Solving Presistent Pathogens Problem in Viburnum Production

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Introduction

Viburnum species are one of the top-selling ornamental shrubs in Central Florida and placement in landscapes. This includes *Viburnum suspensum* and *V. odoratissimum*. Nurseries propagate viburnum by using landscape or production stock plants that may appear healthy, but often harbor several foliar diseases prevalent in nurseries and landscape environments (Fig 1 & 2). These diseases then compromise production during the propagation stage. This is especially problematic for ornamental shrub nursery production reliant on overhead irrigation that is optimal for foliar pathogen spread and development. While effective fungicide treatments can help manage foliar diseases during container production, making applications during or immediately following propagation may improve liner production and limit disease losses following transplanting.

Figure 1: Various foliar disease symptoms on *Viburnum* sp. in a local nursery under overhead irrigation in Hillsborough County, FL.

Figure 2: Viburnum liners (propagation trays) showing high foliar disease incidence with different leafspot symptoms.

Hypothesis

Fungicide treatments can offer foliar disease control during propagation to reduce overall foliar disease progression.

Objective

Measure the efficacy of five fungicide products during liner (cutting) production as either a soil drench or a dip-treatment for cuttings to minimize disease development early in the production cycle.

Materials and Methods

Cuttings from Sandankwa viburnum (*Viburnum suspensum*) from naturally, fungal infected #3 plants in Hillsborough County were used to initiate two fungicide trials in the summer of 2022 (July and August) for standard liner production (Fig 3).

Two experimental trials were completely randomized blocks design with 5 replicates including a water control and five fungicide treatments (Table 1 & 2.) Fungicides were either applied as a soil drench (10 ml) to cuttings following the application of rooting hormone (Fig 3C), or as dip treatment to prepared cuttings followed by the application of rooting hormone and planting (Fig 3D). Standard nursery propagation practices were used, cuttings (12 per a replicate) were stuck in potting medium (50% peat: 50% perlite) on 6/21/22 in liner trays. Trays were immediately placed under an overhead mist system (4 seconds water cycle every 6 minutes) to keep soil moist (Fig 3F).

Starting at two weeks, cuttings were rated for disease incidence and severity on a weekly basis. After ratings of six weeks, the Area Under the Disease Progression Curve (AUDPC) was calculated. Leaf tissues were periodically sampled for disease identification. At week 7 plants were uprooted to assess root length and root biomass (fresh and dry).

Data analysis was conducted using a generalized mixed model analysis (PROC GLIMMIX) within SAS with blocking as a random variable and fungicide treatment as a fixed effect. Disease severity over time was analyzed using the repeated measures function within GLIMMIX. Means separations were performed using Fisher's protected LSD at a 95% level of confidence to further analyze differences between multiple treatment means.

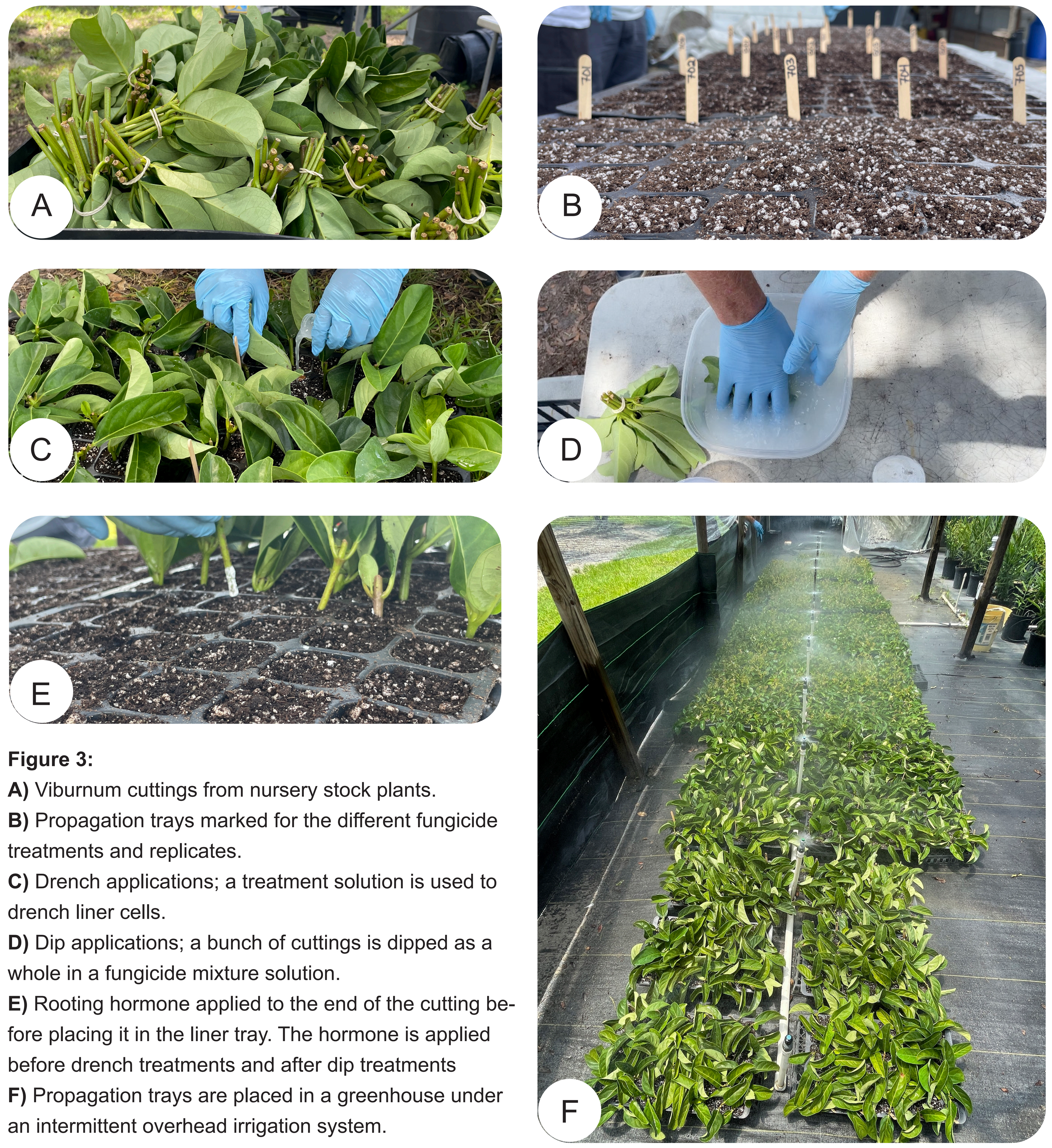


Figure 3:
A) Viburnum cuttings from nursery stock plants.
B) Propagation trays marked for the different fungicide treatments and replicates.
C) Drench applications; a treatment solution is used to drench liner cells.
D) Dip applications; a bunch of cuttings is dipped as a whole in a fungicide mixture solution.
E) Rooting hormone applied to the end of the cutting before placing it in the liner tray. The hormone is applied before drench treatments and after dip treatments
F) Propagation trays are placed in a greenhouse under an intermittent overhead irrigation system.

Table 1: Fungicide treatments applied by drench to viburnum cuttings for liner production with the corresponding Area Under Disease Progression Curve (AUDPC) representing disease severity.

Product	Active Ingredient	FRAC	Rate/100 gal	AUDPC[X, Y]
Postiva	benzovindiflupyr + difenoconazole	7+3	28 fl oz	145 c
Orkestra	pyraclostrobin+ fluxapyroxad	11+7	10 fl oz	173 bc
Ryora	flutriafol	3	14 fl oz	289 ab
Omega	fluazinam	29	16 fl oz	317 a
Topsin 4.5L	Thiophanate methyl	1	20 fl oz	239 ab
Water Control	-	-	- -	288 ab

[X] Area Under the Disease Progression Curve (AUDPC), calculated using seven disease severity ratings. Lower numbers represent less disease severity. *P-value* 0.0618. [Y] AUDPC means followed by the same letter are not significantly different.

Table 2: Fungicide treatments applied by dipping viburnum cuttings for liner production with the corresponding Area Under Disease Progression Curve (AUDPC) representing disease severity.

Product	Active Ingredient	FRAC	Rate/100 gal	AUDPC[X, Y]
Postiva	benzovindiflupyr + difenoconazole	7+3	28 fl oz	244 ab
Orkestra	pyraclostrobin + fluxapyroxad	11+7	10 fl oz	131 b
Ryora	flutriafol	3	14 fl oz	181 b
Omega	fluazinam	29	16 fl oz	236 ab
Topsin 4.5L	Thiophanate methyl	1	20 fl oz	325 a
Water Control	-	-	- -	243 ab

[X] Area Under the Disease Progression Curve (AUDPC), calculated using seven disease severity ratings. Lower numbers represent less disease severity. *P-value* 0.0314. [Y] AUDPC means followed by the same letter are not significantly different.

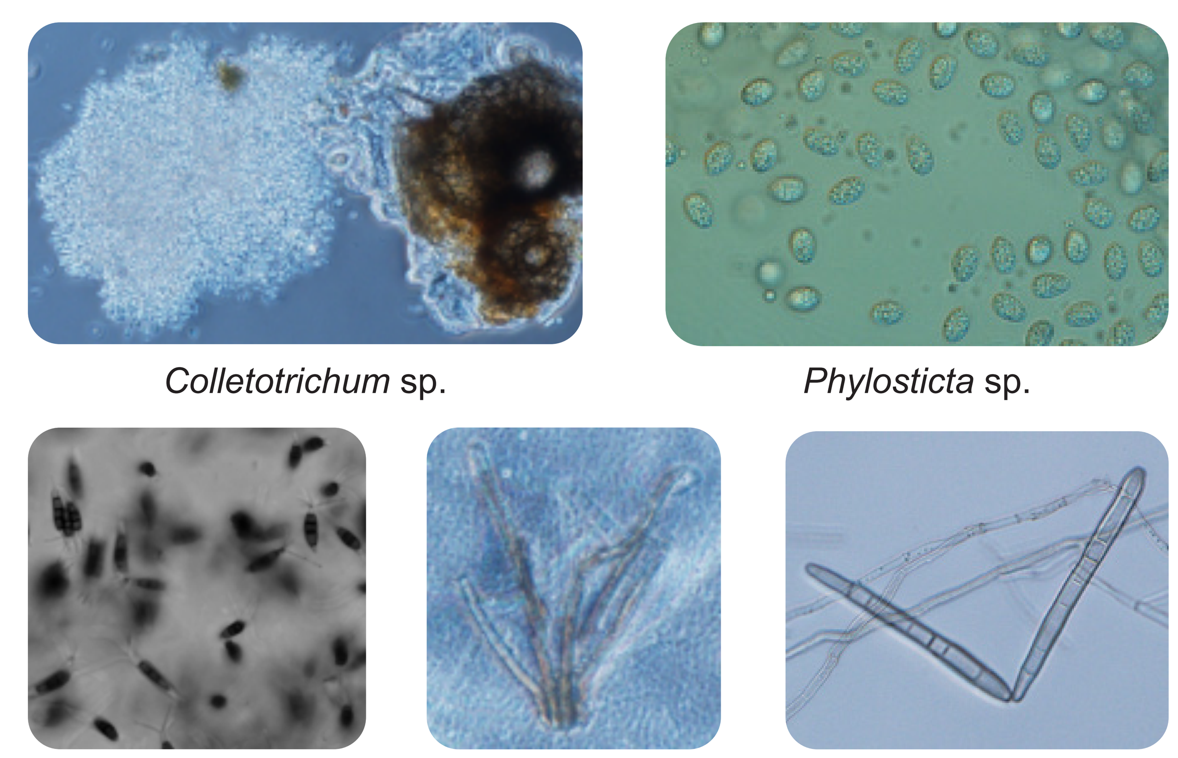
Results and Discussion

In sampling, *Colletotrichum* sp. was the most abundant fungus found, but others including *Cercospora* sp., *Corynespora* sp., and *Phyllosticta* sp. were observed causing symptoms of leaf spotting, blighting and defoliation on propagated cuttings (Fig 4 & 5).

Both drench-applied and dip-applied fungicides helped reduce final disease severity in propagated cuttings (Table 1 & 2). For drench-applied fungicide treatments, both Postiva and Orkestra significantly reduced final disease severity by more than 50% compared to the water control. In addition, both Postiva and Orkestra prevented disease severity from increasing over time, relative to the control and other ineffective fungicide treatments. For the dip-applied fungicide treatments, Postiva, Orkestra, Ryora, and Omega all reduced final disease severity by 57% on average compared to the control. The same four treatments also prevented disease severity from increasing over time, unlike the control.

Interestingly, drench-applied fungicide treatments had a negative impact on cutting vigor based on root length and root biomass. Relative to the other fungicide treatments, Ryora resulted in cuttings with the shortest root length, and lowest fresh and dry root biomass compared to the control and the other fungicide treatments, however, further investigation may be required.

Figure 4: Example of the viburnum stock plants used for propagation with naturally infected foliage. A typical standard practice of commercial nursery production settings.



Colletotrichum sp. *Phylosticta* sp.

Pestalotiopsis sp. *Cercospora* sp. *Corynespora* sp.

Figure 5: Fungi identified under a compound microscope from a variety of leafspots collected from local nurseries in Hillsborough County, FL. Fungi pathogensity was confirmed for all except *Pestalotiopsis* sp.

Conclusions

Fungicide applications during propagation reduced disease development. Nevertheless, using disease-free cutting coupled with protective fungicide application will greatly reduce disease severity as well as delay the disease onset on viburnum, especially during the critical propagation stage.

However, these fungicides are not curative treatments. The largest limiting factors to influence positive outcomes in the propagation area would rely on taking disease-free cuttings from stock plants and an alternative to overhead irrigation and mist propagation.

References

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