

The battle against *Stemphylium* leaf blight of onion in Ontario, Canada

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Stemphylium leaf blight is a foliar disease of onion caused by the fungus *Stemphylium vesicarium*. The disease has been observed in onion fields in Ontario since 2008. The disease was first observed in 2008 in a few fields, more infected fields were identified in 2009, and in 2010 yield losses were associated with this disease. Symptoms start as small yellow to tan, water-soaked lesions that develop into elongated spots which turn dark olive brown to black when spores develop (Fig. 1). Leaves may be completely blighted as the lesions coalesce. The symptoms of stemphylium leaf blight can be confused with purple blotch, which is caused by *Alternaria porri*. Although both stemphylium leaf blight and purple blotch are managed similarly, it has been reported that stemphylium leaf blight is more challenging to manage than purple blotch.



Figure 1. a) and b) *Stemphylium* leaf blight (*Stemphylium vesicarium*) symptoms on onion leaves, c) *Stemphylium* leaf blight infected onions in a field, d) spores of the fungus that causes stemphylium leaf blight.

Plant disease survey

Surveys for foliar diseases of onion were conducted in the main onion producing areas in Ontario, Canada in 2012 and 2013 to assess the occurrence and severity of *Stemphylium* leaf blight and other new foliar diseases. All of the surveyed fields had stemphylium leaf blight with severity ranging from 2 to 60%.

Field trials

Field trials were conducted in the Holland/Bradford Marsh region of Ontario, Canada to determine the efficacy of several fungicides for control of stemphylium leaf blight in 2011, 2012 and 2013 growing seasons. *Stemphylium* leaf blight started to develop around mid to late June in the Holland Marsh. In 2011, disease pressure was higher than in 2012 and 2013 and increased over the assessment period. During all the years all of the fungicides reduced disease compared to the untreated check.

In 2012, Quadris top, Luna Tranquility, Inspire and Fontelis were the most effective in reducing stemphylium leaf blight (Table 2). Reduced marketable yield was correlated ($r = -0.5$; $P = 0.002$) with percent total leaf length with stemphyliums leaf blight symptoms. The percent of small onions (culls) also increased ($r = 0.39$; $P = 0.02$) with an increase in leaf length with disease symptoms.

In 2013, disease pressure was moderate. *Stemphylium* leaf blight started to develop in mid to late June in the Holland Marsh. Quadris top was more effective in reducing *Stemphylium* leaf blight with 11.8% foliage with symptoms, as compared to Pristine, Fontelis, Switch, Inspire, and the untreated check that had 18-29.7% foliage with symptoms (Table 3). Although no differences in marketable yield were found among the treatments, onion sized was correlated ($r = -0.36$; $P = 0.05$) with percent total leaf length with *stemphylium* leaf blight symptoms (smaller onion size when more *Stemphylium* leaf blight was present).

In 2013, disease forecasting systems were tested in a field trial to determine if disease management could be improved. Treatments were: Application of fungicide following Botcast (the *Botrytis* leaf blight forecasting model), Tomcast with Disease Severity Value 20 and 30 (forecasting model for early blight, septoria leaf spot and fruit anthracone), spraying following first time spore is found on spore trap rods and standard calendar spray schedule. For all the spray timing trial, Quadris Top (azoxystrobin 18.2%, difenoconazole 11.4%) at a rate of 83.6 oz/A was used. Although for growers, it is recommended to rotate fungicides with different modes of action for resistance purposes. Three sprays applied following Botcast provided equivalent control as the other spray timings that resulted in five sprays (Table 4). No significant differences were observed in marketable yield or size distribution among the treatments (Table 4) although the Botcast model resulted in the numerically lowest yield. Further improvements can be made to the forecasting models.

In conclusion, the survey indicated that *Stemphylium* leaf blight has spread throughout Ontario, Canada. The disease is present in all major onion growing regions of the province. The results from the research trials indicated that the disease affects marketable yield of onions. *Stemphylium* leaf blight incidence and severity was reduced by fungicide application. The timing of fungicide applications with effective fungicides is crucial to control *Stemphylium* leaf blight. Future, research focus in improving the forecasting models to identify the initial spray timing and test new products to control this disease

Table 1. Disease ratings for stemphyllium leaf blight symptoms and marketable yield of onions, cv. Patterson, treated with various fungicides, grown near the Muck Crops Research Station, Holland Marsh, Ontario, 2011.

Treatment	Active Ingredient	Rate/ A	% Total Leaf Length with Symptoms	Marketable Yield (Bushel/A)
Fontelis	penthiopyrad	19.2 oz	19.8 a ¹	457.5 ns ²
Luna Tranquility	fluopyram + pyrimethanil	16.4 oz	20.7 ab	515.9
Inspire	difenoconazole	7.0 oz	24.5 abc	381.4
Pristine	pyraclostrobin + boscalid	1.2 lb	33.6 bcd	391.9
Switch	cyprodinil + fluodioxinil	0.9 lb	37.1 cd	457.5
Manzate	mancozeb	2.9 lb	37.4 cd	407.9
Bravo	chlorothalonil	65.7 oz	38.4 d	372.9
Check	--	--	67.0 e	414.9

¹ Numbers in a column followed by the same letter are not significantly different at $P = 0.05$, Fisher's Protected LSD test.

² Not significantly different at $P = 0.05$, Fisher's Protected LSD test.

Table 2. Disease ratings for stemphyllium leaf blight symptoms and marketable yield of onions, cv. Tahoe, treated with various fungicides, grown near the Muck Crops Research Station, Holland Marsh, Ontario, 2012.

Treatment	Active Ingredient	Rate/A	% Total Leaf Length with Symptoms	Marketable Yield (Bushel/A)
Quadris Top	azoxystrobin + difenoconazole	13.7 oz	12.0 a ¹	914.1 ns ²
Luna Tranquility	fluopyram + pyrimethanil	16.4 oz	12.8 ab	822.3
Inspire	difenoconazole	7.0 oz	16.8 abc	756.9
Fontelis	penthiopyrad	19.2 oz	18.9 bcd	775.2
Pristine	pyraclostrobin + boscalid	1.2 lb	19.8 cd	809.7
Manzate	mancozeb	2.9 lb	20.1 cd	787.6
Switch	cyprodinil + fluodioxinil	0.9 lb	23.1 d	787.3
Bravo	chlorothalonil	65.7 oz	23.4 d	794.4
Check	---	--	33.0 e	658.7

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² Not significantly different at $P = 0.05$, Fisher's Protected LSD test.

Table 3. Disease ratings for stemphyllium leaf blight symptoms and marketable yield of onions, cv. Patterson, treated with various fungicides, grown near the Muck Crops Research Station, Holland Marsh, Ontario, 2013.

Treatment	Active Ingredient	Rate/A	% Total Leaf Length with Symptoms	Marketable Yield (Bushel/A)
Quadris Top	azoxystrobin + difenoconazole	13.7 oz	11.8 a ¹	841.6 ns ²
Luna Tranquility	fluopyram + pyrimethanil	16.4 oz	13.0 ab	987.5
Dithane	mancozeb	2.9 lb	16.1 abc	915.1
Pristine	pyraclostrobin + boscalid	1.2 lb	18.9 bc	938.8
Fontelis	penthiopyrad	19.2 oz	19.4 bc	726.9
Switch	cyprodinil + fluodioxinil	0.9 lb	19.6 bc	807.2
Inspire	difenoconazole	7.0 oz	20.3 c	974.6
Check	---	--	29.7 d	679.4

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² Not significantly different at $P = 0.05$, Fisher's Protected LSD test.

Table 4. Disease ratings for stemphyllium leaf blight symptoms and marketable yield of onions, cv. Patterson, treated with various fungicides, grown near the Muck Crops Research Station, Holland Marsh, Ontario, 2013.

Treatment	Spray Date	% Total Leaf Length with Symptoms	Marketable Yield (Bushel/A)
TOMCAST 30	Jul 12, 25 Aug 2, 9, 19	15.5 a ¹	889.4 ns ¹
TOMCAST 20	Jul 3, 22 Aug 2, 9, 19	16.3 a	1044.4
Calendar spray	Jul 15, 25 Aug 2, 9, 19	16.3 a	986.7
Spore trap	Jul 15, 25 Aug 2, 9, 19	16.5 a	728.8
BOTCAST	Aug 2, 9, 19	17.9 a	720.9
Check	Not sprayed	23.7 b	794.8

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