

10 Defoliation experiment

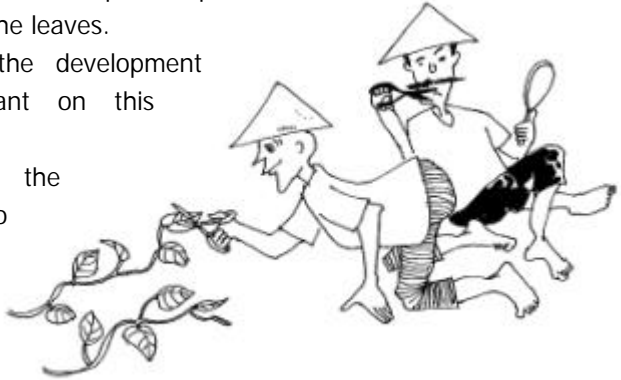
Background

Leaves play a very important role in crop development, since in the leaves important substances are formed that will later be used for the growth of new vines, leaves and roots. Farmers are often worried when they see that insects damage the leaves of the crop, and fear a considerable yield loss. However, sweetpotato plants possess an enormous capacity to compensate leaf damage by forming new leaves. By means of a defoliation experiment, in which damage by leaf-eating insects is imitated by cutting parts of the leaves, we will demonstrate the effects of leaf damage to vine growth and root yield, and prove the plant's regenerative capacity to compensate for damage.

Objectives

After completing this activity the participants will comprehend:

- The reaction of the sweetpotato plant to insects damage on the leaves.
- The influence of the development phase of the plant on this reaction.
- The capacity of the sweetpotato plant to recover from and compensate for leaf damage.



Materials

- 10 bamboo stakes.
- Scale (at harvest).
- Copies of the Defoliation Experiment form (Appendix II-F).
- Newsprint paper and felt-tip markers.

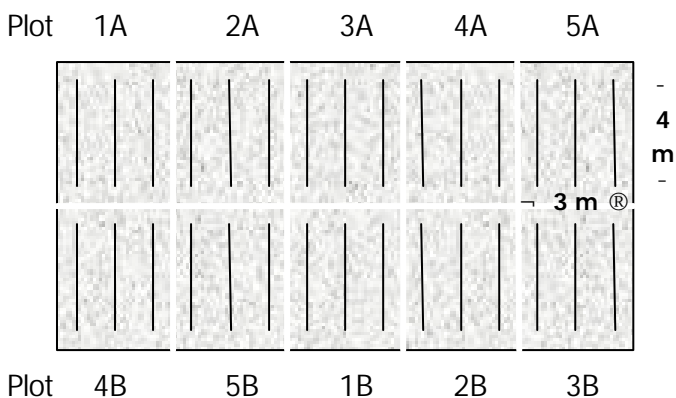
Experiment design

This experiment is carried out in the small groups; each group is responsible for one treatment. It requires a field of 120 m². This field is divided into 10 plots, each of 12 m² (3 by 4 m; for instance three ridges of 4 meters long). The experimental field should be prepared and planted during FFS session 2.

The experiment described here consists of five treatments with two replications (A and B), but can be adjusted as desired. The treatments compare different variations between percentage of leaves cut with age of the crop when defoliation is done, as follows:

Plot no.	Replication	% Defoliation	Crop age (months after planting)
1	A and B	0%	-
2	A and B	50%	1 month
3	A and B	50%	3 months
4	A and B	100%	1 month
5	A and B	100%	3 months

The field could be laid out as follows:



Leaf cutting is done by picking the leaves and vine tips according to the percentage for each treatment. The stem is left in the field.

Activity steps

A *Leaf damage versus yield loss*

- A.1 Ask the participants to mention pests and diseases that damage the sweetpotato leaves, and list them on paper.
- A.2 For each of the pests and diseases listed, the participants should come to an agreement on what percentage of leaf damage they would tolerate without expecting yield loss as a result of the damage.
- A.3 They are then asked during what development stage the crop would be more or less susceptible to leaf-damaging pests and diseases. Would the percentages mentioned before vary over the season?

B *Defoliation experiment*

B.1 Preparation (FFS session 6):

- Explain the objective and design of the defoliation experiment.
- Prepare plot labels using bamboo stakes by marking them with the plot number and treatment. Place them in the plots.

B.2 Treatment (FFS session 6 and 12):

- The participants implement the first defoliation (one month after planting treatments) during FFS session 6. At that time, they also measure the area of each plot and count the number of plants that are alive. All data are recorded on the Defoliation Experiment form (copied from Appendix II-F).
- The first defoliation is done on plots 2A, 2B, 4A and 4B by picking off the leaves and vine tips, 50% for plots 2A and 2B, and 100% for plots 4A and 4B.
- The second defoliation is done on plots 3A, 3B, 5A and 5B when the crop is three months old (FFS session 12).
- During consecutive FFS sessions, the condition and crop development of each plot is monitored and any striking observations are recorded.

B.3 Evaluation (FFS session 17):

- At harvest time, the participants count the number of plants alive in each plot. They weigh the root yield of each plot, separately. All data are recorded on the Defoliation Experiment form.
- The average yield (in kg/plant and t/ha) of the two replications per treatment is calculated.
- The results of the small groups are compiled, presented on a sheet of newsprint paper, and analyzed by the group.

B.4 Discussion:

- What percentage of leaf damage is still acceptable since it does not cause yield loss?
- When is the effect of leaf damage on the root yield greater, when the crop is attacked at 1 or 3 months after planting? Why is this the case?
- What can we learn from this experiment in relation to the management of leafeating pests?

For more information see:

- The regenerative capacity of plants (Part III, Section 2.5).

Notes