

LAQUA

HORIBA



POTASSIUM SPOTLIGHT

Potassium (K) is an essential macronutrient for plant growth and development. It plays a crucial role in photosynthesis, enzyme activation, water regulation, and overall plant metabolism. Potassium deficiency in soil can lead to reduced crop yields, poor plant health, and increased susceptibility to diseases and environmental stresses.

Causes of Potassium Deficiency

1. **Soil Type** : Sandy and highly weathered soils tend to have low potassium-holding capacity.
2. **Leaching**: Excessive rainfall or irrigation can wash potassium out of the root zone.
3. **Imbalanced Fertilisation**: Overuse of nitrogen (N) and phosphorus (P) without adequate potassium application can induce deficiency.
4. **Crop Removal**: High-yielding crops remove large amounts of potassium from the soil, depleting available reserves.
5. **Soil pH**: Extremely acidic or alkaline soils can affect potassium availability. **Maintain your pH between (6.0-7.0)**
6. **Clay Mineralogy**: Soils rich in certain clay types (e.g., kaolinite) have lower potassium retention.

Symptoms Of Potassium Deficiency

1. Leaf Symptoms :

- Yellowing or browning of leaf edges (chlorosis and necrosis).
- Older leaves affected first, progressing to younger leaves.
- Leaf curling and wilting under stress.



2. Growth Effects:

- Stunted plant growth due to reduced cell expansion.
- Weak stems leading to lodging in cereal crops.

3. Reproductive Impact:

- Poor fruit and seed development.
- Reduced resistance to drought, pests, and diseases.

Diagnosis of Potassium Deficiency

- **1 Soil Testing**: Measures exchangeable and available potassium levels.
- **2. Plant Tissue Analysis**: Confirms potassium deficiency in plant tissues.
- **3. Field Observation**: Identifies visual symptoms in affected crops.



LAQUAtwin is a series of compact water quality testers. Using Ion Specific Electrode (ISE) technology, they are available for Conductivity, Calcium ion, Nitrate ion, Potassium ion, Sodium ion and pH measurement.

Using just a single drop of sample, the LAQUAtwin proprietary flat sensors can quickly and accurately measure the values of the chemical parameters for quality check of food in production lines.

Measurment of Potassium in soil

A simple method for a rapid measurement of potassium ion in soil uses the LAQUAtwin potassium ion meter K-11. The extraction method is the same as the lab method.

The following procedure explains how you can measure K⁺ with good correlation to analytical lab tests.

Method

1. Put 1g each of air-dried soils (four samples) in 100mL glass beakers, two beakers per soil sample.
2. Prepare two kinds of extraction per soil sample, one by adding 20 ml of 1mol/L CH₃COONH₄ to one beaker, and 20 ml of 0.01mol/LCH₃COONH₄ to another beaker.
3. Shake the beakers around 1 hour to extract K⁺ from the soil using a bench top shaker.
4. Calibrate LAQUAtwin K-11 with 150mg/L and 2000mg/L K⁺ standard solutions included in the product.
5. Measure potassium ion concentration of the filtrated solution with calibrated K-11 and with ICP-OES (e.g. HORIBA Jobin Yvon. Model ULTIMA2).
6. Perform this measurement with 4 different samples.

Results and Benefits

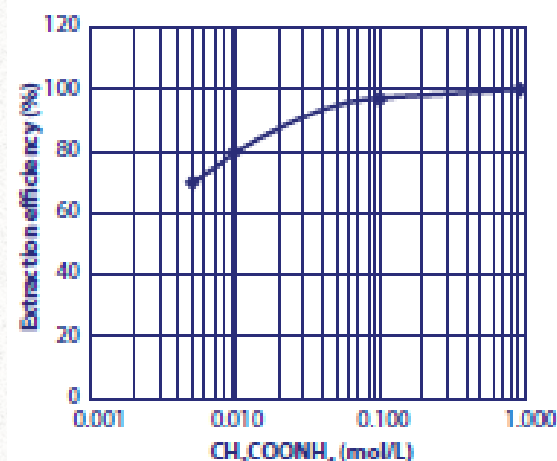
Table 1: K⁺ concentrations measured by ICP-OES and LAQUAtwin extracted with 1 mol/L CH₃COONH₄ and 0.01 mol/L CH₃COONH₄.

(Unit: mg/L)

Kind of soil	Extracted by the use of 1 mol/L CH ₃ COONH ₄		Extracted by the use of 0.01 mol/L CH ₃ COONH ₄	
	ICP-OES	LAQUAtwin K ⁺	ICP-OES	LAQUAtwin K ⁺
For vegetables (In house)	35	120	27	25
For Chinese cabbage (field)	16	76	14	14
For turnip leaf (Komatsuna)(field)	25	130	18	19
For potherb mustard (field)	21	93	17	16

Fig. 1: Variation of extraction efficiency with CH₃COONH₄ concentration.

*Extraction efficiencies will vary amongst soil samples.



The LAQUAtwin K-11 allows for a simple on site determination of potassium which provides accuracy close to laboratory techniques.

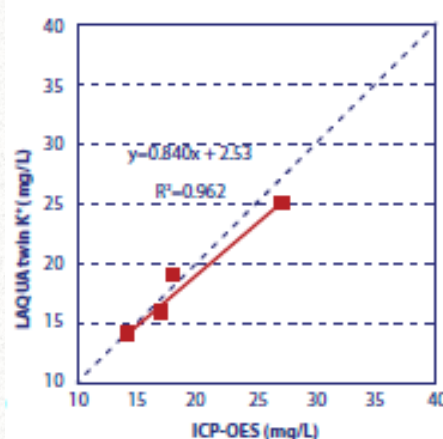
Table 1 shows the results from ICP-OES and LAQUAtwin K⁺ extracted with 1 mol/L and 0.01 mol/L CH₃COONH₄.

Figure 1 shows the potassium extraction efficiency measured with ICP-OES.

Setting 1 mol/L CH₃COONH₄ extraction as 100%, efficiency trend is plotted depending on different CH₃COONH₄ concentration.

Figure 2 shows the correlation between ICP-OES and LAQUAtwin K⁺ measurments with 0.01 mol/L CH₃COONH₄ extraction.

Fig. 2: Relation between measured values of K⁺ (mol/L) by ICP-OES and by LAQUAtwin.



Potassium deficiency in soil can significantly impact crop health and productivity. Regular soil and plant tissue testing, balanced fertilization, and proper soil management practices are essential to maintaining adequate potassium levels.

