

Comparing chelated and non-chelated micronutrients

Why chelates?

In this experiment you will explore why metal chelates are used to provide micronutrients for growing plants. You are going to add a range of reagents to a solution of iron(III) ions and to a solution in which the iron(III) is chelated with ethylenediaminetetraacetate, EDTA.

Equipment and materials

- Test tubes (6)
- Dropper pipettes
- 0.1 mol dm⁻³ iron(III) chloride solution
- 0.1 mol dm⁻³ sodium iron(III) EDTA
- 0.1 mol dm⁻³ sodium hydroxide solution
- 0.1 mol dm⁻³ sodium fluoride solution
- 0.1 mol dm⁻³ potassium thiocyanate solution

Method

Care: Wear eye protection. 0.1 mol dm⁻³ iron(III) chloride and sodium hydroxide solution are irritants and 0.1 mol dm⁻³ solution of sodium fluoride is harmful.

1. Add 10 drops of 0.1 mol dm⁻³ iron(III) chloride solution and 10 drops of 0.1 mol dm⁻³ sodium iron(III) EDTA into separate test tubes.
2. Add 10 drops of 0.1 mol dm⁻³ sodium hydroxide solution to each of the test tubes and record the observations in a table.
3. Repeat your tests using a 0.1 mol dm⁻³ solution of sodium fluoride instead of sodium hydroxide.
4. Repeat your experiments using a 0.1 mol dm⁻³ solution of potassium thiocyanate instead of sodium fluoride.

	Addition of ...		
Solution tested	NaOH(aq)	NaF(aq)	KSCN(aq)
Fe ³⁺ (aq)			
Fe(EDTA) ⁻ (aq)			

Conclusions

- Use your observations to decide whether water or the EDTA ligand binds most strongly to iron(III) ions.
- Explain why chelates are often used to provide micronutrients to soils to feed growing plants.
- Suggest a disadvantage of using chelates rather than simple salts.