Evaluation of fluopyram and abamectin for the management of beech leaf disease in nursery-grown European beech (*Fagus sylvatica*)

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Background

- Beech leaf disease (BLD) is an emerging disease affecting *Fagus* spp. It is caused by the foliar-feeding nematode, *Litylenchus crenatae*, which feeds within developing buds, causing characteristic interveinal banding (Figure 1)[1,2].
- Repeated infection can lead to leaf distortion, canopy decline, branch dieback, and tree mortality[1,2].
- Fluopyram has shown promise for reducing BLD symptoms, whereas the efficacy of abamectin against BLD remains uncertain[3]. No studies have been done in Ontario European beech.

Objectives

(1) Evaluate preventative treatments: Determine whether fluopyram (Luna Privilege®) and abamectin (Avid®) prevents BLD symptoms in newly transplanted European beech.

(2) Evaluate application timing: Determine one versus two applications of fluopyram reduces BLD symptom severity in established, symptomatic European beech.

Methods

Two European beech field trials
Oxford County, ON · 2025-2026

Field A	Field B
Newly transplanted · No BLD symptoms	Established · Already infected with BLD
Fluopyram 500 mL/ha Applied Jul 15 & Aug 11	**One app fluopyram** 100 ml/250L Applied Jul 15
Abamectin 1.2 L/ha Applied Jul 15 & Aug 11	**Two apps fluopyram** 100 ml/250L Applied Jul 15 & Aug 11
Untreated control	**Untreated control**
4 blocks · 10 trees/plot	3 blocks · 12 trees/plot

Measurements

Canopy and leaf symptoms with BLD
Rated on a 0-4 scale before (Jul 3, 2025) and after treatment (Jun 3, 2026)

Nematode detection
Leaf (Jul 3, 2025; Aug 7, 2025; Sept 4, 2025) and bud (Mar 30, 2026) sampling with lab extraction

Weather
Compared with 1991-2020 climate normals

Statistical Analysis

- CLM used for Field A canopy ratings
- CLMM used for repeated-measures canopy ratings
- Dunnett-adjusted comparisons against untreated control
- Tukey-adjusted comparisons among treatments
- α = 0.05

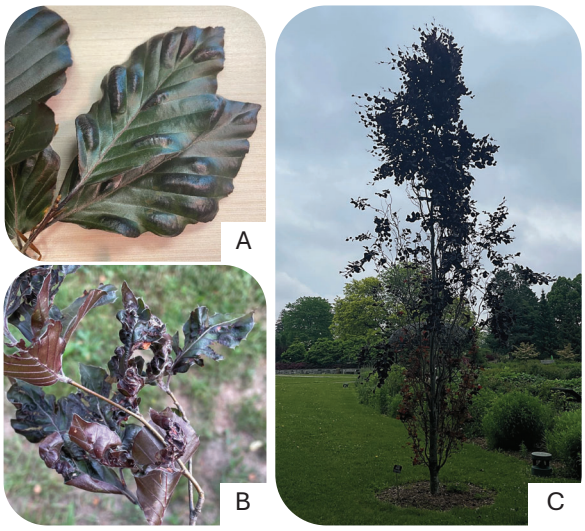


Figure 1: Symptoms of BLD in European beech: (A) characteristic interveinal banding and blistering; (B) advanced leaf crinkling and distortion; and (C) twig dieback and leaves emerging with a thick, leathery texture after several years of repeated infection.

Results

Objective 1 – Field A: Preventative treatments

- BLD symptoms developed in most trees by June 2026, despite no visible symptoms before treatment in July 2025. Symptoms were generally limited to one or a few branches.
- Neither fluopyram nor abamectin significantly reduced canopy symptom ratings relative to the untreated control (Dunnett-adjusted $P = 0.983$ and $P = 0.985$, respectively).

Objective 2 – Field B: Fluopyram application timing

- Canopy symptom ratings declined between 2025 and 2026 in all three treatment groups, but the reduction was greater in fluopyram-treated trees (Figure 2).
- In 2026, both one application ($P = 0.00031$) and two applications ($P < 0.0001$) resulted in significantly lower canopy symptom ratings than the untreated control. The two fluopyram treatments did not differ significantly ($P = 0.761$).

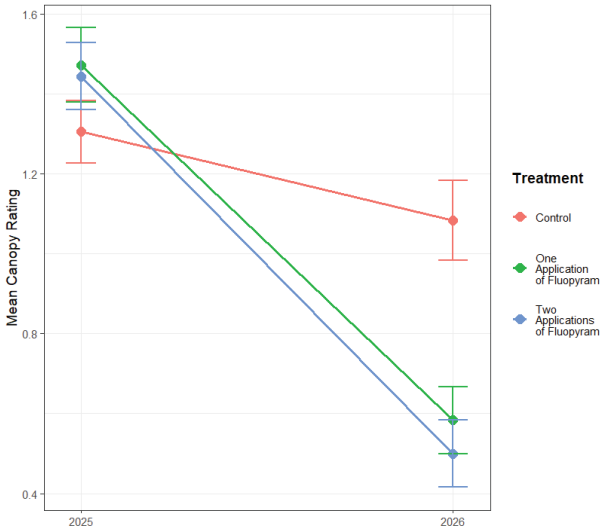


Figure 2: Mean canopy rating ± SE for each treatment in Field B (2025-2026). Ratings: 0 = asymptomatic; 1 = 1-25%; 2 = 26-50%; 3 = 51-75%; 4 = 76-100% of canopy exhibiting symptoms.

Leaf symptoms and nematode recovery

- Leaf symptom severity decreased from 2025 to 2026 across all treatments (Figure 3).
- The leaf-rating ordinal model did not satisfy the proportional-odds assumption.
- The alternative leaf severity-index analysis detected a significant year effect ($P < 0.0001$), but no significant treatment differences.
- Nematode recovery was very low. Only a few nematodes were detected across the sampling dates, with detections primarily in untreated plants and one Avid-treated plant.

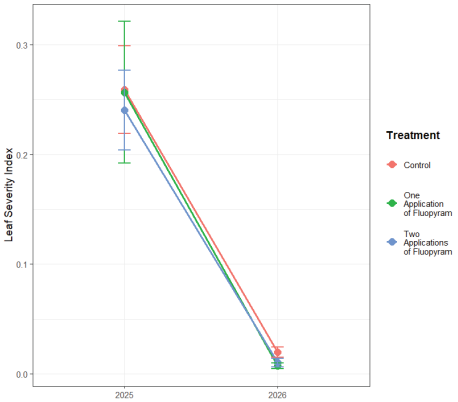


Figure 3: Mean leaf severity index value ± SE for each treatment in Field B (2025-2026). Ratings: 0 = asymptomatic; 1 = banding on <50% of leaf; 2 = banding on >50% of leaf; 3 = banding on >50% of leaf with leaf distortion and/or leathery texture; 4 = twig dieback or extreme leaf distortion.

Weather conditions

- June–October 2025 was warmer and drier than the 1991–2020 climate normals.
- Precipitation was 57% below normal in July, 64% below normal in August, and 51% below normal in September.

Key Findings

- **Fluopyram reduced canopy symptom severity** in established, symptomatic European beech, with both one and two applications outperforming the untreated control.
- **A second application did not significantly improve canopy symptom ratings** relative to a single application.
- **Neither fluopyram nor abamectin prevented symptom development** in newly transplanted trees in Field A.
- **Low precipitation levels may have significantly reduced disease pressure** due to restricted movement of nematodes[4,5].

Limitations and future research

Low nematode recovery, mild disease symptoms, and dry conditions limited interpretation. Multi-year trials should assess larger sample sizes, extraction methods, application timing, and long-term tree health.

Acknowledgements

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References

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