Twinpot Water Management System

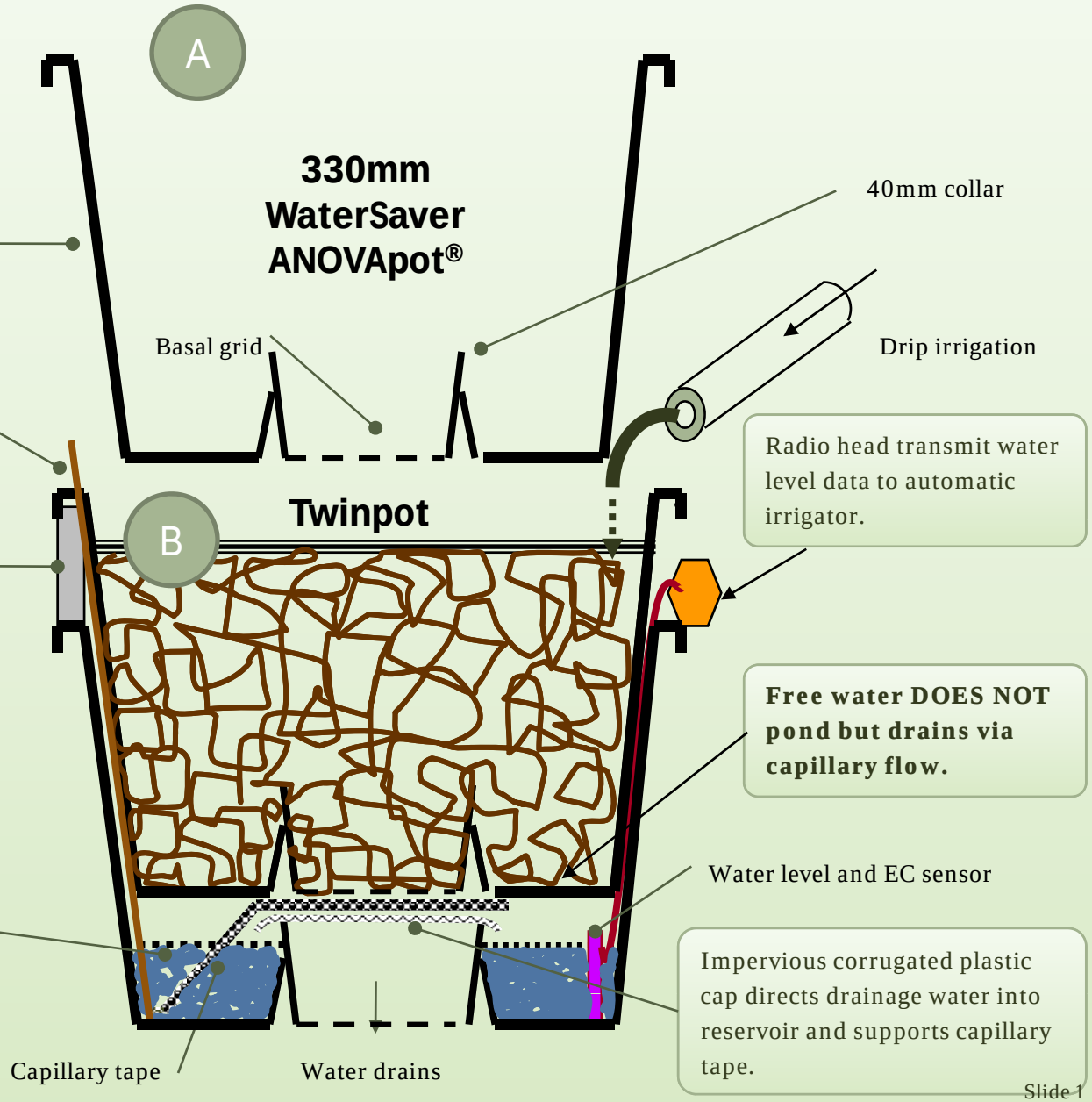
This illustrates the conversion of the 330mm WaterSaver ANOVApot® into a Twinpot configuration.

Upper pot fits snugly into lower pot with basal grid in close contact with capillary tape.

A Dip Stick slides between pots and into the bottom reservoir allowing manual water level monitoring.

Vertical polypipe spacers optimises separation distance and ensures weight of pot supported by rim of lower pot. Spacers may be replaced with WindClip brackets that separate pots vertically and provide horizontal stability.

Lower pot stores 2L water to the height of the collar (any more drains away). Water moves upwards by capillary action flow through the tape into the upper pot.



With Dr Wal Scattini

Capillary Cap in Twinpot Configuration.

Capillary cap consisting of geotextile tape lying over indented plastic sheet.

Capillary cap in position on top of collar in the lower pot, in contact with the grid of the upper pot, providing a capillary conduit for water from the bottom reservoir to the potting mix in the upper pot.

The Dip Stick.

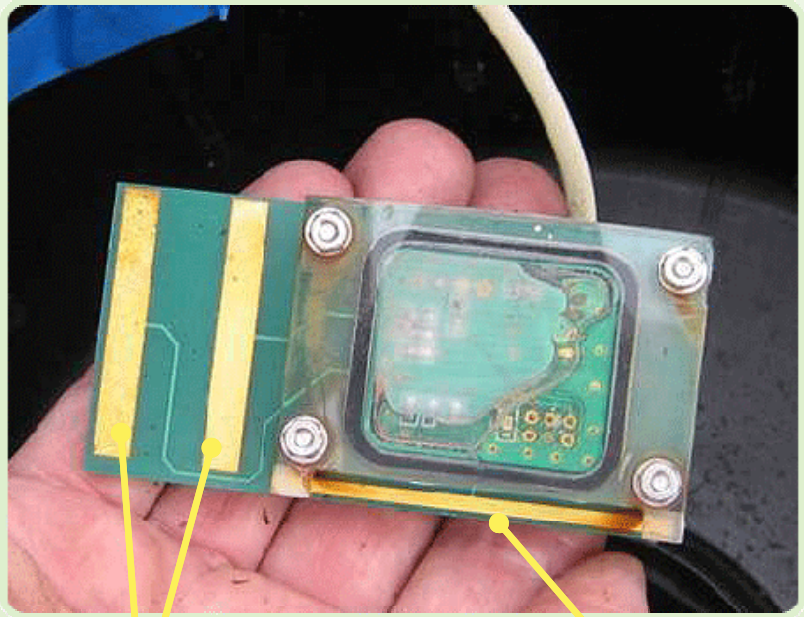
The Dip Stick lies between the walls of the two pots and is used as a manual monitor of the water level in the reservoir.

To stop rotting, the Dip Stick is withdrawn slightly to rest above the reservoir water table between measurements.

Preventing litter accumulation in the ANOVApot® when used in the Twinpot Water Management System.

Set of 9 WaterSaver ANOVApot®s clipped together as the lower pots in the Twinpot configuration picked up and turned over to prevent leaf and water accumulation while empty.

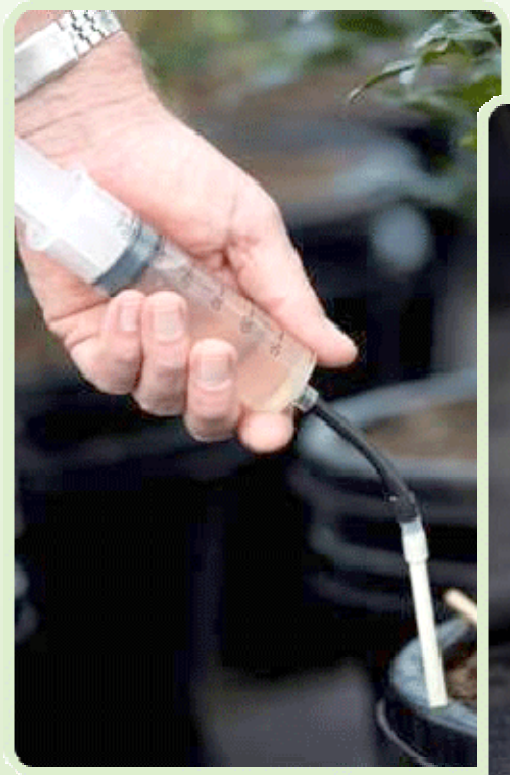
Water level and electrical conductivity sensor (prototype) in the reservoir of the lower pot in the Twinpot Water Management System.



Vertical metallic strips monitor water level.

One of two horizontal metallic strips that monitors electrical conductivity of reservoir solution.

Reservoir water used to detect nutrient deficiency or salt toxicities.



Solution is very easily extracted from the reservoir by inserting a stiff hollow rod down the Dip Stick hole and syringing. An electrical conductivity probe is placed in the syringe with values indicating nutrient deficiency or toxicity.

Effect of pot type on growth of Bamboo Palm (*Chamadorea seifritzii*) 29 May 2008 ~ 21 Oct 2008 at Tropical Exotics Nursery.

Block of six treatment by five replicates

Index

Apot8	ANOVApot 8mm collar
Apot18	ANOVApot 18mm collar
TAPot1818	Apot 18 sitting inside Apot 18 (Twinpot config)
TAPot1840	Apot 18 sitting inside ANOVApot 40mm collar (Twinpot config)

Proof of Concept experiment

Effect of culture system (a) 300mm Sidehole (SH) pot, (b) Twinpot Water Management System with 300mm **ANOVApot®** prototype, on growth of *Syzygium australis*, cv Cascade and *Magnolia grandiflora*, cv Little Gem, 122 days after transplanting and one day before harvest.

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SH(a) TWMS(b) SH(a) TWMS(b)

Syzygium ***Magnolia***

Proof of Concept

Comparison of the growth of *Syzygium australis*, cv Cascade in "normal' side hole pots and the Twinpot Water Management System with WaterSaver ANOVApot®, 122 days (26 May 2008) after transplanting.

Effect of irrigation system and peat/bark composition of potting mix on growth of *Syzygium australis*, cv Aussie Boomer, 91 days after transplanting (fresh shoot weights (g/plant) shown).

Replicate (a)

Replicate (b)

Peat/bark percentage

10/90	30/70	50/50	10/90	30/70	50/50

Coffee in the Twinpot Water Management System

First

Second

Third

Fourth

The four faces of the root ball of Coffee (with base of root ball uppermost) three months after transplanting into 18L ANOVApot® Twinpot Water Management System

Coffee in the Twinpot Water Management System

Root ball

Front

Side

Base

Coffee (12 Oct 2008) after nine months in the Twinpot Water Management System

Dip Stick

Spacer

Bamboo Palm *(Chamadorea seifrizii)*

Rep A

Rep E

Effect of pot type on root escape and root distribution within pot of Bamboo Palm (29 May 2008 ~ 21 Oct 2008) at Tropical Exotics Nursery

Effect of culture system (a) Twinpot Water Management System with 300mm Watersaver ANOVApot® prototype (b) 300mm side hole pot on root balls of *Syzygium australis*, cv Cascade and *Magnolia grandiflora*, cv Little Gem, 123 days after transplanting, in replicate 2.

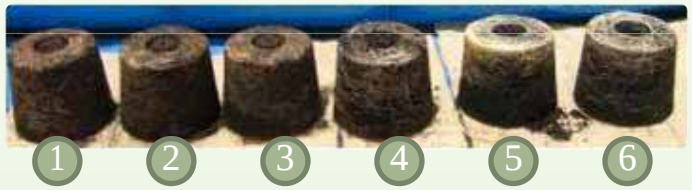
Syzygium

Side hole

TWMS

Magnolia

Twinpot Water Management System



Effect of irrigation system and peat/bark composition of potting mix on basal root distribution of *Syzygium australis*, cv. Aussie Boomer, 91 days after transplanting.

Daily irrigation

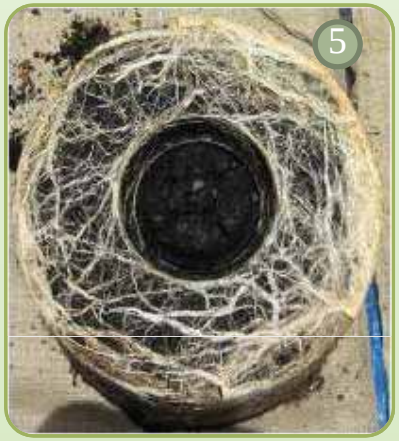
Peat/Bark %

Sensor actuated irrigation TWMS

10/90

30/70

50/50



Effect of irrigation system and peat/bark composition of potting mix on root distribution of *Syzygium australis*, cv. Aussie Boomer, 91 days after transplanting.

Daily irrigation

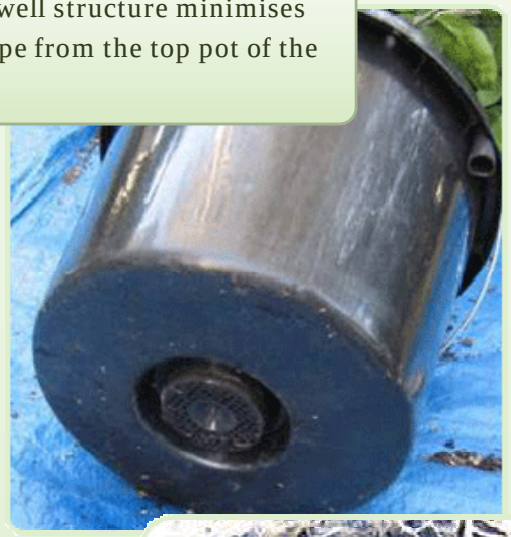
Peat/Bark %

10/90 *30/70* *50/50*

Sensor actuated irrigation TWMS

Tahitian Lime, cv "*Sublime*" (27 Sep 09), 12 months after transplanting into Twinpot Water Management System with 330mm 18l ANOVApots®

Internal well structure minimises root escape from the top pot of the TWMS.

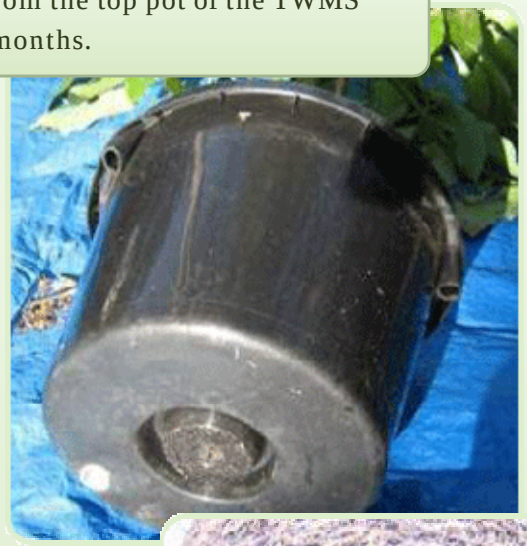


Basal root development on root ball but with very little in the zone of the central well.

Two faces of the root ball show extensive root development to the base of the root ball but with little coiling.

Avocado, cv "*Wurtz*" (27 Sep 09), 11 months after transplanting into Twinpot Water Management System with 330mm 18L ANOVApots®

Internal well structure minimises root escape from the top pot of the TWMS after 11 months.



Basal view of the root ball.

Two faces of the root ball show root distribution after 11 months in the TWMS.

Effect of copper level in compacted coir plugs in the wells of the ANOVApot® prototype on growth and root escape in Marigolds, 36 days after transplanting.

Growth

0	24mg	2.4mg

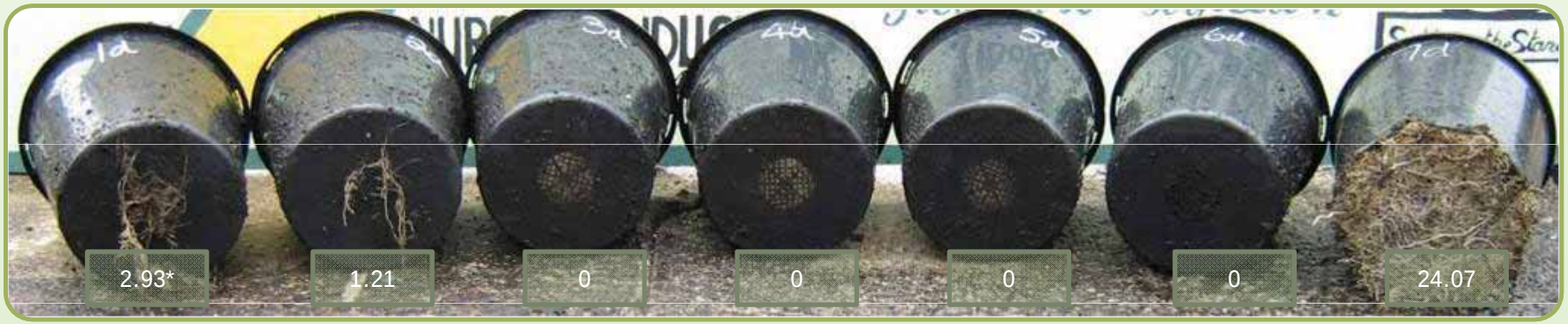
Root escape

Copper level

Root escape* of sunflower (*cv Hysun 38*) after 87 days in a side holed pot compared with capped, unplugged or plugged 200mm Anovapots® (3 grades of porous concrete or Cu coir).

Shoot fresh weight (g/plant)

491	502	500	506	524	490	374



2.93*	1.21	0	0	0	0	24.07
No plug	Cu Coir Plug	Coarse	Medium	Fine	Cap	Side hole

Porous concrete plug

* Fresh weight of escaped roots (g/pot)

Effect of plastic paint containing copper on root distribution in sunflower grown in 200mm ANOVApot®

Copper paint on corner (205g shoot wt)

No copper paint on corner (204g shoot wt)

Response of sunflower roots to basal band of copper impregnated plastic paint.
(Note the complete elimination of vigorous large circling roots)

Growth of Coffee in Twinpot Water Management System.

Coffea arabica in a bark/coir potting mix contained in an 300mm, 18L ANOVApot®

At transplanting (2 Jan 2008) 1 yr old seedling

After five months (6 Jun 2008)

After15 months (23 April 2009)

After 24 months (2 January 2010)

Growth of Coffee in Twinpot Water Management System.

Coffee after 14 months (140cm wide x 150cm tall) in the Twinpot™ Water Management System with the 330mm WaterSaver ANOVApot®.

Heather Hunter wanted a plant to cover the hot water system.

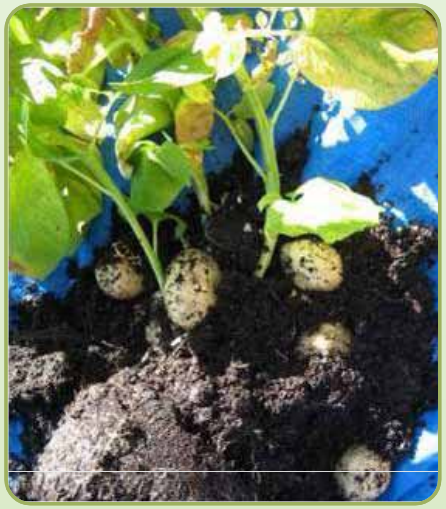
Uses 2-3 L per day in summer.

Potato under Twinpot Water Management System.

Growth and yield (985g of tubers) of potato, cv Sebago after four months (7 Jun 2008 ~ 4 Oct 2008) under the Twinpot Water Management System.

Plants emerged two weeks after planting tubers.

Because of proximity of building and low sun angle, plant received very little direct sun for the first two months.



At harvest

A range of herb species growing under the Twinpot Water Management System.

Chervil

Tarragon

Rosemary

Parsley

All pots, 40mm central well, 4 litre ANOVApot®

Chives

Growth of lettuce in the Twinpot Water Management System.

(40mm central well, 4L ANOVApot®)

Two weeks after transplanting

Sweet potato *(Ipomea batatas)* in the Twinpot Water Management System.

330mm, 18L ANOVApot®

26 January, 2009

Sweet potato *(Ipomea batatas)* In the Twinpot Water Management System.

Sweet potato harvest (1.3kg) from one pot under the Twinpot Water Management System

(root balls upside down)

Effect of the rate of slow release fertiliser (3-4 month Osmocote Exact*) and its position on growth of 36 (upper) and 58 (lower) day old sorghum, cv Buster in the Twinpot Water Management System. (200mm 4L ANOVApot®, 40mm collar).

Surface of pot

Mixed throughout

Only in reservoir

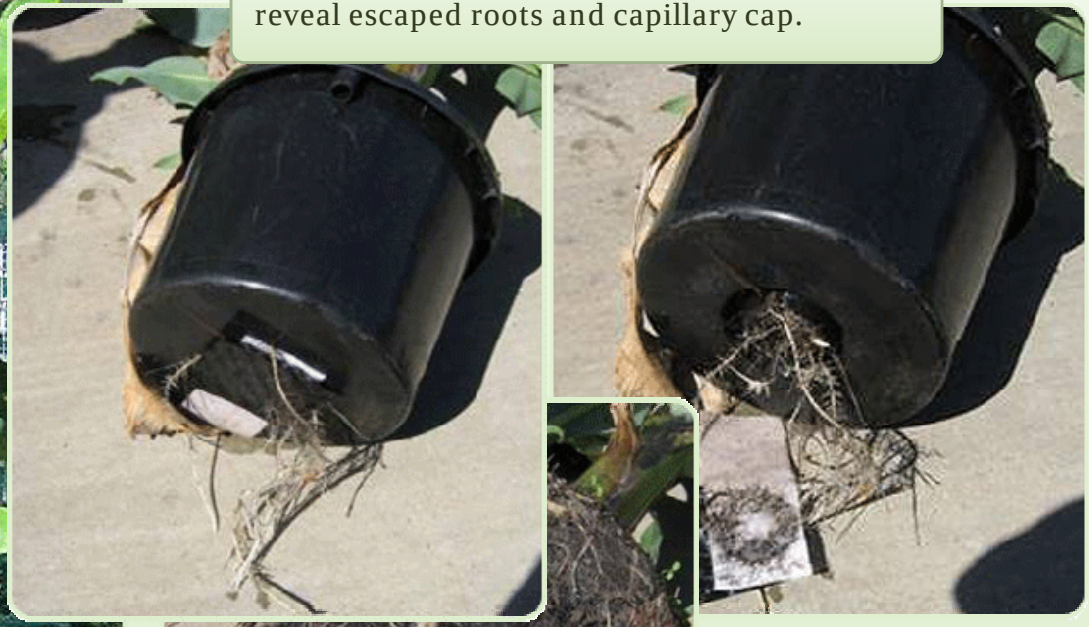
Fertiliser rate (g/L of potting mix)

16 3.9 10 + 1.5mg + traces

Banana growing in the Twinpot Water Management System.

Peter Hunter plus plant.

Upper (top) pot removed from lower pot to reveal escaped roots and capillary cap.



Extracted root ball displays fleshy peripheral roots and much finer central well roots.

Tahitian lime, cv "*Sublime*"

Twelve months after transplanting (27 Sep '09) into Twinpot Water Management System with 330mm 18L ANOVApot®.

At transplanting
(24 Sep 08) into TWMS

Avocado, cv "*Wurtz*"

Eleven months after transplanting (27 Sep '09) into Twinpot Water Management System with 330mm 18L ANOVApot®.

Flowered 4 Sep 09

At transplanting
(28 Oct 08) into TWMS

Commercial Validation

Twinpot Water Management System – Cedar Glen Nursery
March ~ September 2009

Twinpot

Standard Sidehole Pot

Shoot Growth and Root Distribution – Commercial Validation

Twinpot Water Management and Standard single sidehole system – 16 Sep 09 in the irrigated culture of *Murray paniculata*

TWMS Sidehole

TWMS Sidehole

Mal Hunter TWMS

TWMS Sidehole

Weed Growth and Root death occurs in the zone of side holes

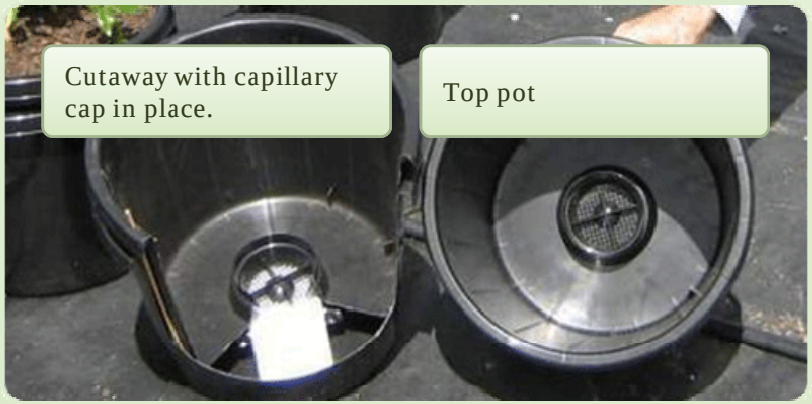
Philodendron, a very aggressive genus that should thrive in the competitive environment of the under storey

However...

Roots are not susceptible to air pruning in a side-holed pot.

Problem - Poor growth of under storey plants (Philodendron sp.cv *"Zanadu")* in a dry environment due to intense competition for water and nutrients from established plants

Solution - Grow the plant in the Twinpot Water Management System which isolates the root system from those of surrounding established plants.



Twinpot Water Management System

In ground for 12 months

Extracted

Exposed root ball in top pot

Socket pot

Top pot with plant

Escaped roots enter capillary cap but are all contained within the socket pot with no interference from roots of surrounding 6m tall established palms