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Aphid transmission of potato viruses and comparison of RNA extraction methods for reliable molecular diagnostics

Potato leafroll virus and potato virus Y are two major viruses that reduce potato yield and quality worldwide. They are mainly spread by small insects called aphids. In the Pomorrown (Potatoes for Tomorrow) project, we carried out a greenhouse experiment to understand how efficiently aphids transmit these viruses to different potato varieties, and how well different laboratory methods can detect the viruses once plants are infected.

In our study, aphids were placed on six potato cultivars (Belana, Nicola, Tomensa, Karlena, Albatros, Laura) to observe whether infection occurred and how quickly it could be detected. We monitored the plants for several weeks and tested leaf samples using four common RNA extraction methods, which are needed to prepare plant material for sensitive molecular virus detection.

Potato leafroll virus was successfully transmitted in most cultivars and could be detected after one week. The cultivar Nicola reached full infection by four weeks, while Laura and Albatros showed infection in about three quarters of the plants. Visible symptoms were very mild in the greenhouse only slight leaf curling and minimal stunting showing that controlled conditions can mask typical field symptoms and highlighting the importance of molecular testing. In contrast, potato virus Y was rarely transmitted, likely because the virus remained at very low levels in the plants.

Among the tested laboratory methods, RNAzol produced the most reliable results and detected the virus even when infection levels were low. The CTAB method and a commercial RNA kit showed moderate sensitivity, while the silica-based method worked well only when virus levels were high.

These results help us understand how different potato varieties respond to virus infection, how effectively aphids spread these viruses, and which laboratory methods are most suitable for early and accurate virus detection. Future work could explore why some cultivars show lower virus transmission, and how diagnostic tools can be improved for routine monitoring in potato production.