HORIBA

LAQUAtwin K+

Application Note

Measurement of potassium in soil

In laboratories, potassium in soil is extracted with 1M ammonium acetate and analyzed with Atomic Absorption (AA) or Inductivity Coupled Plasma-Optical Emission Spectrometry (ICP-OES). LAQUAtwin potassium ion meter showed values higher than those of ICP-OES. However, with 0.01M ammonium acetate extraction, good correlation (r=0.981, r2=0.962) was obtained between ICP-OES and LAQUAtwin potassium ion meter.

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LAQUAtwin B-731 Product Page

Introduction

Typically, Atomic Absorption (AA) or Inductivity Coupled Plasma-Optical Emission Spectrometry (ICP-OES) is used to measure potassium ion, by first extracting the potassium ion from sample soils by 1 mol/L ammonium acetate (CH_3COONH_4). These are the methods performed in laboratories.

A simpler method for a rapid measurement of potassium ion in soil uses the LAQUAtwin potassium ion meter B-731. 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 CH_3COONH_4 to one beaker, and 20ml of 0.01mol/L CH_3COONH_4 to another beaker.
3. Shake the beakers around 1 hour to extract K^+ from the soil using a bench top shaker.
4. Calibrate LAQUAtwin B-731 with 150mg/L and 2000mg/L K^+ standard solutions included in the product.
5. Measure potassium ion concentration of the filtrated solution with calibrated B-731 and with ICP-OES (e.g. HORIBA Jobin Yvon. Model ULTIMA2).
6. Perform this measurement with 4 different samples.

Results and Benefits

The Laqua Twin B-731 allows for a simple on site determination of potassium which provides accuracy close to laboratory techniques.

[1]Table 1 shows the results from ICP-OES and LAQUAtwin K^+ extracted with 1 mol/L and 0.01 mol/L CH_3COONH_4.

[1] Internal study by HORIBA labs, 2013

*Extraction efficiencies will vary amongst soil samples.

Table [1]: K^+ concentrations measured by ICP-OES and LAQUAtwin exctracted with 1 mol/L CH_3COONH_4 and 0.01 mol/L CH_3COONH_4.

(Unit : mg/L)

Kind of soil	Extracted by the use of 1 mol/L CH_3COONH_4		Extracted by the use of 0.01 mol/L CH_3COONH_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

Based on table 1, higher value against ICP-OES is detected by LAQUAtwin K^+ with 1 mol/L CH_3COONH_4 extraction, due to strong interference by NH+ of CH_3COONH_4. However, with 0.01 mol/L CH_3COONH_4 extraction, although the extraction efficiency is reduced by approximately 80%* (Figure 1), very good correlation (R=0.981, R2=0.962) is obtained between ICP-OES and LAQUAtwin (Figure 2).

Figure 1 shows the potassium extraction efficiency measured with ICP-OES. Setting 1 mol/L CH_3COONH_4 extraction as 100%, efficiency trend is plotted depending on different CH_3COONH_4 concentration.

Figure 2 shows the correlation between ICP-OES and LAQUAtwin K^+ measurements with 0.01 mol/L CH_3COONH_4 extraction.

Fig. 1 : Variation of extraction efficiency with CH_3COONH_4 concentration.

*Extraction efficiencies will vary amongst soil samples.

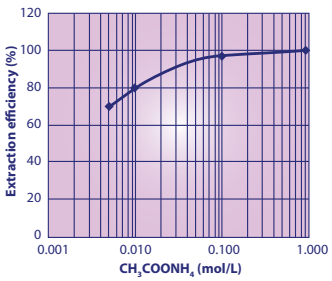
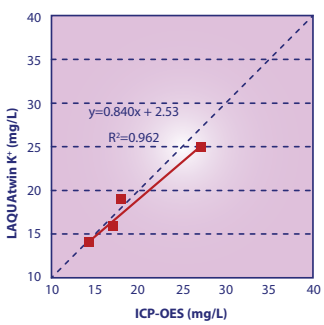


Fig. 2 : Relation between measured values of K^+ (mol/L) by ICP-OES and by LAQUAtwin.



LAQUAtwin Pocket ION Meter

Unique Features

Calibrate and measure at the touch of a button—the smiley face will tell you when the result can be read.

Hassle-free automatic calibration with a few drops of standard solution reassures you of your measurement accuracy. Two-point calibration is also possible.*1

*1 Except for B-711

LAQUAtwin is fully waterproof and dustproof.

The meter and sensor are fully waterproof*3 and dustproof, so you can take it anywhere.

*3 IP67 rated. Will withstand immersion for 30 minutes at 1 m. Not suitable for underwater use.

LAQUAtwin: the only meters with flat sensor technology.

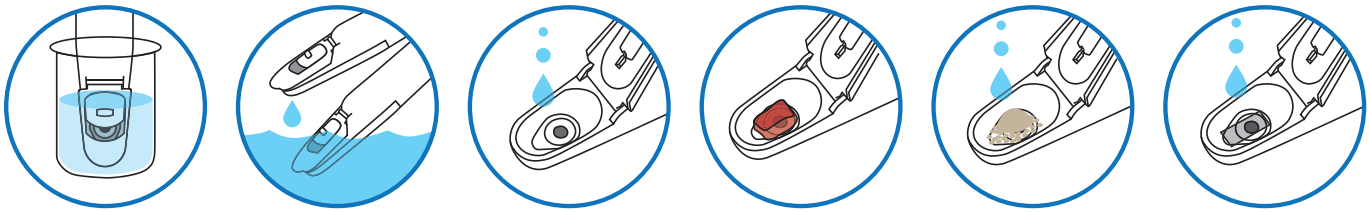
HORIBA's highly-sensitive, flat sensor technology opens up new possibilities for sampling and sample types. Only a small amount of sample is required, so you can easily sample in situ without the need for beakers or other labware. Sensors are easily replaced as required.

Carry case comes as standard for handy portability.

The compact carry case contains everything you need for your measurements, including the standard solution and sampling sheets.

1 X 6 One meter, six methods.

Only LAQUAtwin allows you to be this flexible!
Choose the best method according to your sample, your situation, and your needs.



01 Immersion

When you're in the lab, you can test the sample in a breaker. Ensure the sensor guard sliding cap is open.

02 Scoop

Use as a scoop to test water eg from a river. A vertical scoop for an aquarium is also available with a unique sensor guard.

03 Drops

Place a drop of the sample onto the sensor with a pipette. Laquatwin meters can measure sample volume as low as 0.1mL

04 Solid Samples

Foods containing some moisture can be tested by placing a small piece directly onto the sensor.

05 Powders

Laquatwin meters can also test dry powders. Simply place the powder sample onto the sensor and drop on your defined volume of pure water.

06 Paper and textiles

To test sheets of paper and textiles, cut up the sample into small pieces and place directly onto the sensor. Drop on your defined volume of pure water.

LAQUAtwin Pocket Ion Meters Lineup

pH	COND/TDS	Na^+	K^+	Ca^{2+}	NO_3^-	Salt-EC	Ca^{2+}
pH-11, pH-22, pH-33	EC-11, EC-22, EC-33	Na-11	K-11	Ca-11	NO3-11	Salt-11	Ca-11C

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IMS

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