Retention of *Escherichia coli* and *Salmonella* sp by two soil layers closely topping groundwater table in equatorial region in Cameroon (Central Africa)

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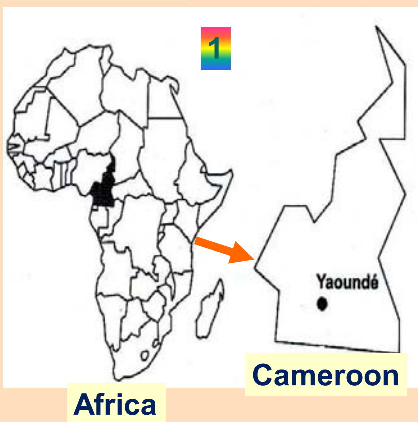
Introduction

In many regions of the world, groundwater is still the main source of drinking water supply. Bacterial movement in soil is important in the pollution follow-up of the surface and underground waters. Knowledge of the adsorption capacity and kinetics of bacterial retention in soil could contribute to the scientific understanding of the microbiological quality of groundwater in specific soil types. The main purpose of this laboratory research was to assess the sorption kinetics of *Escherichia coli* and *Salmonella* sp on two soil layers H_X and H_Y collected closely above a groundwater table in Yaounde, Cameroon (Central Africa). H_X is located above H_Y which is located in close proximity of the water table.

Materials and Methods

Site of study

1



Soil layers sampling

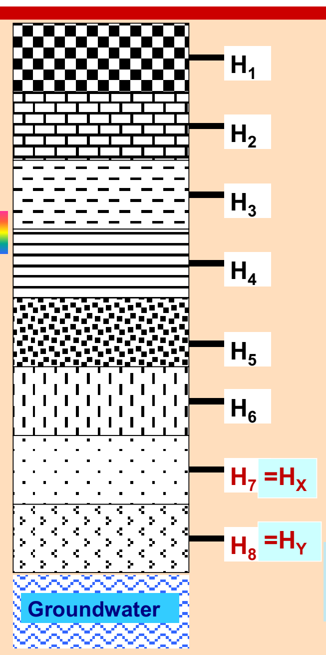
2

a) Hole dug until the appearance of the groundwater table.

b) Hole crossing 8 different soil layers $H_1, H_2, \ldots, H_8$

c) Collection three kg samples from soil layers $H_X(H_7)$ and of $H_Y(H_8)$ and its drying at laboratory temperature (23±1° C) for several months.

3



Soil layers sequences from soil surface to the groundwater table

Soil layers (H_X and H_Y) chemical characteristics

4

	pH	*C (mg/l)*	*N (mg/l)*	*P (mg/l)*	*WRC (%)*
H_X	4.435	4.140	0.100	17.425	41.55
H_Y	4.559	4.315	0.235	26.145	43.64

WRC: water retention capacity

Laboratory experiments

5

a) Cells adsorption on soil layers particles

b) Bacteriological analysis by CFU method (Endo and Wilson-Blair agar media) (Bio-Rad)

Data analysis

6

Freundlich isotherm: $C_s = K_f . C^{1/n}$

C_s: amount of cells adsorbed by soil particles,

C: equilibrium concentration of non adsorbed cells,

K_f: Freundlich adsorption coefficient (adsorption capacity),

1/n: linearity exponent (adsorption intensity).

Results

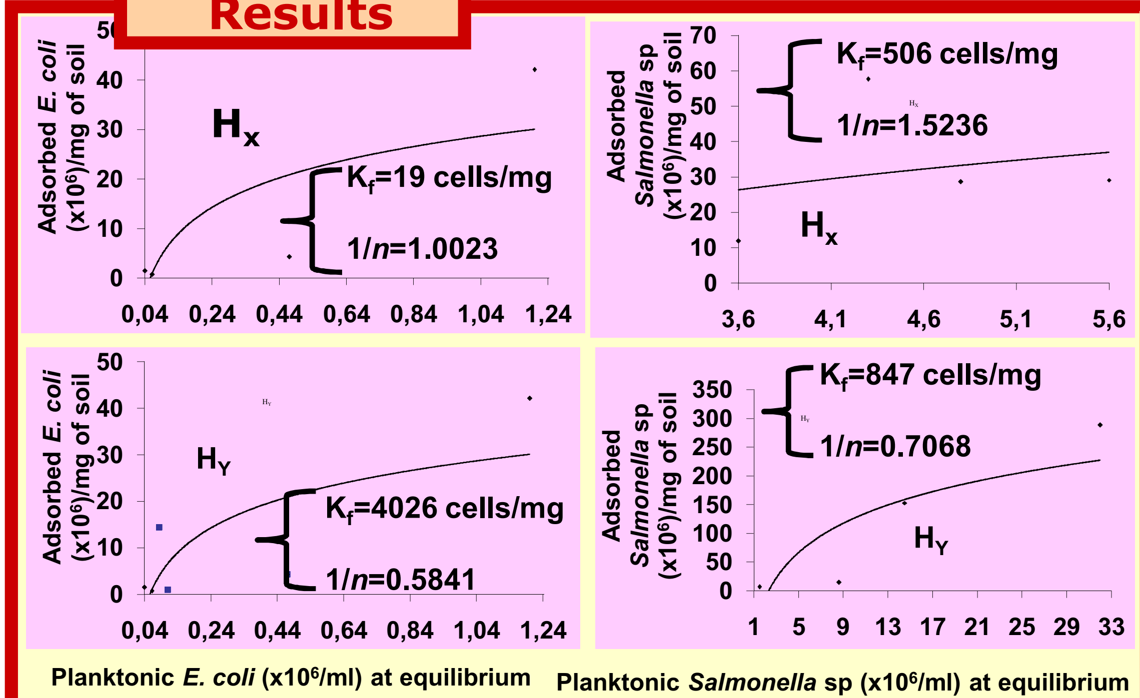


Figure: Adsorption isotherms of *E. coli* and *Salmonella* sp on soil horizons H_X and H_Y

Comment

*Adsorbed cell number increase swiftly at lower equilibrium planktonic cell concentrations.

*Adsorption of *Salmonella* sp on H_X would express a relatively less complexity of systems, and would depend on the lower difference in interactions energies among equilibriums.

*Adsorption coefficient of layer H_Y was positively correlated with the pH values and N/P ratios, and negatively with the values of C/N and C/P ratios.

*Variation of adsorption potentials of soil layers particles would be linked the adsorption sites properties located on the surface of soil particles, which can undergoes temporal variation.

*Variability in K_f and *1/n* would be in part at the origin of the variability of the abundances of microbial species in groundwater.

Conclusion

Variation in adsorption potentials of soil layers particles would be linked the adsorption sites Properties located on the surface of soil particles, which can undergoes temporal variation. It seems convenient to carry out other experiments with several cell species together in order to predict the interactions nature among bacterial cells for the attach sites or group of sites on soil surface particles during microbial transport from soil surface to the groundwater.

References

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