

# Ground Water Quality Analysis for Irrigation of Some Villages in Dewas

Pratiksha Dubey, D. J. Killedar<sup>2</sup>, S. K. Sharma<sup>3</sup>, M. Islamuddin Faraz<sup>4</sup>

<sup>1</sup> Faculty, Re-Easy, M.P., India

<sup>2</sup> Professor, CE&AMD, S.G.S.I.T.S., M.P., India

<sup>3</sup> Professor, Agriculture Department, RVSKVV, M.P., India

<sup>4</sup> Assistant Professor, CE&AMD, S.G.S.I.T.S., M.P., India

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**Abstract** – Water is one of the most important natural resource available on earth without which existence of any living being would have been impossible. It has various types of uses such as: drinking, washing, bathing, irrigation etc. In the present study various tests have been performed on the grab samples collected from different villages of Dewas district namely, Akbarpur, Badoli, Dhanora, Laxmipura and Rewadi. Different parameters were determined such as pH, electrical conductivity, sodium, potassium, calcium, magnesium, chloride, boron & fluoride. On the basis of these parameters the suitability of water for irrigation was assessed on the basis of various classifications. On the basis of these classifications it was concluded that the ground water was suitable for irrigation use.

**Key Words:** SAR, Na%, EDTA, Curcumin method.

## 1. INTRODUCTION

As per the world agriculture statistics given by FAO in 2010, India was found to be the world's largest producer of several fresh fruits and vegetables, select fibrous crops such as jute, major spices, several staples such as millets, castor oil seeds etc. India was also found to be the second largest producer of rice and wheat. Thus, it can be well concluded that a major portion of the Indian economy is dependent on agriculture. Along with its allied sectors, agriculture is the largest source of livelihood in India,

It is well understood that there are two basic features which affect the crop cultivation and growth i.e.

- Soil
- Water

There are several other factors such as fertilizers that affect the crop growth but these two factors are the basic factors in the absence of which it is impossible to grow crops.

The latitude of Dewas is 70°34' E, longitude is 22°58' N and altitude is 545. The average annual rainfall is about 1065 mm. The maximum area of the villages in Dewas district consist of black cotton soil and almost uniform in nature.

In this study, various parameters have been determined by suitable methods and with the help of these parameters the water quality has been assessed using different classifications.

## 2. OBJECTIVES

The following are the objectives of the study:

- To determine several parameters of irrigation water such as pH, EC, Na, B etc.
- To classify the irrigation water with the help of different classification system.
- To assess the suitability of the water for irrigation use.

## 3. METHODOLOGY

The following methodology has been adopted:

- A total of four grab samples were collected for each village at a frequency of one sample each week.
- The following instrument/ method were used for determination of different parameters:
  - pH meter (pH)
  - Electronic conductivity meter (electrical conductivity)
  - Flame emission photometer (Sodium, Potassium)
  - EDTA Titration (Calcium, Magnesium)
  - Titration with AgNO<sub>3</sub> (Chloride)
  - Curcumin method (Boron)

- The following are the formulae used:

- $SAR = \{Na^+ / (Ca^{++} + Mg^{++})/2\}^{1/2}$
- $\%Na = (Na^+ + K^+) \times 100 / (Ca^{++} + Mg^{++} + Na^+ + K^+)$

#### 4. CLASSIFICATIONS USED

The following are the classifications used:

**Table -1:** Classification for pH value as per (Ayers & Westcot, 1985)

Classification	pH value
Pass	6.5-8.5
Fail	Any other value

**Table -2:** Classification for EC value as per (Ayers & Westcot, 1985)

Degree of restriction to use	EC value (ds/m)
None	0.7
Slight to moderate	0.7 -3.0
Severe	>3.0

**Table -3:** Classification for B value as per (IS: 11624-1986)

Class	Boron (ppm)
Low	<1.0
Medium	1.0 - 2.0
High	2.0 - 4.0
Very high	>4.0

**Table -4:** Classification for SAR value as per (Todd 1959; Richards 1954)

SAR values	Sodium Hazard classes	Remark on quality
<10	S1	EXCELLENT
10-18	S2	GOOD
18-26	S3	DOUBTFUL/FAIR
>26	S4 & S5	UNSUITABLE

**Table -5:** Classification for Na% value as per (Eaton 1950)

Na %	Class
<60	Safe
>60	Unsafe

**Table -6:** Classification for Cl value

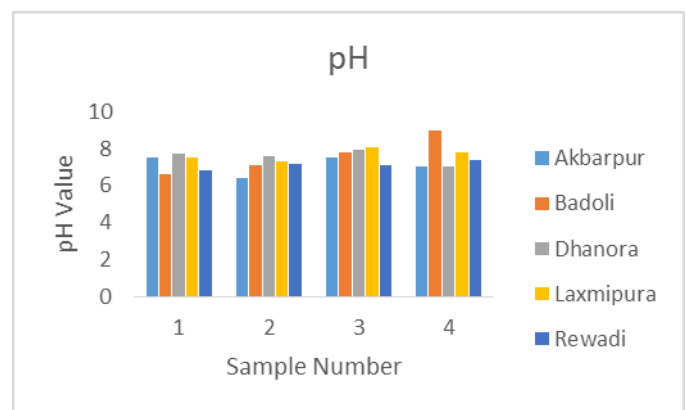
Chloride (ppm)	Effects on crops
<70	Generally safe for all plants
71 - 140	Sensitive plants show injury
141 - 350	Moderately plants show injury
>350	Can cause severe problems

#### 5. RESULTS

The values of parameters of different samples obtained are tabulated below:

**Table -7:** pH value

	Akbarpur	Badoli	Dhanora	Laxmipur	Rewadi
	7.5	6.6	7.7	7.5	6.8
	6.4	7.1	7.6	7.3	7.2
	7.5	7.8	7.9	8.1	7.1
	7	9	7	7.8	7.4
AVG	7.10	7.63	7.55	7.68	7.13



**Fig -1:** Bar Chart for pH value

**Table -8:** EC value

	Akbarpur	Badoli	Dhanora	Laxmipur	Rewadi
	1.50	1.80	2.23	2.20	2.50
	1.80	1.75	2.15	2.32	2.77
	2.00	2.15	2.00	2.12	2.50
	1.95	2.21	2.10	1.77	2.41
AVG dS/m	1.81	1.98	2.12	2.10	2.55

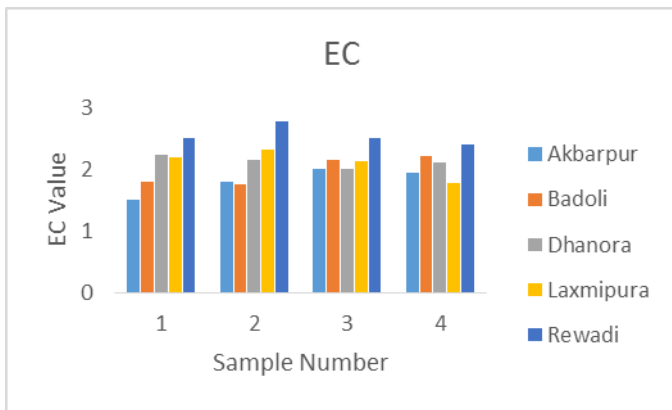


Fig -2: Bar Chart for EC value

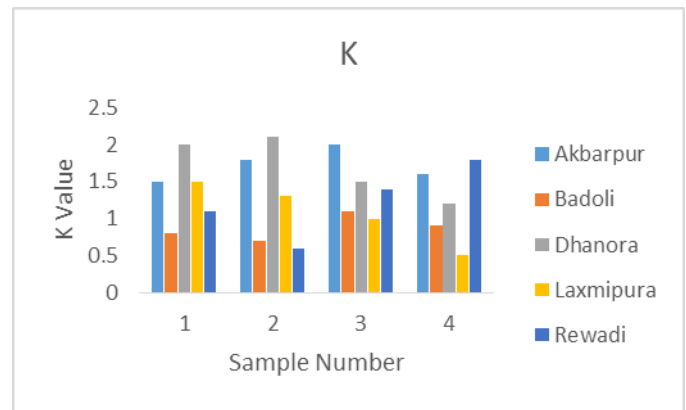


Fig -4: Bar Chart for K value

Table -9: Na value

	Akbarpur	Badoli	Dhanora	Laxmipura	Rewadi
	125.0	122.0	150.0	175.0	145.0
	130.0	118.0	148.0	150.00	152.0
	128.0	110.0	160.0	162.0	157.0
	140.0	120.0	155.0	155.0	162.0
AVG Mg/l	130.75	117.5	153.25	160.50	154.0

Table -11: Ca value

	Akbarpur	Badoli	Dhanora	Laxmipura	Rewadi
	110	120	90	150	120
	121	132	95	165	128
	118	123	101	142	140
	119	125	98	152	146
AVG Mg/l	117	125	96	152	134

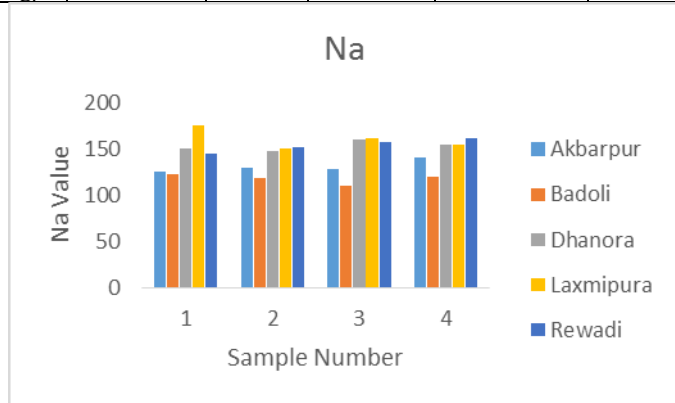


Fig -3: Bar Chart for Na value

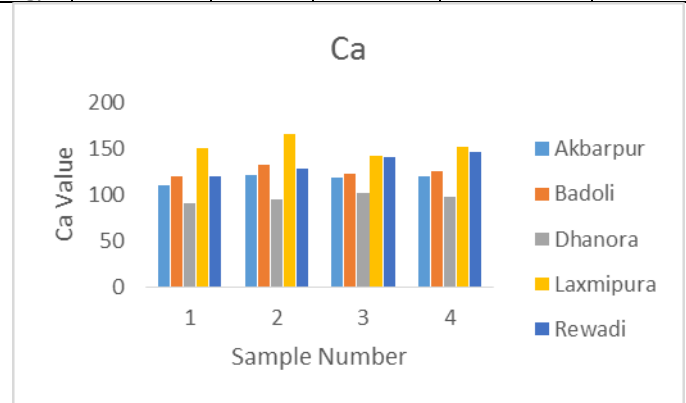


Fig -5: Bar Chart for Ca value

Table -10: K value

	Akbarpur	Badoli	Dhanora	Laxmipura	Rewadi
	1.5	0.80	2.00	1.50	1.10
	1.80	0.70	2.10	1.30	0.60
	2.00	1.10	1.50	1.00	1.40
	1.60	0.90	1.20	0.50	1.80
AVG Mg/l	1.73	0.88	1.70	1.08	1.23

Table -12: Mg value

	Akbarpur	Badoli	Dhanora	Laxmipura	Rewadi
	60.00	72.00	50.00	65.00	69.00
	62.00	68.00	48.00	68.00	75.00
	65.00	65.00	55.00	72.00	74.00
	72.00	80.00	47.00	70.00	66.00
AVG Mg/l	64.75	71.25	50.00	68.75	71.00

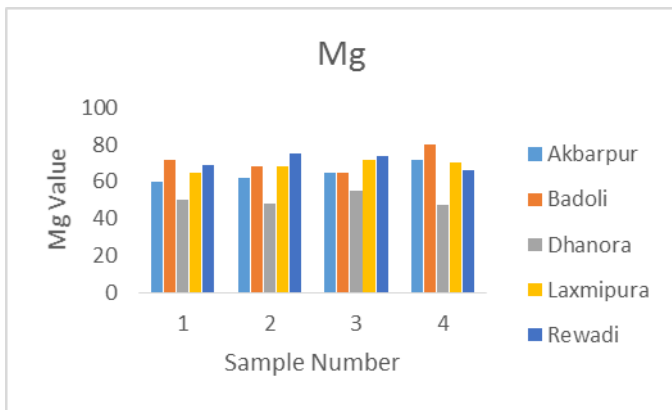


Fig -6: Bar Chart for Mg value

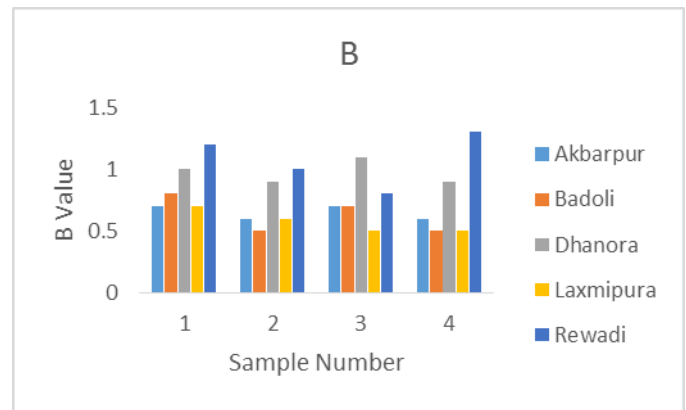


Fig -8: Bar Chart for B value

Table -13: Cl value

	Akbarpur	Badoli	Dhanora	Laxmipura	Rewadi
	150.0	166.0	75.0	88.0	65.0
	171.0	170.0	120.0	92.0	78.0
	135.0	162.0	79.0	75.0	68.0
	121.0	180.0	105.0	100.0	67.0
AVG Mg/l	144.3	169.5	94.8	88.8	69.5

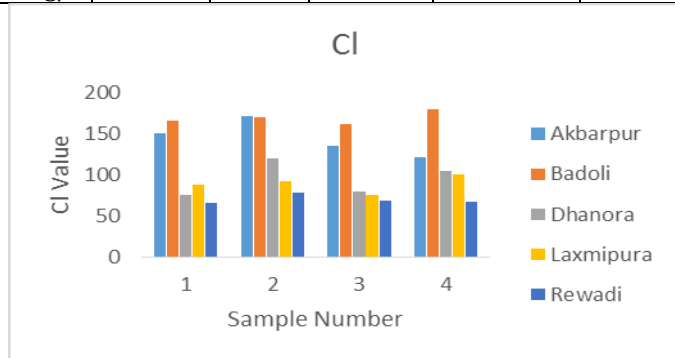


Fig -7: Bar Chart for Cl value

Table -14: B value

	Akbarpur	Badoli	Dhanora	Laxmipura	Rewadi
	0.70	0.80	1.00	0.70	1.20
	0.60	0.50	0.90	0.60	1.00
	0.70	0.70	1.10	0.50	0.80
	0.60	0.50	0.90	0.50	1.30
AVG	0.65	0.63	0.98	0.58	1.08

Table -15: SAR value

	Akbarpur	Badoli	Dhanora	Laxmipura	Rewadi
	2.38	2.17	3.15	3.00	2.61
	2.40	2.08	3.09	2.48	2.64
	2.35	2.00	3.18	2.76	2.67
	2.50	2.06	3.22	2.61	2.79
AVG	2.41	2.08	3.16	2.71	2.68

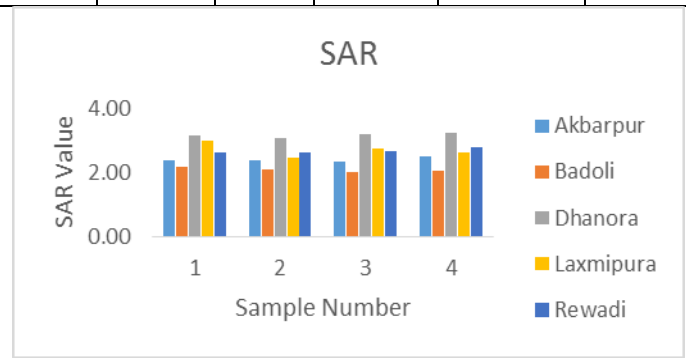


Fig -9: Bar Chart for SAR value

Table -16: Na% value

	Akbarpur	Badoli	Dhanora	Laxmipura	Rewadi
	34.44	30.91	43.33	37.35	35.20
	33.86	29.72	42.76	32.17	34.55
	33.34	29.53	42.26	35.22	34.43
	34.08	29.04	43.61	33.61	35.81
AVG	33.93	29.80	42.98	34.59	35.00

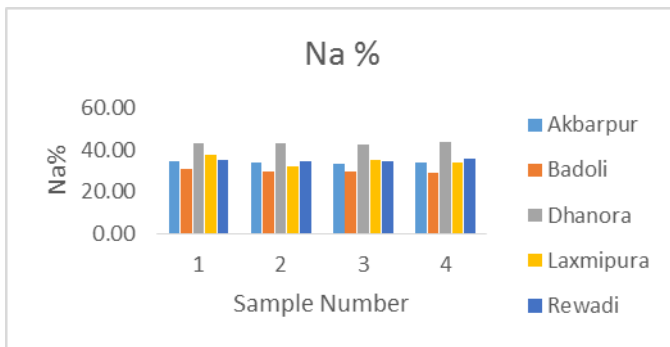


Fig -10: Bar Chart for Na% value

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## 6. CONCLUSIONS

On the basis of the above results following conclusions may be drawn:

- All the samples from all the villages lie in the range of permissible limit for pH value.
- The degree of restriction for use of all the water samples from all the villages has been found to be slight to moderate on the basis of EC.
- On the basis of boron concentrations all the samples lie in the high class.
- On the basis of SAR values the Sodium Hazard classes of the water samples has been found to be S1 i.e. of excellent quality.
- On the basis of chloride concentration it can be concluded that
  - a. Water of Rewadi is generally safe for all plants
  - b. Water of Laxmipur and Dhanora will cause injury to sensitive crops
  - c. Water of Akbarpur and Badoli will cause injury to moderate plants
- Na% of all the water samples indicate that the water is safe for irrigation use.

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