

Visualisation of potato late blight protection levels in potato foliage and tubers

G.J.T. KESSEL¹, P. RAATJES² AND R.J.F. VAN HAREN³

¹ Plant Research International, P.O.Box 16, 6700 AA Wageningen, the Netherlands

² Dacom Plant Service, P.O.Box 2243, 7801 CE Emmen, the Netherlands

³ AVEBE, Department R&D, Division Starch & Feed, Nijverheidsstraat 8, 9648 JA Wildervank, the Netherlands

Summary

Within the framework of Agrobiokon an internet application was developed allowing potato growers a simple evaluation of their potato late blight control strategy. The goal of developing this application was to confront the perception of growers regarding the protection level of their crops with an independent calculation of this level. Calculations of the daily infection risk allow growers to retrospectively track periods of under- and over protection of their crops. This form of interactive knowledge transfer is hoped to trigger improvements in growers' potato late blight control strategies with respect to spray timing and fungicide selection.

This internet application is available in 2005 and 2006 after which period its use will be evaluated. Agrobiokon is a joint venture between the Dutch "Main Board for Arable Products" (HPA), AVEBE and "The Northern Netherlands Assembly" (SNN).

Introduction

Potato late blight (PLB) control is no longer a matter of applying protective fungicides every 7 days. The new highly aggressive *P. infestans* population, established in most of Europe, and an increasing societal pressure to reduce the pesticide input urge growers to control potato late blight as efficiently as possible. Ideally, fungicides are applied following a preventive control strategy implemented through adaptive spray schedules in which an application is only recommended prior to a predicted infection event.

Historical, current and predicted weather, remaining fungicide protection and cultivar resistance are some of the factors used to calculate infection risks for the near future. Decision support systems (DSS's) integrate all these factors in a daily recommendation to the grower. With the integration of (automated) DSS's in daily practice, the fungicide input is optimized and fixed spraying schedules can be abandoned.

Apart from an objective calculation of the infection risk as provided by DSS's, growers justifiably have their own perception of the daily infection risks of their crops. From an operational point of view, adaptive spray schedules may even be undesirable. Conflicts between calculated infection risks, risk perception by growers and operational problems to carry out sprays at the desired time, result in over or under application of fungicides with undesirable results in both cases.

To allow potato growers to retrospectively evaluate their own control strategy during or after the growing season, a public internet application was created visualising calculated infection risks for potato foliage and potato tubers (when present). Several control strategies can be easily compared, allowing potato growers to evaluate decisions taken during the past growing season. At the same time it allows growers to monitor current disease pressure in their region and the performance of experimental control strategies in (local) Wageningen - UR (WUR) field experiments.

Concepts and implementation

The internet application developed serves three purposes:

1. Visualisation of the general disease pressure (critical periods) in regions in the Netherlands
2. Monitoring of the performance of experimental control strategies in WUR field experiments (umbrella plan Phytophthora)
3. Retrospective evaluation of grower's control strategies with respect to the daily infection risk to foliage and tubers as a tool to improve growers control strategies in future growing seasons.

These three different aspects of the application are accessed through the tabs at the top of the welcome page. The application can be found through: www.kennisakker.nl, the "advies" tab followed by the link "Visualisatie infectierisico Phytophthora" or directly through www.dacom.nl/kennisakker.

Visualisation of critical periods

This part of the application is only available for the North Eastern potato growing area in the Netherlands. It allows growers to monitor the general infection risk on a daily basis. A map of the area displays available weather stations. Once the weather station of interest is selected, the infection risk of a virtual unprotected, susceptible crop is displayed. Infection risks are calculated using PLANT-Plus algorithms. Daily infection risks are represented by yellow, orange and blue bars representing a low, average and high daily foliar infection risk (Figure 1).

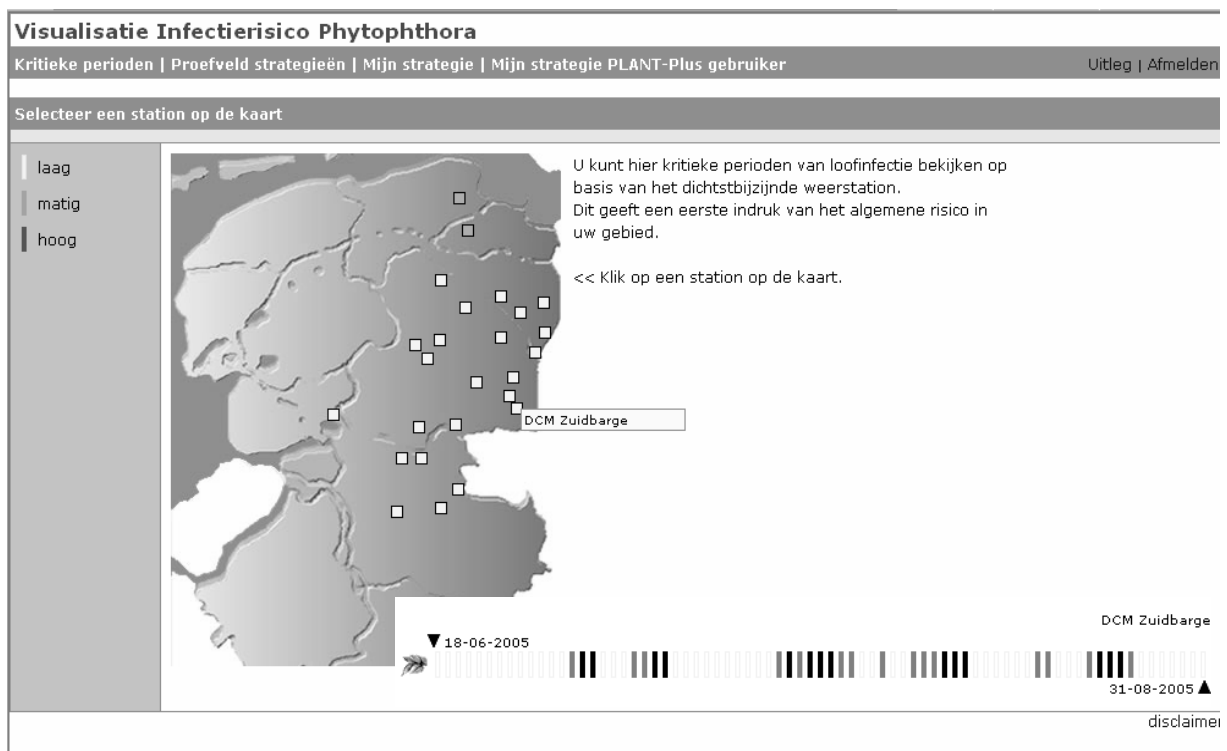


Figure 2. Visualisation of critical periods. Once a weather station (representing a region) is selected, a coloured bar with daily infection risks is displayed. Yellow, orange and blue sub-bars represent a low, average or high daily infection risk. The date of planting is given at the left of the bar whereas today's date and the name of the weather station are given at the right of the bar. Colours of the squares representing the weather stations on the map indicate the current infection risk.

Monitoring of the performance of experimental control strategies

The second tab on the welcome page allows access to a page where, following selection of an experimental farm, the infection risks for foliage and tubers is visualised for the PLB control strategies that are implemented on that farm. The bars representing the daily infection risks are calculated using PLANT-Plus algorithms and identical to the bar described above. Calculation of tuber infection risk is done using experimental PLANT-Plus algorithms developed for this purpose. In this case however the infection risk for foliage and tubers is represented separately and the fungicide applications are incorporated in the calculation of the infection risks. Fungicide applications are graphically represented by the black arrows on top of the infection risk bars. The two sets of bars (Figure 2) represent two (out of four) control strategies that have been selected for visualisation of infection risks.

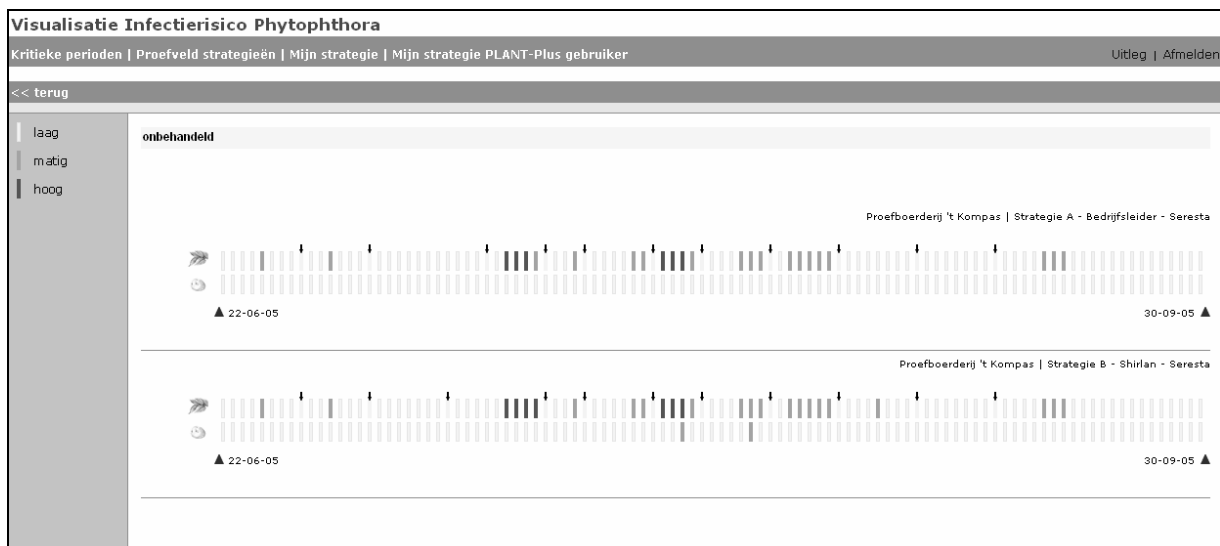


Figure 3. Visualisation of *P. infestans* infection risk to potato foliage and tubers (cv Seresta) for two of the experimental control strategies (“farm manager” and “Shirlan only”) present on experimental farm ” ‘t Kompas” in Valthermond, the Netherlands.

Retrospective evaluation of grower’s control strategies

The third tab (or fourth tab for registered PLANT-Plus users) on the welcome page allows access to a page where potato growers can enter their own crop and fungicide application data. Following data entry they are given the possibility to evaluate the protection levels achieved by their own control strategy and compare the performance of their private control

strategy (or strategies) with the performance of standard or experimental control strategies on a nearby experimental farm. Comparison of the protection levels of the different strategies with the critical periods represented by the top bar will reveal periods where the crop was under - or over protected. This may or may not agree with the farmers own perception of the protection level of his crop throughout the growing season. In both cases a positive effect will be achieved: farmers with periodically over- or under protected crops will be extra alert in the near future to step up the performance of their control strategy. Farmers whose control strategy generally performs well are boosted in their confidence and may incorporate the latest insights from the research arena into their future control strategy.

Discussion

The primary goal of developing the application described above was to give potato growers an independent tool which can be used to evaluate their PLB control strategy. Periods of under- or over protection should be looked at carefully to determine the most likely cause. This knowledge can then be used in discussion with colleagues or advisors and for future improvements on the control strategy. The secondary goal was to stimulate farmers to monitor the latest insights and results from PLB research. All in all, an interactive evaluation and knowledge transfer tool was developed that can be a valuable tool to Dutch potato growers.

