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Research on the measurement of soil effective boron

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Abstract

From the method of method principles, reagent preparation, operation steps, results calculation, etc., the detection method of effective boron is introduced, and the precautions in the test are pointed out.

Keywords

Effective boron; measurement method; precautions.

1. Introduction

Boron is an indispensable trace element for normal growth and development of plants. It can promote the lush growth of plants and the normal development of reproductive organs, which is conducive to flowering and strong, promotes precocious production, and improves production and quality. The cell differentiation and elongation were suppressed, wood embolism occurred and necrotic, and formed "buds without flowers", "flowers but not true", "shell and no benevolence" and "unparalleled disease", which seriously affected the output of crops. And quality. However, excessive boron supply will cause the crops to form boron poisoning. Therefore, according to the effective boron content of the soil, reasonable supply of boron elements is one of the key measures to improve the production and quality of crop. Essence Based on the detection experience of effective boron -effective boron in recent years, the author introduces the soil effective boron detection method and precautions as follows.

2. Measurement method

2.1. Method principle

Effective boron in the soil uses boiling water extraction. The extract solution uses EDTA to eliminate the interference of iron and aluminum ions. After the color of potassium permanganate is used to fade the organic matter, the boron volume in the extraction solution is determined by a metamorne-H color method. In the weakly acidic medium, the boron and methylisamine generate a yellow complex, and the determination of the concentration range is 0 ~ 1 mg/ml in line with the Langbo Bill's law. The stable time of the color rendering can reach 3h, which is generally color after 1h.

2.2. Reagent preparation

Potassium permanganate solution: It is called to dissolve potassium permanganate 31.62g in water and dilute to 1L. Sulfuric acid solution: A measure of concentrated sulfuric acid (super - level) 168ml slowly adds to a large cup with about 800ml, continuously stirred, and after cooling, dilute to 1L. Potassium permanganate solution: The above -mentioned potassium

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permanganate solution is mixed with sulfuric acid and other volumes. Anti -hemorrite solution: 5.00g of ascorbic acid is dissolved in water and dilute to 5 0ml. Norerine solution: It is called 0.90g of methylisamine and 2.00g solution of 2.00g of ascorbic acid in the slightly hot 60ml water, dilute to 100ml, and filter it if necessary, and use it time. PH value 5.6 ～ 5.8 buffer: Called ammonium acetate 250g and EDTA two sodium salt 10.0g in 250ml of water, dilute to 500ml after cooling, add 80ml 1: 4 sulfuric acid (super pure) solution, shake the acidity (acidity with acidity degree Plan for pH). Mixed color rendering agent: Take 3 parts of the above part of the above -mentioned methamphetamine solution and 2 parts of the volume above the above -mentioned buffer. Magnesium sulfate solution: 10.0g of magnesium sulfate is dissolved in water and diluted to 100ml. Boron standard series solution: Take at least 24h boric acid (super -level pure) 0.5719g in a 400ml cup in the concentrated sulfuric acid dryer, add 200ml boron -free solution, move into 1L capacity bottle, store in a plastic bottle in a plastic bottle Essence The above solution of 50.00ml above is in a 500ml capacity bottle, and the capacity is 10 μg/ml boron standard series solution and stored in a plastic bottle. Require 0.0ml, 0.50ml, 1.00ml, 2.00ml, 3.00 ml, 4.00ml, 5.00ml of 7 50ml capacity bottle, set, that is, 0.0 mg/ml, 0.1mg/ml, 0.2mg/ml,,, 0.2mg/ml,,, 0.2mg/ml,,, 0.2mg/ml,,, 0.2mg/ml,,,,, 0.4 mg/ml, 0.6mg/ml, 0.8mg/ml, 1.0 mg/ml boron standard series solution, stored in plastic bottle (boron standard solution can also be purchased directly from the manufacturer).

2.3. Operation steps

The fineness of the sample is 2mm air -dried soil samples 10.00g in 250ml of quartz triangle bottle, add 20.00ml water, install the backflow condenser, boil the fire and keep it slightly boiling for 5 minutes (accurate time), remove the heat source, continue to return to condense 5min (Accurate timing), cooling. Add 2 drops of magnesium sulfate solution to the sample to accelerate the clarification and pour on the filter paper once. The filter liquid is undertaken in a plastic bottle. Do a blank test at the same time.

Remove the 4.00ml filter liquid in the color tube, add 0.5ml acid potassium permanganate solution, shake it, and place it for 2 to 3min; add 0.5ml of anti -hemoglobin solution and shake well; Tonogen, shake well; after 1H, at the wavelength metering meter at 415nm, use a 2cm light diameter to determine the color dishes, read the absorbance, and check the accuracy curve after the blank absorbing value to obtain the measured liquid to obtain the measured liquid to obtain the measured liquid Boron content. Use the same method to make a standard curve.

2.4. Results calculation

$$\omega(\mathrm{B}) = \frac{m_1 \times D}{m \times 10^3} \times 1\,000$$

In the formula:

m1 is the content of boron in the color rendering solution, μg;

D is divided into multiple, here is 5;

m is the sample quality.

3. Note

This method is simpler and fast, and it is convenient for batching operations, but the sensitivity and accuracy are not high, and the color reaction is slow. Therefore, the main points must be grasped in the operation. The problems and precautions found during the test process are now introduced as follows:

(1) Prepare the boron standard series solution, potassium permanganate solution and sulfate solution of different concentrations, and should be stored in a plastic bottle.

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(2) Due to the darker color of methylemine reagents itself, it affects the suction light. Add a 5ml hybrid color remedant with a fat belly straw to improve the accuracy and reduce errors.

(3) Each batch of sample standard series and blank test must be re -determined.

(4) Since the inhalation of the solution is not stable in the optical light meter, each batch of samples should be completed within 1H.

(5) One parallel measurement is made every 10 soil samples. The results of the parallel measurement use the arithmetic average to indicate 2 decimal numbers, allowing absolute errors. Effective boron content <0.20mg/kg, allowing absolute differences ≤0.03mg/kg; effective boron content is 0.20 to 0.50mg/kg, allowing absolute differences ≤0.05mg/kg; effective boron content> 0.50mg/kg, allowing absolute differences ≤0.06mg/kg.

(6) Monamine-H ratio is suitable for the measurement of higher concentration. The detection sensitivity of different soil content is different. For example, the effective boron content in the black soil soil is 0.3 to 1.0mg/kg, which is more convenient to measure; When mg/kg, the measurement conditions are required to be extremely strict, otherwise the measurement results are prone to negative values. These measurement conditions: ① The quality of ohmunamine drugs has a greater impact on the measurement results. Generally, high -quality products are yellow and bright, without impurities. If there are dark yellow impurities and black sediments, most of them are inferior drugs. The measurement results are not ideal. ② The absorbing filter fluid is placed in a plastic pipe tube. ③ Plastic comparison tube must be cleaned to minimize the error. ④ Under the condition of closing light and constant temperature, put it in a 25 ° C insulation box for 1 to 2 hours, and then measure it with a spectrophotometer.

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