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Short Communication

EVALUATION OF QUALITY OF UNDERGROUND IRRIGATION WATER OF RAIBARELI DISTRICT, UTTAR PRADESH

RAVINDRA KUMAR AND VINOD KUMAR

Soil Salinity Project, Department of Soil Science and Agricultural Chemistry Chandra Shekhar Azad University of Agriculture & Technology, Kanpur (U.P.) -208002
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Water is vital for realizing the full potential of the agriculture sector and country's development. With the advancement in modern technologies and irrigation system, there is a tremendous pressure on ground water quantity and quality. As a consequence, groundwater depth and quality are deteriorating at a alarming rate in many part of state. Therefore, the evaluation of the water quality is important. Keeping in view these facts, the evaluation of water quality appraisal of the underground water of Raebareli district was done for irrigation purpose. Eight hundred thirty two underground water samples were collected from Raebareli district during November and December 2011 for assessing the quality of water for irrigation. Out of total samples, 74, 177, 103, 110, 166, 90 and 112 samples were collected from Dalmau, Lalganj, Maharajganj, Tiloi, Raibareli, Unchahar and Salon tehsils of the district. All the water samples were collected from running tube wells. The running tube wells were selected randomly for collection of water samples. Each selected tube well was run for three to four hours and then the samples were collected in cleaned plastic bottles, properly leveled and brought to the laboratory for chemical analysis. These underground water samples were analyzed for pH, EC, cations and anions using the methods described by Richards (1954). Sodium adsorption ratio (SAR) and residual sodium carbonate (RSC) were worked out.

Table 1: pH, EC, SAR and RSC of underground water of Raebareli district

Tehsil	pH	EC (dSm^{-1})	SAR	RSC ($meqL^{-1}$)
Dalmau	7.2-8.2 (7.5)	0.40-4.82 (1.13)	0.6-5.6 (2.13)	0.0-2.7 (0.06)
Lalganj	7.1-8.2 (7.3)	0.45-4.06 (1.17)	0.7-9.8 (2.66)	0.0-6.7 (0.14)
Maharajganj	7.1-8.3 (7.6)	0.54-3.94 (1.11)	0.6-16.0 (2.52)	0.0-2.8 (0.24)
Tiloi	7.0-8.3 (7.4)	0.28-3.37 (1.02)	0.2-10.2 (2.39)	0.0-10.2 (0.29)
Raibareli	7.1-8.2 (7.6)	0.34-4.82 (1.13)	0.5-10.2 (2.13)	0.0-7.2 (0.18)
Unchahar	7.2-8.2 (7.5)	0.40-4.80 (1.14)	0.6-10.1 (2.45)	0.0-2.6 (0.07)
Salon	7.2-8.3 (7.3)	0.56-3.27 (1.16)	0.9-10.2 (2.57)	0.0-7.2 (0.15)
Whole district	7.0-8.3 (7.5)	0.28-4.82 (1.12)	0.2-16.0 (2.24)	0.0-10.2 (0.16)

Table 2: Ionic composition of underground water of Raebareli district

Tehsils	Anions ($meqL^{-1}$)				Cations ($meqL^{-1}$)			
	CO_3	HCO_3	SO_4	Cl	Ca	Mg	Na	K
Dalmau	0.0-1.5 (0.37)	1.5-10.7 (3.17)	0.2-4.7 (1.35)	0.5-35.0 (6.31)	1.5-30.2 (5.10)	0.6-4.5 (2.14)	0.7-20.7 (4.24)	0.01-0.08 (0.03)
Lalganj	0.0-2.2 (0.69)	0.6-17.3 (3.66)	0.3-3.9 (1.65)	1.2-32.2 (5.97)	1.5-21.4 (5.00)	0.6-12.8 (2.20)	1.3-22.7 (4.71)	0.01-0.10 (0.03)
Maharajganj	0.0-3.2 (0.62)	1.0-20.2 (2.81)	0.2-9.0 (1.80)	1.2-30.1 (5.33)	0.9-18.7 (4.72)	0.7-6.4 (2.13)	1.2-25.9 (4.03)	0.01-0.10 (0.02)
Tiloi	0.0-2.2 (0.30)	0.9-17.6 (3.56)	0.4-8.0 (1.37)	0.4-26.1 (5.34)	1.4-18.1 (4.49)	0.4-5.2 (1.80)	0.6-18.8 (3.90)	0.01-0.10 (0.02)
Raibareli	0.0-2.1 (0.33)	0.7-17.6 (3.21)	0.2-3.9 (1.43)	0.5-25.7 (6.09)	1.6-18.5 (5.12)	0.6-12.8 (1.93)	0.7-20.7 (4.47)	0.01-0.11 (0.03)
Unchahar	0.0-2.1 (0.45)	1.6-20.2 (3.27)	0.2-4.5 (1.42)	0.5-25.7 (5.43)	0.8-18.5 (4.92)	0.6-6.6 (2.16)	0.7-25.9 (4.72)	0.01-0.12 (0.02)
Salon	0.0-1.2 (0.54)	2.0-17.6 (3.42)	0.5-3.4 (1.51)	2.0-25.7 (5.22)	0.9-17.0 (5.23)	0.6-12.8 (2.21)	1.7-18.5 (4.14)	0.01-0.10 (0.03)
Whole district	0.0-3.2 (0.47)	0.6-20.2 (3.30)	0.2-9.0 (1.05)	0.4-35.0 (5.66)	0.8-30.2 (4.94)	0.4-12.8 (2.08)	0.6-25.9 (4.32)	0.01-0.12 (0.03)

The ranges of pH, electrical conductivity, sodium adsorption ratio and residual sodium carbonate were from 7.2 to 8.2, 0.40 to 4.82 dSm^{-1}, 0.6 to 5.6 and 0.0 to 2.7 $meqL^{-1}$ in Dalmau, 7.1 to 8.2, 0.45 to 4.06 dSm^{-1}, 0.7 to 9.8 and 0.0 to 6.7 $meqL^{-1}$ in Lalganj, 7.1 to 8.3, 0.54 to 3.94 dSm^{-1} , 0.6 to 16.0 and 0.0 to 2.8 $meqL^{-1}$ in Maharajganj, 7.0 to 8.3, 0.28 to 3.37 dSm^{-1}, 0.2 to 10.2 and 0.0 to 10.2 $meqL^{-1}$ in Tiloi, 7.1 to 8.2, 0.34 to 4.82 dSm^{-1}, 0.5 to 10.2 and 0.0 to 7.2 $meqL^{-1}$ in Raibareli, 7.2 to8.2, 0.40 to 4.80 dSm^{-1}, 0.6 to 10.1 and 0.0 to 2.6 $meqL^{-1}$ in Unchahar and 7.2 to 8.3, 0.56 to 3.27 dSm^{-1}, 0.9 to 10.2 and 0.0 to 7.2 $meqL^{-1}$ in Salon tehsil of district, respectively. The ranges of pH, EC, SAR and RSC were from 7.0 to 8.3, 0.28 to 4.82 dSm^{-1}, 0.2 to 16.0 and 0.0 to 10.2 $meqL^{-1}$ with a mean value of 7.5, 1.12 dSm^{-1}, 2.41 and 0.16 $meqL^{-1}$ respectively in Raibareli district (Table 1). The values of CO_3, HCO_3, SO_4 and Cl ranged from 0.0 to 3.2, 0.6 to 20.2, 0.2 to 9.0 and 0.4 to 35.0 $meqL^{-1}$ with mean values of 0.5, 3.3, 1.5 and 5.7 $meqL^{-1}$ and calcium, Mg, Na and K ranged from 0.8 to 30.2, 0.4 to 12.8, 0.6 to 25.9 and 0.01 to 0.12 $meqL^{-1}$ with mean value of 4.9, 2.1, 4.3 and 0.03 $meqL^{-1}$ respectively (Table 2).

Table 3: Distribution frequency of underground water into different categories of water quality in Raebareli district

Category	Dalmau	Lalganj	Maharajganj	Tiloi	Raibareli	Unchahar	Salon	Total
Good	69	154	84	102	142	71	104	726
Marginally Saline	4	20	17	7	23	17	17	95
Saline	1	1	-	-				2
High Saline	-	-	1	-		1		2
Marginally Alkali	-	1	1	-		1		3
Alkali	-	1	-	-				1
Highly alkali	-	-	-	1	1		1	3
Total samples	74	177	103	110	166	90	112	832

Sodium and calcium were dominant cations followed by magnesium and potassium. In case of anions, chloride and bicarbonate were dominant ion followed by sulphate and carbonate in the underground irrigation water of the district. Similar results were also reported by Chauhan *et al.* (1990). Out of 832 water samples, 726 (87.3%) belongs to category good, 95 (11.4%) marginally saline, 2 (0.24%) saline, 2 (0.24%) highly saline, 3 (0.36%) marginally alkaline, 3 (0.36%) highly alkaline and 1 (0.12%) samples belongs to alkali in the district (Table 3). Similar results were also reported by Shahid *et al.* (2008), Jaidev *et al.* (2009) and Sharma (2011).

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