IMPROVING PREDICTIVE DIAGNOSTICS FOR **TOBACCO RATTLE VIRUS** IN THE POTATO SECTOR

A fera led collaborative R&D model

ENIGMA IV

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INTRODUCTION

TOBACCO RATTLE VIRUS (TRV) IS A MAJOR CAUSAL PATHOGEN OF SPRAING DISEASE OF POTATOES, RENDERING MASSES OF CROP YIELDS UNFIT FOR THE MARKET.

THE VIRUS MAY BE WIDESPREAD ACROSS THE UK, WITH LARGE AREAS OF FARMLAND ESTIMATED TO HAVING THE VIRUS PRESENT WITHIN THE SOIL.

TRV and other potato-infecting viruses represent a significant threat to the UK potato sector, as they are some of the most economically damaging diseases affecting potatoes.

Along with other ongoing industry issues including unpredictable bad weather, and an increase in agricultural production costs (labour, machinery, fertilisers), it is causing farmers and growers to struggle in keeping up with the demand for the crop.

Previous research has also shown that while many crop varieties are susceptible to the virus, some may not exhibit spraing symptoms, which makes it difficult to detect the virus.

However, if tubers infected with asymptomatic TRV are used as seed potatoes it can cause an increased chance of future crops being unfit for sale through cracking and misshapes.

Critically, varieties unaffected by spraing could also act as reservoirs of TRV for spreading the virus via infected seed into previously "healthy" land.

THE PROBLEM WITH CURRENT INDUSTRY METHODS OF DEALING WITH TRV

The diagnostic standard test for pre-planting detection of TRV is to bait test from field soils, taking 1Kg of soil from 4ha field plots. The soil sample is used as a substrate for growing seedling test plants (bait plants), commonly either cultivated tobacco or tomato. Following a growing period of three weeks plants are harvested and the roots washed free of soil and tested using real-time RT-PCR for TRV.

THERE ARE SEVERAL AREAS WHERE THE SERVICE CAN BE IMPROVED:

1 The current soil sampling strategy may not be representative of the entire field, as not all the soil within the field will be affected by the virus is a result of nematodes which do not have a homogenous distribution and freely move within the soil.

2 With a five-week turnaround time the method does not offer a responsive service. Leaving growers in a situation where they are unable to implement management practices whilst waiting for results. By which time certain nematodes, which can vector the virus, could have further migrated.

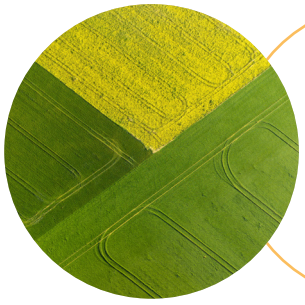
3 The method requires actions such as transportation and disposal of soil samples and glasshouse heating and lighting, which means this approach is not environmentally sustainable and also adds unnecessary costs to the test.

4 Further, due to the recent increases in fuel prices, the costs of heating and lighting glasshouse space, have inflated the costs of testing.

TRV has a broad host range, with over 400 susceptible hosts including many common field weeds. The Potato Council previously funded a project to look at the use of field weeds as 'in situ' bait plants for TRV.

This research showed promise, however, the research was not further developed into a meaningful diagnostic service to the industry. Since this previous work was completed there has been an industry shift towards regenerative agriculture, with a much broader spread of the use of cover crops, amongst which are multiple hosts for TRV.

There is the need for the industry to identify methods to collectively deal with this issue to support potato growers and farmers in this difficult time and help them develop profitable, and productive businesses.



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THE POTENTIAL ANSWER: ENIGMA IV

The main aim of the Enigma IV project is to build upon existing research to improve the knowledge of TRV epidemiology and also develop an improved predictive diagnostic service that can be offered to the UK potato sector. This service will have faster turnaround times and reduced costs for growers.

THE PROJECT WILL CONTINUE TO BUILD UPON ON PREVIOUS RESEARCH WORK INTO WEED AND COVER CROP TESTING AND WILL GO THROUGH FOUR STAGES TO FIND A POTENTIAL SOLUTION TO THE ONGOING ISSUE SURROUNDING TRV:

STAGE 1:

Test relative susceptibility of different cover crop and field weed species to ascertain the effect different weed populations would have on the accuracy of tests for TRV and PMTV (Potato Mop Top Virus). This will include glasshouse trials and a combination of artificial and natural inoculation of target host species.

STAGE 2:

Testing of cover crop samples to correspond with bait test submission which will be tested in parallel. Compare results of the old and new methods on a sample block scale or field plot scale. This is initially intended to be carried out on 200 comparative samples.

STAGE3:

Evaluate predictions based on pre-crop testing by both methods against results of post-harvest testing.

STAGE4:

Extend the service offer to include field mapping within rotations to allow growers to have a predictive tool to support future cropping and selection of cover crops and varieties.

OUTPUTS

- A VALIDATED SERVICE FOR PRE-SCREENING FIELDS FOR THE PRESENCE OF TRV VIRULIFEROUS NEMATODES AND PREPARATION FOR PMTV TESTING IF REQUIRED.
- LOWERED TESTING COSTS AND FASTER TURNAROUND TIMES.
- REDUCED WASTE ACROSS THE SYSTEM.
- REDUCED INCURRED COSTS IN SAMPLE SHIPMENTS; SOILS TO DISPOSE OF; ENERGY INPUT IN THE TRANSPORT AND TESTING OF SAMPLES.
- A SERVICE PROVIDING A MEANINGFUL RISK ASSESSMENT PACKAGE FOR SPRAING IN POTATOES.
- A FINAL STORABLE SAMPLE THAT COULD BE TESTED FOR FURTHER VIRUSES IF REQUIRED.

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