Protocol

Yam *(Dioscorea)* Husbandry: Cultivating Yams in the Field or Greenhouse

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INTRODUCTION

This protocol describes how to cultivate yams (*Dioscorea*) in the field or greenhouse. It refers especially to the tropical food species but it will also work for temperate species. The tropical food species of *Dioscorea* grow in warm, sunny climates with temperatures between 25°C and 30°C. Short days of 10-11 h result in tuber formation, while days longer than 12 h favor vine growth. Yams require deep, loose, textured loamy soil that is rich in organic matter. They are best planted at the beginning of the rainy season. Mulch around the planted sets protects them from excessive heat and desiccation, especially in areas with hot temperatures and dry weather. It also adds organic matter to the soil, prevents soil erosion, preserves water in the soil, and increases microbial activity in the soil. Yams do not tolerate waterlogged conditions. It is important to stake the plants to allow full exposure of their leaves to light for photosynthetic activity and to reduce disease.

RELATED INFORMATION

For more information about yams as a model organism, see **True Yams *(Dioscorea):* A Biological and Evolutionary Link between Eudicots and Grasses** (Mignouna et al. 2009).

MATERIALS

CAUTIONS AND RECIPES: Please see Appendices for appropriate handling of materials marked with <**!**>, and recipes for reagents marked with <**R**>.

Reagents

Seed tubers of desired yam genotype(s)

Equipment

Baskets
Bowls, plastic
Digging implement for harvesting (for fieldwork only)
Facility at ~29°C-35°C and 90%-95% relative humidity (for yam tuber curing; see Step 15.ii)
Fertilizer (optional; see Step 12)
Fungicide (e.g., thiabendazole)
Gloves

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Cite as: Cold Spring Harb Protoc; 2009; doi:10.1101/pdb.prot5324

Herbicide (for fieldwork only)
Hoe (for fieldwork only)
Kitchen knife
Measuring tape (for fieldwork only)
Mulching material (for fieldwork only)

Dry grasses (without seeds), broad leaves, compost manure, and cover crops can be used as mulching materials.

Net bags
Plant labels and marking pen or pencil
Planting pots (for greenhouse only)
Scale
Stakes (bamboo sticks, small tree branches, or polyvinyl chloride [PVC] pipe) or trellis (see Step 9)
Storage area (see Step 16)
Table
Tarpaulin, canvas
Tools for clearing land and working soil (e.g., machete and hoe; for fieldwork only)
Watering can or hose

METHOD

Soil Preparation

In the Field

1. Clear the bush and remove large tree stumps. Allow the debris to decay and then work it into the soil.

   Land preparation can be done manually or with tractor-drawn implements. The soil at planting time should be loose and well-worked.

2. Plough, harrow, and ridge the land, or form mounds with hoes.

   The size of the mounds depends on the size of tubers desired at harvest. Yam seed tubers can also be planted on flat ground.

In the Greenhouse

3. Prepare plastic pots or, if the floor is earthen, raised beds.

Preparation and Planting of Seed Yams

4. Cut large yam tubers into appropriate sizes.

   Yam sets can be from 30 to 300 g depending on desired tuber sizes at harvest. Yams can also be planted as whole seed tubers.

5. Treat sets with a fungicide (e.g., thiabendazole), and allow to air dry under shade (e.g., for 4 h) before planting.

6. Plant yam sets 10 cm deep in soil to avoid exposure to sun.

   Spacing of yams depends on the set size. The normally recommended spacing of yams for commercial yam production is 1 m × 1 m between rows and stands, respectively (10,000 stands/ha). Use narrower spacing (1 m × 0.25 m) for smaller sets (e.g., 30 g).

7. Mulch yam mounds and ridges.

Cultivation of Yams

8. Water yam plants regularly during the growth cycle, particularly during the first 2-4 mo of establishment.

   See Troubleshooting.

9. Stake the plants with bamboo sticks, branches of trees from pruning, or PVC pipes 1-3 m high. Stake them individually or in groups of two or three, depending on requirements and resources.

Alternatively, construct a trellis for the vines.

10. Guide and train the yam vines (particularly the lateral branches) to the stakes during active growth of the plant.

11. Control weeds using manual hoeing, hand pulling, and herbicides.
Weed control is especially important during the first 2-3 mo after planting.
See Troubleshooting.

12. (Optional) Apply fertilizer, if necessary, after soil analysis. Split the fertilizer application to minimize leaching:

    i. Apply fertilizer ~1 mo after emergence in a continuous band along the row of plants, ~10 cm away from the plants.

    ii. Refertilize ~7-9 wk later, when tuber bulking is in progress.

Harvesting, Curing, and Storage

13. Harvest the yams 7-8 mo after planting, any time after large-scale leaf yellowing (senescence of the shoot) occurs in the field. Dig around the tuber to loosen it from the soil, lift it, and cut it from the vine. Avoid bruising the tubers.
The timing of harvest depends on the yam variety.

14. Sort the tubers and grade them according to size and health status.
Only healthy tubers that are free from nematodes, rots, cuts, insects, scrapes, and bruises can be stored.

15. Cure the freshly harvested tubers:

    i. Stack the yam tubers and cover them with a canvas tarpaulin.

    ii. Expose them for 5-7 d to a controlled temperature range of ~29°C-35°C and 90%-95% relative humidity.

The skin thickens and new tissue forms under the surface of injured areas in the tuber.

16. Store the yams in the shade with good ventilation and security from pests (i.e., in a barn on a raised platform).
See Troubleshooting.

TROUBLESHOOTING

Problem: Sometimes after planting, the ridges or mounds tend to diminish from the impact of rain splashes or the process of weeding.
[Steps 8 and 11]
Solution: Remold the ridges or mounds to avoid exposure of the growing tubers.

Problem: Some tubers produce sprouts in storage.
[Step 16]
Solution: If tubers are not required for planting soon, detach sprouts from tubers to avoid loss of tuber quality.

ACKNOWLEDGMENTS

R.G. thanks Dr. K. Abraham, Central Tuber Crops Research Institute (CTCRI), Trivandrum, India, for discussion and logistical help, and the State University of New York at Stony Brook for greenhouse and research facilities.

REFERENCES

Mignouna HD, Abang MM, Asiedu R, Geeta R. 2009. True yams *(Dioscorea)* A biological and evolutionary link between eudicots and grasses. *Cold Spring Harb Protoc* (this issue). doi: 10.1101/pdb.emo136.