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CHEMICAL CHARACTERISTICS OF WELL WATER

K.V.S.N. Raju, J. Ramaprasad* and O. Sreemannarayana

Feed and Fodder Analytical Laboratory
Government Dairy Farm Campus
Visakhapatnam, Andhra Pradesh

Water is one of the essential components required for the existence of life. It is widely used for the various day-to-day life activities of both man and animals, agricultural and industrial purposes. It gets contaminated from surface percolation of washouts of slaughter wastes, drainage of slurry of animal excreta and chemical fertilizers (Yaalon, 1967). Chemical contaminants of water can cause acute and chronic diseases in man and animal. Such contaminated water can damage the industrial equipments which results in economic loss to the industry and is also unfit for agriculture purposes. Therefore, present study was undertaken to evaluate the chemical characteristics of open and bore well water used for drinking, agriculture and other routine purposes in the cattle yard.

Materials and Methods

Ground water samples from 13 open wells and two bore wells located at different places in 270 acres of land under active cultivation of Government Dairy farm, were collected. About half litre of water samples from the sources were collected in duplicate for the purpose of chemical analysis as per the procedure followed by USDA (1954).

Parameters studied for evaluation of water quality included, conductivity, pH, alkalinity, hardness, nitrite nitrogen, chlorides, fluorides, sulphates and calcium. Analysis of all the above chemical characteristics was done as per standard methods prescribed by Indian Standard Institute (1964).

Results and Discussion

The results of chemical analysis of water samples are given in the Table. The electrical conductivity of all the samples was relatively high, but within the tolerable limits, except for the four open well samples (numbers 2, 5, 6 and 13) with higher values ranging from 1000 to 2300 micro mho/om, indicating the presence of

* *Associate Professor, Animal Nutrition Department, College of Veterinary Science, Tiruapti - 517-502*

Table. Chemical characteristics of water samples

Sl. No.	Type of well	Electrical conductivity (Micro mho/om)	pH at 35°C	Total Alkalinity as Ca CO3, mg/l	Total hardness mg/l	Nitrite nitrogen as No_2 mg/l	Chlorides mg/l	Fluorides mg/l	Sulphates mg/l	Calcium as Ca CO_3
1	Openwell	1540	7.13	448	432	0.00025	136	0.9	1+	88
2	Openwell	2300	7.19	704	484	0.00	312	0.7	3+	60
4	Openwell	1690	7.38	536	340	0.0025	144	0.9	2+	32
5	Openwell	1900	7.18	580	460	0.065	184	1.3	2+	72
6	Openwell	2200	6.92	704	512	0.45	248	0.7	3+	180
7	Openwell	1450	6.88	268	312	0.0025	112	0.9	1+	48
8	Openwell	1540	7.44	448	368	0.00025	144	0.9	2+	32
9	Openwell	1930	7.38	560	400	0.45	192	1.1	2+	52
10	Openwell	1480	7.5	400	256	0.25	96	0.5	1+	28
12	Openwell	1780	7.31	520	544	0.0025	144	0.9	2+	92
13	Openwell	1900	7.21	456	528	0.0025	116	0.5	1+	128
15	Openwell	1170	6.75	256	276	0.0025	116	0.5	1+	48
16	Openwell	1270	6.75	256	276	0.0025	116	0.5	1+	76
17	Borewell	1590	7.36	460	392	0.0025	140	0.9	1+	48
18	Borewell	1760	7.21	492	448	0.00025	152	0.8	2+	64

Each value is an average of two observations

high content of ionizable salts due to contaminants discharged into water through chemical wastes (Shukla and Srivastava, 1992). Total alkalinity of all water samples collected from open wells and borewells in the area ranged from 256 to 704 with pH of 6.75 to 7.5 which was well within the permissable values of 6.5 to 8.5. These values are in accordance with the values reported by Mittal *et. al.* (1994) for water used for drinking and agricultural purposes.

The maximum permissible limit of hardness in drinking water is 500 mg/l as per recommendations of WHO (1971). All the water samples had the hardness with in the permissible limits except for the water samples obtained from three open wells (Nos. 6, 12 and 13). This increase in hardness of water samples in open wells may be due to the presence of bicarbonates of calcium and magnesium or

chlorides and sulphates of calcium and magnesium.

The nitrite nitrogen levels of most of the water samples evaluated both from open wells and bore wells were in traces but a few had higher values of nitrite nitrogen levels upto 0.45 mg/l as observed in four open wells (Nos. 5, 6, 9 and 10). This indicates the evidence of contamination of water possibly with nitrogenous organic matter from sewage or from animal excreta or from chemical fertilizers (Yaalon, 1967).

With respect to chloride content, all the water samples were within the permissible limits of chlorides (20 mg/l) for drinking purpose except for the one open well water sample (No.2) which may be due to lithological influence as reported by Thyagi and Dutta (1995). Some samples contained chloride beyond the permissible levels (150 mg/l).

With respect to fluoride content, all the samples were within the permissible limits of 0.6-1.5mg/l. Higher levels of sulphates (3 +) were found to be present in the water samples obtained from two open wells, Nos.2 and 6 than in the samples obtained from bore wells indicating the hardness of water in open wells that causes scaling problem.

In general, calcium content of water samples obtained both from open wells and bore wells was with in the limits of 200 mg/l.

On perusal of the results of chemical analysis of water samples obtained from open wells and bore wells in the vicinity of the Government Dairy farm, it is recommended that for drinking water purpose bore well water may be preferred as they contain low dissolved solids as indicated by the low electrical conductivity and relatively low hardness and have traces of nitrite nitrogen as compared to the open well water. Open well water sources are suitable for agriculture/ irrigation purposes.

Summary

A total of fifteen water samples consisting of thirteen from open wells and two from bore wells were examined for various chemical characteristics. The study revealed that out of the 13 open well samples, four samples had high electrical conductivity probably due to the contamination of organic nitrogenous materials from sewage, animal excreta as it was supported by high levels of nitrite nitrogen levels. So these sources were suitable for agriculture or irrigation purposes. None of the bore well water samples had higher electrical conductivity or nitrite nitrogen levels. Hence it was recommended that for drinking water purposes the water from bore well

source was preferred as they contained low dissolved solids, relatively low hardness and traces of nitrite nitrogen.

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