

STUDY AND ANALYSIS OF SOIL SAMPLING

At DSTL Kozha, Kottayam

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DECLARATION

I hereby declare that ,the report of the project held in district Soil Testing Lab, Parasite breeding station Kozha.,Kottayam submitted to St.Dominic's college, Kanjirapally ,Kerala. Is the parital fulfillment of requirement for the award of degree of Bachelor of Vocational programmes in Agriculture Technology ,is the record of the original work carried out under the guidance of Renu Mathew(Head of the B.VOC Department). I further declare that, the content of this report has not been submitted to any other degree.

INTRODUCTION

Soil tests seldom extract the total amount of nutrients or elements in a soil sample. Soil tests have been developed to measure a fraction of the total soil nutrient concentration that correlates with plant growth. Interpreting a soil-test value requires an understanding of the impacts on test results of the extractant used, method of soil sampling, sample handling, and the intended use for the result. The amount of nutrient measured by various soil tests can vary widely depending on the extractant used. Important extractant properties include the concentration of the chemical compounds and the reaction time with the soil. The method used to measure the nutrient after extraction may be important for some nutrients. For example, colorimetric methods usually measure only orthophosphate P, while other methods may also measure other P forms. Also, the same soil test may measure widely different amounts of nutrients in soils with contrastingly different chemical and (or) mineralogical properties. Extractants used and interpretations of results often vary depending on soil properties and the purpose of soil testing (for example, measurement of total, soluble, or plant-available concentrations).

A soil-test method useful for predicting crop response to fertilization should produce values that are well correlated with plant nutrient uptake and growth. Greenhouse and field research is conducted to determine which soil-test extractant is best suited for a given combination of soil, crop, and growing conditions. Accurate interpretations of soil-test results and appropriate fertilizer recommendations require that the relationship between the amount of a nutrient measured by a given soil test and the crop response to the added nutrient must be known. The process of determining the probability of crop response at a given soil-test value is known as soil-test calibration and must be determined by field experimentation. The calibration procedure usually involves growing a crop or various crops in soils representative of the region on which the test will be used and the application of various fertilization rates. The soils should have a broad range of soil-test values that include deficient, optimum, and above-optimum values.

The crop yield response can be expressed as an absolute value or as a value relative to the yield achieved without nutrient addition. As an example, Figure 1 shows the relationships between the relative or absolute yield increase of maize and the amount of P extracted by a soil test. Although the specific shape of the relationship between soil-test values and crop growth or yield can differ, the general response is fairly consistent. At low soil-test values, crop yield is limited by nutrient deficiency. As soil-test values increase, yield increases at a

reduced rate until a maximum yield value. At higher levels, there is no longer a relationship between the soil-test values and yield. The maximum yield value can remain approximately constant for a wide range of soil-test values or can decrease at excessively high nutrient levels.

Soil Test

Soil testing by a specialty laboratory can evaluate many parameters including pH, levels of nitrogen, phosphorus, potassium, calcium, magnesium and sulfur and organic content.



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Estimation of available Phosphorus in soil

In soils with pH below 7.0, P₂ can be used to determine reserve levels of phosphorus in the soil. The Bray tests are colorimetric, which means the amount of light passing through a liquid is measured to determine P levels. Mehlich 3 is also a commonly used test for phosphorus.

Bray's method no.1

1. Bray solution no.1 (0.03 normal ammonium fluoride in 0.025 normal HCL)
2. Boric acid (50g of boric acid in 1 litre of distilled water)
3. Reagent A: 12g of ammonium molybdate in 250ml of distilled water + .2908g antimony potassium tartrate in 100ml distilled water . Add both reagents to 1000ml of 5 normal sulphuric acid ,(140 ml of conc .sulphuric acid per litre . Mix thoroughly and make up to 2 litre with distilled water

4. Reagent B: Dissolve 1.056g of ascorbic acid in 200ml of reagent A and mix. This reagent should be prepared fresh as and when required.

Procedure:

Add 25ml of bray extractant no.1 to 2.5g of soil sample in 100ml conical flask. Shake for 5 min and filter (use whatmann no.1). Take 5ml aliquot in a test tube. Add 3ml of boric acid and 4ml of reagent B. After 10 min read the blue colour of the solution on the photo-electric colorimeter.

Preparation of standard curve:

0.439g of AR grade potassium dihydrogen ortho phosphate dissolved in ½ litre of distilled water. 25ml of 7 N sulphuric acid is added and made up to 1 litre with distilled water. This gives a 100 PPM solution is made up to 1000ml in a volumetric flask with distilled water for preparation of the standard curve. Different conc. of P (1,2,3,4,5 & 10ml of 2 PPM p solution) are taken in 25ml volumetric flask. To this 5ml of extracting reagent (bray solution) is added and the colour is developed as described:

Add 4ml of the reagent B after adding 3.5ml of boric acid solution. Make up the volume to 25ml after 10 min. Read the blue colour using photo electric colorimeter with 660 red filter.

This curve is plotted taking the colorimeter reading on the vertical axis and the amount of P in the horizontal axis.

Estimation of organic carbon

colorimeter method of estimation

Instrument : photo-electric colorimeter (double cell)

Reagents:

1. 1N AR grade potassium dichromate (49.04g per litre)
2. concentrated sulphuric acid

Procedure:

1g of soil is taken in a dry 100ml conical flask. 10ml of 1N potassium dichromate is added and swirled a little followed by 10ml of concentrated sulphuric acid and swirled again. After keeping for 30 mins the content in the flask is carefully for 10 mins to a clear state. the green chromium sulphate colour of the supernitent colour is read in the colourimeter. After adjusting the blank (without soil) solution to zero using

660mu (red) filter.

Instead of centrifuging, add 10ml of distilled water, after 30mins addition of sulphuric acid . Stir the contents of the flask and keep overnight. Read the green chromus colour of the clear supernitent liquid on the colorimeter using 660mu (red) filter.

Organic carbon(%):colorimeter reading (R)×factor (from standard curve)

Preparation of standard calibration curve:

A standard solution sucrose in prepared by weighting accurately 1.25g of AR(Analetical grade reagent) sucrose and dissolving in 1 normal potassium dichromate solution and making up the volume to 250ml mix well. Pipette 1,2,3,4,5 and 6ml aliquots from the stock solution to 100ml conical flask. Dilute the aliquoter with 1N potassium dichromate to 10 ml and add 10 ml of sulphuric acid. After 30 mins and 10 ml of distilled water. Prepare a 'blank' solution(without sucrose) in a similar manner. This can be used for zero adjustment measure.the green colour developed using photo-electric colorimeter.

Draw the standard curve by plotting the colorimeter readings against carbon values calculated from the quantities of sucrose in the aliquots by multiplying with 44.

Estimation of potassium

Available phosphorous should be estimated flame photometrically using 1N neutral ammonium acetate solution as the extractent.

Reagents:

1.Normal neutral ammonium acetate solution preparation : Dissolve 1540g of ammonium acetate 20l of water

Test the pH of the solution and neutralize it. (either ammonium hydroxide or acetic acid)

2. Standard potassium solution: Dissolve 1.906g of pure KCL in 1l distilled water

This solution contains 1mg k/ml (1000PPM)

It is the standard stock solution of K

Working solution

40 PPM solution

Procedure:

Add 25ml of ammonium acetate extractant to 5g of soil sample . Shake well for 5 min and filter .This filtrate is used for determining potassium with the flame photometer .

Estimation of boron

Reagents:

1. Buffer solution: dissolve 250g of ammonium acetate and 1g of EDTA in 400ml of distilled water slowly add 125ml of glacial acetic acid and mix thoroughly.
2. Azomethine –H reagent : dissolve 0.45g of azomethine –H in 100ml of 1% L ascorbic acid solution.
3. Boron standard solution: dissolve 1.14g of AR grade boric acid in distilled water and make the volume to 1000ml .
4. Activated charcoal.

Procedure:

Extraction and estimation

1. Weigh 20g of air-dried processed soil in a 250ml quartz or other boron free conical flask and add 40ml distilled water .
2. Add 0.5g of charcoal and boil for 5 min on a hot plate, filter immediately through Whatman no.42 filter paper.
3. Cool the condensate to room temperature and transfer 1ml aliquot of blank diluted boron standard.
4. Add 2ml of buffer and mix
5. Add 2ml of azomethine –H reagent , mix, and after 30 min , read the absorbent at 420nm on spectrometer.
6. Prepare a standard curve plotting B concentration on x-axis and absorbance on y-axis.

Estimation of Sulphur

Reagents :

1. 0.15% CaCl_2 SOLUTION: Dissolve 1.5g of calcium chloride dehydrate in about 500ml of distilled water and make up the volume of one litre.
2. Gum acacia: dissolve 0.25g of chemical pure gum acacia in hot water and filter the hot solution through whatman number 42 filter paper. cool the filtrate and dilute 100ml.
3. BARIUM CHLORIDE: Grind analytical grade BaCl_2 to pass through 1mm sieve.

PROCEDURE

shake 10 gram of air dried processed soil with 50ml of 0.15 percentage CaCl_2 solution in 250ml conical flask for 30 minutes filter the extract through whatman number 42 filter paper and estimate the sulphur content by turbidimetric procedure.

TURBIDIMETRIC ESTIMATION OF SULPHUR

1. Pipette out 10ml of the soil extract into a 25 ml volumetric flask.
2. Add one gram of BaCl_2 crystals and swirl to dissolve.
3. Add 1ml of 0.25 percentage gum acacia solution make up the volume with distilled water and shake well
4. Within 5 to 30 minutes of development play off turbidity read the absorbance at 440nm on a spectrophotometer.

Estimation of soil pH

Reagent

1. standard buffer solution prepare buffer solution using commercially available buffer tablets. Dissolve the respective tablets in freshly prepared distilled water and make up the volume to 100ml. It is necessary to prepare fresh buffer solution after every few days as these solutions do not keep for long

procedure:

calibrate the pH meter using buffer solution the pH of soil is determined in 1:2:5 soil water suspension . Take 10g sample of soil shifted through 2mm sieve in a 50 or 100ml beaker add 25ml of distilled water stir well for about 5min and keep for half an hour. Stir well again and take the reading using pH meter.



Estimation of TSS (total soluble salt)

Reagent

0.01N potassium chloride solution. dry a small quantity of AR grade potassium chloride at 60 degree c for 2 hour in a hot air oven weight 0.145g of it and dissolve in freshly prepared distilled water and make to 1 litre.

Procedure

The clear supernatant of 1:2:5 soil water suspension prepared for pH measurement can be used for estimation of easy calibrate the conductivity meter using 0.01N KCL solution prepared and determined the cell constant.

Analysis of lime

About 5g of the sample is weight accurately and transferred into 250ml beaker provided with a cover glass. To the sample 50ml of a 2 hydrochloric acid are added. The solution is warmed and then allowed to stand for sometimes it is then filtered through the previously weight filter paper. The residue is wash through very dilute

HCL and finally two times with water. The residue along with the filter paper dried and weight accurately from the weight difference the percentage of insoluble matter is calculated.

Estimation of Iron , Manganese , Zinc , Copper

Reagent : Hydrochloric acid 0.1 normal

Preparation : Add 8.1 ml of concentrated HCL to approx. 900ml of distilled water , mix up to 1 litre.Ratio:1:10

Estimation:

Shake 2g of soil with 20ml of .1 N HCL for 5 mi filter it through what man no.42 filter paper. Collect the filtrate and estimate the contents of Fe, Mn, Zn, Cu using an atomic absorption spectro photometer

Calculation:

Amount of micro nutrient (Mg/kg soil)(PPM) which is equal to concentration from the instrument.

Nutrient deficiency and symptoms

PRIMARY NUTRIENTS

1. Nitrogen deficiency :appears as a general pale yellowish green plant with slow growth and reduced filled development. If the deficiency persist,plant remain pale green, have reduced growth and the stand appears thin
2. one of the mobile element phosphours deficiency:
phosphours deficiency tends to inhibit or prevent shoot growth. Leaves turn dark blue-green and may become pale in severe deficiency
potassium deficiency:
typical symptoms of potassium deficiency in plants include brown scorching and curling of leaf tips as well as chlorosis (yellowing) between leaf veins.

SECONDARY NUTRIENTS

Calcium deficiency:

Calcium deficiency symptoms appear initially as localized tissue necrosis leading to stunted plant growth, necrotic leaf margins on young leaves or curling of the leaves, and eventual death of terminal buds and root tips.

Blossom end rot in tomato

to control ,apply lime 2.5-3.5/cent or egg shell or calcium nitrate 3g/L as foliar spray on leaves.

Copper deficiency:

in most plants young foliage is severely stunted as well as chlorotic

.

Chlorine deficiency:

chlorine deficiency plants show chlorotic and necrotic spotting along leaves with distinct boundaries between dead and a live tissue. Withering of leaves along margins and highly branched roots are also seen in chlorine deficiency plants

sulphur deficiency:

the plants often are pale green, yellowish-green to completely yellow. The deficiency plants are small often narrow leaves.

Other micro nutrients deficiency:

Boron deficiency:

Boron deficiency expressed at growing tip of the root or shoot, generally including stunting and destruction of the growing tip that can lead to tip death, brittle foliage, yellowing of lower leaf tips. male bud of flower are in whitish colour. the growth pattern of coconut button is not same. apply solubor at rate of 2g/l of water in foliar spray.

Manganese deficiency:

Most common symptoms is for leaves to turn pale green between the veins, with normal coloured areas next to the veins.

REARING TECHNIQUES OF PARASITE

Black headed caterpillar-*Opisina arenosella* wlk

Controlled by – *Bracon bravicornis*

In costal areas the infestation we can see severe attack is in the leaf.

- ***Time of attack***

1 Severe infestation: January – May

2 Medium infestation: November – January

3 Lowest infestation : July – October

Symptoms of black headed caterpillar

- ❖ Insect attack the lower leaves.
- ❖ Drying of leaves productivity decreases.
- ❖ Occurrence of button shedding.
- ❖ The attacked leaves have been not used for other purposes.

Life cycle of caterpillar

- ❖ Black headed caterpillar lays egg in the lower portion of leaf.
- ❖ Female moths lay 140 or more than eggs.
- ❖ It requires one week for hatching of eggs.
- ❖ Larvae take 40 days to grow as adults.
- ❖ Two black lines are on the ventral side of the young larvae.
- ❖ Pupal stage of BHC = 12 days
- ❖ For complete life cycle of BHC is 2 months

Control measures

- ***Natural enemies***
- ❖ **Bracon brevicornis**
- ❖ **Goniozus nephantidis**
- ❖ **Malathion 2ml per litre apply foliar form.**
- ❖ **1.5 litre of solution is required for 1 coconut tree.**
- ❖ **The application is done in 15 days of interval.**

Rearing techniques of *Goniozus nephantidis*

The parasitoid is multiplied on *Corcyra cephalonica* larvae in diffused light . A part of parasitoid is introduced in tube (7.5 x 2.5 cm). The adults are provided honey in the in the form of small droplets on wax coated paper. After a pre-oviposition period of six days one healthy last instar larva is provided in a vial. The larvae parasitized and containing eggs of *G. nephantidis* are removed regularly from the vials till the death of the female. Such larvae are kept in accordion type strips of paper in plastic boxes which are covered by muslin cloth.

Considering the fecundity as 20-50, the female is capable of parasitizing 6-7 larvae in three oviposition spells each separated by 4-5 days.

Production Procedure

Clean fresh *Corcyra* egg by passing through 15, 30 and 45 mesh sieves prepare Trichocard by cutting card board sheets to size of 10x10 cm which can accommodate lcc to eggs. Apply gum on the card and sprinkle the cleaned eggs uniformly. Remove the excess egg from the cards by using brush. Allow the card for shade during for 30 minutes. Treat the eggs under UV lamp for 30 minutes. Take polythene bags, insert UV treated “Trichocard” and nucleus card at the ratio of 6:1(6 *Corcyra* egg cards.1 *Trichogramma* nucleus card) and provide 50%honey vitamin E in a soaked cotton swab. Remove the trichocard after 2days *Corcyra* egg changes black colour on 3rd day indicates the parasitization of eggs. Release the parasitization egg card immediately in the field (or) store them in refrigerator at 10 degree centigrade up to 21 days. Place/tie/staple parasitized cards on leaf sheath of plants.

Trichocard

Materials Required

1. Corcyra egg
2. Nucleus Culture of Trichogramma
3. Polythene bag
4. Rubber bands
5. Scissors
6. Gum
7. Brush
8. Tea strainer
9. Trichocard
10. 50% honey solution
11. Stapler
12. Refrigerator
13. UV lamp

Pheromone trap

- Light brown colour
- Mainly attacks in cucurbitaceous vegetables

Life cycle

- Female fruit flies laying egg under the skin of leaf
- Mirror like wings
- Egg laying -3 to 4 days
- Larval stage -10days

- Pupa stage -7-10 days
- Death -7days

Control measures in cucurbitaceous vegetable

- Clean the land
- Plough the land and destroy the pupal stage
- Destroy male fruit flies using culur trap
- Spray malathion 1% per cent

Fruit flies in mango

- Light brown colour
- Mirror like wings
- Mainly attacks in pappaya, guava, mango, banana

Symptoms

- Yellowing
- Rooting

Control measures

- Clean the land
- Trap- methane ugenol (15 cent- 1 trap)
- Burn the attacked leaves

CONCLUSION

Soil testing is an inexpensive practice to learn about the ability of soil to support crop growth. What knowledge of what each soil test value means, grower can make more informed crop input decisions to minimize risk and maximize profitability. Soil testing is a critical aspect of construction projects. It is used to determine the physical and engineering properties of the soil in the construction site, including the soil type. Strength, moisture content, susceptibility to liquefaction, ability to drain, and presence of contaminants. Soil sampling and testing can and should be highly informative for the agronomist and the farmer. Information from a well-conducted soil-sampling event can be useful in moisture changes in soil fertility, developing fertilizer recommendations, and improving on-farm nutrient efficiency.