A comparative studies of Ionic imbalance of irrigation water in Sriganganagar and Hanumangarh district of Rajasthan

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1.ABSTRACT

A comparative studies of Ionic imbalance parameters of irrigation water of IGNP, Bhakra and Gang canal system in Sriganganagar and Hanumangarh district of Rajasthan .The cationic imbalance changed the quality of irrigation water. The SAR, RSC, Total Hardness, Mg/Ca ratio are the main components of ionic imbalance . A systematic calculation of the correlation coefficient has also been carried out between different analyzed parameter. The cationic imbalance in water and soil effect plant growth and crop yield.

Keyword: SAR(sodium absorption ratio),RSC(Residual sodium carbonate),ESP(exchangeable sodium permissible)

2.INTRODUCTION –

The modern civilization, industrialization urbanization and increase in population have lead to fast degradation of our water quality. Canal water & ground water forms a major source of agriculture & drinking water. The soluble inorganic constituents of irrigation water react with soil as ions rather than as molecule.The saline/ alkaline hazard involved in the use of water for irrigation is determined by the absolute and relative concentration of the cations. The principle cations are Na^+ , Ca^{+2}, Mg^{+2} ,& K^+ ordinarily present.

3.MATERIALS AND METHODS

3.1 STUDY AREA - Rajasthan is the largest state of the Indian union with a geographical area of 34.3 million hectare. The study area comprises of Hanumangarh and Sri ganganagar districts of Rajasthan, located between 28.4^0 and 30.3^0 north latitude and 72.3^0 to 75.3^0 east longitude at an altitude of 175.6 meters above mean sea level. 100 water sample from different sites tubewell were collected from left and right hand side area of each IGNP, Bhakhra and Gang canal command. The sample were collected in high grade plastic bottles of 2.0& 2.5 liter capacity after rinsing with distilled water.

3.2 ANALYSIS METHODS - The analysis of ground water were carried by instrumental and volumetric method . P^H and EC measured by digital P^H meter and conductivity meter. The quantitative analysis of Na+ made through Flame photometer and Ca^{+2},Mg^{+2},CO_3^{-2} and HCO_3^- done by volumetric methods.The SAR of water sample is calculated by the formula

$$SAR = \frac{Na^+}{\sqrt{(Ca^{+2} + Mg^{+2})/2}}$$

Where Na^+, Ca^{+2} and Mg^{+2} represent the concentrations in Meq L^{-1} of respective ions.
The RSC of water sample is calculated by the formula(Eaton)

$$RSC = (CO_3^{-2} + HCO_3^-) - (Ca^{+2} + Mg^{+2})$$

Concentration expressed in Meq L^{-1} .
The total hardness expressed as $CaCO_3$ Mg L^{-1} was calculated simply by the formula

$= 2.497 \times Ca^{+2} + 4.118 \times Mg^{+2}$ (APHA 1995)

4.RESULT AND DISCUSSION

Table-1 Minimum and maximum value of different parameter of under ground water samples of IGNP,Bhakhra,Gang canal commands area(100 sample from each canal)

SR NO.	Chemical characteristics	IGNP Command	Bhakhra Canal Command	Gang Canal Command
1	**SAR (Meq L^{-1})**	0.42-44.15	0.91-14.81	0.37-6.79
2	**RSC (Meq L^{-1})**	0.1-16.3	0.8-6.2	0.4-1.4
3	**TH (Mg L^{-1})**	35-1965	135-2840	133-4210
4	**Mg^{+2}/Ca^{+2}**	0.6-17.0	0.5-227.5	0.8-2.9

Table-2 percentage value of different parameter of under ground water samples of IGNP,Bhakhra,Gang canal commands area(100 sample from each canal)

SR NO.	Chemical characteristics	IGNP Command	Bhakhra Canal Command	Gang Canal Command
1	**SAR (Meq L^{-1})**			
	< 10	96	84	100
	10-15	2	16	NIL
	15-20	NIL	NIL	NIL
	>20	2	NIL	NIL
2	**RSC (Meq L^{-1})**			
	<2.5	84	92	100
	2.5- 5.0	5	6	NIL
	5.0-7.5	4	2	NIL
	>7.5	7	NIL	NIL
3	**TH (Mg L^{-1})**			
	>100	35	26	18
	>500	65	74	82
4	**Mg^{+2}/Ca^{+2}**			
	<1.5	37	55	78
	1.5-3.0	51	36	22
	>3.0	12	9	NIL

(classification of permissible limits of different parameter based on Gupta et all ,WHO and BIS standards)

Chauhan & kumar concluded that an increases in RSC of irrigation water progressively increased the P^H, SAR and ESP and decreased the hydraulic conductivity of soil. According to Yadav et all. increasing the Mg/Ca ratio (1:1) to (4:1) in the inceptisols deteriorated the water transmission property by 57% and decrease to 1:4 improved it by 48% . According to Yadav increased Mg/Ca ratio (>2) along with high EC, reduced the affinity of PO_4^{-3}ions to exposed Ca^{+2} ions in $CaCO_3$ surfaces and thereby minimized the absorption magnitude.

5.CONCLUSION-

The study was undertaken to assess the ionic imbalance of ground water sample of Sriganganagar and Hanumangarh district of Rajasthan. The high concentration of salt of sodium,maganesium and calcium as chloride, sulphate, carbonate and bicarbonates develop an ionic imbalance in irrigation water in the forms of SAR, RSC, Mg/Ca ratio and Total hardness. An irrigation water containg more than permissible and maximum permissible limits of SAR, RSC, Mg/Ca ratio and Total hardness, disturb physco-chemical property of irrigated soils and ultimately reduce the crop yields

6. REFRENCES

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