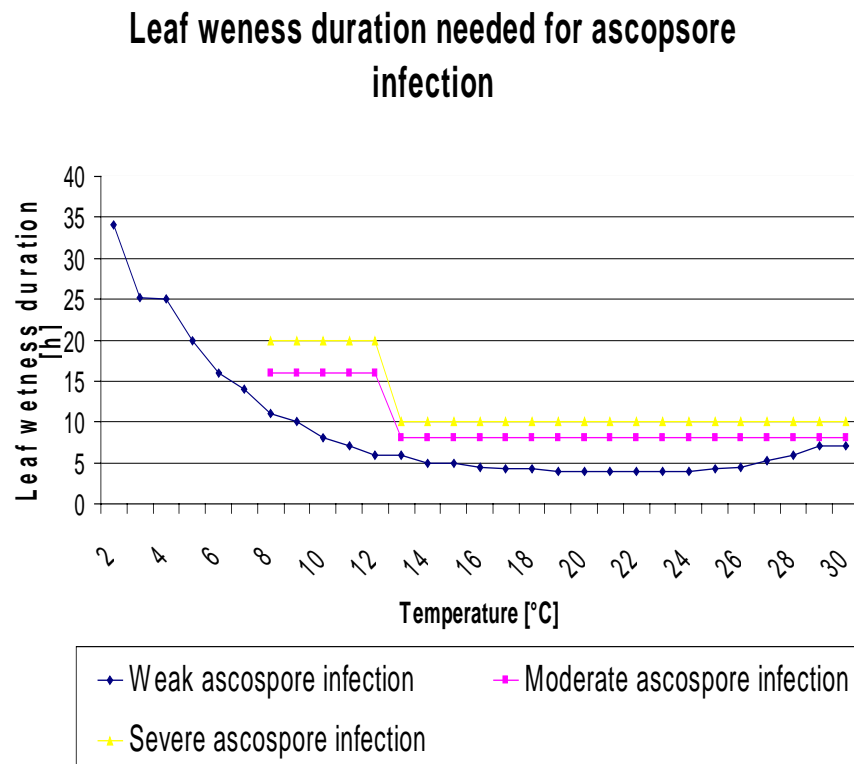


The Apple Scab Program

The most important apple disease is apple scab caused by the fungus *Venturia inaequalis*. Thanks to the publications of MILLS and LAPLANTE (1945) the relation between leaf wetness periods, temperature and apple scab infections is well known in any apple growing area.



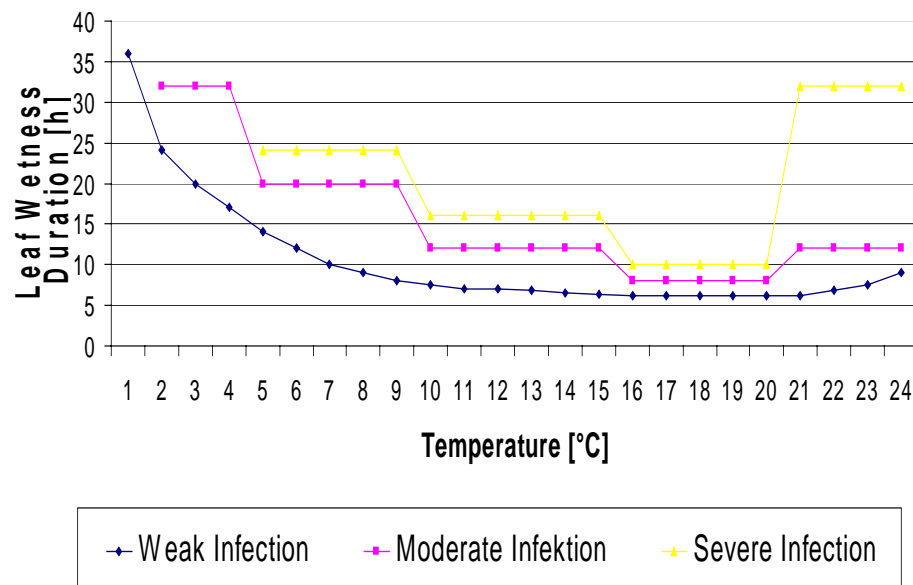
Using electronic climate stations is therefore quite common too. It saves the guesswork in not really knowing if the leaf wetness period was lasting long enough for infection.

Ascospore infections

Depending on air temperature regimes the ascospores of *Venturia inaequalis* need longer or shorter leaf wetness periods for germination and penetration of leaves, or fruits of the apple tree. This relationship was first published by MILLS and LAPLANTE (1945). Our calculations are carried out based on the publications of SCHWABE (1980). SCHWABE showed the severity of scab infections depending on temperature. This agrees with our own observations.

Ascospore discharge is much higher during daylight and short after sundown then during the night. Therefore no hard infections are calculated if leaf wetness starts at night before sunset.

Leaf Wettness Duration Needed For Conidia Infection



Apple Scab

Conidia infections

Conidia infection needs similar climate to ascospore infection. The first papers pointing out the relation between leaf wetness duration, temperature and infection were also published by MILLS and LAPLANTE. The calculations of MetWinII also follow the publications made by SCHWABE (1980). There is no influence of daylight on the conidia phase of apple scab.

The **influence of interrupted leaf wetness periods** is an often discussed question for apple scab infection. MILLS and LAPLANTE showed germinating apple scab ascospores and conidia can survive in the absence of free water for only a certain length of time. The literature shows a wide variation from 3 hours to 32 hours, depending on temperature.

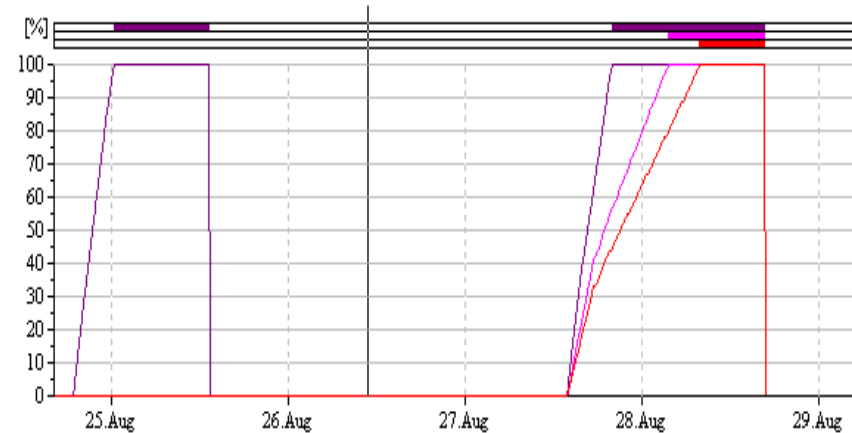
We are using a function depending on temperature and relative humidity which is very conservative. See the table below.

Temperature [°C]	2°C – 5°C	6°C – 10°C	11°C – 18°C	19°C – 30°C
Leaf wetness interruption accepted	> 6 days	> 3 days	> 1.5 days	> 20 hours

Apple Scab

Data Presentation

The PC software shows the increase of the infection during the leaf wetness periods. If a light, moderate or severe infection could be finished it is indicated by a bar on the top of the graph.



Graphic of the apple scab infection

Apple Scab Ascospore Infection
Light, Moderate, Severe, Progress [%]
M-DD HH LMS Pr

Label

5-12 07	*	95
5-12 08	**	75

M-DD HH LMS Pr
M-DD HH LMS Pr

Screen

μMETOS displays the progress of light moderate or severe infections. If the infection starts **μMETOS** displays the progress of the light infection and as soon as this infection reaches 100% it displays an second asterix indicating that the progress of moderate infections is displayed now. If three asterix and a value of 100 are displayed this means a severe infection has been finished.

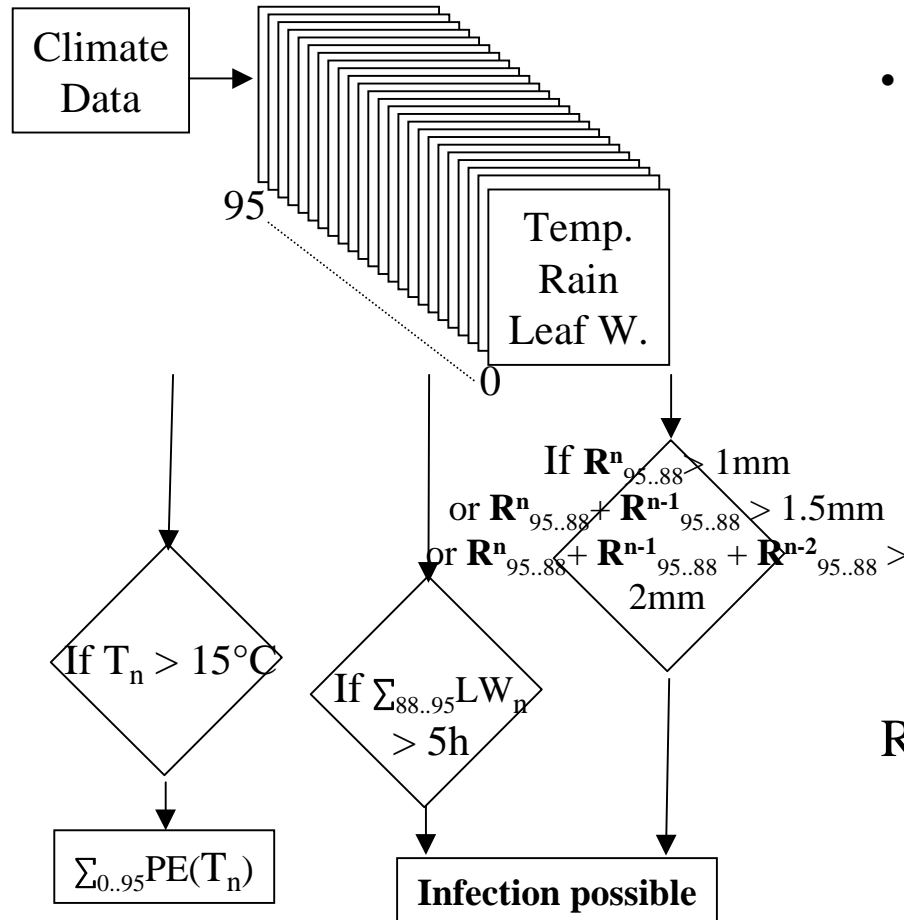
Fire Blight (Apples and Pears)

... Model assesses the bacteria propagation on base of:

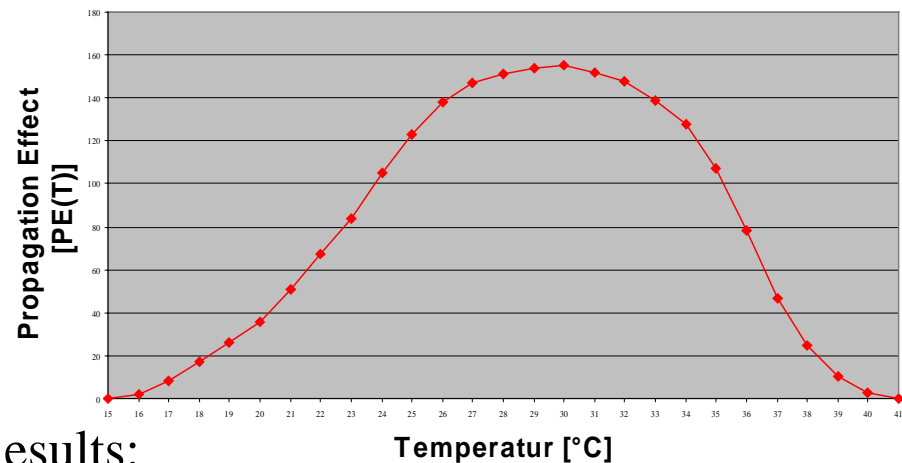
- Temperature

... and the possibility of infection on base of:

- Rain within last 8 hours (R)
- Number of hours with leaf wetness within last 7 hours



Fire Blight Degree Hours of Smith Fire Blight Model



Results:

- Value indicating the speed of bacteria propagation
- Risk figure between 0 and 7
- Possibility of infection

Fire Blight (Apples and Pears) Risk Figure and PET_Σ interpretation

Potential for Pathogen Presence		Very Low	Low	Low - Moderate	Moderate	High
No Fire Blight in area past 2 seasons	PET _Σ	0 – 200	200 – 220	220 – 250	250 – 325	325+
	Risk Figure	0,1,2,3	4	5	5,6	7
Fire Blight in local area 2 seasons ago	PET _Σ	0 – 100	100 – 200	200 – 220	220 – 325	325+
	Risk Figure	0,1,2	3	4	5,6	7
Fire Blight in local area last season	PET _Σ	0 – 100	100 – 200	200 – 220	220 – 300	300+
	Risk Figure	0,1,2	3	4	5	6
Fire Blight in or near your orchard	PET _Σ	0 – 60	60 – 110	110 – 160	160 – 220	220+
	Risk Figure	1	2	3	3,4	5
Active cankers are now nearby	PET _Σ	0	0 – 60	60 – 80	80 – 160	160+
	Risk Figure	0	1	2	2,3	4

Simple Risk Figure Evaluation: 0 = no risk at all, 1 = Low risk if there is fire blight in the orchard, 2 = Low to moderate risk if there is fire blight in your village, 3 = moderate risk for villages with fire blight, 4 high risk for villages with fire blight, 5 = high risk for areas with fire blight, 6 = high risk for areas with fire blight in last season, 7 = high risk for areas with fire blight 2 and more seasons ago

Fire Blight (Apples and Pears)

Data Presentation:

Fire Blight
Bacteria Propagation (BPro), Risk (R), Infection (I)
M-DD HH BPro R I

Fire Blight Hourly Values:

μMETOS and μLINK shows the hourly values bacterial propagation, risk and the possibility of an infection.

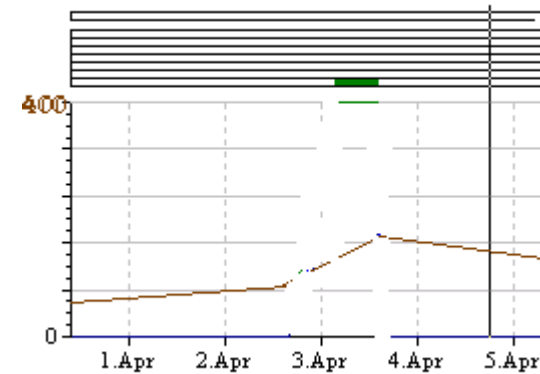
Daily Values:

Maximum values of every day are shown.

Label

5-12 07 220 4
5-12 08 300 5 *
M-DD HH Bpro R I
M-DD HH Bpro R I

Screen



Fire Blight (Apples and Pears)

Practical Use:

The fire blight model indicates the climate effect on bacterial propagation. The bacteria is well adapted to warm climate. As warmer the time around blossom as higher the risk of a fire blight infection. If the propagation rate is very low orchards with no fire blight in the nearer area are not in danger. With the increase in propagation rate the risk of wide spread fire blight is increasing. If there is a very high volume of bacteria available even orchards quite far away from an active fire blight spot can be infected. This is indicated by the table shown on the slides before. The risk figure from 0 to 7 should indicate this in a faster way.

Fire blight infections will take place as soon as we have bacteria and a little bit free water. The possibility of bacterial infection is indicated by the infection flag.