THE USE OF TRAP PLANTS TO DETERMINE INFECTION PERIODS OF SCLEROTINIA WHITE ROT IN RAPESEED

The use of trap plants to determine infection periods of sclerotinia white rot in rapeseed

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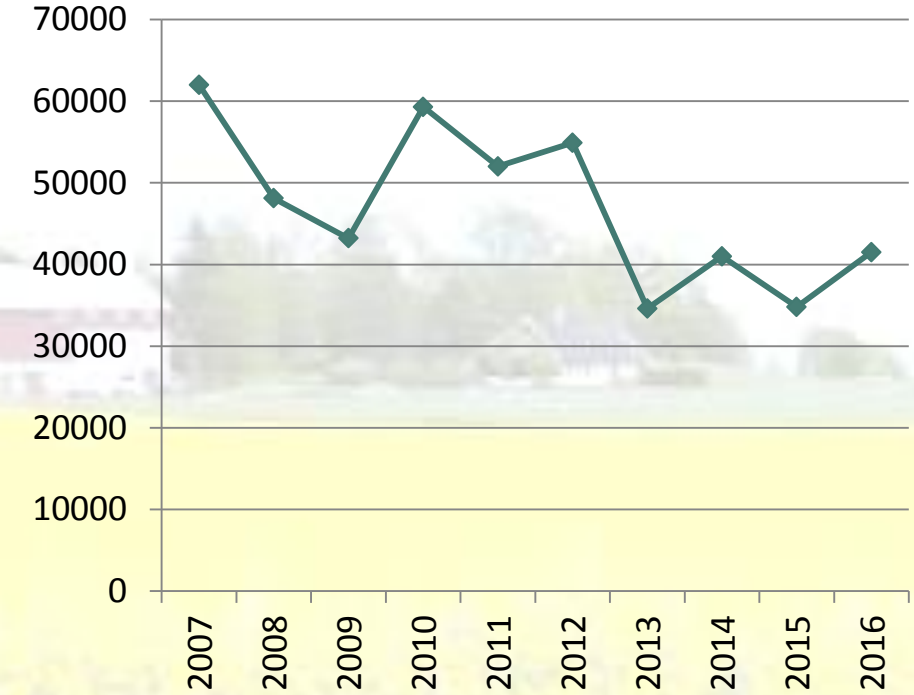
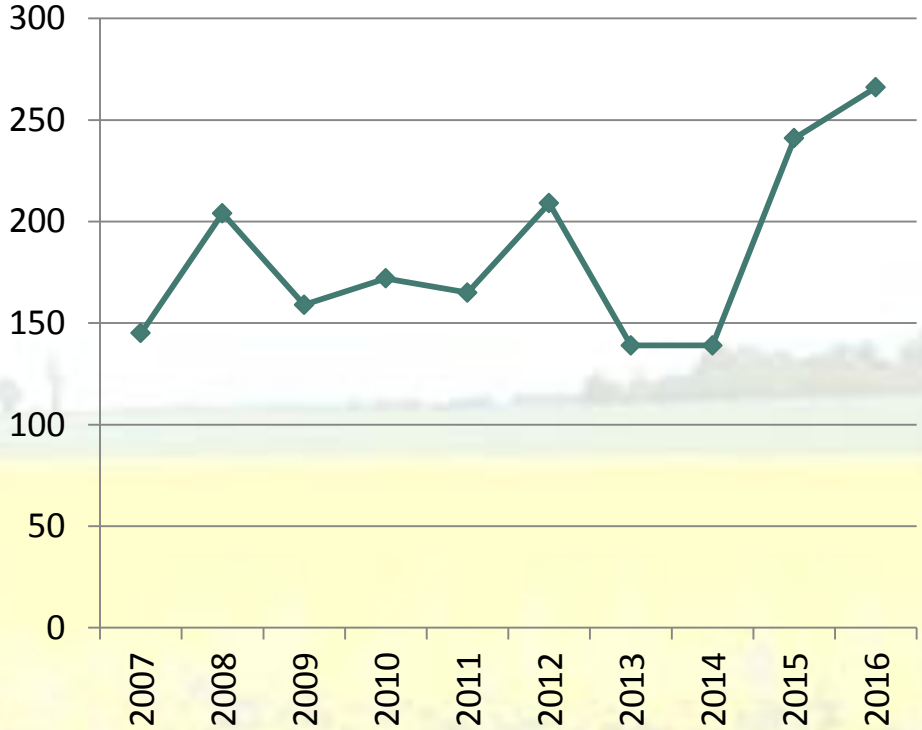
Sclerotinia white rot (SWR), caused by *Sclerotinia sclerotiorum*, has been one of the most damaging diseases on rapeseed in Norway, causing significant yield losses in farmer fields. Due to its wide host range and long-term survival structures, the sclerotia, this disease can persist in an area over many years without its host. Sclerotia require a conditioning period to germinate carpogenically and produce apothecia, which release windborne ascospores. These ascospores play a critical role in the infection of flowering rapeseed. Flower petals appear to serve as an important nutrient source, before infection of the rapeseed stem can proceed. As good varietal resistance is not available, long term rotations and application of effective fungicides during the period of high infection risk are the basis of sound integrated plant protection strategies. Many existing models to predict SWR infections are based on a correlation between infection risk and precipitation during flowering. However, most of the currently available models do not predict infection risk satisfactory, which means an accuracy above 80%. The objective of our investigation was to determine the period of high infection risk of SWR under Norwegian field conditions based on precipitation patterns using trap plants. Spring rape ('Mosaik') was grown in the greenhouse until flowering and placed in field areas known for previous infection with SWR or in research plots where sclerotia of *S. sclerotiorum* had been planted and conditioned the previous season. Plants were exposed to field conditions for one week, covered with transparent plastic bags to increase humidity and incubated for 2-4 weeks, before the plants were assessed for SWR symptoms. Trap plant experiments in 10 different fields over 4 years showed an unexpected weak correlation between precipitation and sclerotinia white rot infection with 55% of cases with precipitation, but no SWR, 35 % precipitation and SWR, 6% without precipitation and no infection and 4% of cases without precipitation, but with SWR infection. Implications of these results for current and future modelling of SWR in rapeseed will be discussed during the meeting.

Overview

- Oilseed production in Norway
- The pathogen, symptoms, biology and management
- Modelling sclerotinia white rot; the challenge
- The use of trap plants
- Correlation between infection periods and precipitation
- Discussion

NORWEGIAN OILSEED PRODUCTION AND YIELD (KG/DAA)





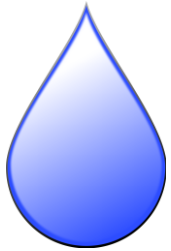
SCLEROTINIA SCLEROTIORUM

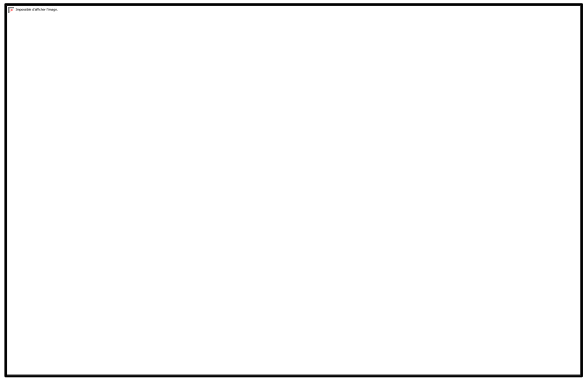
- Symptoms on rapeseed: gray-white lesions on stems, wilting, plant death
- Yield reduction: 50-70%
- A pathogen with a large host range (over 400 species)

www.canolawatch.org

Department of Agriculture and Food
Government of Western Australia

FOCUS ON GERMINATION, RELEASE AND INFECTION





MANAGEMENT

Clean seeds: reduce sclerotia

Long term crop rotation: reduce sclerotia over time

Tillage: reduce sclerotia

Apetalous canola: reduce infections

Biological control: reduce sclerotia in the soil

Fungicide applications: reduce infections

http://www.ploughmen.co.uk/

To determine the need for fungicide application….

ECONOMY OF FUNGICIDE APPLICATION

- Have conditions been moist over the past few weeks for apothecia development and survival?
- Is the canopy thick and is yield potential high?
- Does the forecast call for more rain and/or humidity in the next week?
- Is the pathogen present in sufficient quantities?

If the answer is "yes" to all 4, then spraying is recommended’

(The Canola Council of Canada)

MODELING APPROACHES:

Apothecia depot

Flower petal testing

The Swedish check-list

SkleroPro

An infection risk map

Photo: Nicole Baxter, GRDC, Australian Government

Do the prediction models work in Norway?

TRAP PLANTS: THE SET-UP

- Spring oilseed rape (‘Mosaik’) were grown in the greenhouse until flowering
- 2-6 pots with 3 plants each were placed next to the field for 7 days
- After field exposure, plants were incubated at high humdity, 15-20C for 2-3 weeks
- Experiments were conducted over 2 to 4 years in 3 different regions

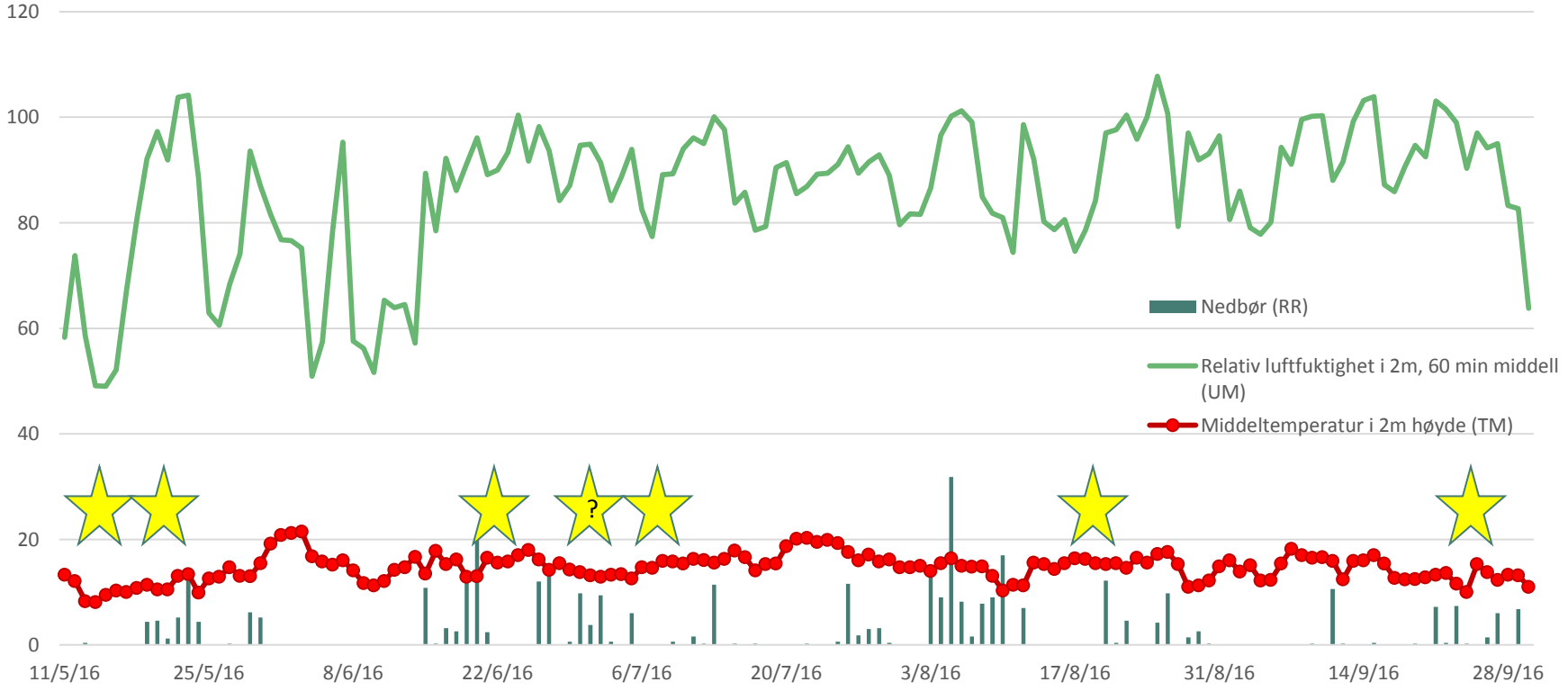
LOCATIONS WITH TRAP PLANTS

ASSESSMENT AND DATA ANALYSIS

- Number of plants with symptoms
- PCR analysis of different plant parts
- Correlation between precipitation before and during plant exposure and infection

An example…

WEATHER FACTORS AND INFECTION PERIODS



RESULTS

	Akershus 4 years	Sør Øst 2 years	Viken 2 years
Precipitation/no infection	71	33	63
Precipitation/ infection	17	63	31
No precipitation/no infection	10	0	6
No precipitation/ infection	2	4	0

SUMMARIZED:

	Precipitation	No precipitation
Infection	35	4
No infection	55	6

Precipitation appears to be a rather poor predictor for SSR infection

POSSIBLE EXPLANATIONS:

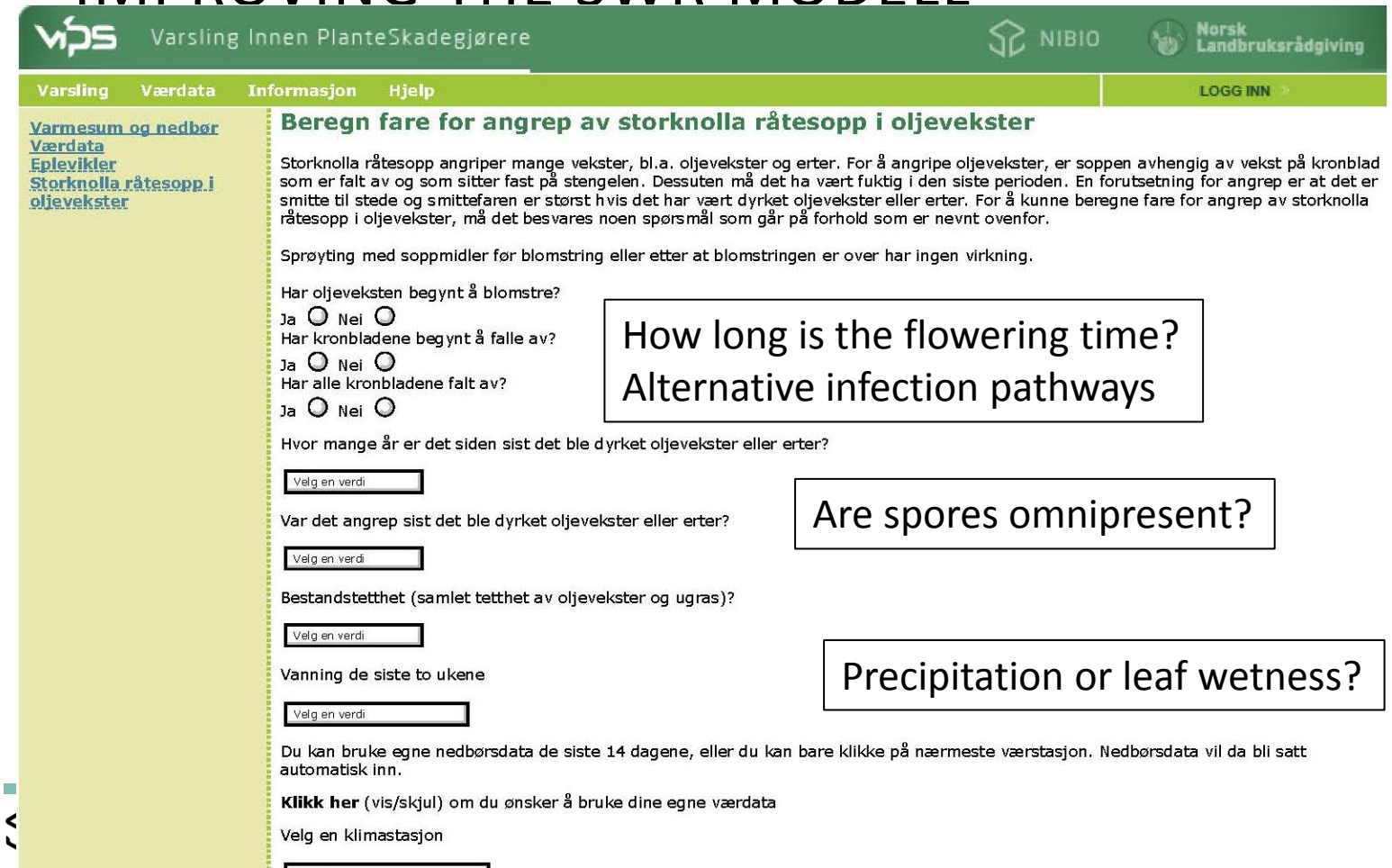
Weakness of the method:

- No sclerotia present in the trap plant area
- Weather stations not close enough to the site
- To dry in the potted plant canopy

Lack of correlation:

- Rain might reduce the amount of spores reaching the upper plant parts
- Dew or high humidity in the canopy might be sufficient

IMPROVING THE SWR MODELL

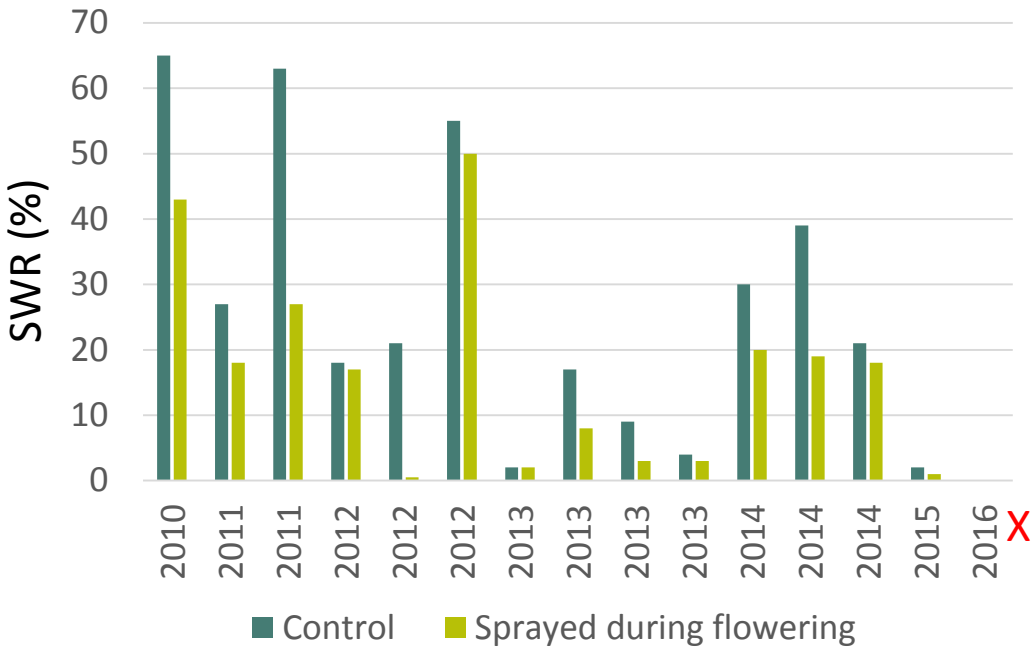


FACTORS TO LOOK AT

- Field data from the Nordic field trials in Norway (NFTS)
- The possible role of senescing leaves
- Extended flowering times
- What causes ascospore release?

NFTS DATA FROM OILSEED RAPE IN SØR ØST

Weather station: Øsaker
Number of fields: 14
Number of fields SWR >10%: 10
Average yield increase: 7.5%
Variaiton in yield increase: +30/-10%



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