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SEASIONAL VARIATION AND PORTABILITY OF WATER SUPPLY SOURCES OF BUNDI CITY

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ABSTRACT

Seasional variation and potable quality of some water supply resources of Bundi City have been studied, for which annual variation in some physico-chemical characteristics viz: pH, TotalHardness. T.D.S., Chiorides, Nitrates, Fluorides were checked and results are discussed in this paper.

This study has its importance due to health aspects related with the chemical composition of drinking water.

KEYWORDS: Seasional Variation, Drinking Water, Potability, Water Quality

INTRODUCTION

Water is the major constituent of human body animal Kingdom, as well as vegetable kingdom . No living entity can survive, grow and develop without water.

Inherently water is a multiple use resource. The general area of water use having specific quality requirements are-

- Public water supplies.
- Agriculture
- Industry
- Propagation of fish, other aquatic life & wild life
- Recreation and aesthetics etc.

India is a vast country with extreme climate difference in various areas and rainfall varying from 100mm in western region to 11000mm in Cherapunji Meghalaya. Ground Water is a vital source of water supply specially in area where dry summer or extended drought cause flows in streams to cease and which are left hardly with any water at the surface. Due to ever growing industries, agriculture and municipal demand for water excessive stress on aquifers has led to the problem of critical lowering of water table, sea water intrusion in costal aquifers, land subsidence and water quality deterioration in many contries[1]. Optimal control and management of water resources system have recevied considerable attention in recent years as various studies [2-7]have been conducted in this area.

WATER QUALITY AND HEALTH ASPECTS

Water is considered as very dilute solution of number of chemicals essential for maintaining an equilibrium in biochemical reaction taking place in all living organisms in order to properly manage their physiology.

Water undergoes substantial changes in quality due to some environmental and artificial factors. Water quality changes even during the water leaves the treatment plant and reaches to customers tap.

Thus water quality of particular resource is a dynamic system. Therefore water quality technologists should always be alert about changes in the water quality parameters specially those which could led potential health hazards and would need to eliminate making water safe & potable.

WATER QUALITY STANDARDS

Indian standards laid down by the CPHEEO, ministry of urban development and Govt. of Indian on water quality criteria are summarized as follows-

Table 1: Physical and Chemical Standards[8]

S. No	Parameters	Max. Acceptable Concentration	Max Allowable Concetration
1	pH	7- 8.5	6.5-9.2
2	Total Hardness	200mg/Litre	600mg/L
3	T.D.S	500mg/L	1500mg/L
4	Chloride	200mg/L	1000mg/L
5	Nitrates	45mg/L	100mg/L
6	Fluorides	1.0mg/L	1.5mg/L

Various water resources of Bundi City have been studied for their water quality i.e. potability as well as for seasonal variation in hardness, T.D.S Chlorides, Nitrates, Fluorides and pH

Some Major Comments about Health and Other Aspects of Drinking Water

The chloride concentration is generally higher in waste water than in raw water because NaCl is increased by industrial processes. A high chloride content may harm metallic pipes and structures as well as growing plants.

Numerous sources in the environment contribute to the total nitrate content of natural water viz. geological sources, anthropogenic sources, atmospheric,nitrogen fixation and soil nitrogen.

In atmosphere high NO and NO_2 gas concentration are due to increased traffic flow.

The probable sources for nitrate in ground water includes rocks, fossil fuels and nitrate deposits. It appears that clay, slates, sand stones, lime stones,magnetic rocks have been reported to have nitrates.

In sandy soils with low water holding capacity and high permeability movements of pollutants like Chlorides and Nitrates is much more quicker than in clayey soil.

Indiscriminate use of nitrogenous fertilizers, insanitary disposal of human and animal wastes, industrial water and changes in land use pattern also contribute to the high Nitrate concentration in water resourees [9-14].

HEALTH EFFECTS OF HIGH NITRATES IN DRINKING WATER

High Nitrate concentration in drinking water may cause mathemoglobenemia or ^^Blue Baby syndrome** in infants in which ability of blood to carry oxygen is decreased due to oxidation of heamoglobin into mathemoglobin. Moreover high nitrates in drinking water is carcinogenic due to formation of nitrosamine in gastrointestinal tract.

Evidence in favour of this are the no. of epidemiological studies [13-19] carried out by earlier workers who found a correlation between incidence of stomach cancers and high Nitrates in drinking water.

Some animal studies indicate that long exposers to high level of Nitrate can reduce the intrathyroid iodine pool and thus renders the gland more sensitive to goitrogens[20] (WHO 1985)

HEALTH EFFECTS OF HIGH FLUORIDE IN DRINKING WATER

Fluorides have cumulative effect on human body

- Fluorides concentration below required level could not prevent ^^Dental caries**as Fluoride in drinking water is regarded to fulfill two major objectives in case of children up to the age group of 10 years i.e. the period during which maximum calcification takes place.
  - To provide enough Fluorides for enamel formation.
  - To overcome the ill effect of Aluminium ion in drinking water.

2. On the other hand, exposure to high levels of Fluorides causes harmful effect on human health as it is assimilated in teeth, bones and even in muscles.

Effects of higher amounts of Fluoride intake in order of severity are-

- Dental Fluorosis
- Skeletal Fluorosis
- Non Skeletal Fluorosis

Recently Fluoride ion is also being incriminated as carcinogen and mutagen though this aspect is not universally accepted [21-23]

In Rajasthan more than 50% districts are found affected with high Fluoride in drinking water [24-25]

Table 2: Seasonal Variation in Physico-chemical Characteristics of Water Sources of Water Supply at Bundi

Resources / Parameters	I		II		III	
	Highest in	**Lowest in**	**Highest in**	**Lowest in**	**Highest in**	**Lowest in**
1. pH	March-May 7.6	Sept. Oct. 7.4	April-June 7.7	July –Oct 7.5	May-June7.7	June –Oct 7.5
2.Total Hardness	March –Apr 396 (300)	July-Sept. 305 (272)	Nov-Dec 410 (360)	May- June 276 (220)	Sept –Oct 590 (410)	May-June 284 (170)
3.T.D.S	July-August 900 (420)	Dec- Jan 588 (520)	Aug. 835 (625)	Oct 600 (480)	May-June 947 (800)	Dec-Jan 604 (460)
4.Chloride	April-May 150(133)	June-July 88 (75)	Jan-Feb 144 (110)	Oct-Nov 75 (70)	April,Sept-oct 167 (30)	July 48 (20)
5. Nitrate	Feb-March 40 (15)	Sep – Nov 20 (4)	May- June 75 (20)	Dec-Feb 20 (5)	May –june 40 (15)	Dec- Feb 15 (4)
6. Fluoride	Sept-Oct 0.77 (0.33)	June- Aug. 0.42 (0.16)	April – June 1.0 (0.19)	Jan – Feb 0.09 (0.06)	Aug – May 0.72 (0.26)	Feb – March 0.11 (0.09)

(Values in brackets are minimum values)

Here, Resources - I. Raniji ki Bawri

II. Abhaynath ki Bawri

III. Open well Bhata Vilas

RESULTS AND DISCUSSIONS

- In hot season pH was rather high while low in rainy season.
- Water of above resources is rather hard as total hardness was found beyond permissible limits as well as highest value 590 (Laimit 200mg/L)was found in Sept-Oct month i.e. Rainy season.
- TDS of all resources is beyond permissible limits and was specially high in May – Aug ie.947 (While Max Limits is 500).
- Chloride in ground water resources of Bundi city were found mostly well within the permissible limits.Although lowest values were found after rainy season possibly due to dilution.
- Although Nitrates in these sources were mostly within permissible limit yet sometimes high values like 75 beyond permissible limits were found in hot season like may-June.
- Fluoride in Bundi water supply system is mostly well within the permissible limits and it was lowest in summers and rainy season while higher values were found in winters.

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