Embrapa
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Comparing aluminosilicates adsorption capacity of N, P and K

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INTRODUCTION

- ✓ Aluminosilicates with negative charges provide an exchangeable site for positive cations such as K, Ca and Mg, and positively charged groups such as water and ammonia.
- ✓ Due the weak attraction absorbed cations can be easily replaced using the standard ion exchange techniques, making these natural minerals good ion exchangers.
- ✓ Aluminosilicates use may improve the fertilizers use efficiency by controlling nutrient retention and release.

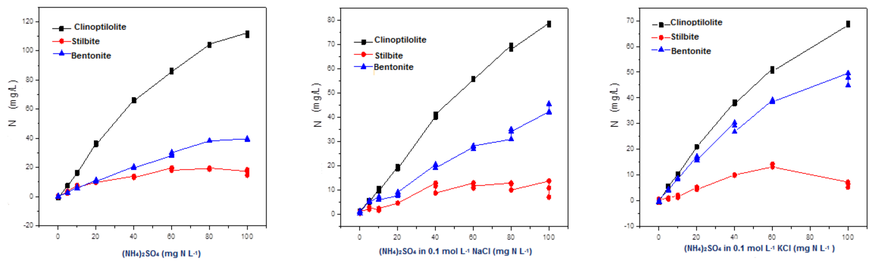
OBJECTIVE

Determine the adsorption capacity of N, P and K by the three natural aluminosilicates.

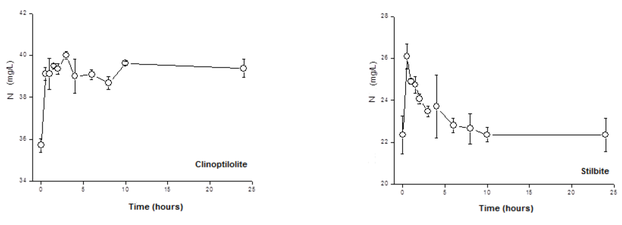
MATERIAL & METHODS

- ✓ Four experiments were carried out in laboratory.
- ✓ Experimental design: totally randomized experimental design with three replications.
- ✓ Aluminosilicates: clinoptilolite, stilbite and bentonite
- ✓ Adequate period for adsorption :
  - N = 1 g of clinoptilolite and stilbite was shacked in 50 mL solution of 0.001 mol L^{-1} $(NH_4)_2SO_4$ for 0, 0.5, 1, 2, 4, 5, 8, 10 and 24 hours;
  - K = 1 g of clinoptilolite and stilbite was shaken in 50 mL solution of 0.001 mol L^{-1} $K(H_2PO_4)$ for 0, 0.5, 1, 2, 4, 5, 8, 10 and 24 hours;
- ✓ N adsorption :
  - 1 g of clinoptilolite, , zeolite and bentonite were shaken in 50 mL solution of $(NH_4)_2SO_4$ at 0, 5, 10, 20, 40, 60, 80 and 100 mg N L^{-1} diluted in water, 0.1 mol L^{-1} NaCl and 0.1 mol L^{-1} KCl, respectively, for 30 min;
- ✓ P and K adsorption :
  - 1 g of clinoptilolite, , zeolite and bentonite were shaken in 50 mL solution of $K(H_2PO_4)$ at 0, 5, 10, 20, 40, 60, 80 and 100 mg L^{-1} of P and K, for 30 min;
- ✓ After centrifugation N and P concentrations in supernatants were measured by spectrophotometry with flow injection analysis (FIA), and K concentrations with flame photometry.

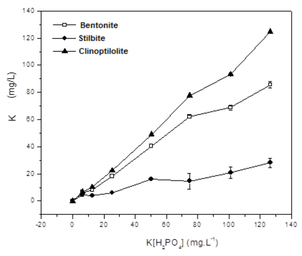
N adsorption curves



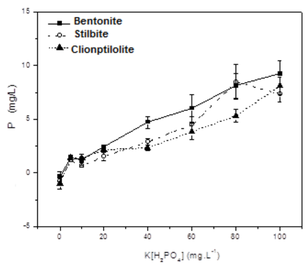
Adequate period for adsorption of N



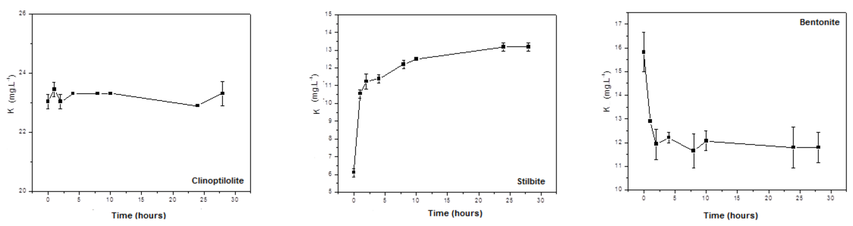
K adsorption curves



P adsorption curves



Adequate period for adsorption of K



CONCLUSIONS

- ❑ Results showed N and K adsorption order was clinoptilolite, bentonite and stilbite.
- ❑ There was no difference on P adsorption, which was lower than 10% of total P in solution for all aluminosilicates.
- ❑ These results also indicate that aluminosilicates minerals probably are able to improve the efficiency of N and K through the control of retention of NH4 and K ions and, therefore, enhancing plants absorption ability.

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