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Short Communication

Assessment of underground irrigation water quality of Auraiya district of Uttar Pradesh

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Agriculture alone accounts for about 85% water use in the country and the remainder 15% is used by the domestic and industrial sector. Water is vital for realizing the full potential of the agriculture sector and country development with the advancement in modern technologies and irrigation system, there is a tremendous pressure on ground water quantity and quality. As a consequence, ground water depth and quality are deteriorating at a alarming rate in many part of state. Good quality water available in desired quantities is of utmost impotence for higher agriculture productivity. Many parts in India suffering from water scarcity are used by poor quality groundwater. The maximum area under saline, alkali and brackish groundwater occurs in the arid and semi arid regions. The main cause of salanigation and sodification is the use of poor quality irrigation water and continuous use of this water, ultimately results in increased cost of production and crop failures. Therefore, the assessment of underground irrigation water quality of Auraiya district of Uttar Pradesh was done for irrigation purpose.

Two hundred four underground water samples were collected from well, tube well and hand pumps of Auraiya district of Uttar Pradesh during November and December 2018 along with GPS location. The running open wells, tube wells and hand pumps were selected randomly for collection of water samples. These collected underground water samples were analyzed for pH, EC, cations and anions using the methods described by Richards (1954). Sodium adsorption ratio (SAR) and residual carbonate (RSC) were worked out.

The electrical conductivity of underground irrigation water ranged from 0.33 to 4.12 dSm^{-1} with a mean value of 0.96 dSm^{-1} (Table 1). The lowest EC of 0.33 dSm^{-1} was observed in Sandalpur village of Ajitmal block and the highest (4.12 dSm^{-1}) in Chimkauni village of Achalda block. The pH ranged from 7.2 to 8.7 with mean value of 7.85. The sodium absorption ratio (SAR) varied from 0.0 to 10.3 $(mmol\ 1^{-1})^{1/2}$ with a mean value of 2.90 $(mmol\ 1^{-1})^{1/2}$. Minimum value of SAR was noted in Umrain village of Erwaktra block and maximum in Palia village of Bidhuna block. The value of residual sodium carbonate (RSC) was recorded from 0.0 to 7.4 me L^{-1} with a mean value of 0.33 me L^{-1}. Highest value of RSC was noted in Gopalpur village followed by Khera village of Sahar block and lowest in Jalalpur village of Achalda block. Similar results were reported by Kuma *et al.* (2017).

Table 1: Range and mean values of different water quality parameters of Auraiya district

Parameters	Range	Mean
pH	7.2-8.7	7.85
EC (dSm^{-1})	0.33-4.12	0.96
Anions (me L^{-1})		
CO_3	0.0-1.3	0.22
HCO_3	0.7-20.3	3.58
SO_4	0.2-4.7	1.25
Cl	0.4-32.1	4.69
Cations (me L^{-1})		
Ca	1.7-17.8	3.35
Mg	0.4-12.5	1.55
Na	0.7-25.7	3.85
K	0.1-0.9	0.03
SAR $(mmol\ 1^{-1})^{1/2}$	0.0-10.3	2.90
RSC(me L^{-1})	0.0-7.4	0.33

The maximum value of carbonate was observed in Jaitpur village of Auraiya block and minimum in Harrajpur of Bhagayanagar block (0.0 to 1.3 me L^{-1}). Highest bicarbonate in Baraua village of Erwakatra block and lowest in Jaitpur of Sahar block ranged 0.7 to 20.3 me $L^{-1.}$ The maximum value of sulphate was recorded from Khurjapur and minimum in Janakpur village of Bidhuna block was (0.2 to 4.7 me L^{-1}). The minimum value of chloride was obtained from

Behta of Bhagayanagar block and maximum in Rampur village of Ajitmal block (0.4 to 32.1 me $L^{-1)}$.The mean value of carbonate, bicarbonate, sulphate and chloride anions were 0.22, 3.58, 1.25 and 4.69 me L^{-1} respectively. In these water samples bicarbonate followed by chloride was the dominant anions among other anions. The maximum calcium value was observed in Bidhuna and minimum in Pailawar village of Achalda block (1.7 to 17.8 me L^{-1}).

Table 2: Quality of underground irrigation water of Auraiya district

Category	No. of water samples	Per cent
Good	139	68.1
Marginally saline	42	20.5
Saline	05	2.45
Highly saline	03	1.47
Marginally alkali	05	2.45
Alkali	06	2.94
Highly alkali	04	1.96

Highest value of magnesium was obtained from Mohanipur village and lowest in Mangalpur with the mean value of 1.55 me L^{-1}. Maximum sodium value was recorded in Karsa village and minimum in Khagipurwith mean value of 3.85 me L^{-1}. The highest value of potassium was recorded in Bhaisol and lowest in Rania village ranged from and 0.1 to 0.9 me L^{-1}. In the water samples sodium followed by calcium was the dominant cations among other cations. The results are in close conformity with those of Kumar and Kumar (2014).

According to AICRP on Management of Salt Affected Soils and Use of Saline Water in Agriculture classification, 68.1 % samples were categorized as good, 20.5 % as marginally saline, 2.45 % as saline water, 1.47 % as highly saline water, 2.45 % as marginally alkaline, 2.94 % as alkaline and 1.96 % as highly alkaline water (Table-2). Similar results were reported by Sharma, (2011) and Kumar *et al* (2018). Based on the present study it can be concluded that about 31.8 percent water of the Auraiya district had marginal and poor quality, but this poor quality ground water can be used with special management practices depending upon the soil types, rainfall and crops to be grown. The application of gypsum along with good amount of FYM in light to medium textured, well drained and permeable soils will enhance the efficacy of this marginal and poor quality ground water and helpful in arresting the decreasing trend in crop production.

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