Mapping LATE BLIGHT of potatoes

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Late blight, caused by *Phytophthora infestans* (Mont.) de Bary, is an extremely destructive disease. Under optimum conditions it can cause total destruction of all plants within a week or two. Late blight is usually controlled by using genetic resistance and fungicides.

Top: Detail of the sheet of mycelium (Sporophores).

Left: White mycelium of *P. infestans* at the edge of lesions on the underside of the leaves.

The control of late blight is expensive. On average, at least eight fungicide sprays are required for control. These usually comprise 5-6 contact fungicide applications and 2-3 systemic fungicide applications. Contact fungicides range in price from R60 - R120/ha. Total cost per ha per season can be between R360 - R720/ha. Systemic fungicides cost from R150 - R270, with a total cost of between R450 - R810/ha. The combined cost per hectare works out at R630 - R1530/ha, using nine fungicide applications (this excludes application costs) per season. If late blight becomes epidemic then add yield loss to the cost of the fungicides and the application thereof.

There is a heavy reliance on fungicides to control late blight.

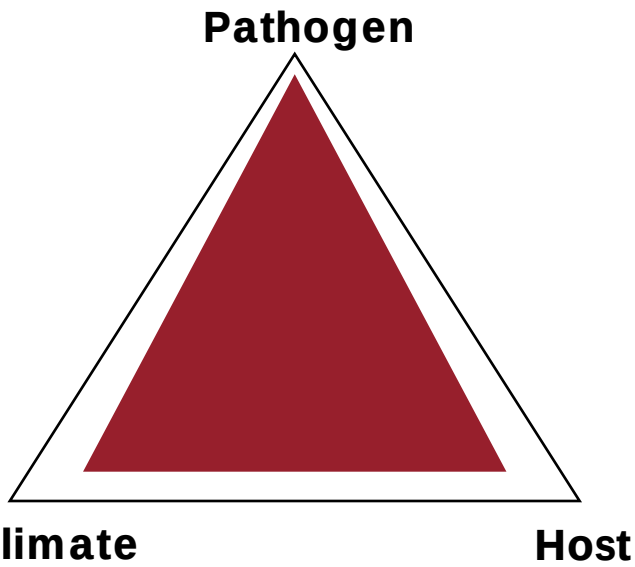

Figure 1: Disease triangle comprising host, pathogen and climatic conditions.

Polycyclic pathogens like *P. infestans* are able to build up resistance to systemic fungicides rapidly. This is especially true when a single product is used repeatedly without rotation of the fungicide and when high disease levels are already visible.

An important concept is that of the disease triangle (see Figure 1). The triangle shows that unless all three factors are present the disease will not occur. For instance, in KwaZulu-Natal climatic conditions for late blight are suitable from early in the season and the potato plant is present, yet late blight does not always occur. This is due to the absence of the pathogen. Only when pathogen, host and favourable climatic conditions are present will late blight occur.

This proposal deals with:

- the initial start of the preventative contact fungicide programme.
- the timing of the first initial systemic application.

To help in the timing of starting the preventative fungicide programme it is proposed that the "Young forecasting rules" be dusted off. Brian Young was an active plant pathologist at Cedara from ca. 1955-1996. At one stage he was heavily involved in the epidemiology of potato late blight. From this work a set of rules was adapted and used to warn farmers when to start with preventative fungicide applications.

The rules are as follows:

- Max temperature <24 C for two days
- Min temperature >10 C for same two days
- Min humidity 70% or higher at 14h00 on each of the two or more days

If these conditions were met, it was defined as a favourable period. After two favourable periods had accumulated, a warning was issued to prepare the spray equipment. After three periods a warning was issued to start fungicide applications.

Stem affected by *P. infestans* in two places (the white dots on some of the leaves are injuries caused by leafhoppers).

The KZN Department of Agriculture and Environmental Affairs has ten automatic weather stations and a further station is available from the private sector. These stations can be used to determine when the "Young rules", have been met. Using this information, it will be possible to warn farmers and advisers when preventative fungicide sprays should start, if the programme has not been started already.

The ideal time to use systemic fungicides is before the disease symptoms are visible but after climatic conditions have been favourable for infection, i.e. immediately after the three conditions for the disease triangle have been met. In the 2000/01 potato season at Cedara weather conditions for late blight were so favourable that before the pathogen had appeared at Cedara, a prediction model had forecast the need for two systemic fungicide applications. This is not an error in the model, as all models calculate as if the pathogen is present. However, in this case it was not present and two expensive systemic fungicide applications were "wasted". In the 2001/02 season systemic fungicides were only applied once it was confirmed that late blight was on a farm about 40 km away from Cedara. By doing this, applications of systemic fungicides were reduced.

Necrotic spots on leaves caused by *P. infestans.*

From this experience a map of late blight occurrence in KZN has been established to enable growers to know when late blight has occurred near their farms (NOT on their farms but near to). This will enable farmers and advisers to get the best timing for the first systemic fungicide application, i.e. when all three factors for the disease triangle have been met but the disease is not yet visible in the potatoes.

The late blight map is a non-commercial map and is for the benefit of the entire potato industry. Information (where late blight has been confirmed) for the map is provided by the whole industry:

- Growers
- Chemical advisers
- Seed inspectors
- Departmental officials, etc.

The information used is a location where blight was confirmed and is sent to Crop Protection, Cedara by any means possible.

Late Blight

Left: Initail stage of tuber infection caused by *P. infestans.* Right: Tuber entirely infected by *P. infestans.*

Suggestions are:
- Via e-mail
- Fax
- Phone
- Visit

The areas that have been confirmed with late blight change colour and a red triangle is used to confirm a late blight report at the weather station locations. No names appear on the map and this ensures grower confidentiality.

The map is generated using GIS maps and confirmed late blight reports from the industry. The map is on the Cedara-Crop Protection Web page and available for anyone with Internet access. Alternatively, e-mailed text messages are sent to those interested. The map is updated on the report of confirmed late blight outbreaks. There is no cost to producers (other than a phone call to Cedara if a blight report is made).

The advantages of the map are multiple:
- The map is an aid for deciding when to start systemic fungicide applications.
- Reduces unnecessary systemic fungicide applications.
- Helps prevent fungicide resistance buildup.
- Aids advisers in spray decisions.
- Allows the industry to know at a click the current state of late blight occurrence in KZN.

The success of the map is dependent on industry-wide involvement.

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