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GROUNDWATER CONTAMINATION DUE AGRICULTURAL PRACTICES IN MANDYA TALUK, KARNATAKA, INDIA

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Abstract : The present study highlights the impact of agricultural practices on groundwater quality. The study area lies between Long. $76^0\,40'$ to $77^0\,00'$ and lat. $12^0\,25'$ to $12^0\,45'$ with an aerial extent of 720 km^2. The area falls in Kaveri River basin and its tributaries. The interpretations are based on 28 water sample from both dug wells and bore wells. The area under study has an annual rainfall of 700 mm, but vigorous agricultural activities are mainly due to network of canals in the entire taluk connected to the major reservoirs. Hence the water availability is assured throughout the year for agricultural practices paving way for more drylands being brought under irrigation. Thus, the farmers started cultivating cash crops, sugarcane, groundnut, paddy etc. resulting in indiscriminate usage of bio-manure, chemical fertilizers and pesticides for higher crop yield. This has caused deterioration of groundwater quality, resulting in the anomalies for the constituents like Na, K, Cl, and SO^4. These anomalies can be related to the excess usage of fertilizers, rather than lithology and soils of the taluk. To overcome this problem of groundwater quality further, the farmers must be educated about the judicious usage of input products such as fertilizers and pesticides.

***IndexTerms* – Groundwater, Contamination, Anomaly, Fertilizer, Mandya**

I. INTRODUCTION

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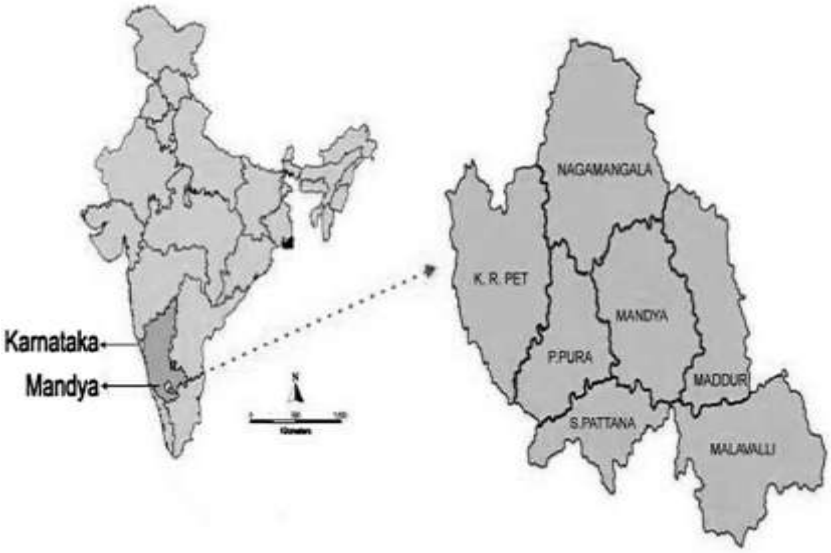
The green revolution in India is both boon and bane for the population and environment. The reason is that population grew by staggering number, hence the need for more food grains and other essentials are increased. This resulted in achieving green revolution to meet the basic minimum requirement and this has paved way for various agricultural projects. As a result, many governments aided projects and schemes came into being and the target was well achieved. But repercussions of these schemes were not considered, because the aim was to achieve more production/hectare. The farmers were encouragedto go in for application of more of chemical fertilizers and pesticides (Alymoreand Kookana1993). without thinking their impact on the groundwater quality. The consumption of fertilizers per hectare, earlier to green revolution was an average of 50kg/hectare, but of late it is about 100kg/hectare and also an average pesticide used is 1kg/hectare. Hence the indiscriminate use of chemical fertilizer is seen and that too not in optimal quantity at an appropriate time.

The input which is not completely utilized percolated into the ground by water action and other agricultural activities thus, contaminating the groundwater in the study area. This paper highlights the impact of agricultural activities on groundwater quality in Mandya taluk, Karnataka, India, which is considered to be one of the bowls of paddy and sugarcane production in the State. The study area is cri-crossed by a network of canals of major irrigation projects thus, water is available in plenty throughout the year for growing various types of crops. The average rainfall is 700mm per year with an average 40 rainy days. The maximum temperature is 35^0 C and minimum is 21^0 C.

Location:

The study area lies between Long. $76^0\,40'$ to $77^0\,00'$ and lat. $12^0\,25'$ to $12^0\,45'$ with an aerial extent of 720 km^2. The area falls in Kaveri River basin and its tributaries. (Fig.1)The State highway linking Mysore and Bangalore passes through the study area and Mandya is 95kms from Bangalore



II. METHODOLOGY

The results of the study area are based on 28 water samples collected from both dug wells and bore wells. The collected samples were analyzed for the chemical constituents like Na, Ca, Mg, K, Cl, SO_4, HCO_3, NO_3, $CaCO_2$ and pH. The analyzed data has been subjected to statistical analysis (Table 1) are interpreted and correlated with geology, soils and agricultural activity in the study area for the interpretation.

Geomorphology:

The eastern flank of the taluk exhibiting an undulating terrain and the western part of the taluk is covered with hillytracts andare seen as strips. The southern part is almost flat. The general slope is in southeasterly direction. The taluk is drained by Kaveri and its tributaries, which show dendritic type of drainage pattern.

Geology and Soils:

The rock types identified and studies in the taluk are migmatites, granulites, meta-basalts, ultramafic rocks, pelitic schists and dolerite dykes. The major aquifers here are migmatites and meta-basalts. The soils of the taluk are red sandy loams and clayey loams. The soils have good infiltration capacity with an average thickness of 1.8 to 3.5 mtrs.

Agricultural Activity:

The entire taluk falls under Kaveri River basin. The tributaries of Kaveri viz. Shimsha, Hemavathy and Lokapavani are the main source of water for agricultural and irrigation activity. The total geographical area is 71500 hectares, of which about 50000 hectares f land is cultivated. The 65 km network of canals cris-cross the study area irrigating 39000 hectares of land in the taluk. The important crops are paddy, sugarcane, groundnut and of recent mulberry along with traditional crops like ragi, jowar and bajra.

Water Quality:

The groundwater chemistry data has been utilized here to interpret and correlate for anomalies with geology, soils and agricultural activity. The samples analyzed for chemical constituents are Na, Ca, Mg, K, Cl, SO_4, HCO_3, NO_3, $CaCO_2$ and pH (Table 1). The prominent anomalies are seen in case of Na, K, Cl and SO_4, which are basically due to excess usage of chemical fertilizers, bio-manure and pesticides (Piskin 1973, Mehta et al. 1990).

Table 1: Showing the Water quality parameters of Mandya taluk, Karnataka.

Constituents	Minimum	Maximum	Average
Ca	17	116	40.6
Mg	12	99	39.2
Na	28	230	97.4
K	2	46	8.4
Cl	22	490	130.6
SO_4	6	170	38.5
NO_3	0	54	12.4
HCO_3	114	613	277.5
$CaCO_3$	108	590	256.1
Ph	7.65	9.00	8.33
All the values are in mg/litre, except pH			

Sodium is used in classifying water quality for agricultural practices rather than drinking purpose. The alkalis being more mobile, are released from rocks and minerals by percolating water, hence, one of the sources weathering of litho-units and other being landuse. Landuse here refers to agricultural activity. The average sodium content in the study area is 97 mg/litre ranging from 28 to 280 mg/litre. The anomaly has been noticed in and around Mandya, Basaralu - Tavarekere of the study area. The high sodium percentage is noticed due to excess usage of animal waste and chemical fertilizers (Pionke and Urban 1985), rather due to the weathering of rocks and minerals.

Potassium being an essential component for both for a and fauna, it is less harmful in agricultural activity when compared the sodium. The main source of potassium is weathering of rocks and minerals. The other source being the usage of animal waste and chemical fertilizers. In the study area the average value of potassium is observed is 8.4 mg/litre and it ranges between 2 to 46

mg/litre. The anomalies are observed in and around Mandya and Kothathi village. The agricultural activity in these regions is to a great extent responsible for the anomaly with usage of fertilizer such as Urea, Phosphorous and potash (NPK), Di-ammonium Phosphate (DAP) and other micronutrients for boosting food production.

Chloride (Cl) is highly soluble anion found in high concentrations in groundwater. The presence of chloride in drinking water is harmless but in excess may affect the taste. The rocks types and minerals due contribute chloride to groundwater but on an average of 6-10 mg/litre (White et al. 1963). The average value of Cl in the study area noticed is 130 mg/litre with a range of 22 to 490 mg/litre. The anomaly has been observed in and around Mandya, Basaralu, Tavarekere and Kothathi regions. The major source of anomaly is from organic fertilizers viz. K-fertilizers, pesticides and insecticides.

Sulphur is present in groundwater largely in oxide form as sulphates. It is also one of the readily soluble compounds. The average value of the sulphate content in the study area is 39 mg/litre and it ranges from 6 to 170 mg/litre. The variation sulphate over the study area has been observed in the southern part of the taluk. The anomaly has been observed in and around Kothathi village of the taluk. The source for the sulphates is usually from soils and rocks that too in little quantity. But the anomaly noticed here is due to excess usage of chemical fertilizers and pesticides in agricultural practices.

The average value of the pH in the study area is 8.33 and it ranges between 9 to 7.65. At some places it slightly exceeds the permissible range as per the WHO (6.5 to 8.5)

III. CONCLUSIONS

The present reveals that the groundwater in the study area is polluted due to the excess usage of chemical fertilizers, pesticides and insecticides. Indiscriminate use of chemical fertilizers has to reduced as remedial measure. In addition to this there is need to use R & D based seeds for high yielding and pest resistant. The belief of farmers that the usage of more and more chemical fertilizers, insecticide sand pesticides results in good yield, which is a misconception should be highlighted.

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