

μ METOS Models for *Cercospora Beticula*

- Calculation of Incubation Period following Bleiholder und Weltzien (1972)
- Calculation of Sporulation following Bleiholder und Weltzien (1972)
- Risk Assessment on Base of Incubation and Sporulation
- Calculation of Daily Infection Values (DIV) Shane and Teng (1985)

Calculation of Incubation Period following Bleiholder und Weltzien (1972)

Incubation Period of *Cercospora Beticula* is strongly influenced by temperature and slightly influenced by relative humidity. The model points out how many percent of an incubation period can be finished in a fortnight period. This is a good indicator for the temperature effect on this disease.

Incubation Period Duration: $\sum t_o = 4963^\circ\text{C}$

Calculation of Numbers of Generation in % ($n_{g[\%]}$)

if hourly Air temperature $< 6.3^\circ\text{C}$ then $t_o = 0^\circ\text{C}$

if $6.3^\circ\text{C} <$ hourly Air temperature $< 32^\circ\text{C}$ then $t_o =$ Air temperature - 6.3°C

if hourly Air temperature $\geq 32^\circ\text{C}$ then $t_o = 32^\circ\text{C} - 6.3^\circ\text{C}$

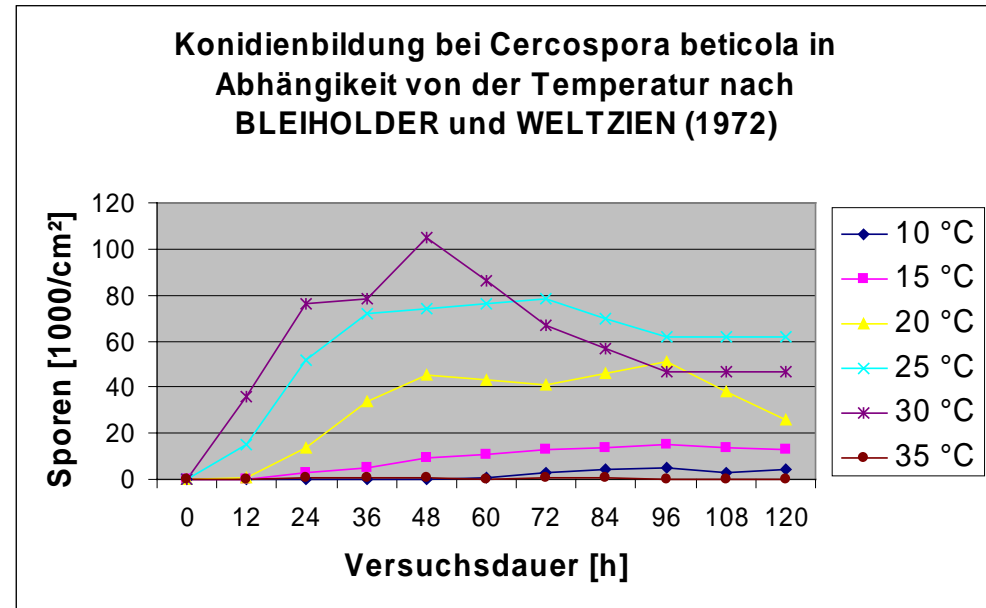
if hourly Relative Humidity $\geq 80\%$ then $t_o = t_o/8*9$

if hourly Relative Humidity $< 80\%$ then $t_o = t_o/8*7$

$$n_{g[\%]} = \sum_{1..336} t_o * 100 / 4963$$

Calculation of Sporulation following Bleiholder und Weltzien (1972)

Sporulation of *Cercospora beticola* takes place at night during periods with more than 90 relative humidity. Speed of sporulation is depending from temperature.



The model calculates the number of hours with relative humidity $\geq 90\%$ and their average temperature for a 120 hour period. This value is used to access the potential sporulation following the graph above.

Optimum Conditions of 48 hours of high relative humidity with an average temperature of 30°C is used as 100% sporulation.

Risk Assessment on Base of Incubation and Sporulation gives a brief overview how favourable temperature and relative humidity conditions have been within the last week.

If $n_{g[\%]} < 100\%$ risk is 0

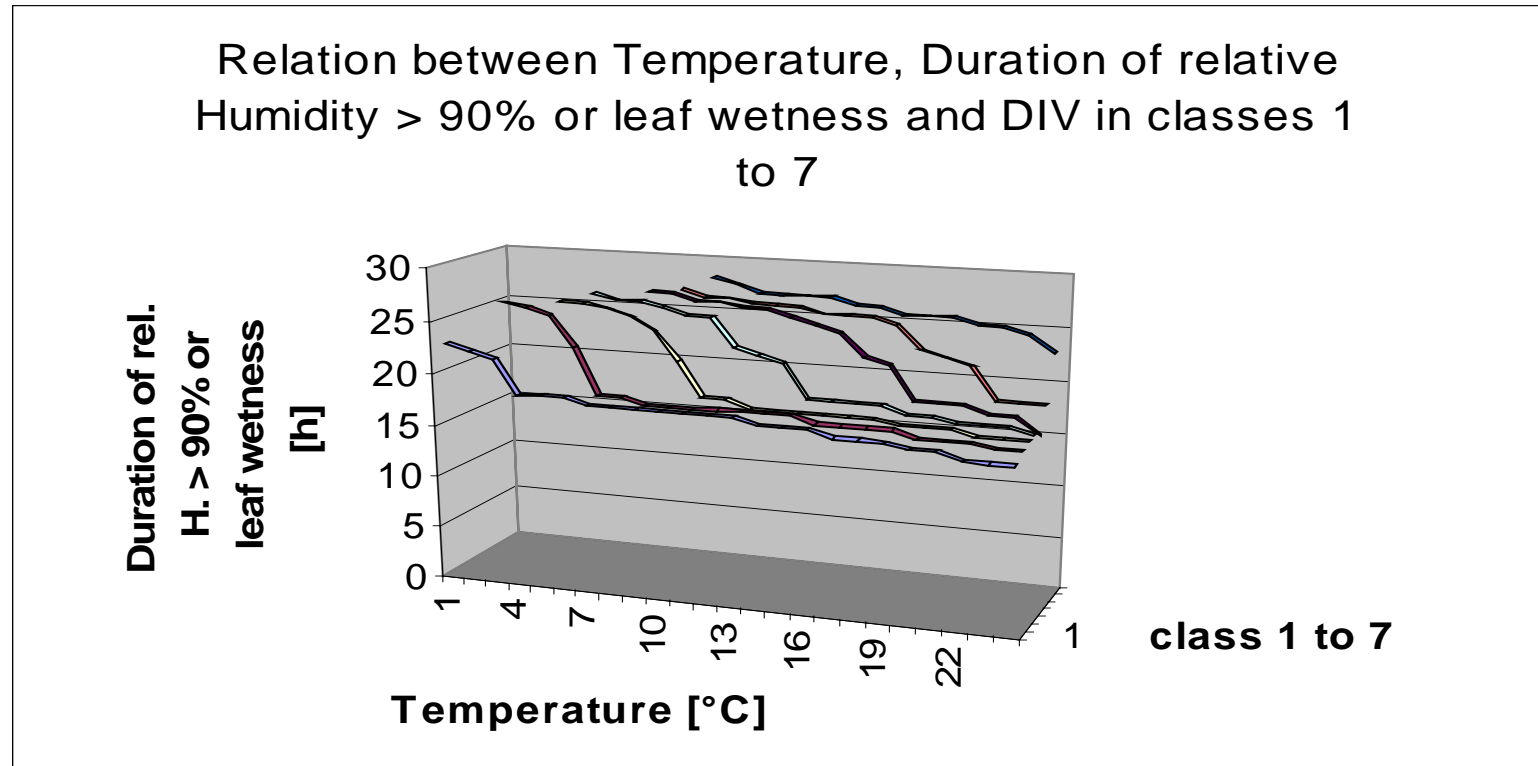
If $n_{g[\%]} = 100\%$ and sporulation $< 10\%$ risk is 1

If $n_{g[\%]} = 100\%$ and $10\% \leq \text{sporulation} < 30\%$ risk is 2

If $n_{g[\%]} = 100\%$ and sporulation $\geq 30\%$ risk is 3

Calculation of Daily Infection Values (DIV) Shane and Teng (1985)

Cercospora beticola leaf spot model
from University of Minnesota Crookston



The model classifies the last 24 hours for hours with relative humidity higher than 90 or leaf wetness. Number of moist hours and the average temperature during the moist period are classified for infection severity following the graph beside.

µMETOS points out the daily infection value (DIV) between 0 and 7 for every day.

Cercospora beticola models Data Presentation on μMETOS Display and in μLink Graphics

μLink uses two displays for the
Cercospora beticola models:

The first display shows the results of the Incubation and Sporulation model following Bleiholder und Welzien (1972) and the risk assesement on base of this two models.

The second screen shows the results of the daily infection value model form University of Minesota Crookston.

Cercospora beticola
(%)Incubation in 14 d., (Sp)orulation, (Ris)k
M-DD HH RIS INF

1th Label

5-12	XX 20 **
5-13	XX 30 ***
M-DD	%I Sp Ris
M-DD	%I Sp Ris

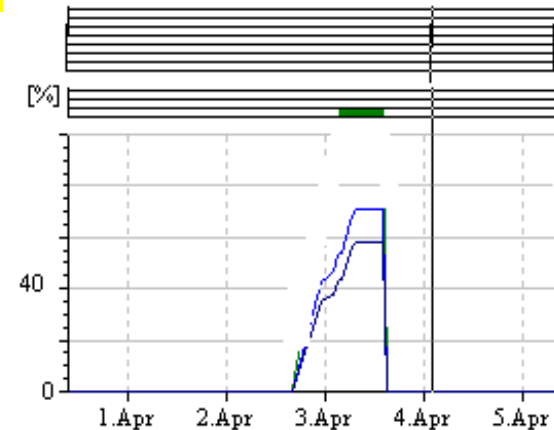
1th Screen

Cercospora beticola
Daily infection values (DIV)
M-DD HH RIS INF

2nd Label

5-12	3
5-13	4
M-DD	DIV
M-DD	DIV

2nd Screen



μLink displays the result of all the models in one graph. The result of the incubation model funning from 0 to 100 are displayed in the coordinate system. The risk model is shown in 3 quality lines above and the result of the DIV model is sown in 7 quality lines at the top.

Cercospora beticola models the practical Use:

All three models are indicating periods of risk for *Cercospora beticola*. The model checking if the incubation period of *Cercospora beticola* can be fulfilled within a fortnight will be helpful in spring and early summer to indicate an early appearance of this disease like it happens in many parts of Europe in the season 2000. The check for sporulation possibilities and the risk model using incubation period and sporulation possibilities will indicate periods of high disease pressure in the running season like the DIV infection model from University of Minnesota Crookston.