

# Evaluation of Groundwater Quality in Deeg Tehsil of Bharatpur District, Rajasthan

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**Abstract –** Water is one of the basic human needs and directly related to human health. Thus safe, wholesome and adequate drinking water for every human is constitutional right. Ground water is the major source of drinking water for the residents of Deeg tehsil since the surface water is very limited. Ground water abstraction is increasing day by day due to its increasing demand for various uses. In the present study, the evaluation of ground water quality in this region is taken up. 133 water samples have been collected during April 2015-Sept.2015. Alkalinity, Hardness, Fluoride, Nitrate, Total Dissolved Solids, Chloride contents have been analysed from the collected water samples. Some of samples show the high concentration levels of TDS, Hardness, Chloride, Nitrate. This study reveals the present status of ground water quality. It is essential to assess the ground water resources for efficient ground water management.

**Key words:** Ground Water Quality, Human Health, Ground Water Management

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## INTRODUCTION

Ground water is one of the most valuable natural resources to meet the water requirements of rapidly expanding urban, industrial and agriculture purposes particularly in arid and semiarid zones. Because of its continuous availability and excellent natural quality, it becomes an important source of water supply in urban and rural areas of any country. Ground water is the important and valuable resources to support human health and economic development. Ground water management is under pressure on increased water demands, climate change and pollution problems. There are changes in quality and quantity of ground water due to human activities and climate change. So, it is necessary to understand these problems and solve scientifically.

Various data is required for the computation of significant ground water levels decline. Ground water estimation committee is formed by the Government of India to collect the data of ground water in different regions of India. According to World Health Organisation, the water proposed for human consumption must be free from harmful micro-organisms, organic wastes, excessive amount of minerals and toxic substances (WHO 1996).

## STUDY AREA

Deeg is located to the north of Bharatpur District in Rajasthan and is towards the northern part of Agra (98

Kms. From Agra). The geographical position of Deeg is about 27.47 degree North and 77.33-degree East. The average elevation of Deeg is about 174 meters (571 feet).

## METHODOLOGY

133 water samples were collected from 108 villages & Dhanis which covered 36 panchayats of Deeg tehsil. The samples were collected during April 2015 to Sept.2015. The samples were collected in polythene bottles of one litre capacity for chemical analysis. The collected samples were analysed with standard laboratory analysis methods (APHA-2012). Important chemical parameters such as pH, Total dissolved solids, Nitrate, Fluoride, Chloride, Total Hardness and Total Alkalinity were analysed in the laboratory.

TDS were estimated by Digital TDS meter (Systronics make 308). Nitrate ions were measured by the UV-Visible spectrophotometer as well as visual comparative method. Fluoride ion was estimated by Orion Fluoride ion meter and different methods have been used for the analysis.

Total Hardness was determined by the complexometric titration method using Eriochrome Black T as an indicator. Total Alkalinity of water samples were analysed by titration with N/50 sulphuric acid using Phenolphthalein and Methyl

orange as indicator. pH of the water samples was determined by Systronics pH meter.

## RESULT AND DISCUSSION

pH of water indicates the degree of deterioration of water quality. The desirable pH range is 7 to 8.5. pH of water samples analysed in the study area ranged from 6.5 to 8.0 which is according to BIS 2012 and WHO 2011 norms.

**TOTAL DISSOLVED SOLIDS (TDS):** TDS of water samples of the study area ranges from 776 to 10130 mg/L. Out of 133 water samples, number of water samples and percentage in different TDS ranges have been shown in table 1.

TDS range	Less than 1500 mg/L	1500 to 3000 mg/L	3000 to 5000 mg/L	More than 5000 mg/L
Number of water samples lies within range	10	9	47	67
% of samples	7.51%	6.76%	35.33%	50.37%

These results represent that most of the water samples (85.70%) have high TDS (more than 3000 mg/L). High value of TDS is due to high dissolution of soluble salts namely Chlorides, Nitrates, Carbonates & Bicarbonates of Ca, Mg, Na, K ions. High TDS is harmful for irrigation, soil, animals, and human health. It deteriorates soil and plants. A large number of populations may have gastrointestinal disorders and high blood pressure.

**FLUORIDE (F):** Fluoride ions present in water samples of the study area ranges from 0.5 to 3.10 mg/L. Out of 133 water samples, number of water samples and percentage in different Fluoride ranges have been shown in table 2.

Fluoride range	Below 0.5 mg/L	0.5 to 1.0 mg/L	1.0 to 1.5 mg/L	1.5 to 3.0 mg/L	More than 3.0 mg/L
Number of water samples lies within range	105	11	09	07	01
% of samples	78.94%	8.27%	6.76%	5.26%	0.75%

These results show that most of the water samples (87.28%) have less Fluoride ion concentration which is less than 1.0 mg/L. Only 8 samples have more than 1.5 mg/L Fluoride ion concentration. This water is safe for drinking purpose from Fluorosis disease point of view. Fluoride comes naturally in water from dissolution of rocks such as fluor spar, cryolite, fluorite, fluorapatite etc. High concentration of Fluoride in drinking water causes dental & skeletal fluorosis and aging effects.

**NITRATES (NO<sub>3</sub>):** Nitrate ions present in water samples of the study area ranges from 2 to 361 mg/L. Out of 133 water samples, number of water samples and percentage in different Nitrate ranges have been shown in table 3.

Nitrate ion conc. range	Below 45 mg/L	45 to 100 mg/L	100 to 150 mg/L	More than 150 mg/L
Number of water samples	69	56	04	04
% of samples	51.87%	42.10%	3%	3%

These results represent that 51.87 % of water samples have nitrate ion concentration within permissible limits of BIS & WHO, 42.10% of water samples have moderate and borderline concentration and Only 8 samples have very high concentration of nitrate ion. High concentration of nitrate ion causes Blue baby disease (Methemoglobinemia).

**CHLORIDE (Cl<sup>-</sup>):** Chloride ions present in water samples of the study area ranges from 90 to 8070 mg/L. Out of 133 water samples, number of water samples and percentage in different Nitrate ranges have been shown in table 4.

Chloride ion conc. range	Below 250 mg/L	250 to 500 mg/L	500 to 1000 mg/L	1000 to 2000 mg/L	More than 2000 mg/L
Number of water samples	07	05	09	93	19
% of samples	5.26%	3.75 %	6.76%	69.92%	14.28%

These results show that most of the water samples (84.20%) have high Chloride ion concentration which are more than 1000 mg/L. Only 7 samples have less than 250 mg/L Chloride ion concentration. This water is not safe for drinking purpose, Chloride together with sodium may cause increase in blood pressure.

**TOTAL HARDNESS (TH):** Total hardness present in water samples of the study area ranges from 150 to 4290 mg/L. Out of 133 water samples, number of water samples and percentage in different Total hardness ranges have been shown in table 5.

Total Hardness	Below 600 mg/l	600 to 1000 mg/L	1000 to 2000 mg/L	More than 2000 mg/L
Number of water samples	11	06	53	63
% of samples	8.27%	4.51%	39.84%	47.36%

Most of the water samples (87.20%) show more than 1000 mg/l TDS. High concentration of carbonates and bicarbonates of Calcium, Magnesium, Sodium, Potassium salts increases the hardness of water. This type of water is not good for washing and bathing purposes and causes gastrointestinal disorder to humans and animals.

**TOTAL ALKALINITY:** Total Alkalinity present in water samples of the study area ranges from 80 to 930 mg/L. Out of 133 water samples, number of water samples and percentage in different Total alkalinity ranges have been shown in table 6.

Total Alkalinity	Below 600 mg/L	600 to 1000 mg/L
Number of water samples	101	32
% of samples	75.93%	24.06%

These results show that most of the water samples (75.93%) have less total alkalinity which are less than 600 mg/L. only 32 samples have more than 600 mg/L Chloride ion concentration which are 24% of total water samples analysed. It is within permissible limit of BIS and WHO.

On the basis of above results we can conclude that the ground water quality of Deeg tehsil of Bharatpur has high concentration of TDS, Chlorides, Carbonates and Bicarbonates of Ca, Mg, Na, K. It can be suggested that water may be intended to use for domestic and drinking purposes after pre-treatment, demineralization and purification of water by standard prescribed methods.

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