


STANDARD OPERATING PROCEDURE			
CONTINUOUS OUTPUT (UPFOLD) HOT WATER TREATMENT TANK			
Version 1	Approved date	Developed by	
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PURPOSE

To document the operation of a 13-basket continuous output (Upfold) hot water treatment (HWT) tank used to treat seedcane before planting in a Certified Nursery.

SCOPE

Start-up, operation and monitoring of the performance of the tank.

BACKGROUND

Seedcane used to establish Certified Nurseries is treated in hot water, mainly to eliminate ratoon stunt (RSD). Hot water treatment (HWT) for 2 hours at 50°C ($\pm 0.5^\circ\text{C}$) should eliminate populations of viable RSD bacteria in the seedcane that were too low to be detected through routine testing. Accurate control of the time and temperature is essential for the treatment to be effective.

Note: Do not HWT cane that has tested positive for RSD. Fields that have tested positive for RSD may not be used as a seedcane source as HWT is not effective in eliminating the RSD bacteria in severely infected stalks. The procedure that is followed for establishing Certified Seedcane nursery beds, where Certified Seedcane is HWT before each planting (i.e. repeated HWT), is the most reliable way of maintaining RSD-free seedcane stocks.

REFERENCE

SASRI Seedcane Production Bulletin

PROCEDURE

1. Prior to start-up

- 1.1 Check that the buildings housing the HWT tank are in good condition. Repair as necessary. Ensure that the tank is protected against excessive draughts which can affect temperature control.
- 1.2 Check that the seedcane baskets are in good condition. Ensure that the sides are sufficiently screened to prevent billets from falling out (see 2.5 below).
- 1.3 Arrange a mechanical audit:
 - 1.3.1 Before filling the HWT tank:

- 1.3.1.1 Check the general condition of the tank (internally and externally) as well as all pipes, electronic control panel and monitors.
 - 1.3.1.2 Place 13 empty baskets in the tank (see explanation below).
 - 1.3.2 Fill the tank and allow to reach temperature (~50°C) before checking that:
 - 1.3.2.1 The tank, pipes and seals are not leaking.
 - 1.3.2.2 The circulation systems are functioning correctly.
 - 1.3.3 Using a digital thermometer with 1m probe, check that:
 - 1.3.3.1 The temperature of the water near the corners of the tank (near the surface, halfway down and bottom) is 50°C (±0.5°C).
 - 1.3.3.2 The overall temperature of the tank matches the digital display on the external electronic monitor.
- 1.4 Ensure that the swivel / gantry cranes to load and unload the baskets into and from the tank, if available, are in good working order.
- 1.5 Ensure that the Y-shaped pull-through ropes are in good condition. Replace if necessary.
- 1.6 Ensure the fungicide dipping tank is positioned correctly to receive treated baskets from the tank.
- 1.7 Check the timing of the buzzer. It should sound every 10 min.
- 1.8 Repair or make adjustments as required.

Once the tank and all other equipment required during the HWT process is confirmed to be in sound working order, the treatment of seedcane can begin.

2. HWT procedure

- 2.1 Before filling with water, hang 13 empty baskets in the empty tank. This is done in case any baskets fall off the rails while being inserted. This can easily happen if a basket turns a little sideways somewhere in the tank but is avoided when the tank is filled with 13 baskets. A fallen basket is very difficult to retrieve in a tank full of water.

NB: Do not hang full baskets on the longitudinal spray pipes unless the tank is full of water.

While inserting the baskets, attach the Y-shaped pull-through rope (it will be difficult to do this after all the baskets are inserted. The rope must lie on top of each basket. Hooks must be at the output end of the tank. In some cases, poles are used to push the baskets forward from the input end of the tank.

- 2.2 Fill the tank with clean water to a few millimetres below the longitudinal spray pipes.
- 2.3 Close the input and output lids, switch on the tank and allow the water to reach 50°C (this will take about 6 hours if starting from 20°C). Do not switch on unless the tank is at least 25% full of water or the pump and elements may be damaged.
- 2.4 Remove most of the dead leaf material from the stalks but leave the leaf-sheath bases in the nodal region to protect the buds. There should be no loose trash on the stalks that could clog the filters.
- 2.5 Cut the seedcane into 1 m lengths. These can be placed in the skeletal baskets. Any shorter pieces must be placed into mesh-lined baskets. Fill the baskets to level with the top of the basket end plates. This will allow free flow of the water circulation over the top of the baskets.
- 2.6 Weigh the baskets if required.
- 2.7 Once the buzzer sounds, open the lid at the output end of the tank and remove one empty basket. Slide all the baskets along the rails from the top end of the tank to the output end to fill the gap.
- 2.8 Close the lid at the output end.
- 2.9 Insert a full basket into the space made at the input end of the tank.
- 2.10 Ensure no seedcane is protruding above the water line before closing the lid.
- 2.11 When the buzzer sounds, open the lid at the output end of the tank and remove another empty basket. Slide all the baskets along the rails to close the gap and make space at the input end. Close the lid.
- 2.12 Insert another full basket at the input end and close the lid.
- 2.13 Repeat every 10 minutes on the buzzer, until 13 full baskets have been placed in the tank.
- 2.14 As empty baskets are removed and full baskets are placed into the tank, the water level will rise. Drain the tank at intervals to keep the water level a few millimetres below the pipe rails.
- 2.15 When the buzzer next sounds, indicating that 10 mins has passed, remove the first full basket that was placed in the tank – it will now be at the output end of the tank - and place another basket in at the input end the tank. There must always be 13 baskets in the tank. This gives an actual 2 hr 10 min treatment (13 x 10 minutes), 10 minutes to allow the cane time to reach 50°C before timing the 2 hour treatment.
- 2.16 Transfer the treated basket that has just been removed from the HWT tank to the fungicide dipping tank.

- 2.17 When the buzzer sounds, remove the next basket from the tank, slide all baskets along and place a new basket into the tank.
- 2.18 Remove the first basket from the fungicide dipping tank and transfer to the holding area.
- 2.19 Transfer the second basket that was removed from the HWT tank to the fungicide dipping tank.
- 2.20 Continue the process until all the seedcane has been treated.
- 2.21 2 hours before knockoff time, on the buzzer, start placing empty baskets into the tank at 10 minute intervals. After two hours, the tank will be full of empty baskets ready for the next day. During this process, the water level will drop. To compensate for the water drop and to prevent any seedcane from protruding out the water, slowly add water making sure the temperature does not drop. It is critical to keep the temperature constant throughout the process.

Notes:

After every 20-30 hours (or when the water is foul), drain the tank, wash thoroughly and refill before commencing with further HWT. A routine should be established where, for example, the tank is drained at the end of the day on Wednesdays and rinsed out before re-filling. Then, when the tank is drained on Fridays, it is cleaned more thoroughly before re-filling. The fungicide / cool water tank is drained every day.

The circulating pump is a domestic pool pump and has a built-in filter basket. Depending on cane cleanliness, this filter basket gets clogged. Clean the basket every time the tank is emptied

There is a stainless steel screen on the suction plate inside the tank. This can get blocked by trash. This screen can only be cleaned by draining the tank. A drop in pressure can be seen by a reduced flow from the spray pipes onto the baskets. This indicates a blocked pump filter or screen. A reduced flow will seriously affect circulation and temperature control. On start-up, take note of the jet of water from the spray pipes and use this as an indication a few times per day to monitor circulation.

3. Temperature monitoring during operation

The temperature of the tank should be tested manually during operation at least once a year, but preferably once a month.

- 3.1 Take a temperature reading at the input end of the tank as the lid is removed to add a new basket by inserting the temperature probe as far into the tank as possible.
- 3.2 Record the temperature, remove the probe and replace the lid.
- 3.3 Repeat for the output end of the tank.
- 3.4 Compare the manual readings with the electronic control panel readings.

- 3.5 Once the next basket of seedcane is placed in the tank, insert the probe as far into the basket of seedcane as possible. Record the temperature.
- 3.6 Leaving the probe in the same position, record the time it takes for the temperature to return to 49.5 and 50°C.
- 3.7 Remove the probe and replace the lid.
- 3.8 Compare the manual readings with the electronic control panel readings.
- 3.9 Just before the 10-minute buzzer is due to sound, remove the lid from the output end of the tank.
- 3.10 Take a temperature reading by inserting the probe as far into the basket of seedcane as possible.
- 3.11 Record the temperature, remove the probe and replace the lid.
- 3.12 Compare the manual reading with the electronic control panel reading.
- 3.13 Repeat the process (from 3.6 onwards) to confirm readings.
- 3.14 Adjustments will need to be made by a qualified technician if 1) the temperature readings fall outside the 50°C ($\pm 0.5^\circ\text{C}$) range; 2) the manual readings do not match the electronic control panel readings; 3) the time taken for the temperature to return to 50°C after a basket has been added to the tank is >2 min (methods to improve circulation within the tank may be required).

4. Notes on planting HWT seedcane

- 4.1 Handle HWT seedcane carefully to avoid damaging the buds which soften during the HWT process. If seedcane is to be transported over long distances and / or on rough roads, the likelihood of bud damage is high so special care should be taken under these circumstances.
- 4.2 Allow the seedcane to cool completely after HWT, preferably overnight, before further handling to limit bud damage.
- 4.3 Transfer seedcane to the field in the baskets used for HWT if possible.
- 4.4 Do not cut the HWT stalks in the furrow.