Apr 29, 2019 Version 2

Soil collection and preparation for pot experiments V.2

PLOS One

DOI
dx.doi.org/10.17504/protocols.io.2eygbfw

Matema LE Imakumbili[1]

[1]Sokoine University of Agriculture

Matema LE Imakumbili
Sokoine University of Agriculture

OPEN ACCESS

DOI: https://dx.doi.org/10.17504/protocols.io.2eygbfw

External link: https://doi.org/10.1371/journal.pone.0228641

Protocol Citation: Matema LE Imakumbili 2019. Soil collection and preparation for pot experiments. **protocols.io https://dx.doi.org/10.17504/protocols.io.2eygbfw**

Manuscript citation:
Imakumbili MLE, Semu E, Semoka JMR, Abass A, Mkamilo G (2020) Plant tissue analysis as a tool for predicting fertiliser needs for low cyanogenic glucoside levels in cassava roots: An assessment of its possible use. PLoS ONE 15(2): e0228641. doi: 10.1371/journal.pone.0228641

Protocol status: Working
We use this protocol and it's working

Created: April 29, 2019

Last Modified: April 29, 2019

Protocol Integer ID: 22712

Keywords: preparation for pot experiment, pot experiment, potting soil, soil collection, potting medium, soil, preparation

Abstract

This protocol describes how to collect and prepare soil that will be used as a potting medium (potting soil) in a pot experiment.

Materials

- Open van or light truck
- Scale with 100 - 200 kg capacity
- Shovel
- Hand-hoe
- Rake
- Empty polypropylene sacks of about 100 kg in capacity
- Surface for air-drying soil

Troubleshooting

Before start

It is important to clean all implements (shovels, buckets, surfaces, etc.) before use. This can be done by simply washing soil collection tools with tap water and soap. However, disinfection in a 10% bleach solution (1 part bleach to 9 parts water) would be more ideal for certain experiments like those involving innoculation. Rinse off soap and disinfectant with clean water.

1 **Determining the amount of soil needed for the pot experiment**

Make sure you determine the amount of soil you shall need before setting out to collect the soil from the field. You can make the calculation by multiplying the amount of soil to be placed in each pot by the number of pots you will use to set-up the entire experiment. The amount of soil to be collected will also determine the size of the vehicle needed to carry it. Be clear about this when arranging for transport and get the necessary advice before setting out. The number of sacks to be carried will also depend on the amount of soil to be collected.

$$\text{Amount of soil to collect from field for pot experiment (kg)} = \text{amount of soil to be placed in each pot (kg)} \times \text{total number of pots}$$

2 **Site selection for soil collection**

Much planning is needed when selecting the site from which the potting soil will be collected. The type of soil needed will determine where the soil will be collected from. The type of soil to be collected depends on what you are interested in investigating. You may sometimes use any soil, but if you want to depict actual field conditions then a soil representative of the area being investigated must be used. You can refer to literature to get the soil classification name of the needed soil. This is especially helpful if the needed soil is located far away as it gives the possibility of getting a soil with similar characteristics from a nearer location. If you have previous information on the soil characteristics (chemical, physical or biological) of a certain field, which fit the characteristics of the desired soil, this can also help in selecting the site from which you will collect the potting soil.

3 **Soil collection time**

You will have to plan the best period for collecting the soil sample. Avoid taking samples around the wet season as soil will be wet and heavy with water during sample collection. The best period is about a month after the rains have ended. During this period, certain soils types will not have hardened so much and sampling will require less energy. The mid or late dry season period is however generally the best period for soil sampling as soils will be dry and farmers would have also harvested their crops. Soil sampling time is however also associated with the experiments purpose and the required soil state will affect the sampling time.

4 **Site history**

Once at the site from which you will collect the soil sample, try to find out its management history. Soils are usually collected from farm fields, the farmer should thus be interviewed to collect information on how the site had been previously managed. The sites (fields) history is important as it will help you to identify areas on the field that are best for sample collection and which should be avoided. A uniformly managed field or patch of land is best for soil collection. You may need to also record the general site characteristics of the field in addition to the management history. This information may be necessary for explaining certain inexplicable observations in the experiment when they arise. This is also simply a good soil science practice. Also take note of the geographic location of the field.

5 Selecting sampling points on the field

Select about 10 points on the field (Fig 1). These points will be the points on the field from which sub-samples of the fields' soil will be collected. These points should not be near depressions or near field corners. Mark the points so you do not forget them. You can use the sacks to mark the points, just do not forget to place something heavy on them to hold them down in case the wind tries to blow them away. The total area from which the soil will be collected should not exceed 1 ha to avoid collecting soil of a different soil type. The smaller the area the less the variation in soil types.

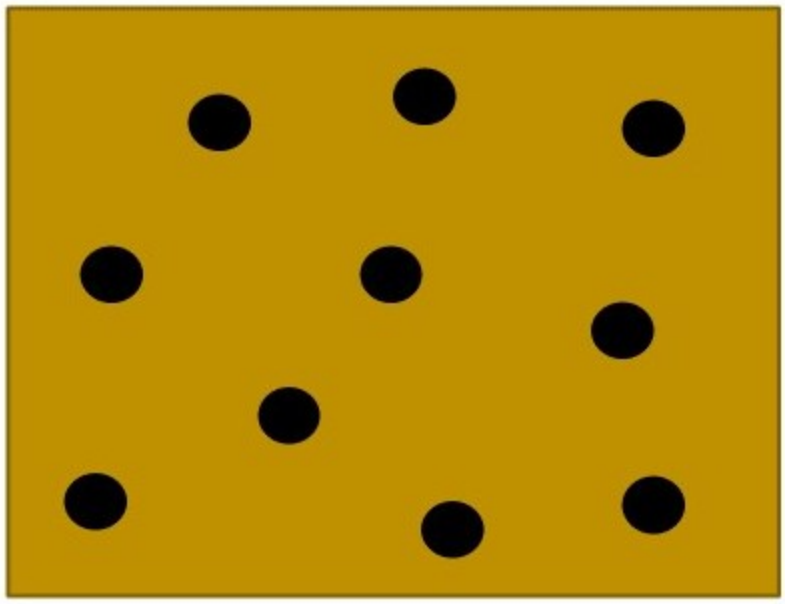

Fig 1. Sampling points on field

6 Soil sample collection

Remove vegetation and surface litter from about a 2 m radius around each selected point. A hand-hoe and rake can be used for this purpose. Once the surface litter has been cleared, collect soil from a depth of 0 – 20 cm around each selected point using a shovel. This depth represents the plough layer or top soil layer from which plants mainly get soil nutrients during growth. Some researchers advise for the first 1 cm layer of top soil to be removed before collecting the soil sample. Place the collected soil in a polypropylene sack. A sack with a 100 kg capacity is best for sample collection as once it is about half-filled the remaining length of sack can be used to tie-up the sack ensuring that the contents are well secured inside the sack. Collect soil from each selected point on the field. You can weigh the collected soil to be sure of the amount collected, this may however not be necessary if you are good at estimating soil weights. You can also assume that the quantity of collected soil is equivalent to the weight of whatever material that the sack was meant to hold. Soil is however mostly heavier than most crop products packed in sacks. Always collect a bit more soil than initially planned, just in case your initial estimation of the amount of soil needed was wrong. Once packed the soil is ready to be transported back to where you shall conduct the pot experiment.

7 **Bulking the collected soil sub-samples**

The sub-samples of the fields' soil must be bulked and evenly mixed together. A large hard surface is needed for this. If this surface is raised it would be better. A glasshouse is best used for bulking and air-drying collected soil (Fig 2). Make sure to thoroughly clean the surface on which the soils will be bulked. Clean plastic sheets can be placed on the hard surface before placing soil on them. If the soil cannot all fit on one surface and needs two such surfaces then pour only half the contents of each sack onto one of the surfaces. If three surfaces are needed then only a third of the sack contents should be poured onto each surface and so on. This helps ensure that each bulked composite soil sample is representative of the soil on the field and minimises differences in the bulked soil.

Fig 2. Bulk soil samples in a glasshouse

8 **Air-drying the collected soil**

Pass the soil through a 5 mm sieve to facilitate air-drying. This however also helps to remove stones, clods and trash from the soil. An 8 mm sieve can also be used for this purpose but sieves less than 5 mm should not be used. The soil must then be left to dry, this should preferably be in a well-aerated but enclosed room like a glasshouse. Air-drying should be generally carried out in a shady cool environment. The area where the soil is left to air-dry should be free from dust. The soil should also be placed away from chemicals and other possible contaminants. Continually mix the soil at least once or twice a day everyday while it is air-drying. Depending on how moist they are, soils should be left to air-dry for 2 – 4 weeks. Soils that appear dry still need to be air-dried. Air-drying ensures that the composite bulk soil has an even soil moisture content in readiness for the pot experiment.

Note: Do not heat treat the soil or sun dry it, if using it to grow certain plants like cassava. You need to find out if soil treatment is necessary for the crop you plan to grow and the exact type of treatment required.

Bibliography

9

1. Johnston M, Askin D. Container grown experiments. AusAID and NARI; 2005.
2. Singleton PW, Somasegaran P, Nakao P, Keyser HH, Hoben HJ, Ferguson PI. Applied BNF technology. A practical guide for extension specialists. NifTAL Project; 1990.