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## KUVEMPU UNIVERSITY

**“STUDIES ON PHYSICO-CHEMICAL AND BACTERIOLOGICAL CHARACTERISTICS OF GROUND WATER IN AND AROUND ARSIKERE TALUK, HASSAN DISTRICT”**

###### Thesis submitted for the award of degree of

**DOCTOR OF PHILOSOPHY**

**IN**

**ENVIRONMENTAL SCIENCE**

###### By

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#### SUMMARY AND CONCLUSION

#### The study of ground water in and around Arsikere for a period of two years has revealed variations among the different parameters seasonally at different study locations. For the analysis of ground water, 20 sampling sites were selected. The study includes the collection of the water samples following the random sampling method. Few of the parameters were analyzed on the spot and the remaining parameters were analyzed in the laboratory within 24 hrs following APHA (1998) method. The analysis was made following titration methods and standard procedures using Atomic Absorption Spectrophotometer (AAS). For E. coli examination sampling was carried out using a sterile glass stopper bottle, covered with aluminum foils to prevent contamination. Final estimation was made by membrane filter method. Statistical analysis was carried out by SPSS version 10.

#### The interrelationship between the various physico-chemical and bacteriological parameters in the ground water has been evaluated. Further, the ground water was classified on the basis of Freez and Cherry (1979), Sharma (1982) and Stuyfzand’s Classification.

#### Physico-chemical parameters

#### Among the physico-chemical parameters studied, pH is an important parameter in assessing water quality. It is a term used to express the intensity of acid or alkaline condition of solution. pH values varied from a minimum of 7.09 to a maximum 8.3 with mean value of 7.65 in summer season (Table 8). In rainy season, it ranged from 6.7 to 8.7 with mean value of 7.55 (Table 9) and for winter season pH values varied from a minimum of 7.09 to a maximum of 8.28 with a mean value of 7.62 (Table 10). It indicates that the water under study is alkaline in nature. The recommended value of pH for drinking water purpose is between 6.5 and 8.5 (BIS, 1998).

#### Electrical conductivity

#### Electrical conductivity concentration varied from a minimum of 520 mg/l to a maximum of 1850 mg/l in summer season (Table 8) and in rainy season a minimum of 750 mg/l to a maximum of 1950 mg/l (Table 9), in winter season a minimum of 1200 mg/l to a maximum of 1850 mg/l (Table 10). The electrical conductivity values showed that 20% of the water samples belonged to the permissible category, 48% belonged to brackish and 32% belong to saline category. Further, it has been observed that the electrical conductivity values have exhibited an increasing trend in winter season when compared to summer and rainy seasons. This is due to the fact that during winter season the dissolution of minerals, salts and other soil constituents increase as a result of increase in ground water table.

#### Total dissolved solids

#### The values of TDS showed that 76% of the water samples are fresh and 24% fall in brackish category. Further, it has been observed that the TDS values exhibited an increasing trend during winter season as compared to summer and rainy seasons. This is due to dissolution of more quantity of constituents of soil particles as ground water table increases during winter season. It represents the variation among the seasons.

#### Dissolved oxygen

#### The dissolved oxygen of the water from the study sites is found in the consumable range. Further, the values of DO decreased in winter and rainy seasons compared to summer season. This is due to precipitation and surface water run off that rises the water table through percolation.

#### Total hardness

#### The result revealed that, the total hardness concentration varied from a minimum of 150 mg/l to a maximum of 600 mg/l in summer season (Table 8), in rainy season a minimum of 258 mg/l to 720 mg/l (Table 9) and in winter season a minimum of 300 mg/l to a maximum of 604 mg/l (Table 10). The values of total hardness showed that more than 30% of water sample belongs to hard category and 70% of water samples belong to very hard category (>300 mg/l).

#### Calcium

#### The mean values of calcium for three seasons showed 125.95, 144.85 and 143.35 mg/l (Table 8, 9, 10). Calcium showed positive correlation with magnesium, total hardness, electrical conductivity, total dissolved solids, chloride, sulphates, fluoride and E. coli. The BIS (1998) acceptable limit for calcium is 200 mg/l. However, in the present study 30% of water samples in summer, 27.37% of water samples in rainy and 28.7% of water samples in winter season cross the permissible limit of drinking water standards.

#### Magnesium

#### In the present investigation, magnesium values fluctuated from a minimum of 21 mg/l to a maximum of 113 mg/l in summer season with mean value of 53.45 mg/l (Table 8) and a minimum of 62 mg/l to a maximum of 103 mg/l in rainy season with a mean value of 73.4 mg/l (Table 9). In winter season, the values of magnesium ranged from 31 mg/l to 120 mg/l with a mean value of 55.45 mg/l (Table 10).

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**جامـــــــــــــــــعة كوفيمـــــــــــــــبو**

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**دراسات حول الخصائص الفيزيائية-الكيمائية والبكتيرية للمياه الجوفية الواقعة فــي وحول قضاء أرسيكرا، مقاطعة حسان"**

تم تسليم هذه الأطروحة من أجل الحصول على درجة

**الدكتوراه فلسفة**

في

**العلوم البيـــــــئية**

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**الملخـــــــــــص**

تهدف الدراسة الحالية إلى استيعاب مدى تركيز العوامل الفيزيائية-الكيمائية والبكتيرية في المياه الجوفية في منطقة ارسكيرا والمناطق المجاورة لها، وقد تم التوصل إلى النتائج التالية:

وقد خلَصت الدراسة إلى أن الأنشطة الزراعية المكثفة والاستخدام العشوائي للأسمدة الكيميائية وقلة الوعي العلمي لدى الكثير من الناس تحتل المرتبة الثانية من حيث الإسهام في حدوث تلوث في أنظمة المكامن المائية الأرضية.

* وقد تبين أن مستوى تركيز الفلوريد عالٍ في بعض المحطات التي أخذ منها عينات وذلك بسبب وجود الطبقات الجيولوجية في المناطق التي أجريت عليها الدراسة.
* كما لوحظ وجود تغير موسمي في معظم العوامل الفيزيائية الكيميائية وكذا في العوامل البكتيرية التي تم تحليلها، ومن المرجح أن حدوث هذا التغير هو نتيجة ارتفاع مستوى الماء الأرضي في المواسم الممطرة والشتوية مقارنة بفصل الصيف إلا أنه خلال موسم الأمطار فإن عملية انحسار المياه الجوفية تكون ضئيلة، بيد أنها تزداد تدرجياً مع قدوم فصلي الصيف والشتاء. كما وجد أن الاستخدام المكثف للأسمدة الكيميائية والمبيدات الحشرية بالإضافة إلى عدم تقديم النصح العلمي للمزارعين تعدُّ من مصادر التلوث في أنظمة المكامن المائية الأرضية.
* إن الافتقار إلى عملية صرف صحي مناسبة يؤدي إلى تراجع جودة المياه ، ويلعب التلوث المائي دوراً أساسيا في الانتقال المباشر للعديد من الأمراض، ومن الملاحظ أن " *قضاء ارسيكرا"* تفتقر إلى البيئة الصحية بالقرب من الآبار الارتوازية . وعموماً فان الفقر والأمية وقلة الوعي لدى الناس تعدُّ من العوامل المؤثرة في جودة المياه.