Disease forecasting models for management of Stemphylium leaf blight of onion

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Introduction

Stemphylium leaf blight (SLB) caused by *Stemphylium vesicarium* (Wallr.) E.G. Simmons is an important foliar disease of onions in the Holland Marsh, ON. The disease causes lesions and premature leaf dieback **(Fig. 1 A, B)** that reduce yield and prevent the uptake of sprout inhibitors, which results in losses in storage. Growers apply fungicides every 7-14 days, but this is more fungicides than are necessary, especially in low disease pressure years. Disease forecasting can time fungicide applications for high-risk periods, but existing forecasting models are still triggering too many applications.

Fig. 1. Common symptoms of SLB: (A) lesions and (B) leaf dieback.

Materials and Methods

Table 1. Description of the disease forecasting models and fungicide application thresholds based on disease severity values (DSVs) or conidia counts.

Treatment	Model Description
Untreated Control	No applications
Calendar Spray	Apply every 7-14 days
TOMcast 15	Apply at threshold 15 DSVs
Conidia Threshold 20	Apply at threshold 20 conidia/day
Conidia IT	Apply at thresholds 10, 25 and 200 conidia/day
STEMcast 2.0 15	Apply at threshold 15 DSVs
STEMcast 2.0 15/40	Apply at threshold 15 and 40 DSVs
STEMcast 2.0 20C	Apply at threshold 20 DSVs for the first spray and every 7-14 days after

- Onion plots were sprayed with Miravis Duo (pydiflumetofen + difenoconazole) at 1L/ha alternated with Dithane (mancozeb) at 2.5kg/ha when model thresholds were reached **(Table 1)**.

Table 2. Temperature (ºC) and leaf wetness durations (hours) required to accumulate DSVs with STEMcast 2.0.

Temperature (°C)	Leaf Wetness Duration (hours)				
18-20	0-14	15-16	>17		
21-25	0-12	13-14	15-16	>17	>21
DSV	**0**	**1**	**2**	**3**	**4**

- STEMcast 2.0 is a modified version of TOMcast specific to SLB in Ontario **(Table 2)**.
- The three oldest leaves of 20 onions from each plot were rated for leaf dieback weekly and the area under the disease progress curve (AUDPC) was calculated.
- Before lodging 20 onions from each plot were destructively assessed for leaf dieback and the disease severity index (DSI) was calculated.
- Two 2.32m sections of onions were harvested from each plot and weighed to determine yield (t/ha).

Results

Table 3. Number of fungicide applications for each forecasting model.

Treatment	Number of Applications
Control	0
STEMcast 2.0 15/40	1
STEMcast 2.0 15	2
STEMcast 2.0 20C	3
Conidia IT	4
TOMcast 15	5
Conidia Threshold 20	6
Calendar Spray	6

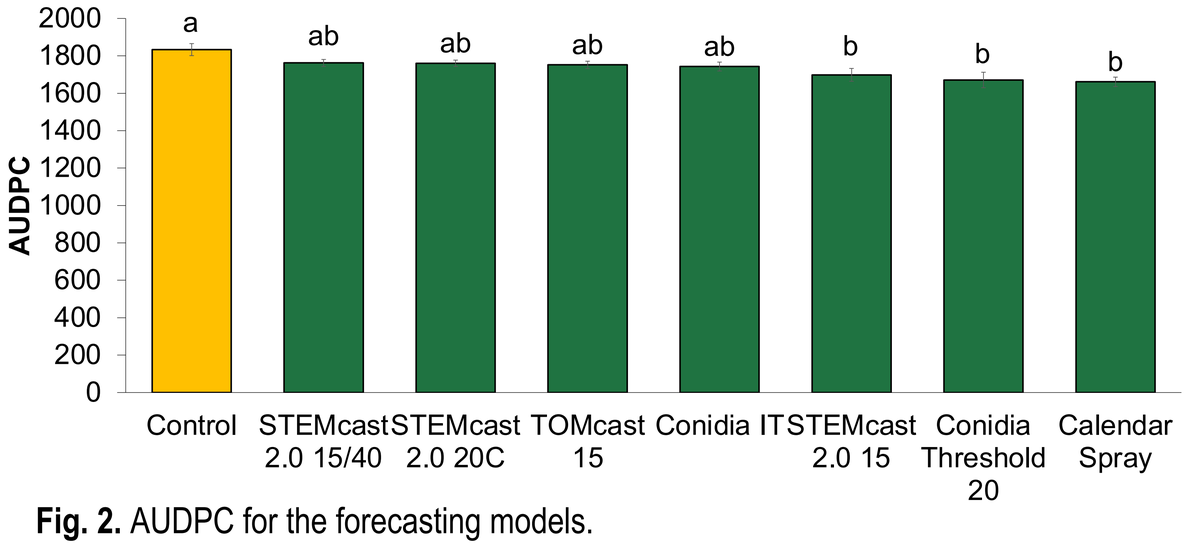

Fig. 2. AUDPC for the forecasting models.

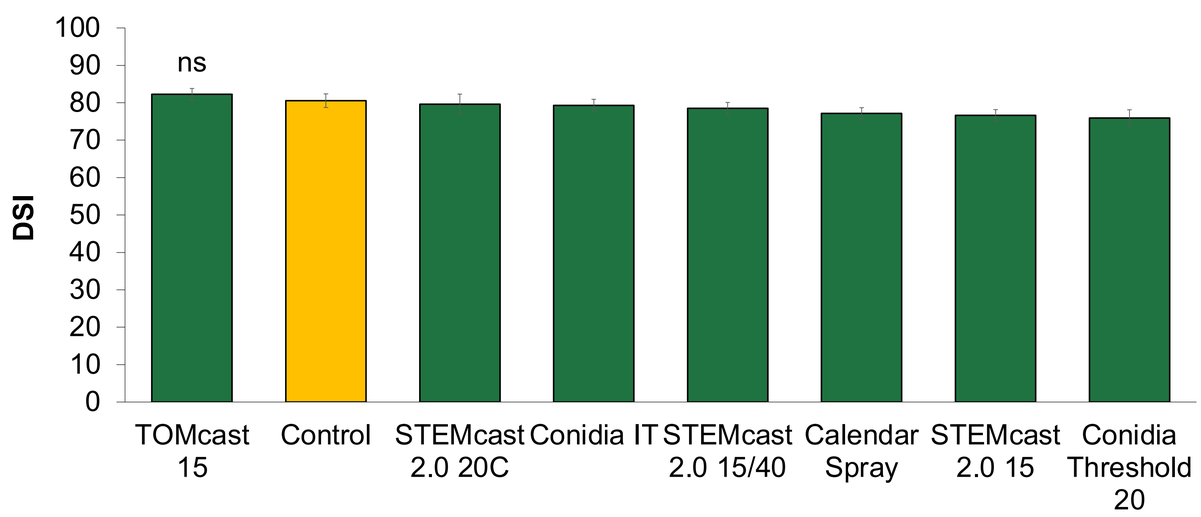

Fig. 3. DSI for the forecasting models.

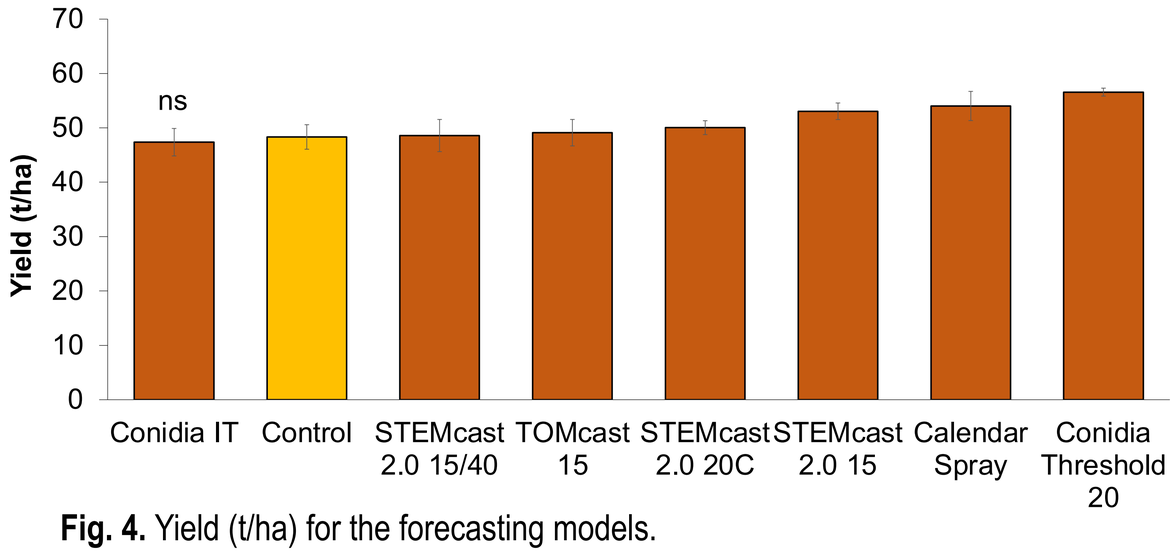

Fig. 4. Yield (t/ha) for the forecasting models.

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Conclusions

- STEMcast 2.0 15 reduced fungicide applications without an increase in severity relative to the calendar spray **(Table 3, Fig. 2)**.
- None of the models effectively suppressed SLB, which is likely due to poor fungicide efficacy **(Fig. 2, 3, 4)**.