

Sample Trial – Evaluating phytotoxicity of a new dip regimen on a commonly used Mandevilla variety in a greenhouse

Introduction

Background

Phytotoxicity in Mandevilla can vary in both severity and presentation between varieties. Generally, it will look like burned or dropped leaves, death of the growing tip, or delayed rooting. For example, one variety may show no phytotoxic effect in response to a product, while another Mandevilla variety's root development may be significantly delayed. For a grower, minor damage that the plants can grow out of quickly is preferred to more serious damage such as death of the growing tips or delayed rooting, which can affect plant habit and production scheduling. Understanding how a plant variety responds to a new product at a small scale is an important first step before moving on to large-scale production changes.

Objective/Hypothesis

In this trial we wanted to know whether using new products in a dip solution as part of a thrips biocontrol program would harm Mandevilla (var. Medina Pink) cuttings (***Our question***). We hypothesized that using new products according to the label in a dip solution would not cause phytotoxicity in this variety, as previous trials by colleagues showed minor-to-moderate damage and little-to-no root developmental delay in other plant varieties when these products were used according to the label (***Evaluate existing knowledge and formulate a hypothesis***).

We aimed to compare the grower's usual dip solution of Suffoil-X 0.1% + Stim Root (Treatment #1/Control) against two treatment groups; Botanigard WP 2.5g/L + Kopa 2% + Stim Root (Treatment #2), and Botanigard ES 4 ml/L + Stim Root (Treatment #3).

Methodology (***Our protocol / How we plan to test our hypothesis***)

Dry, pre-filled trays were fed through a flood conveyor to hydrate the empty plugs (Fig.1). Products used in each treatment were measured out 1-hour ahead of time, and dip solutions (2L each) were prepared at the time of

dipping/sticking. Water for the dips was taken from the grower's usual spray-water source. Cuttings were randomly divided, dipped in one of the three treatments and manually stuck into separate trays, totaling one tray of each treatment per week for 3 consecutive weeks (Fig.2, Fig.3, Fig.4). The full plug trays were put through a mist conveyor to water in the cuttings. Trays were then moved to the propagation zone by cart and watered using fresh water from overhead booms at regular intervals until rooted (Fig.5). Three sets of cuttings were dipped and stuck in total, spanning three weekly shipments. The experimental layout is shown in Fig. 6.

We compared the condition of the cutting trays' foliage weekly for 3 weeks after sticking using the scale in Table 1. We also compared the rooting status of cuttings at two stages using the scale in Table 2; one at the early rooting stage (3wks) and one at the transplant stage (6wks). Foliage and rooting stage were photographed weekly (***Take consistent progress photos***). All trays were kept alongside normal production for the duration of the trial.

After rooting began, trays started receiving fertilizer water instead. After cuttings were fully rooted, they were flooded from below with fertilizer water at regular intervals according to demand (depends on growing season and conditions). Plants were grown for 6 weeks and then trimmed to promote lateral branching. At 7-weeks after sticking (after the conclusion of the trial) plugs were potted up and sold as normal. A breakdown of the experimental timeline can be found in Table 5 in the Supplemental section at the end of this protocol.

Results and Conclusions

No phytotoxicity, nor delays in rooting were observed in any of the treatments in this variety. Representative photos are included in Table 3 and Table 4. The grower was satisfied that there are no concerns with using any of these products on a larger scale with this variety at this location in the future. Next steps in this trial include; testing more Mandevilla varieties and comparing the efficacy of the different treatment groups at preventing or delaying the establishment of incoming arthropod pests such as thrips, aphids or mites.

Tables and Figures

Table 1. Graded visual scale used to assess foliar phytotoxicity of cuttings.

Visual Foliar Phyto Score	Description
Normal	healthy, no phytotoxicity damage (ignore damage caused by physical means)
Minor Damage	small burns taking up less than 5% of leaf surface, slight curling of leaves, slight discoloration; stunted growth but otherwise healthy looking
Moderate Damage	burn scars & necrotic spots taking up 5-25% of leaf surface area, dramatic discoloration
Heavy Damage	burn scars & necrosis taking up 25-75% of leaf surface, dropped leaves, damage/necrosis to growing tips
Severe Damage	necrosis covering more than 75% of leaves, death of cutting highly probable
Dead	-

Table 2. Graded visual scale used to evaluate the rooting level of cuttings.

Rooting Score	Description
0	No visible roots outside soil plug, plant has no hold in the soil
1	No visible roots, but plants have firm hold in the soil
2	Minimal roots/root tip extending from plug (< 7 roots visible and <2 of those roots 2cm or longer)
3	Extensive number of roots extending from multiple locations and intertwining (7 or more roots visible or 2 or more roots that are longer than 2cm)



Fig.1. Sticking line machinery and process. Pre-filled dry trays are fed through a water bath and removed from the conveyor for sticking. Once filled with cuttings, the trays travel on the lower conveyor to a misting station where the cuttings are watered in. Then they are placed on a cart to be delivered to the growing section.



*Fig.2. Labelled vials containing pre-measured volumes of product, alongside a pre-filled dip container to a 2L volume line (pictured right). (***Be organized – lay out supplies in advance, label and colour code***).*



Fig.3. Cuttings were dipped in their respective treatments according to the product labels, using separate 3L Tupperware containers and the grower's usual water source for spray mixes. (***Use your normal growing practices***).



Fig.4. Treatment trays were clearly marked with the date and treatment used. We used different coloured tags for each different to track the trays from a distance.



Fig.5. Once placed in the growing section, the trays were watered with fresh water by an overhead boom until rooted, and then with fertilizer water thereafter. Once the cuttings were well rooted, watering was switched to flood irrigation via the flood tables. (***Trial trays clearly marked, placed next to normal production***).

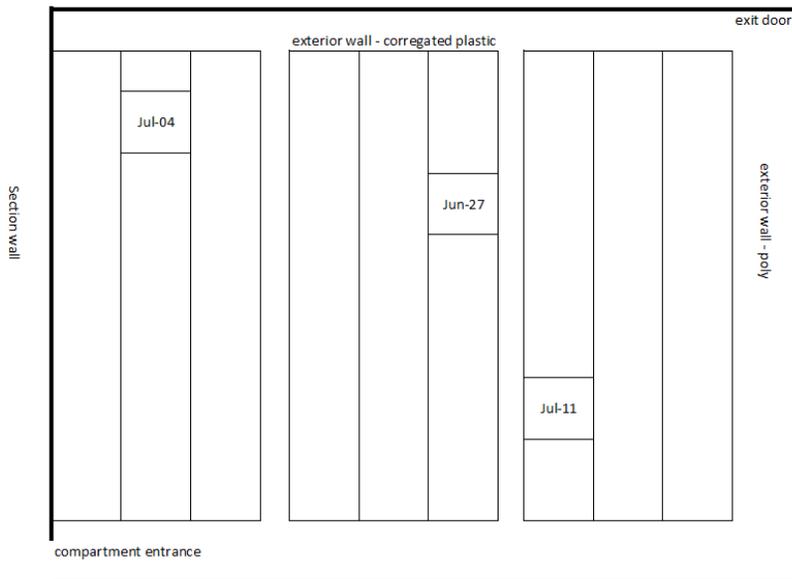


Fig.6. Diagram displaying the experimental layout of three blocks within a greenhouse compartment. The trial trays were grown alongside normal production, and so were interspersed in the compartment as other propagation material was added over time. (***Notice the blocking***)

Table 3. Weekly phytotoxicity assessment of trays dipped and stuck on July 4. No phytotoxicity was observed in any of the treatments, so only the July 4 block is shown here. (***Note the consistent light, angle and distance***).

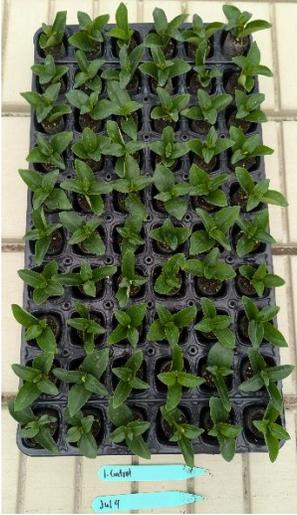
Treatment	1 week since sticking	2 weeks since sticking	3 weeks since sticking
1 (Control)	 A black 10x20 seedling tray filled with green plants, showing healthy growth. A light blue label at the bottom reads "1. Control" and "Jul 4".	 A black 10x20 seedling tray filled with green plants, showing healthy growth. A light blue label at the bottom reads "1. Control" and "Jul 4".	 A black 10x20 seedling tray filled with green plants, showing healthy growth. A light blue label at the bottom reads "1. Control" and "Jul 4".
2	 A black 10x20 seedling tray filled with green plants, showing healthy growth. A red label at the bottom reads "2. Dip 100% - 1 week" and "Jul 4".	 A black 10x20 seedling tray filled with green plants, showing healthy growth. A red label at the bottom reads "2. Dip 100% - 2 weeks" and "Jul 4".	 A black 10x20 seedling tray filled with green plants, showing healthy growth. A red label at the bottom reads "2. Dip 100% - 3 weeks" and "Jul 4".
3	 A black 10x20 seedling tray filled with green plants, showing healthy growth. A light blue label at the bottom reads "3. Dip 50% - 1 week" and "Jul 4".	 A black 10x20 seedling tray filled with green plants, showing healthy growth. A light blue label at the bottom reads "3. Dip 50% - 2 weeks" and "Jul 4".	 A black 10x20 seedling tray filled with green plants, showing healthy growth. A light blue label at the bottom reads "3. Dip 50% - 3 weeks" and "Jul 4".

Table 4. Root assessments of cuttings dipped and stuck July 4. Treatments did not affect root development in cuttings, so only the July 4 block is shown here.

Treatment	3 weeks since sticking	6 weeks since sticking
1 (Control)		
2		
3		

Supplemental

Table 5. Experimental Timeline and Checklist (***Our timeline***)

Week #	Date	Task	Complete
1	June 27	Dip wk1 cuttings	<input type="checkbox"/>
2	July 4	Dip wk2 cuttings Assess wk1 phyto and rooting	<input type="checkbox"/> <input type="checkbox"/>
3	July 11	Dip wk3 cuttings Assess wk1 phyto and rooting Assess wk2 phyto and rooting	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
4	July 18	Assess wk1 phyto and rooting Assess wk2 phyto and rooting Assess wk3 phyto and rooting	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
5	July 25	Assess wk2 phyto and rooting Assess wk3 phyto and rooting	<input type="checkbox"/> <input type="checkbox"/>
6	Aug 1	Assess wk3 phyto and rooting	<input type="checkbox"/>
7	Aug 8	Final wk1 rooting assessment before potting	<input type="checkbox"/>
8	Aug 15	Final wk2 rooting assessment before potting	<input type="checkbox"/>
9	Aug 27	Final wk3 rooting assessment before potting	<input type="checkbox"/>