

Grapevine Viruses, Insect Vectors, and Management Strategies in Canada and the United States: Bibliographic Results of a Scoping Review

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Introduction

- Canadian vineyards are battling increased widespread viral outbreaks which impact the health of grapevines and the quality of grapes
- The impacts of grapevine viruses have serious economic impacts, resulting in up to 40% losses in infected vineyards¹
- Canadian research on grapevine viruses has expanded remarkably over the last decade but is still in its early stages and relies on research efforts from the United States
- A comprehensive summary of Canadian and American research on grapevine viruses, their insect vectors, and management strategies is not yet available^{2,3}
- Basso et al. (2017)⁴, conducted a scoping review-of the literature on grapevine viruses in Brazil
- Scoping reviews follow a rigorous method for synthesizing the scientific literature to summarize current research, highlight gaps, identify fruitful lines of research, inspire new approaches and inform priorities⁵

Objective

To review and synthesize the research on grapevine viruses of economic concern, their impacts and symptoms, their known or suspected insect vectors, and the strategies for managing virus incidence and vector populations in Canada and the United States from 2010 to 2022

Methods

- This scoping review involved conducting literature searches, screening search results through 2 stages, and characterizing eligible articles to extract bibliographic data (Fig. 1)
- Using search strings made up of key terms related to grapevine viruses, insect vectors, and management strategies, we searched 5 bibliographic databases, 1 grey literature database, and industry organizations' websites to gather relevant articles, resulting in 3,937 articles
- After removing duplicates and screening the title and abstracts, and full texts of the remaining articles against inclusion and exclusion criteria, 237 articles were considered eligible for characterization (Fig. 1)
- To be eligible for this review, articles had to be Canadian or American, written in English, published between 2010 and 2022, focusing on grapevine viruses, their insect vectors, or management strategies, and we required access to their full texts
- Methodological Strengths
 - Followed rigorous predetermined steps for conducting a scoping review
- The study protocol was published in Open Science Framework⁶ prior to beginning the review, adding to the credibility and transparency of our methods⁷
- Methodological Weaknesses
 - Due to time and resource limitations, only 1 reviewer conducted the screening and characterization process

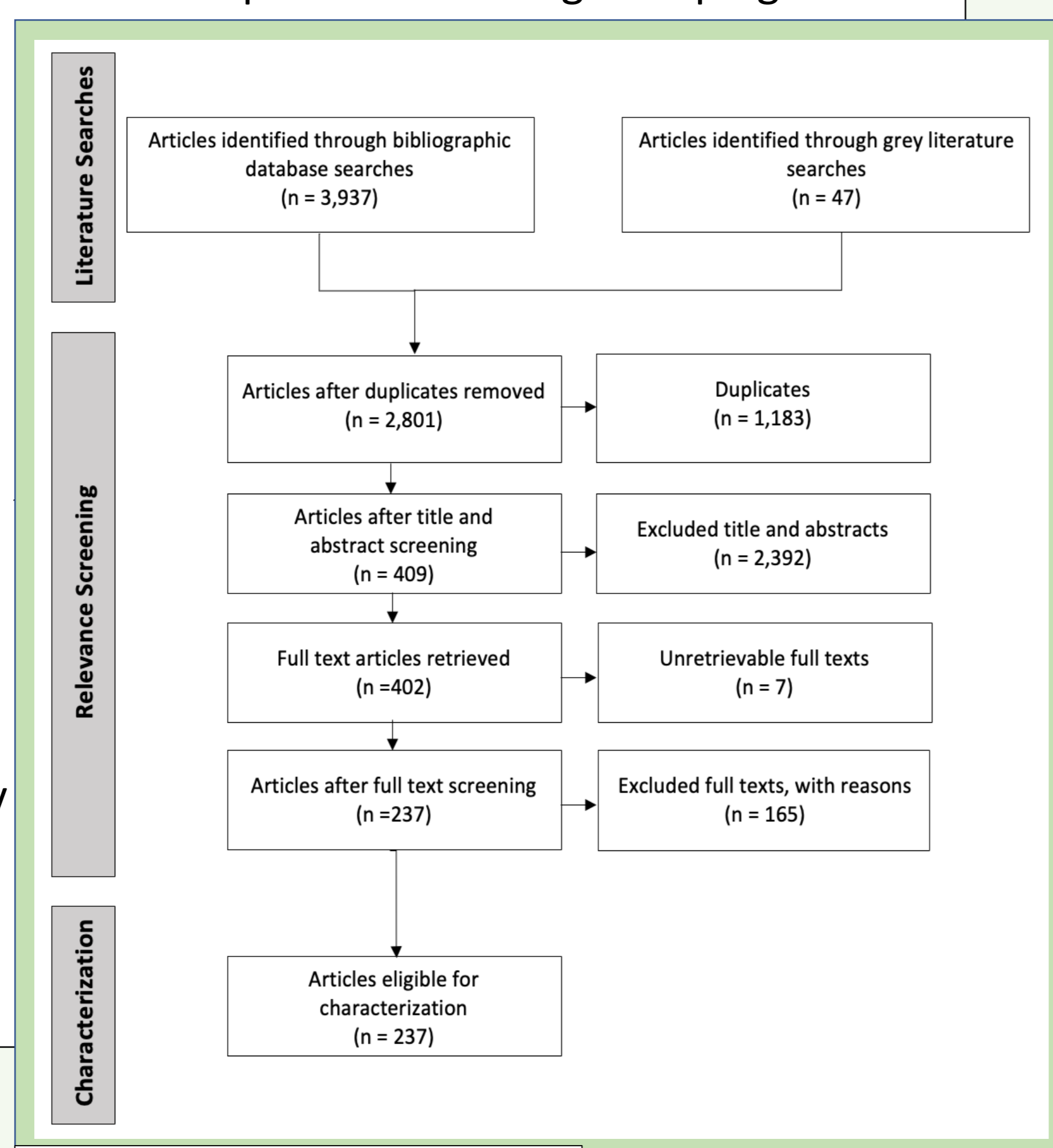


Figure 1. Flow Chart of Scoping Review Process

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Preliminary Results

- Canadian articles account for 17% (n=40) of the 237 final eligible articles (2010-2021) and increased from 0% of articles published in 2010 to 20% (n=6) in 2021 (Fig. 2)
- Grapevine virus genomics research dominates the literature (48%; n=114), followed by insect vectors (27%; n=63) and virus detection (26%; n=62) (Fig. 3)
- The literature discusses 33 different grapevines viruses; however, most articles focus on Leafroll (46%; n=109), Red Blotch (30%; n=72), Fanleaf (10%; n=24), and Vein Clearing Viruses (5%; n=13)
 - Previously, most research focused on Leafroll, but research on emerging viruses increased over the decade (Fig. 4)
- Review articles make up 8% (n= 20) of the literature and tend to only focus on one aspect of grapevine viruses
 - 45% (n=9) on viruses, 45% (n=9) on management, 5% (n=1) on vectors, and 5% (n=1) on viruses, management and vectors for emerging viruses

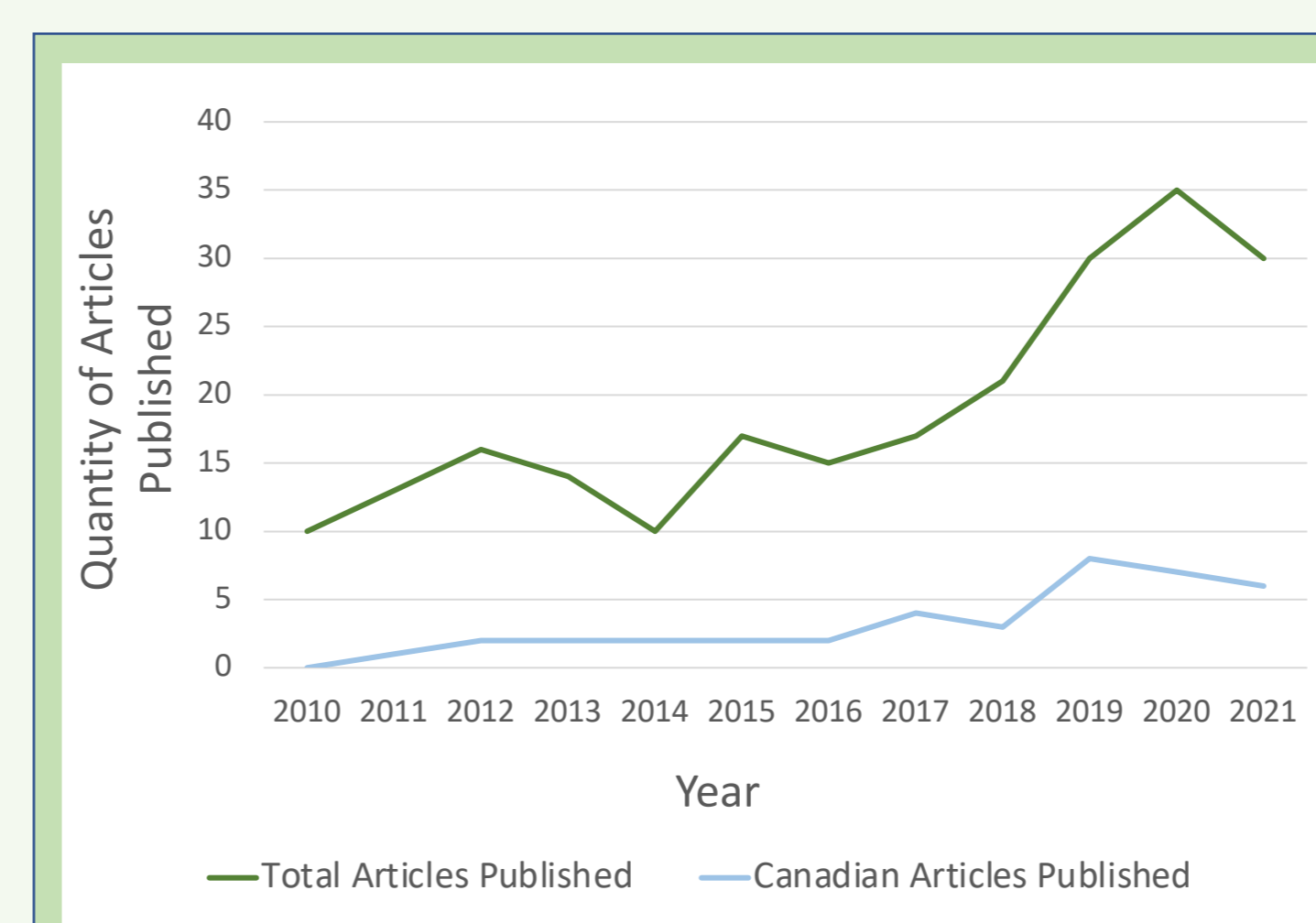


Figure 2. Research Intensity from 2010 to 2021

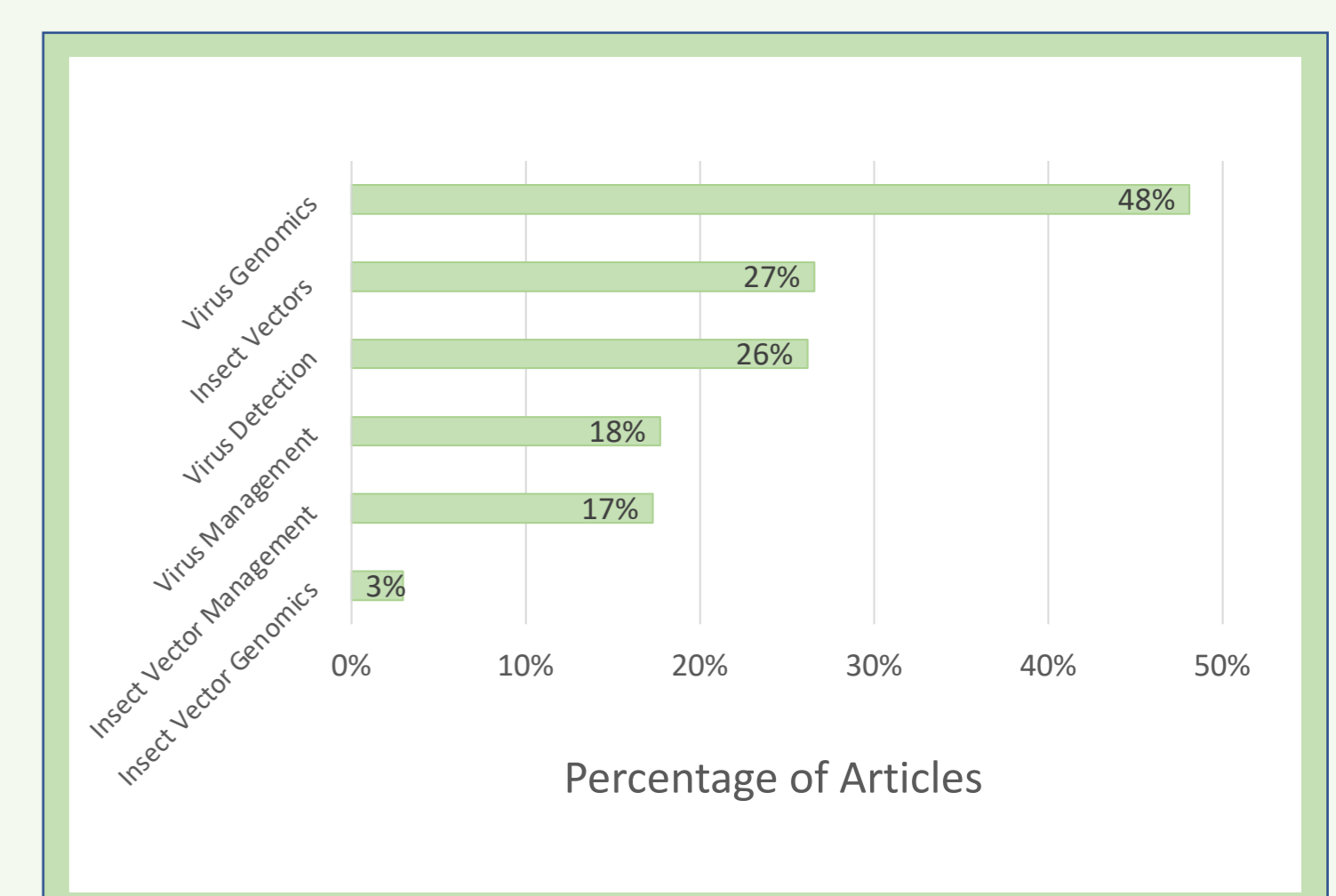


Figure 3. Distribution of Topics within the Literature

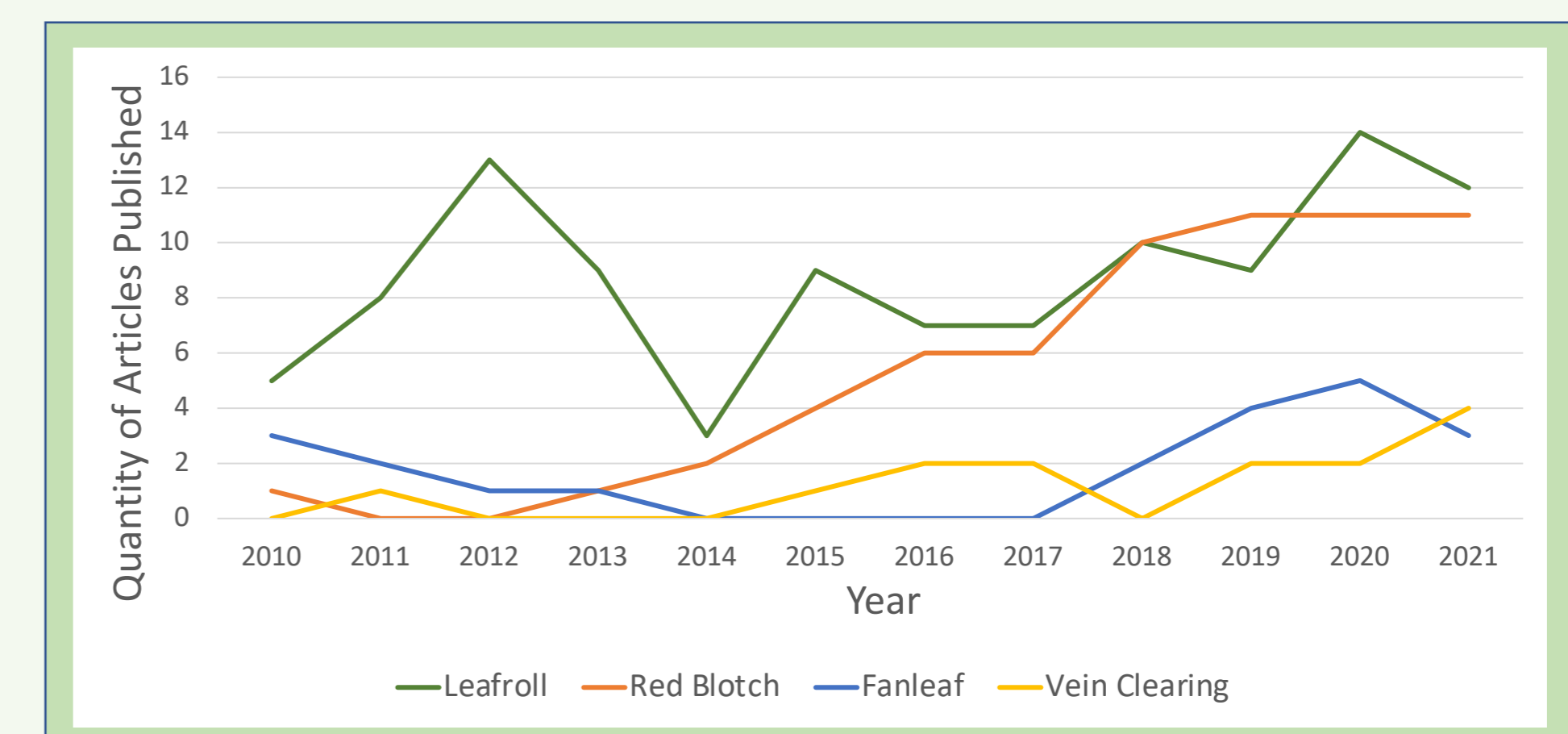


Figure 4. Quantity of Articles Published on the Top 4 Viruses from 2010 to 2021

Discussion

- Canadian research efforts are just beginning; however, Canadian research is becoming a fundamental contributor to the literature based on the increase in volume over the last decade
- Most research looks at genomics which is important for virus identification and detection, but future research on insect vectors is important for identifying management strategies
- Research efforts are expanding to emerging viruses like Red Blotch
- Existing review articles are limited by their scopes, a scoping review would provide a method for assessing a broader body of the literature

Implications



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