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Technical Innovation Brief
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A hot bath cleans all: Boiling water treatment of banana and plantain

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Background

In the humid tropics of Africa, America, and Asia, banana and plantain (*Musa* spp.) are important food crops for millions of people. Global production amounts to about 140 metric tonnes. India, followed by Uganda, produces the most, and the crop is mainly consumed and traded locally (Lescot 2008). *Musa* spp. are clonally propagated crops by using side suckers removed from existing plants/mats. Axenic tissue-cultured plants are increasingly being used, mostly for commercial plantations. Among the key biotic threats to *Musa* spp. are plant parasitic nematodes (several species) and weevils (*Cosmopolites sordidus*). These are easily carried from field to field through the use of infected sucker planting material, thus perpetuating the distribution of these pests. The majority of banana and plantain fields cultivated by smallholder, subsistence farmers are infected with nematodes, weevils or both through the use of infected suckers. Losses resulting from these pests amount annually to millions of US dollars.

The use of clean, healthy planting material, especially when fields not previously planted with *Musa* spp. are to be cultivated, has huge potential to halt the cyclical spread of nematodes, weevils, and other soil- and root-borne pests and diseases. Plant establishment, sucker survival, plantation longevity and consequently yields are all increased by the use of healthy planting material. The duration to harvest is reduced (Tenkouano et al. 2006, Hauser 2007).

Nematode and weevil damage to banana roots and suckers. – D. Coyne

Hot water treatment

Hot water treatment at 50°C of peeled (pared) suckers for 20-25 minutes will effectively reduce nematode and weevil infestation in the plant crop and successive cycles (ratoons) of both plantain and cooking banana (Hauser 2000; Elsen et al. 2004, Hauser 2007). The method has been difficult for smallholder farmers to manage and implement because of the delicate balance needed to achieve a temperature that is lethal to nematodes and weevils in the corm tissue without causing permanent damage to the plant. For commercial plantations and organized cooperatives, for example, this method of sucker sanitation remains a useful and effective technique. For smallholders the method is time-consuming, cumbersome, and tricky to regulate. Although it is effective, it has therefore proved inappropriate in many ways, despite substantial promotion.

Boiling water treatment

To improve the adoption of the hot water treatment, the technique has been adapted by IITA, to use boiling water and immerse suckers for a short and easily measurable time (IITA 2003, Hauser 2007). Suckers are dipped in boiling water for between 20 and 30 seconds. They should preferably be peeled, but can be used with the roots still attached.

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Water can be boiled in any suitable container that is large enough, over an open fire on a temporary or purpose-made frame. Used oil drums are perfect for this purpose, either cut in half or used whole. Suckers are submerged using a basket or net.

A.  B.  C. 

A. Peeling (paring) suckers. **B.** Pared suckers ready for treatment. **C.** Boiling water treatment of suckers using oil drum. – D. Coyne

Although 20-30 seconds is simple to count out, experience in the field showed considerable variability between the rates at which people counted. It is therefore proposed to use 30 small objects (pebbles, beans, etc.) placed on the floor and picked by hand and placed in a small container, cup, or placed to the side. This action takes approximately 1 second/item moved, but it can be timed beforehand to assess accuracy.

Counting 30 seconds. – D. Coyne

The boiling water technique has proved a promising alternative to the use of hot water, reducing the length of time needed for the operation, and simplifying the temperature and timing measurements. It also effectively disinfested suckers of various sizes of plantain and banana without detriment to sucker germination. A period of 30 seconds is viewed as an optimum duration; a longer time has risks of sucker damage for especially small suckers, and a shorter time may be less effective for especially larger suckers (Coyne et al. 2010).

Upscaling boiling water treatment of Musa *spp. suckers*

Treatment of suckers with boiling water will improve plant quality and productivity through the elimination of pests and the consequent long-term improvement of root health. It remains a radical treatment however, which will initially require care and skill when it is promoted to famers who will be likely to have reservations about using it. The use of demonstration plots compared with normal sucker practice is therefore recommended as a mode of introduction. Smallholder farmers have relatively few options for nematode and weevil management so this treatment offers a suitable mechanism for disinfesting *Musa* planting material which could prove essential in reducing losses among smallholders.

Further Reading

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