

INFLUENCE OF LAND USE IN THE QUALITY OF GROUNDWATER IN WATERSHEDS IN THE SOUTHERN PART OF ESPIRITO SANTO, BRAZIL

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Resumo

A água subterrânea vem assumindo importância cada vez mais relevante como fonte de abastecimento, por isso estudos devem ser direcionados para este tipo de recurso hídrico. Nesse sentido, o objetivo deste trabalho foi identificar as alterações provocadas na qualidade da água subterrânea de microbacias hidrográficas ocupadas por diferentes usos agroflorestais (floresta, cafeicultura e pastagens) na região sul do Espírito Santo. Ao analisar a água coletada pode-se perceber que a área com café apresentou maior pH que as outras áreas nos dois períodos estudados e a área com pastagem maior condutividade elétrica. Os teores de nitrato e nitrito mantiveram-se abaixo do máximo permitido pela Resolução CONAMA 396/08 e em alguns casos apresentaram-se tão baixos, que o equipamento não conseguiu detectá-los, assim como o nitrogênio amoniacal.

Abstract

The groundwater has assumed an increasingly important source of supply, so studies should be directed to this type of water resource. Thus, the objective was to identify the alterations in the quality of groundwater in watersheds occupied by different agroforestry uses (forest, coffee and pasture) in the south of Espírito Santo. The area with coffee had a higher pH than the others areas in the two study periods and the area under pasture had a higher electrical conductivity. The nitrate and nitrite levels remained below the maximum allowed by Brazilian National Council legislation (CONAMA) 396/08 and in some cases had become so low that the equipment failed to detect them, as well as ammonia nitrogen.

Keywords: Water quality, groundwater, land use,

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1 – INTRODUCTION

Currently, groundwater is assuming an important increase in the source of supply, both urban and rural, as surface waters become increasingly polluted and scarce.

Due to this increased use, studies should be directed to this type of water resource, because several factors may compromise the quality of groundwater. Among them is the use of soil, which in addition to changing the quality and quantity of water, can also influence their storage ^[1].

To study the water quality it is necessary to evaluate several physical, chemical and biological parameters processes that will characterize its condition. The maximum permitted values for each parameter analyzed are established by CONAMA 396/08 which regulates the classification and environmental guidelines of groundwater ^[2].

Further on, the objective of this work was to identify the alterations in the quality of groundwater in watersheds occupied by different agroforestry uses (forest, pasture and coffee) in the south of Espírito Santo through the analysis of physic-chemical parameters of water.

2 – MATERIAL AND METHODS

The areas of study of this work are located in the sub-basin of the stream Horizonte, in geographic coordinates of approximately 41° 32' and 41° 38' west longitude and 20° 43' and 20° 51' south latitude, with an approximate area of 1,265.36 hectares, located in Experimental Area of the Federal Institute of the Espírito Santo, in Alegre-ES.

The study areas of this work are located in sub-basin of the Córrego Horizonte, in approximate geographical coordinates 41°32' and 41°38' west longitude and 20°43' and 20°51' latitude south, with an approximate area of 1,265.36 ha located in the Experimental Area of the Federal Institute in Espírito Santo (IFES), in Alegre-ES.

Three headwater catchments were collected for water harvesting, each covered only by coffee, pasture and forest. This made it possible to attribute the change in water quality in the soil only because it avoided the influence of other uses.

In each watershed three water samples were collected during periods of drought and rain, following guidelines outlined by CETESB. The collected water was stored in polyethylene bottles, properly identified and kept in Styrofoam boxes containing ice, promoting its cooling time from the collection to the laboratory ^[3].

The analysis of groundwater was done by determining the pH, electrical conductivity (EC), Ammoniacal nitrogen (N Ammon.), nitrate, nitrite and total phosphorus (P total), always respecting the preservation techniques and the term of analysis described in the NBR 9898 [4].

3 – RESULTS AND DISCUSSION

The wells studied were superficial, measuring 2-5 meters and was situated above the rock layer that protects the water infiltration and contamination. Table 1 shows the values of the parameters in the groundwater of watersheds and the comparison between the means.

Table 1 - Comparison between the means of physic-chemical parameters of water samples from wells studied in different seasons.

COLLECTION IN THE DRY SEASON						
Points of collection	pH	EC (µs/cm)	N ammon. (mg/L)	Nitrate (mg/L)	Nitrite (mg/L)	P total (mg/L)
Pasture	6,08 ^B	211,00 ^A	0,00 ^A	0,21 ^A	0,00 ^B	0,18 ^A
Forest	6,30 ^B	197,95 ^B	0,00 ^A	0,00 ^B	0,00 ^B	0,15 ^A
Coffee	7,05 ^A	203,00 ^B	0,00 ^A	0,00 ^B	0,07 ^A	0,16 ^A
COLLECTION IN THE WET SEASON						
Points of collection	pH	EC (µs/cm)	N ammon. (mg/L)	Nitrate (mg/L)	Nitrite (mg/L)	P total (mg/L)
Pasture	7,10 ^A	359,50 ^A	0,15 ^A	0,00 ^A	0,05 ^C	0,07 ^A
Forest	6,65 ^B	179,50 ^B	0,00 ^A	0,00 ^A	0,00 ^B	0,03 ^A
Coffee	7,45 ^A	162,00 ^B	0,10 ^A	0,00 ^A	0,16 ^A	0,04 ^A

NOTE: Letters in the same column do not differ in Tukey test at 5% level of significance.

The parameters ammonia nitrogen and total phosphorus did not differ significantly between the studied watersheds in the dry season and the parameters ammonia nitrogen, nitrate and total phosphorus during the rainy season.

In both seasons studied the area with coffee had a higher pH than the other areas, possibly due to the use of soil correctives.

The pasture area had a higher EC than the other areas in the two study seasons, due to the presence of ions in water, which may have leached into the groundwater by rain.

The values of nitrate and nitrite were below the maximum allowed by CONAMA 396/08 and in some cases the levels of these elements were so low they were below the detection limit of the equipment, the same happened with the N Ammon, indicating that there were zero contamination of nitrogen fertilizers in the study areas [2].

Assis da Silva and Araujo studied the groundwater in urban areas of Feira de Santana (BA), found high levels of nitrate and ammonium in a large percentage of the samples studied, was also a high percentage of samples with acidic pH lower than 6,0 ^[1].

The phosphorus allowed in the CONAMA 396/08 are not cited, but are close to those found by Eckhardt et al. studying groundwater in the city of Paved, RS, Brazil ^[5].

4 –CONCLUSION

The coffee area had a higher pH than the other areas in the two seasons.

The pasture area presented a higher EC than the other areas in the two season studied.

The parameters ammonia, nitrate and total phosphorus showed no significant differences between the watersheds studied.

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