Quality Characterization of Groundwater in Koilsagar Project Area, Mahabubnagar District, Andhra Pradesh, India

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ABSTRACT / Studies of groundwater chemistry in the Koilsagar project area of Andhra Pradesh indicate that the waters are sodium bicarbonate, sodium chloride, mixed cationic--mixed anionic, mixed cationic Na dominating bicarbonate, and mixed cationic Ca dominating bicarbonate types. Of them, sodium bicarbonate and mixed cationic Mg dominating bicarbonate types of waters are more prevalent. Isocone mapping of specific conductance indicates that the ionic concentration increases from east to west in the area. Graphical treatment of chemical data reveals that, in general, the area has basic water, whereas the left flank canal area is dominated by secondary alkaline water, and Pallamarri and Pedda Ramur villages have strongly acidic waters. Ion-exchange studies show that cation--anion exchanges exist all over the area except for two places, which have a base exchange hardened type of water.

Graphical representation further shows that most of the area has medium salinity--low sodium (C2S1) water useful for irrigation purposes. High salinity--low sodium (C2S1) and high salinity--medium sodium (C2S2) waters are present in some areas, which need adequate drainage to overcome the salinity problem.

Introduction

Koilsagar project area (latitude N16°30'40"-16°45", longitude E77°43'47"-77°51'07") is in Atmakur and Makthal taluks of the Mahabubnagar District of Andhra Pradesh, India (Fig. 1). It is a granitic terrain, forming a part of the peninsular shield and, for the purpose of hydrogeology, is a hard rock terrain. It is identified by the government of India as one of the drought-prone areas of the country. Evaluation of hydrogeological parameters in hard rock terrains is quite difficult, unlike in soft rock areas. Since quality is as important as quantity, the groundwater chemistry of the area was studied. The study includes determination of ionic concentrations, chemical classification, chemical relationship, ion-exchange processes, and irrigation suitability.

A number of techniques and methods have been developed to interpret the data. Zaporozec (1972) summarized the various modes of data representation and discussed about their possible use. In the present study, the method suggested by Hem (1975), the Piper trilinear diagram (Piper 1953), the Schoeller index (Schoeller 1959), and the U.S. Salinity Laboratory (1954) diagram are used for classifying groundwater.

Geologic Setting

The Koilsagar project area consists of granites with numerous basic and acidic enclaves and is traversed by basic dikes and veins of quartz, epidote, feldspar, and pegmatite. Granites are divided into pink and grey types, depending on the predominant color of K-feldspar. Pink granites are dominant and occupy a major part of the area under investigation. They are more susceptible to weathering than the grey varieties. Grey granites occupy limited areas and occur as pockets; at places they are interspersed with pink granites. They are compact, hard, and more resistant to weathering than pink granites. Gneissic granites are medium to coarse grained and occur at very few places in the area. In the area joints are more numerous with large intraspaces near the ground surface and diminish in width and intensity with depth. There are four major sets of joints present in the area and in the order of predominance they are in northeast-southwest, north-south, east-west, and northwest-southeast directions.

Sample Collection and Analysis

Water samples were collected from 24 representative wells in the area under investigation. Specific conductance and pH values were measured in the field. Laboratory analyses using standard methods of the American Public Health Association (APHA 1980) include the determination of the ionic concentrations of
Figure 1. Isocone map of EC of Koilsagar project area, A.P. showing salinity variation.