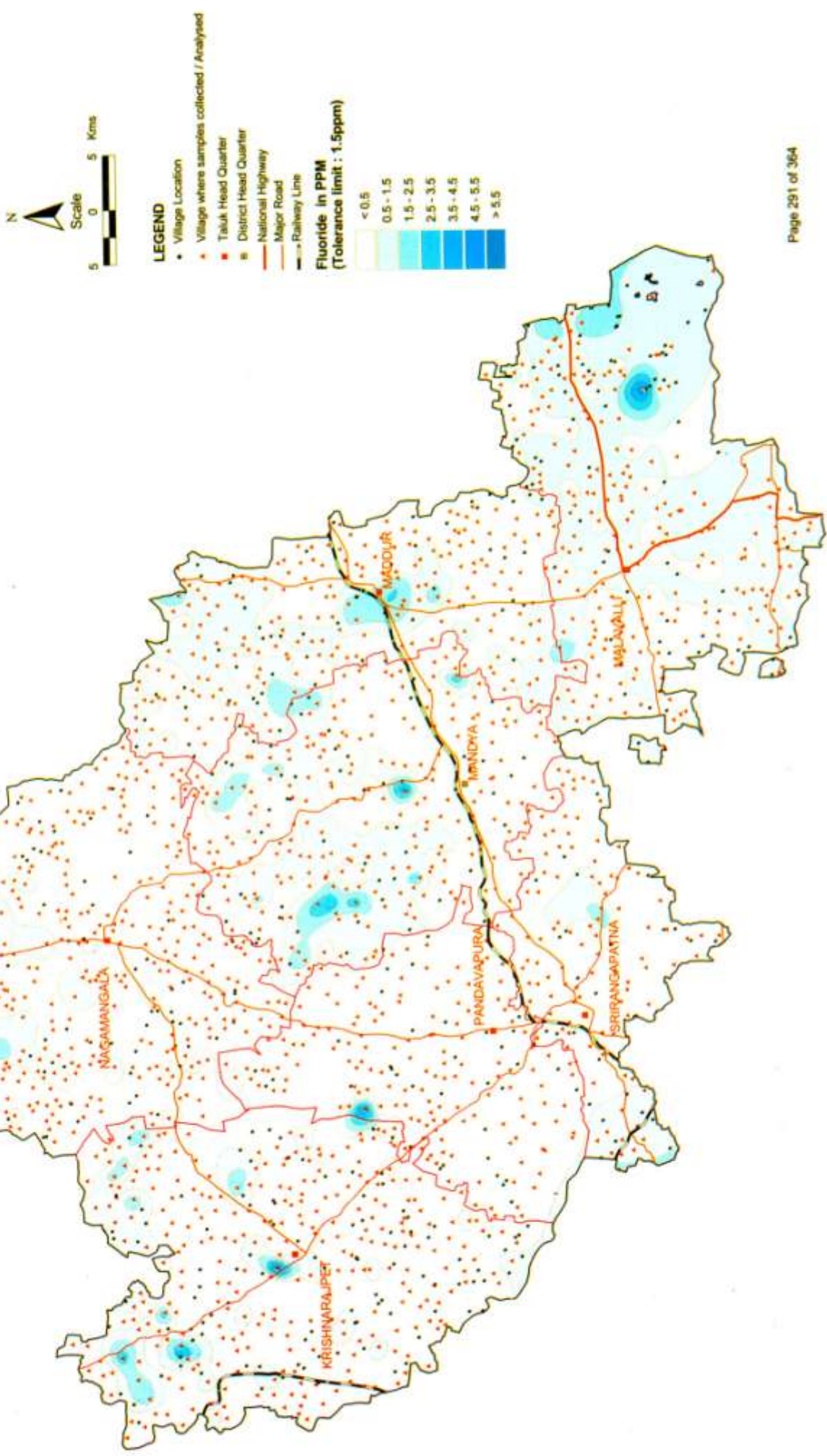
6. Conclusion

The water quality data of Mandya district has reflected the presence of excess CaH, TH, iron and Bacteria. Hardness can be reduced by some conventional methods. To overcome the problem related to the excess Iron content, an attention is required during the source development such as use of galvanized iron / PVC pipes and proper casing. The most important component, which is much more harmful, is the presence of Bacteria viz. *E. coli* in drinking water. The consumption of such water may cause the diseases such as Malaria, Diarrhea etc. Probably, the organisms might have been introduced into the groundwater regime by anthropogenic activities. This clearly indicates non-hygienic / poor sanitation condition prevailing at village levels. To overcome this both the user and the administrator must be trained properly and awareness has to be created regarding hygienic aspects.

Table : Comprehensive analysis of water quality data of Mandya District

SL. NO.	Name of the taluks	Number of villages/habitations	Number of sampled villages	Number of samples analysed	Water quality scenario	Bact (c-100 ml)-0	Tur (10) JTU	Color (25) HU	Cond - mmhos /cm	pH (6.5-8.5)	TDS (2000) ppm	TH (600) ppm	CaH (200) ppm	Cl (1000) ppm	SO ₄ (400) ppm	F (1.5) ppm	NO ₃ (100) ppm	Alk (600) ppm	Fe (1) ppm
1	Kishnarajpete	397	316	205	No. of samples beyond permissible limit	844	3	10	-	36	43	368	162	2	-	42	1	34	227
					No. of villages affected	295	3	10	-	29	86	2	-	27	157	86	2	-	27
2	Maddur	259	247	1424	Range	1-400	25-30	30-100	27-6885	4.4-9.85	2006-4439	604-4110	201-1318	1110-1115	-	1,52-7.05	137	610-970	1,004-36
					No. of samples beyond permissible limit	743	1	60	-	43	114	478	385	8	1	88	70	54	775
3	Malevalli	295	249	1441	No. of villages affected	213	1	49	-	31	59	173	149	3	1	33	37	27	194
					Range	1-360	15	30-150	72-9650	2.4-9.84	2001-4809	604-1976	201-918	1090-1899	573	1,51-3.2	101-987	606-1030	1,01-1,221.6
4	Mandya	292	252	1628	No. of samples beyond permissible limit	692	4	59	-	43	108	345	259	20	3	49	22	27	1125
					No. of villages affected	205	4	45	-	28	41	126	103	17	3	24	20	16	20
5	Nagamangala	484	450	1422	Range	1-624	10.5-16.9	30-301	7.3-9407	0.29-11.42	2010-12425	604-2280	201-912	1018-1807	444-889	1,52-6.25	101-977	604-884	1,02-812
					No. of samples beyond permissible limit	989	1	82	-	39	90	530	509	8	-	107	34	142	443
6	Pandavapura	189	171	767	No. of villages affected	229	1	64	-	30	57	173	172	6	-	60	20	67	160
					Range	1-364	12	30-200	7.6495	0.70-9.86	2006-3900	610-5430	201-990	1025-1700	-	1,53-21.93	101-796	610-950	1,004-20
7	Srirangapatna	132	109	560	No. of samples beyond permissible limit	1034	8	63	-	19	63	292	278	4	-	8	5	12	505
					No. of villages affected	407	8	53	-	17	47	166	163	4	-	7	4	11	264
Total	2048	1794	8467	Range	1-364	10.6-20.8	30-150	5-5395	2.28-8.71	2010-3370	604-3508	201-965	1022-1046	-	1,52-5.2	103-118	604-6000	1,006-9,36	
				No. of samples beyond permissible limit	601	5	34	-	17	15	252	160	2	-	9	-	42	233	
					No. of villages affected	161	5	26	-	16	9	110	81	2	-	6	-	23	110
					Range	1-224	10.3-50	30-250	194-3070	1.75-9.48	2002-3285	610-2460	205-990	1005-1785	-	2,27-7.25	610-1530	1,01-1,727	
					No. of samples beyond permissible limit	346	2	48	-	10	33	243	222	1	-	23	21	42	222
					No. of villages affected	97	2	34	-	10	14	82	78	1	-	13	7	24	84
					Range	1-228	10.8-30.4	30-75	5-4675	4.94-8.66	2014-3964	610-8600	202-3800	1250	-	1,52-10.6	105-274	610-990	1,004-11,84
					No. of samples beyond permissible limit	5249	24	356	-	207	466	2508	1975	45	4	326	153	353	3530
					No. of villages affected	1607	24	281	-	161	256	987	832	35	4	170	89	200	1176
					Range	1-624	10.3-50	30-301	5-9650	0.29-11.42	2001-12425	604-8600	201-3800	1005-1899	444-889	1,51-21.93	101-987	604-6000	1,004-1,221.6

MANDYA DISTRICT
FIG.21A : FLUORIDE VARIATION



MANDYA DISTRICT

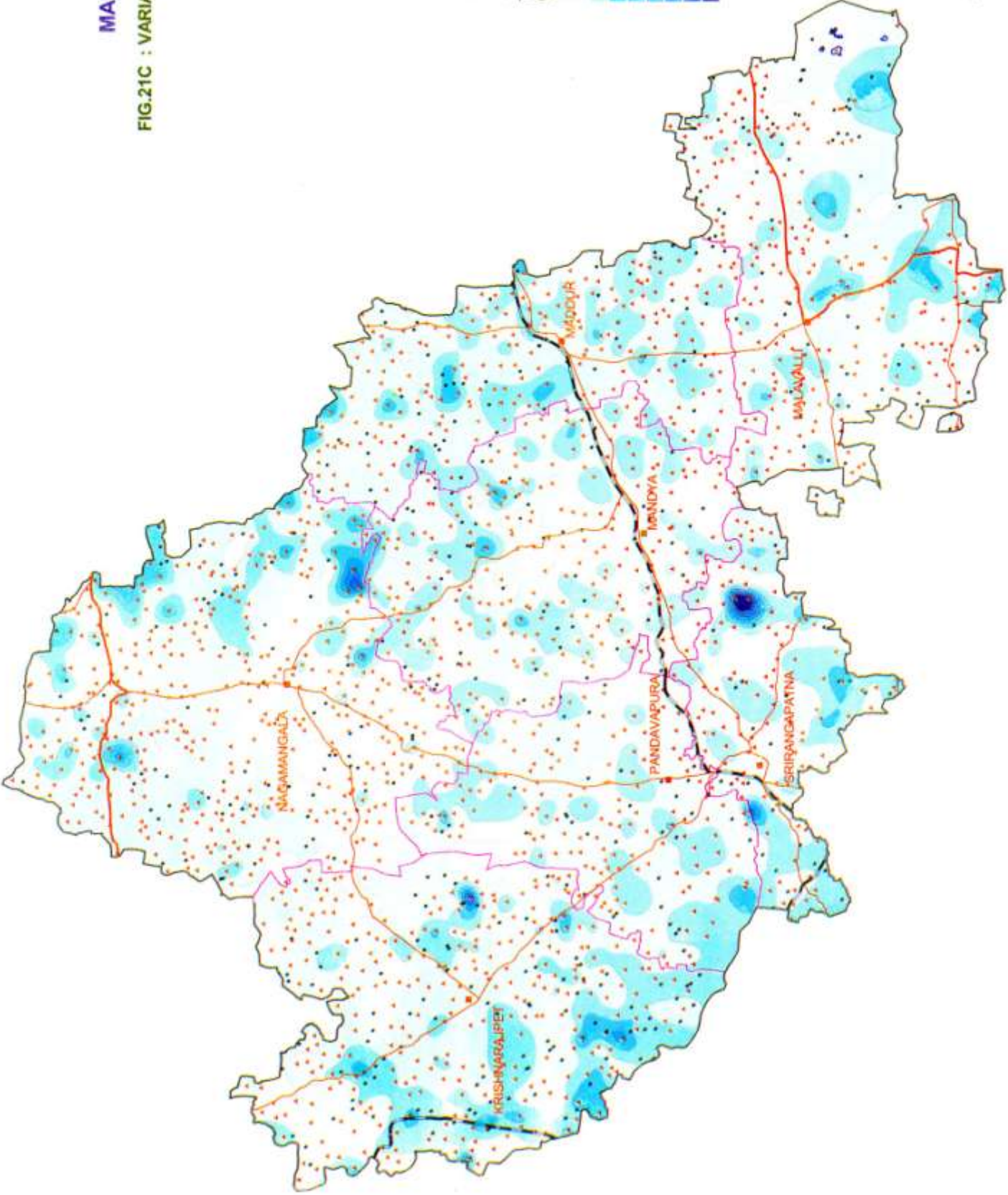
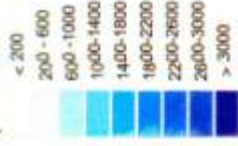
FIG.21C : VARIATION OF TOTAL HARDNESS (TH)



LEGEND

- Village Location
- Village where samples collected / Analyzed
- Taluk Head Quarter
- District Head Quarter
- National Highway
- Major Road
- Railway Line

TH range in PPM
(Tolerance limit : 600ppm)



MANDYA DISTRICT

FIG.21D : IRON VARIATION

