Journal Home: www.bioticainternational.com

Popular Article

Article: RT523

Biotica Research Today

Vol 3:3 2021 169/172

How to cite this article?
Suganya *et al.*, 2021. Importance of Soil Sampling and Its Techniques. Biotica Research Today 3(3): 169-172.

Importance of Soil Sampling and Its Techniques

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Open Access

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Keywords

Fertilizer, Soil, Sample, Techniques

Article History

Received in 13th March 2021

Received in revised form 19th March 2021

Accepted in final form 20th March 2021

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Abstract

Successful farm management requires the regular addition of nutrients (either as fertilizers or as organics) to maintain crop yields and quality. How much fertilizer do we apply and what kind of fertilizer is needed to give a balanced nutrition is an important queries ahead us. Soil and plant testing are the usual means to diagnose nutrient deficiency and recognizing soil with physical and chemical problems. Recommendations on fertilizer application rates are often given as part of the test. These recommendations are usually based on numerous fertilizer field trials that have been conducted over the years.

Introduction

A soil test is the best available guide to the application of fertilizers and other nutrient sources, also in an excellent diagnostic tool for problem soils. Routine analysis for fertilizer recommendation generally includes pH, electrical conductivity, organic matter, nitrate-nitrogen, phosphorus and potassium. The widespread growth in soil testing programme is due in part to improvements in analytical methods and procedures and better and more calibration data, which allow increased efficiency in nutrient management decisions.

Successful soil analysis depends upon the initial soil sample. The soil is a heterogeneous material, as shown by the visual differences in surface appearance and in the profile. A routine soil sample weighs approximately from ½ to 1 kilogram. This represents 0.00005 percent or one part out of each 2 million parts of the average top 6 inches of an acre of soil, commonly referred to as "acre fallow slice". The importance of a representative soil sample prior to laboratory preparation, extraction, analysis and interpretation of results for a fertilizer recommendation is readily apparent. Above all, soil sampling requires time and effort.

The benefits of a soil test depend on a good sample. The sample should represent the area it is taken from; otherwise, the results may have little or no value. When, where and how the sample is taken, what equipment is used, how much information is provided and how well is packaged, all affect the sample quality.

Soil Testing Involves Five Procedures, viz.,

1. Sampling the field;
2. Preparing the sample and shipping to the laboratory (drying and mixing);
3. Laboratory analysis;
4. Results of recommendations;
5. Using recommendations to implement decisions.

When to Sample?

Fields used for crop production are best sampled at any time after harvest and before planting. Collect samples after harvest, usually three to six months before planting. Doing so gives time to plan a liming and fertilization programme before the busy planting season. Sample whenever abnormal growth or plant discoloration occurs.

For coastal soils, collect samples every two years or test one half of the land every year. Sandy soils lose nutrients quickly and become acidic when nitrogen is added. For mountain soils, collect samples every three years or test one-third of the land every year. Silt and clay loam soils do not lose nutrients as quickly as sandy soils. Do not sample immediately after fertilizer has been applied. Fields with non-cultivated crops can be sampled during the dormant season.

Points to be Considered during Sample Collection

- Collect the soil sample during fallow period.
- In the standing crop, collect samples between rows.
- Sampling at several locations in a *zig-zag* pattern ensures homogeneity.
- Fields, which are similar in appearance, production and past-management practices, can be grouped into a single sampling unit.
- Collect separate samples from fields that differ in colour, slope, drainage, past management practices like liming, gypsum application, fertilization, cropping system, *etc*.
- Avoid sampling in dead furrows, wet spots, areas near main bund, trees, manure heaps and irrigation channels.
- For shallow rooted crops, collect samples up to 15 cm depth. For deep rooted crops, collect samples up to 30 cm depth. For tree crops, collect profile samples.
- Always collect the soil sample in presence of the farm owner who knows the farm better. (www.agriportal.tnau.ac.in)

Sampling the Field

The most obvious question is how big an area can be sampled for the soil test? Normally a single field or an area of about one acre that has a similar management history is to be selected. If the area has large differences in topography or problem areas such as salinity, then the field should be subtended into smaller common areas-each subjected to its own test and recommendations.

Identify Similar and Unique Field Areas

Before beginning, a detailed map of the land is to be proposed. Dividing the map into fields or soil test areas of not more than one acre make it easy to keep records of treatments and yield. The location of each field is to be indicated. It is always a good idea to record your sampling spots on a map for future reference. Usually a 0-30 cm sample is used for basic fertility assessment.

Table 1: Guidelines for Sampling Depth

Sl. No.	Crops	Sampling depth (cm)
1	Grasses and grasslands	5
2	Rice, finger millet, groundnut, pearl millet, small millet etc. (shallow rooted crops)	15
3	Cotton, sugarcane, banana, tapioca, vegetables etc. (deep rooted crops)	22
4	Perennial, plantation and orchard crops	30, 60, 90

Sampling Materials

Common tools used to sample soils for routine analysis include; spade, hand probe, hand auger, bucket auger, king tube or vehicle-mounted hydraulic probe and auger (Dhyan *et al.,* 2005).

Figure 1: Spade

Figure 2: Hand Khurpi

Figure 3: Post hole auger

Figure 4: Plastic tray

Sampling equipment should be clean, free of rust and chrome plate or made of stainless steel, especially for micro-nutrient analysis. Store the sampling tools in a location free from contamination, for example, away from fertilizer materials.

Sample Collection

Figure 5: Selecting sampling spot

Figure 6: Remove the surface litter at the sampling spot

Figure 7: Give a 'V' shaped cut through spade or khurphi

Figure 8: Mix the soil samples thoroughly

Figure 9: Remove foreign materials like roots, stones, pebbles and gravels

Figure 10: Quartering is done by dividing the thoroughly mixed sample into four equal parts

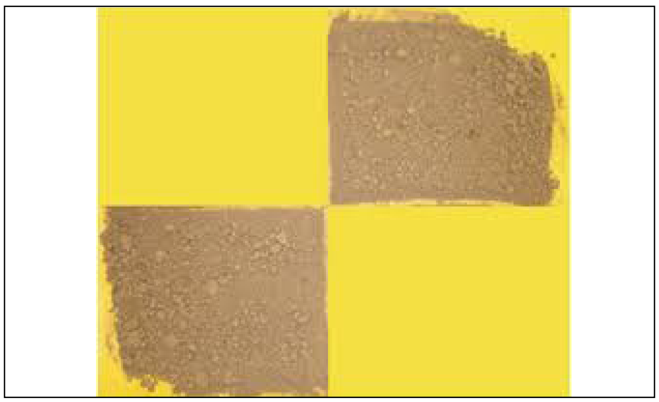

Figure 11: Two opposite quarters are discarded and the remaining is mixed

Figure 12: Collect the sample in a clean polythene bag

Preparing the Sample for the Laboratory

The dried sample can then be sent to the soil testing laboratories where it is extracted with chemicals and analyzed for available nutrients and chemical properties after reducing the sample size.

Figure 13: Label with required information

Figure 14: Stored for testing

The soil sample bags must be properly labeled with field identification, sampling depth, management history and other descriptive characteristics. Moist samples must be air-dried before submission to a laboratory to prevent alteration of the nutrient concentrations by soil microorganisms. Sample contamination from dust and foreign materials should be avoided during the air-drying process. Frozen samples are an alternative, but usually are not practical. Oven drying most soil samples is not recommended because modification of nutrient form and availability, make soil test results invalid.

Conclusion

Soil testing is an essential component of soil resource management as it a significant technique to assess the inherent nutrient supplying power of the soil and its availability to plants. Based on which the presence of available nutrients can be identified and the needed nutrients can be recommended to attain a optimum yield with an minimal fertilizer expenditure. Thus, knowing the exact deficiency that your soil is experiencing will result in zero wastage of such farm inputs.

References

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