Understanding the effects of virus genetics and potato variety on potato leafroll virus symptoms

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Introduction

Potato leafroll virus (PLRV, Genus *Polerovirus*; Family *Luteoviridae*) is the major pathogen of potato worldwide. PLRV is transmitted between plants by aphid vectors and can be passed vertically via tubers to the next generation of plants. The incidence of PLRV in Scottish seed potatoes has increased significantly since the ban on the outdoor use of neonicotinoid pesticides began in the UK and the EU in 2018.

In the absence of the pesticide control of PLRV vector aphids, rouging became the most important way to eliminate infected field growing plants to aid control of virus incidence.

The efficiency of rouging ultimately depends on the accuracy of identifying symptoms the development and degree of which are affected by several factors, including virus strain and potato cultivar. Indeed, variants exist which cause little or no obvious symptoms.

Analysis of global PLRV genetics shows the virus is genetically divergent. We are analysing the genetic diversity of PLRV circulating in Scotland. We also aim to study the variability in PLRV symptoms in potato varieties used in the seed-potato industry in Scotland.

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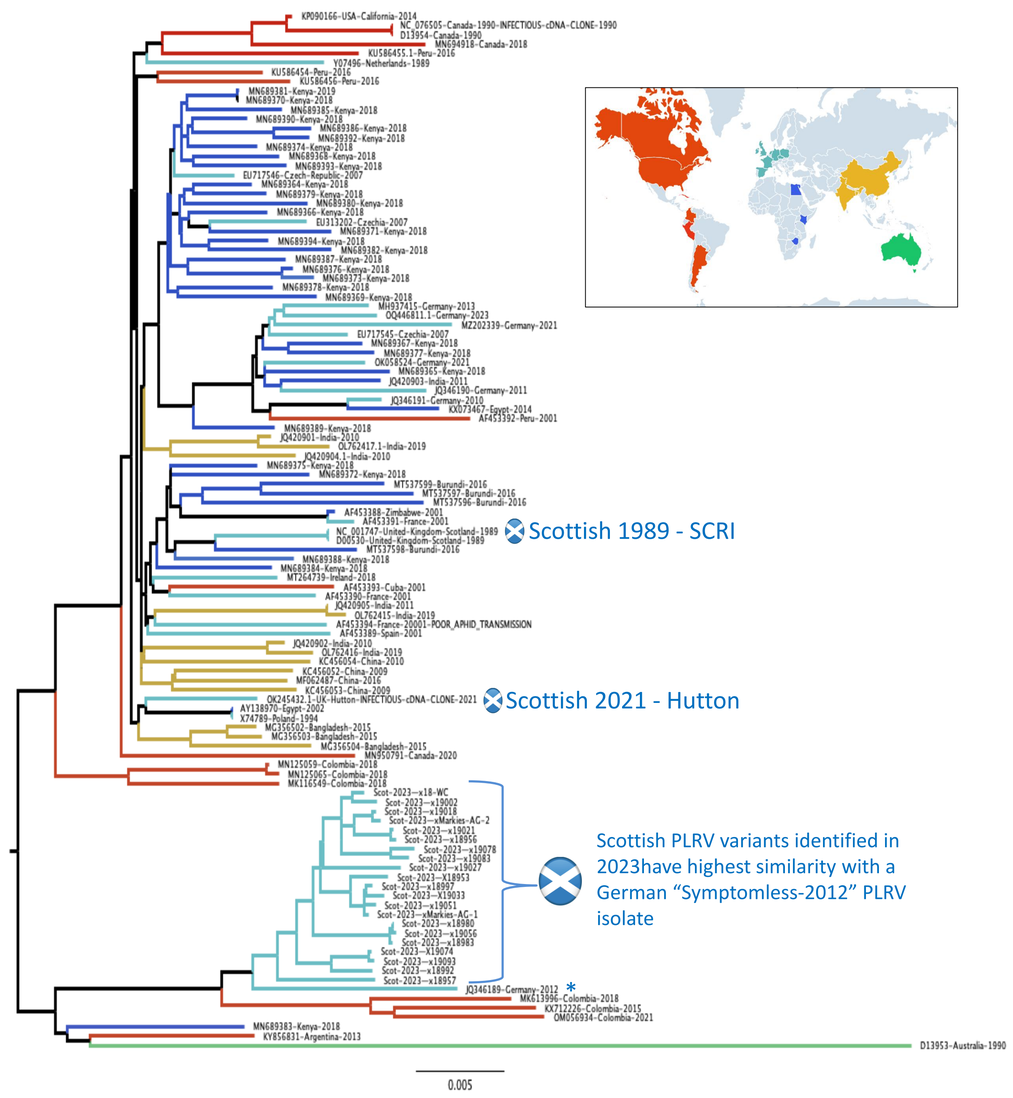
Results

Sequence analysis of Scottish PLRV

We used next-generation sequencing to characterize PLRV isolates from seed potato plants collected in 2023 from Aberdeenshire, Angus, and Perthshire.

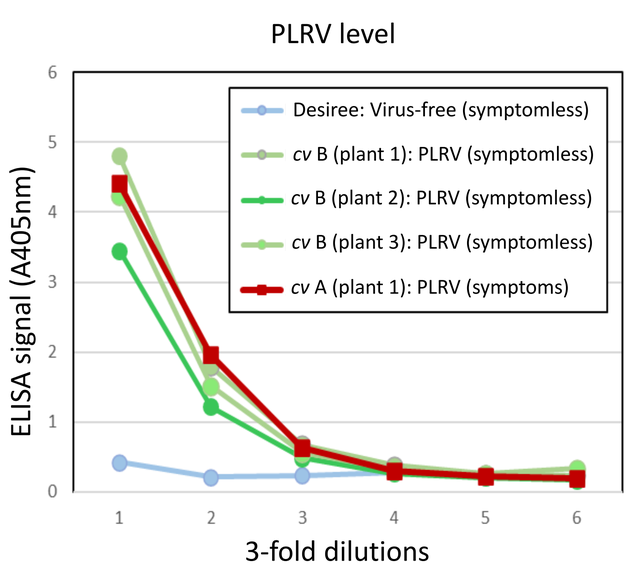
All 2023 Scottish PLRV isolates identified in this study were closely related to each other, suggesting recent common origin. These novel Scottish PLRV isolates were distinct to those reported in Scotland in 1989 - 2021 and were most similar to a German PLRV isolate with reduced symptom severity identified in 2012.

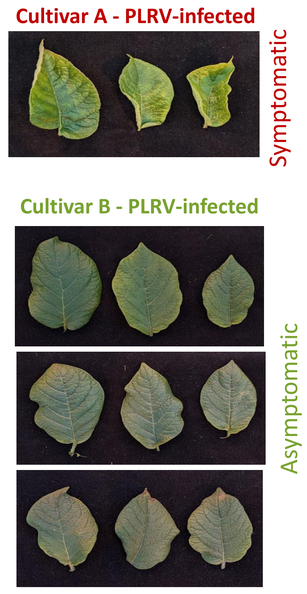
Variants of PLRV that result in reduced symptoms are by nature more difficult to control by rouging. It is possible that the recent rise of PLRV incidence in Scottish seed potato is associated with the arrival and spread of such a PLRV variant which is "symptomless" in some cultivars.



Symptom development in PLRV-infected potato could be variety-dependent

We investigated plants of two potato cultivars grown from tubers produced by plants infected in the field with a novel PLRV variant. The typical PLRV symptoms (discolouration of leaf edges and leaf rolling) were observed only in the plants of one variety (Cultivar A), while another (Cultivar B) remained asymptomatic. The levels of PLRV were similar in both symptomatic Cultivar A and asymptomatic Cultivar B.





The asymptomatic character of the PLRV infection in some potato varieties could support virus circulation. The infected asymptomatic plants may not be removed by rouging and could act as PLRV infection reservoirs for aphid transmission.

Information on the level of PLRV symptom development in Scottish potato PLRV varieties produced in Scotland, would be important for modifying rouging procedures and more efficient PLRV control.

Conclusions

- Novel PLRV variant with potentially reduced levels of symptom induction is currently circulating in Scottish seed potato.
- Preliminary results showed that the development of PLRV symptoms is influenced by potato variety.
- There is a need for a systematic investigation of PLRV symptom development across seed potato varieties produced in Scotland.
- Regular molecular testing and sequencing of potato viruses are important to monitor emergence of novel variants of the most common and damaging viruses such as PLRV and PVY.