RJC
http://www.rasayanjournal.com

RASĀYAN *J. Chem.*
Vol.2, No.1 (2009), 234-242
ISSN: 0974-1496
CODEN: RJCABP

PHYSICO-CHEMICAL ANALYSIS OF GROUND WATER IN PRAVARA AREA, DISTRICT AHMEDNAGAR, MAHARASHTRA

Chhaya V. Wagh[1], Sudarshan J. Kokate[2] ,Haribhau R. Aher[2] and Shashikant R. Kuchekar[2*]

[1]Department of Chemistry, A. C. S. College, Satral,
[2]P. G. Department of Environmental Sciences and Analytical Chemistry, P. V. P. College, Pravaranagar, At/Po. Loni (Kd), Tal. Rahata, Dist. Ahmednagar, 413713, MS, India
[*]E mail: shashi17@gmail.com

ABSTRACT

In present investigation an attempt has been made to investigate the quality of ground water around pravara area. The water quality parameter viz- pH, electrical conductance (EC), total dissolved solid (TDS), total hardness (TH), total alkalinity, dissolved oxygen (DO), chemical oxygen demand (COD), calcium (Ca), magnesium (Mg), sodium (Na), potassium (K), chloride (Cl), sulphate (SO_4), phosphate (PO_4) and nitrate (NO_3), were investigated. The result shows that the ground water from some sampling stations is within permissible limit according to WHO and ISI standards.

Key words: Ground water, physico-chemical parameter.

INTRODUCTION

Ground water is about 20% of the world resource of fresh water and widely used by industry, irrigation and domestic purposes. Only about 1% of all of fresh water available from rivers, ponds and lakes, out of 0.03% water require for survival and growth of many forms of animal and plant life on the earth surface[1]. In town and villages people completely depends on ground water for domestic as well as for agriculture purpose, hence quality of ground water is very important. Ground water is also polluted by acid rain, fertilizers, industrial waste, garbage and domestic waste[2]. Groundwater is a highly useful and often abundant resource, however over use or overdraft can cause major problems to human beings and to the environment. Pravara area in Ahmednagar district is located in survey of India topological sheet number 47, 1/6 and lies between latitude 19^0 30′ N and longitude 74^0 25′ E, as the area falls in semi-arid zone. It receives moderate rain fall during the monsoon and have generally dry climate, but due to availability of water from pravara left bank canal, dugwells, borewells, the 35% of this area is under single crop cultivation (sugar cane) from a few decades. It is essential to study the ground water quality around the pravara area is an environment importance.

In our laboratory monitoring of ground water from some segments of pravara area[3-4] as well as from khadakwasala reservoir has been carried out[5-6]. Impact of human activities on quality of water for pravara river basin and left bank canal has been studied[7]. Threshold odor number of untreated effluent has been reduced by using various oxidants[8-10]. Physico-chemical characteristic of effluents from various samples and places has been studied[11-13]. water hyacinth has been used for removal of iron, manganese, zinc and copper[14]. Dispersion of lead along with highway has been investigated. In extension to our previous work, attempt has been made to investigate the quality of ground water around pravara area. The water quality parameter viz- pH, electrical conductance (EC), total dissolved solid (TDS), total hardness

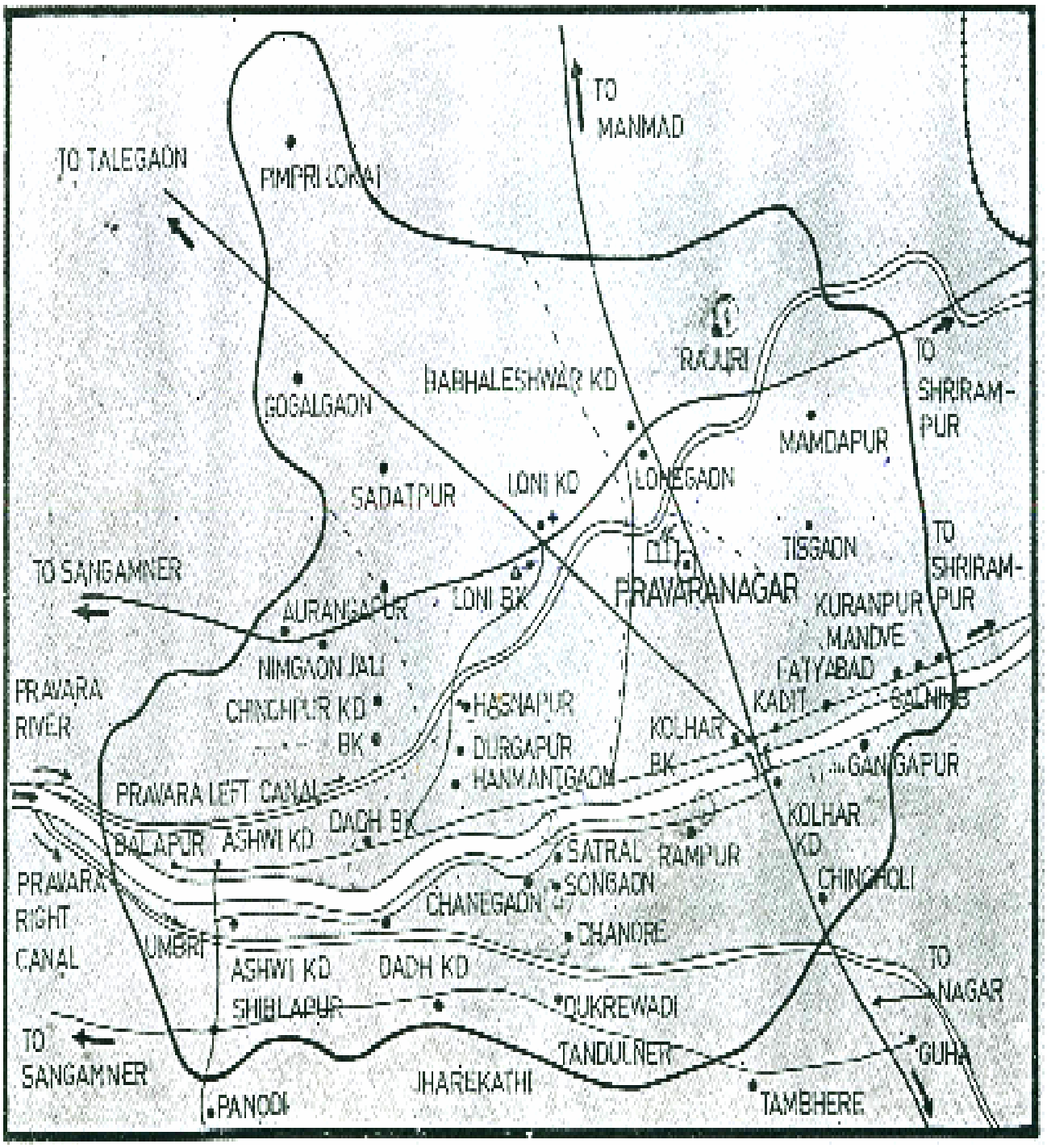


Fig-1: Map of pravara area showing position of sampling stations

(TH), total alkalinity, dissolved oxygen (DO), chemical oxygen demand (COD), calcium (Ca), magnesium (Mg), sodium (Na), potassium (K), chloride (Cl), sulphate (SO_4), phosphate (PO_4), nitrate (NO_3), has been studied.

EXPERIMENTAL

Ground water sample was collected from eighteen different locations of village in pravara area viz Zarekathi, Dhad Kd, Durgapur, Dhad Bk, Pratappur, Chinchpur, Gogalgaon, Loni Kd, Chandrapur, Sadatpur, Hasnapur, Mamdapur, Rajuri, Fatyabad, Songaon, Chanegaon, Satral and Dhanore (Fig. 1 Map of pravara area). The sampling stations are 4 to 5 km away from each other, samples were collected in sterilized screw-capped polyethylene bottles[16] having one liter capacity, labeled properly and analyzed in laboratory. Monitoring work has been carried out (pre-manson) april-may and post-manson october-november 2007. The sample stations are shown in Fig. 1 (map).

Control dynamic pH meter, Elico digital conductivity meter (CM-180), Elico (model CL- 22D) Flame Photometer, Systronics digital Nephelometer (model 132) and Elico Spectrophotometer (model SL-159) where used for determination of pH, conductivity, sodium, potassium, calcium, sulphate, nitrate, and phosphate respectively. Other standard solutions of different metal ions are prepared by dissolving respective salt with distilled water and dilute hydrochloric acid, all other chemical used were of an AR. Grade. Physico-chemical analysis of water samples were carried out using standard methods (APHA, 1985; Trivedy and Goel, 1980).

Table-1: Sampling Stations

Sample. No.	Sampling Locations	Sample No.	Sampling Locations
S_1	Zarekathi	S_{10}	Sadatpur
S_2	Dhad Kd.	S_{11}	Hasanapur
S_3	Durgapur	S_{12}	Mamdapur
S_4	Dhad Bk.	S_{13}	Rajuri
S_5	Pratappur	S_{14}	Fatyabad
S_6	Chinchpur	S_{15}	Songaon
S_7	Gogalgaon	S_{16}	Chanegaon
S_8	Loni kd.	S_{17}	Satral
S_9	Chandrapur	S_{18}	Dhanore

RESULTS AND DISCSSION

Monitoring of ground water samples has been done from 18 stations in pravara area for 15 parameter represent in Fig 2-16.

pH: pH serves as index to denote the extent of pollution by acidic and alkaline waste [16]. These values are in between 7.0 to 8.5. These values are in limit of ISI. Fig. 2.

Conductivity: The conductivity of water depends on the concentration of ions and its nutrient statues[17]. In present study maximum value of electrical conductivity recorded at station 1 in premansoon season. While minimum value at station 11 at post monsoon season. Fig 3.

Total dissolved solid (TDS): Total dissolved solid of ground water samples are due to vegetable decay, evaporation, disposed of effluent and chemical weathering of rocks. Maximum value of TDS in this investigation is at station 1 and 11. (Fig. 4) for premonsoon season while minimum value of TDS are at minimum stations in post monsoon season

Hardness: Hardness of water is due to calcium, magnesium, strontium nitrate, silicates, carbonate, bicarbonate and sulphate [17]. Maximum value observed at station 2 and station 16 at pre monsoon season while these are minimum for most of stations at post monsoon season. (Fig. 5).

Alkalinity: Alkalinity of samples is in between 200 to 800 ppm (Fig. 6) indicates that water from all stations is hard, vass[18] has suggested that total alkalinity value 60 ppm or more indicates hard water.

Dissolved oxygen (DO) and chemical oxygen demand (COD): All samples form pre monsoon and post monsoon season analyzed for DO and COD. (Fig. 7-8) these values observed in between 0 to 8.

Calcium: Calcium is an important nutrient required for organism. Calcium values observed for pre monsoon season are higher at stations seven while it is low at station 1 to 15 (Fig. 9).

Magnesium: Concentration of magnesium is in between 0 to 120 ppm at pre and post monsoon station (Fig 10)

Sodium and Potassium: Concentration of sodium is varied from 50 to 300 ppm for all the samples except S_2, S_3, S_4 and S_{16} (Fig. 11) while potassium is about constant for both season except station S_1 and S_8 (Fig. 12).

Chloride: Chloride content in fresh water is largely influenced by evaporation and precipitation[19]. In present findings, maximum and minimum values of the chloride are in between 50 to 250 ppm except station S_4 and S_5 (Fig. 13)

Sulphate: Sulphate concentration of water samples are in between 0 to 31 ppm except station S_1, S_2, S_9, S_{16}, S_{17} and S_{18} (Fig.14).

Phosphate: Important sources of phosphate depend on geochemical conditions, surface runoff from surrounding field and cattle dung. The high concentration of phosphate give rise to an algal bloom and it also brings eutrophication[20]. Concentration of phosphate in study area is approximately constant and in between 0 to 60 ppm except station 7 to 9. (Fig.15)

Nitrate: Concentration of nitrate varies from 1 to 14 ppm for pre and post monsoon season (Fig. 16). It may be due to agricultural runoff from filed.

CONCLUSION

The various parameters studied are within the permissible limit as per WHO and ICMR norms for drinking purposes in the studied period. The finding of the present work is also recommended ground water is suitable for irrigation and domestic use. Some of locations in study area are unfit for drinking as well other domestic purpose.

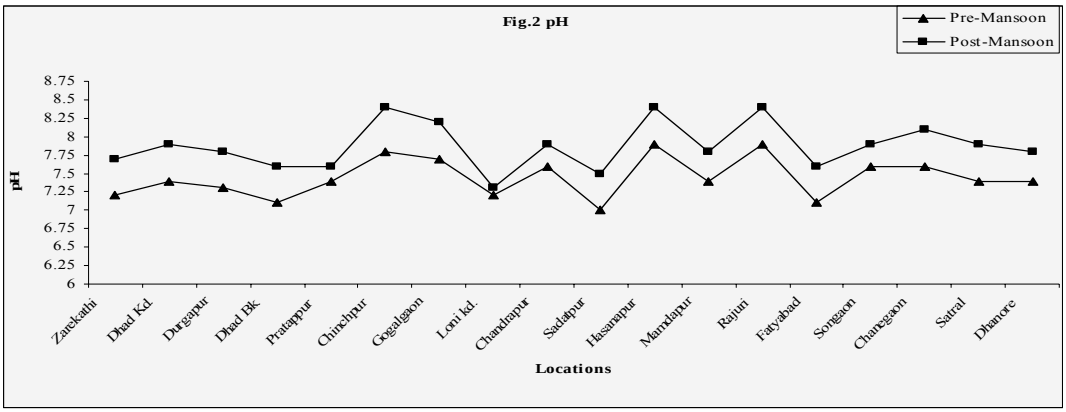
ACKNOWLEDGEMENT

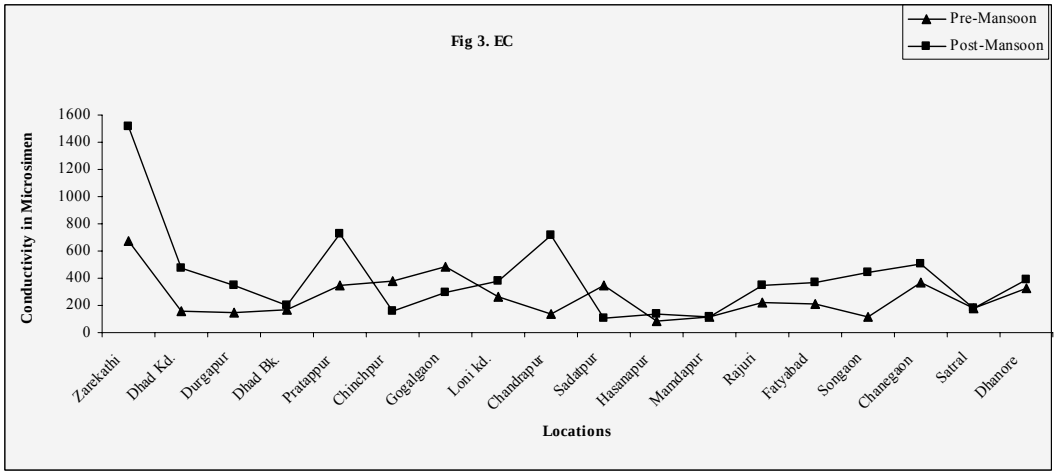
The authors are thankful to the Management, Pravara Rural Education Society and Principal of P. V. P. College Pravaranagar, A. C. S. College, Satral, for providing necessary facilities in the department.

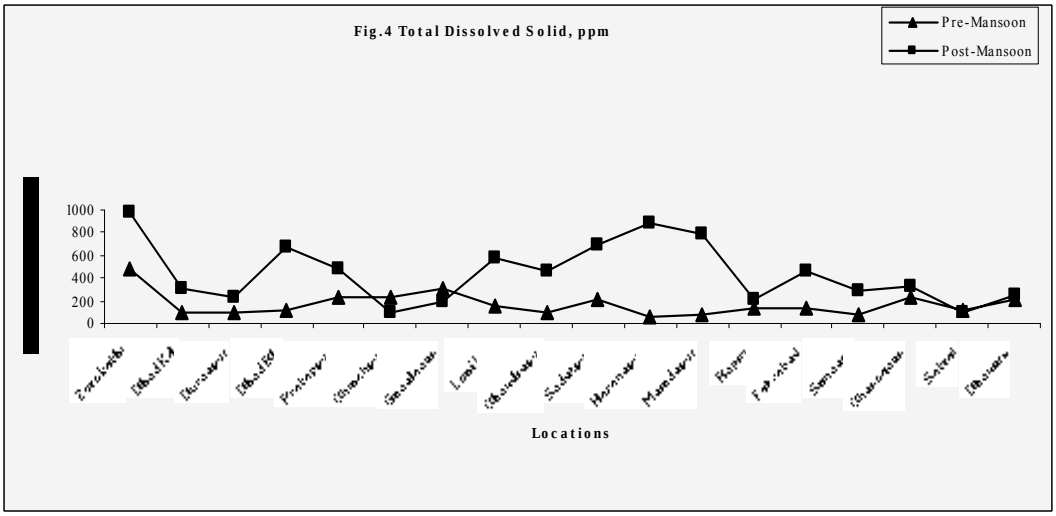
REFRENCES

1. G. S. Birdie and J. S. Birdie., Water Supply and Sanitary Engineering, Dhanpat Rai Publishing Company (P) Ltd., New Delhi, **6,** 33-60 (1998).
2. A. Kaushik and C. P. Kaushik, Perspectives in Environmental Studies, New Age International Publishers, **21,** 4-21 (2006).
3. H. R. Aher, D. G. Zinjad, P. S. Gunjal and S. R. Kuchekar, *Chem. Environ. Res.*, **9 (1 & 2)**, 158 (2000).
4. K. K. Karle, S. S. Bhusal, P. S. Gunjal and S. R. Kuchekar, *Poll. Rese.,* **11 (2),** 65 (1992).
5. P. N. Kamble, H. R. Aher and S .R. Kuchekar. *Int. J. Chem. Sci.*, **6(1)** 325 (2008).
6. P. N. Kamble, S. J. Kokate, H. R. Aher and S. R. Kuchekar, *Rasayan J. Chem*., **1(1),** 68 (2008).
7. H. R. Aher, D. G. Zinjad, P. S. Gunjal and S. R. Kuchekar, *Chem. Environ. Res.*, **11(1&2)**, 101 (2002).
8. P. S Gunjal, S. R. Kuchekar D. G. Thorat and H. R. Aher. *J. Aqua. Biol.*, **10 (1 & 2),** 26 (1995).
9. H. R. Aher and S. R. Kuchekar, *Chem. Environ. Res.*, **15(1&2),** 57 (2005).14.
10. P. S. Gunjal, D. G. Zinjad S. R. Kuchekar and H. R. Aher. *Poll. Res.*, **12 (4),** 219 (1993).
11. M. Dharam, S. C. Jagadale, H. R. Aher and S. R. Kuchekar, *J. Aqua. Biol.*, **20(1)**, 39 (2005).
12. V. Wagh, G. M. Pondhe and S. R. Kuchekar, *Ind. J. of Env. Ecoplan.*, **10(2),** 419 (2005).
13. H. R. Aher, D. G. Zinjad, P. S. Gunjal and S. R. Kuchekar, *J. Aqua. Biol.*, **14 (1 & 2),** 51(1999).
14. U. Shetty, K. Sonwane and S. R. Kuchekar. *J. Annali De Chemica.*, **9-10,** 771(2005).
15. S. S. Gore, S. R. Pingale and S. R. Kuchekar, *Ind. J. of Env. Ecoplan*., 10**(2),** 549 (2005).
16. P. K. Saxena, S. Jobben and R. Sahai, *Geobios.*, **15,** 107 (1988).
17. Gautam Ashutosh, Ecology and pollution of mountain wasters, Ashish publishing house, New Delhi, India, 45 (1990).
18. K. K. Vass, H. S. Raina, D. P. Zutshi and M. A. Khan, *Geobios.*, **4**, 238 (1977).
19. N. Kumaraswamy, *Poll. Res*., **10**, 13 (1991).

20. J. S. Pulle and A. M. Khan, *Poll. Res.*, **22,** 393 (2003).







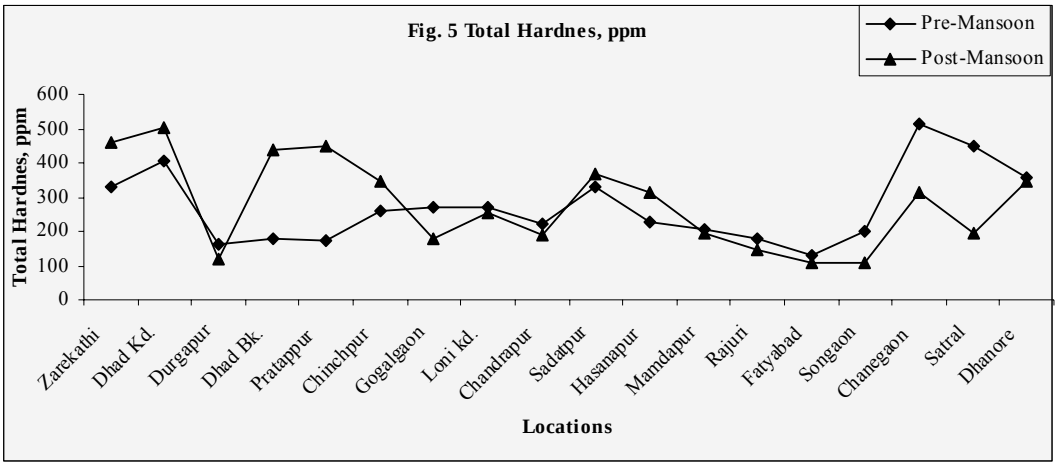


Fig. 5 Total Hardnes, ppm
Pre-Mansoon
Post-Mansoon
Total Hardnes, ppm
600
500
400
300
200
100
0
Zarekathi
Dhad Kd.
Durgapur
Dhad Bk.
Pratappur
Chinchpur
Gogalgaon
Loni kd.
Chandrapur
Sadatpur
Hasanapur
Mamdapur
Rajuri
Fatyabad
Songaon
Chanegaon
Satral
Dhanore
Locations

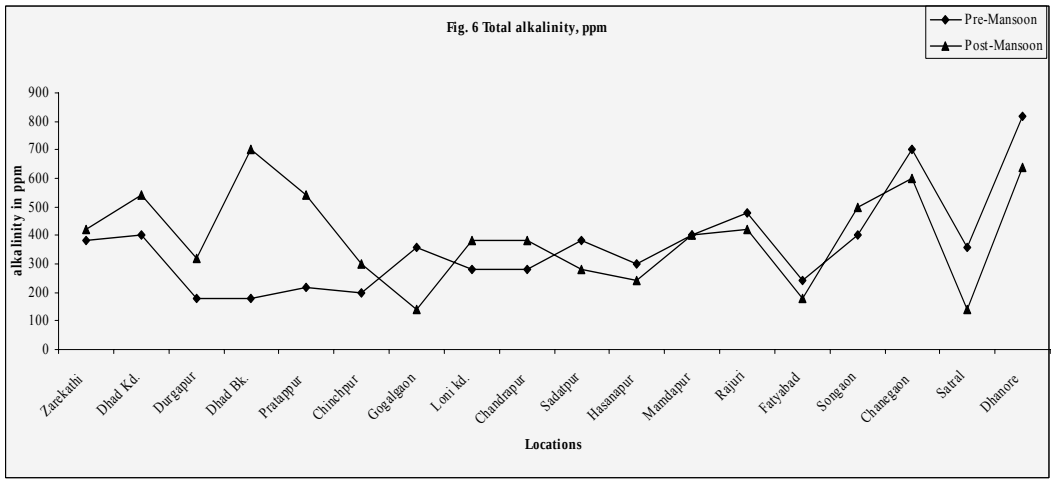


Fig. 6 Total alkalinity, ppm
Pre-Mansoon
Post-Mansoon
alkalinity in ppm
900
800
700
600
500
400
300
200
100
0
Zarekathi
Dhad Kd.
Durgapur
Dhad Bk.
Pratappur
Chinchpur
Gogalgaon
Loni kd.
Chandrapur
Sadatpur
Hasanapur
Mamdapur
Rajuri
Fatyabad
Songaon
Chanegaon
Satral
Dhanore
Locations

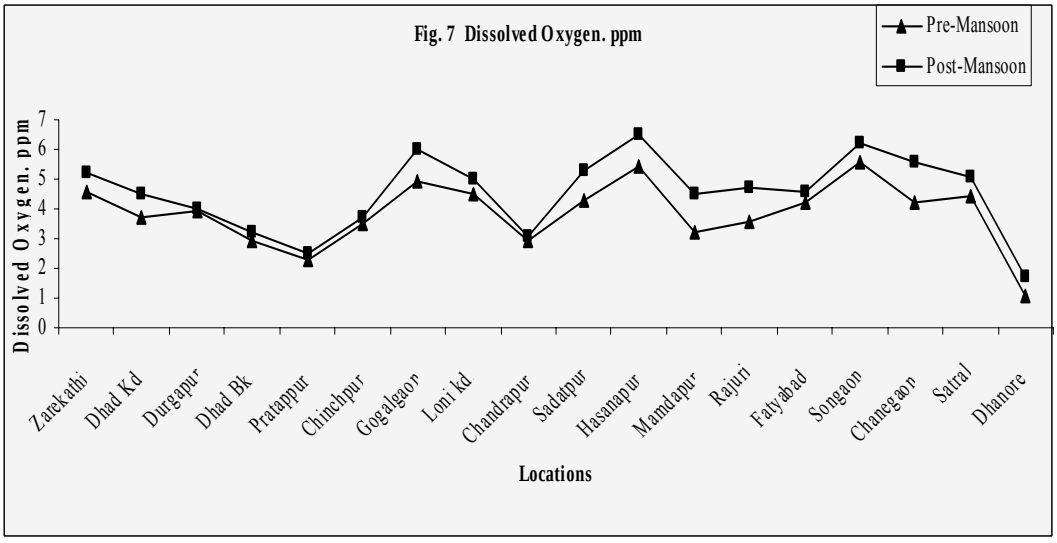


Fig. 7 Dissolved Oxygen. ppm
Pre-Mansoon
Post-Mansoon
Dissolved Oxygen. ppm
7
6
5
4
3
2
1
0
Zarekathi
Dhad Kd
Durgapur
Dhad Bk
Pratappur
Chinchpur
Gogalgaon
Loni kd
Chandrapur
Sadatpur
Hasanapur
Mamdapur
Rajuri
Fatyabad
Songaon
Chanegaon
Satral
Dhanore
Locations

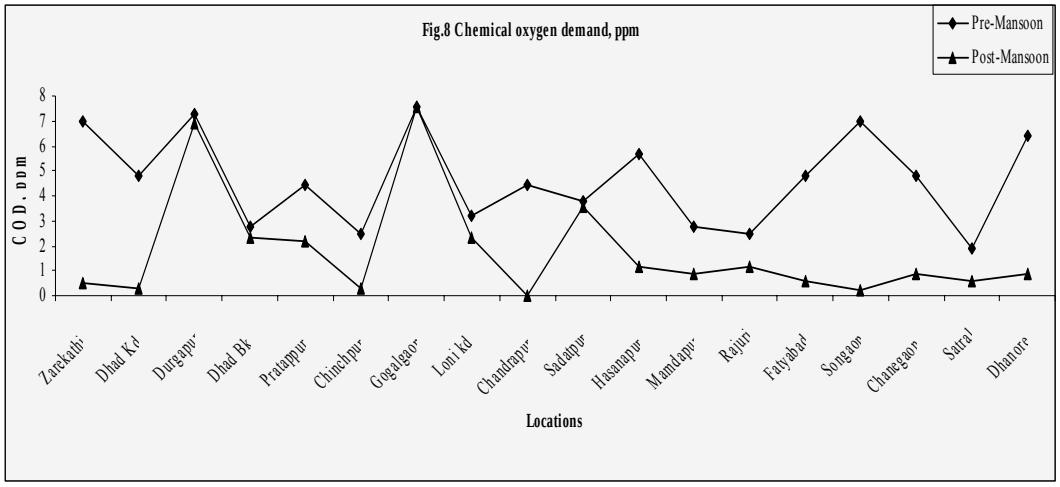


Fig.8 Chemical oxygen demand, ppm
Pre-Mansoon
Post-Mansoon
C O D . p p m
0
1
2
3
4
5
6
7
8
Zarekathi
Dhad Kd
Durgapur
Dhad Bk
Pratappur
Chinchpur
Gogalgaon
Loni kd
Chandrapur
Sadatpur
Hasanapur
Mamdapur
Rajuri
Fatyabad
Songaon
Chanegaon
Satral
Dhanore
Locations

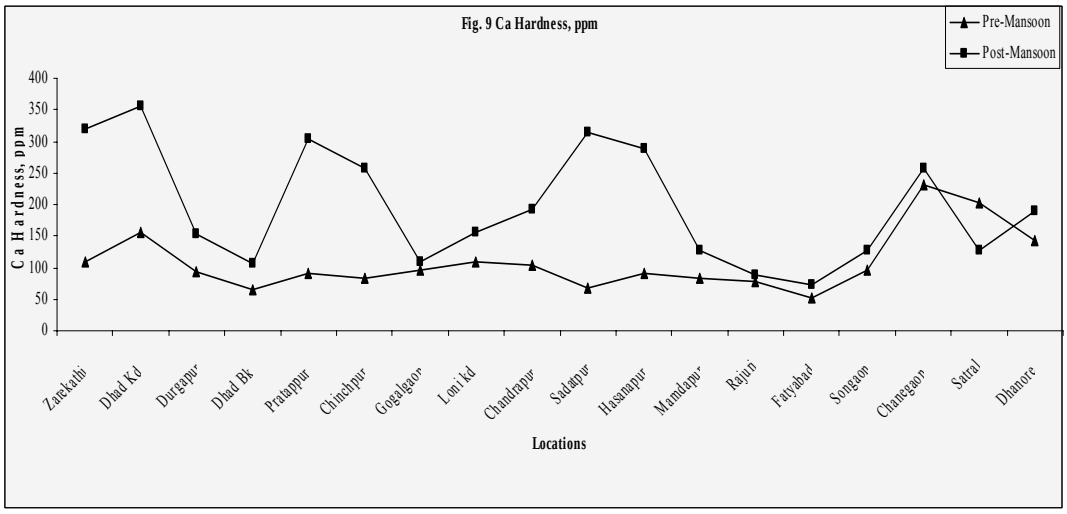


Fig. 9 Ca Hardness, ppm
Pre-Mansoon
Post-Mansoon
Ca Hardness, ppm
0
50
100
150
200
250
300
350
400
Zarekathi
Dhad Kd
Durgapur
Dhad Bk
Pratappur
Chinchpur
Gogalgaon
Loni kd
Chandrapur
Sadatpur
Hasanapur
Mamdapur
Rajuri
Fatyabad
Songaon
Chanegaon
Satral
Dhanore
Locations

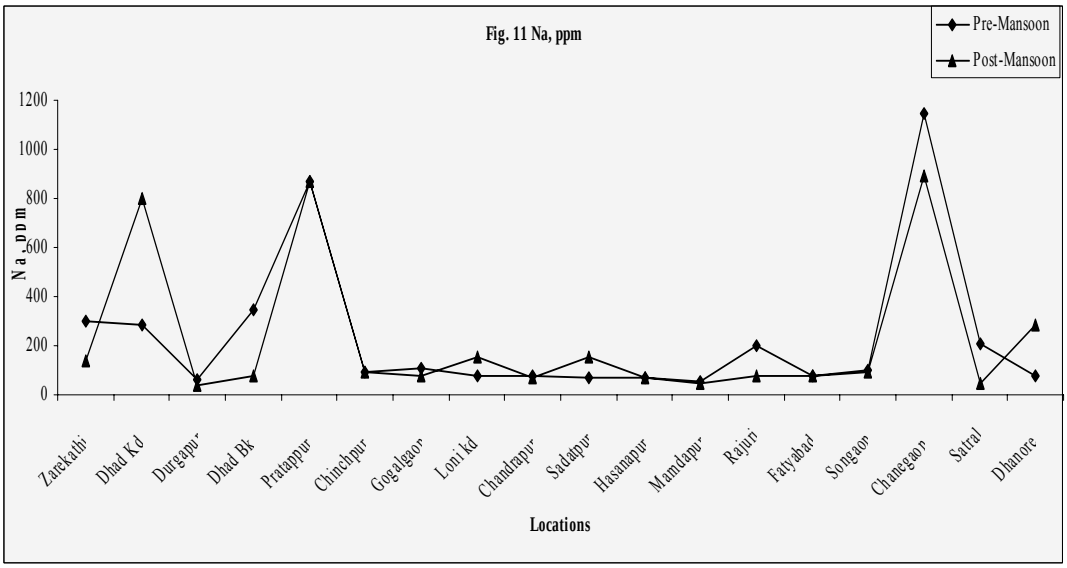


Fig. 11 Na, ppm
Pre-Mansoon
Post-Mansoon
Na , ppm
0
200
400
600
800
1000
1200
Zarekathi
Dhad Kd
Durgapur
Dhad Bk
Pratappur
Chinchpur
Gogalgaon
Loni kd
Chandrapur
Sadatpur
Hasanapur
Mamdapur
Rajuri
Fatyabad
Songaon
Chanegaon
Satral
Dhanore
Locations

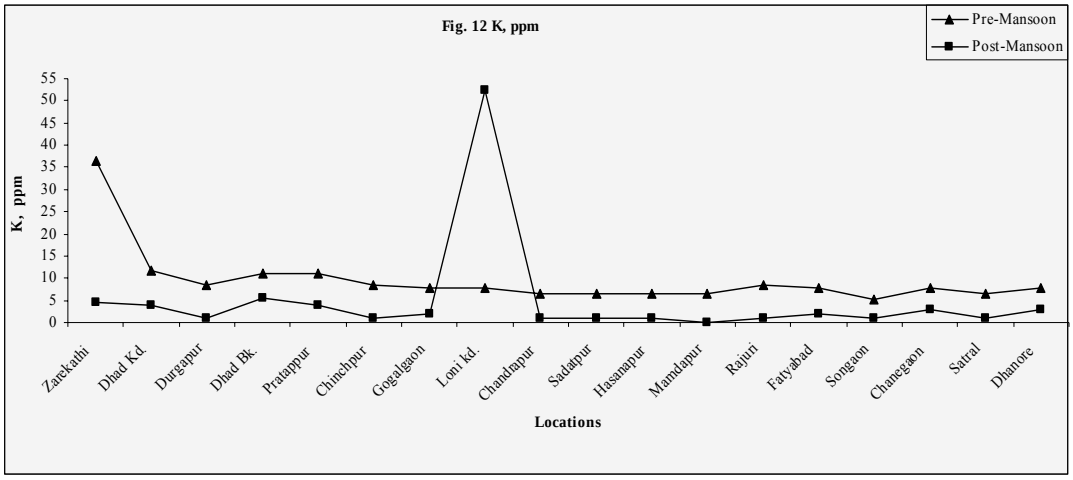


Fig. 12 K, ppm
Pre-Mansoon
Post-Mansoon
K, ppm
55
50
45
40
35
30
25
20
15
10
5
0
Zarekathi
Dhad Kd.
Durgapur
Dhad Bk.
Pratappur
Chinchpur
Gogalgaon
Loni kd.
Chandrapur
Sadatpur
Hasanapur
Mamdapur
Rajuri
Fatyabad
Songaon
Chanegaon
Satral
Dhanore
Locations

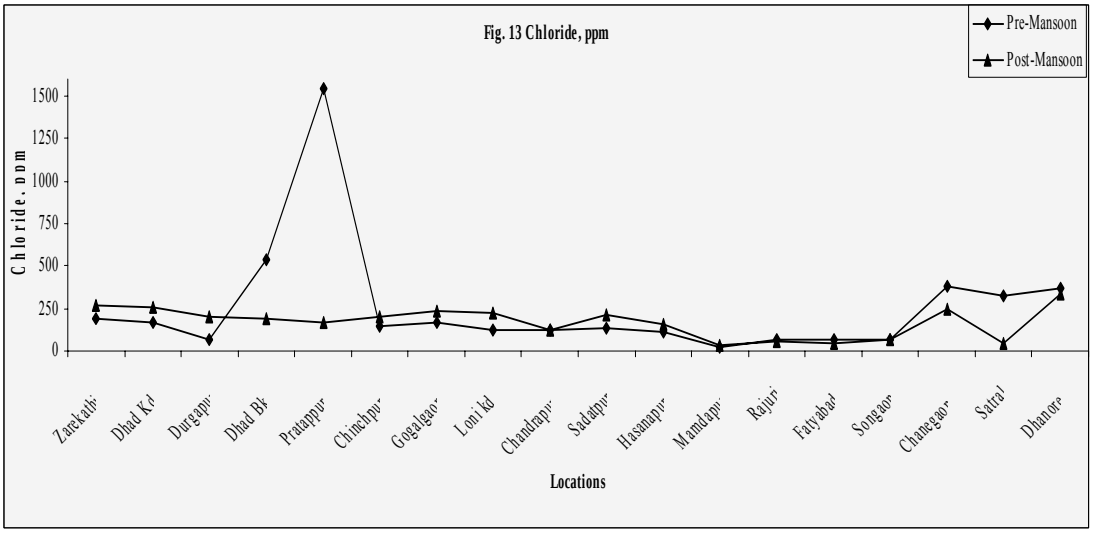


Fig. 13 Chloride, ppm
Pre-Mansoon
Post-Mansoon
Chloride. ppm
1500
1250
1000
750
500
250
0
Locations

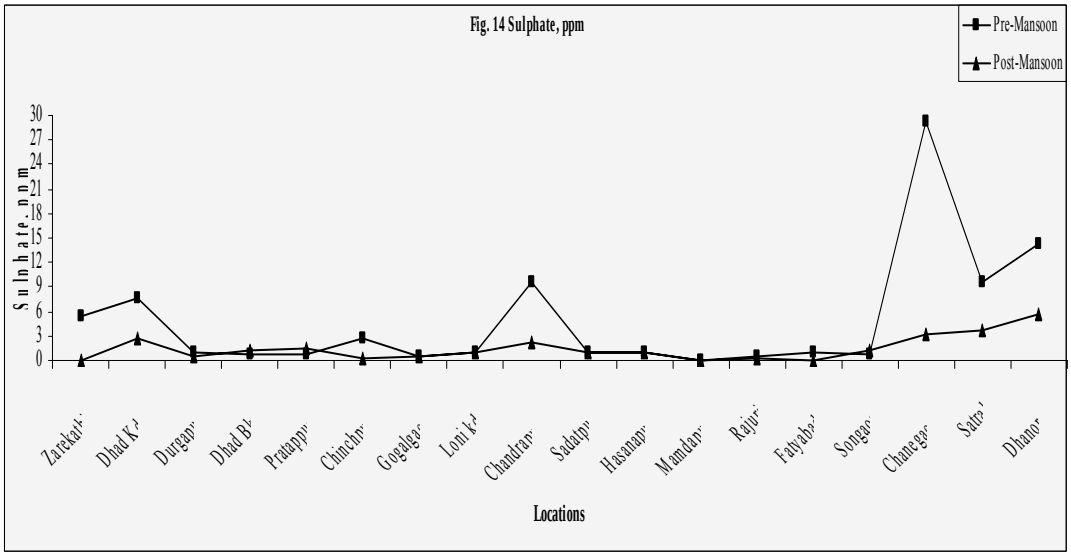
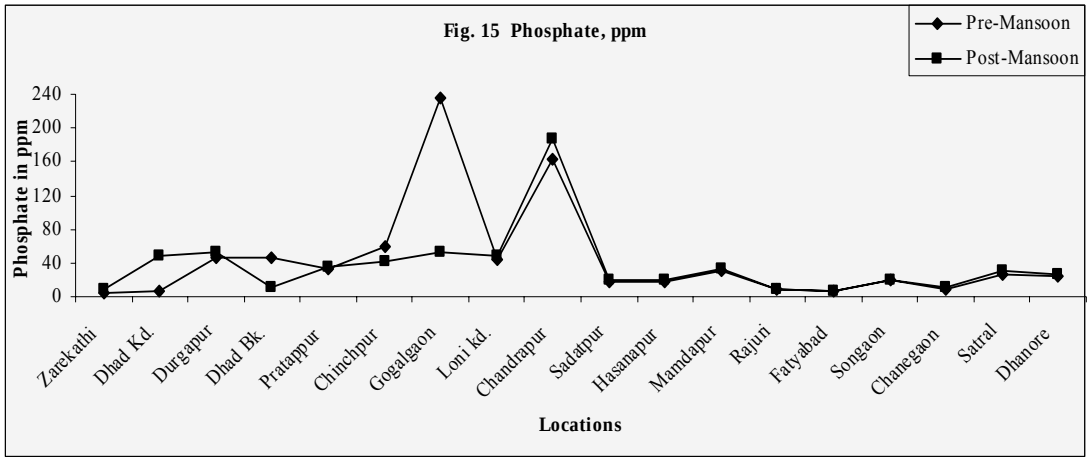
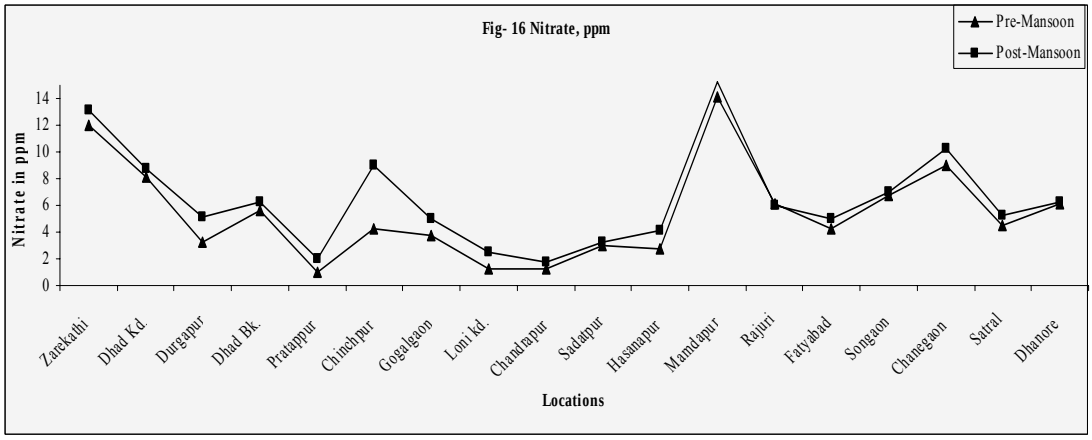


Fig. 14 Sulphate, ppm
Pre-Mansoon
Post-Mansoon
Sulphate. ppm
30
27
24
21
18
15
12
9
6
3
0
Locations





(Received:6 March 2009 Accepted: 8 March 2009 RJC-341)