

Mineral Nutrition:

Hydroponics: Julius Von Sachs → German 1860.

The criteria for essentiality of an element was proposed: Arnon & Stout

- absence of element may/will disturb plant life cycle.
- involved in metabolism of the plant.
- element must be specific & do not replace by any other.
- Absence causes disorder.

17 elements have been found essential.

- | | | | | |
|-----|-----|------|------|------|
| • C | • P | • Ca | • B | • Cl |
| • H | • K | • Mg | • Mn | • Ni |
| • O | | • S | • Cu | |
| • N | | • Fe | • Zn | |
| | | | • Mo | |

Macronutrients: large amount, > 10 mmole kg⁻¹

• obtained from
CO₂ & H₂O
&
other from
soil.

- * C
- * H
- * O
- * N
- * P
- * S
- * K
- * Ca
- * Mg

Micronutrients:

- trace element.
- required in small amount.
- < 10 mmole kg⁻¹
- 8 in no.

- * Fe * Mn * Cu * Mo * Zn * B
- * Cl * Ni

on basis of f(x)

