



Spatial heterogeneity of leaf wetness duration in winter wheat canopy and its influence on plant disease epidemiology

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Plan

- ✓ Introduction
- ✓ Objectives
- ✓ Methodology
- ✓ Results
- ✓ Conclusions and perspectives

Introduction

- ✓ Practical definitions of leaf wetness and leaf wetness duration are the visible presence and duration of wetness on a leaf surface, respectively, (Armstrong et al., 1993; Butt and McGlenn, 1989; Gillespie and Kidd, 1978; Hoppmann and Wittisch, 1997; Potratz et al., 1994; Weiss and Hagan, 1983).
- ✓ Leaf wetness is an important agricultural weather variable for the prediction of plant diseases (Yarwood, 1978).
- ✓ Leaf wetness duration is an important factor influencing the occurrence of winter wheat disease epidemiology.
- ✓ Despite considerable efforts to determine LWD, little attention has been given to study its variability within the canopy.

Objective of the work

- Evaluate spatiotemporal variability of Leaf wetness duration in wheat fields in a heterogeneous landscape.

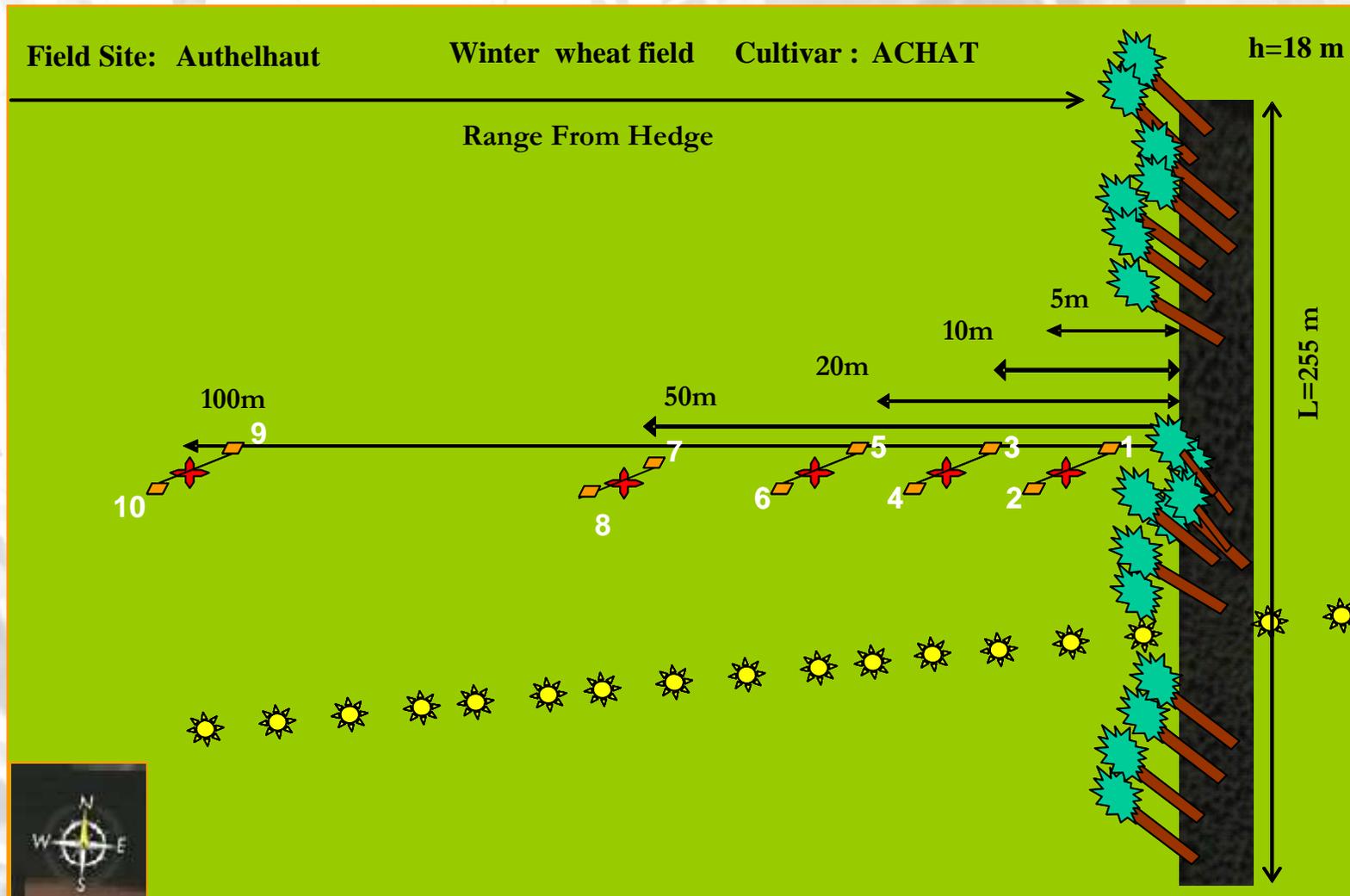
Methodology 1/4



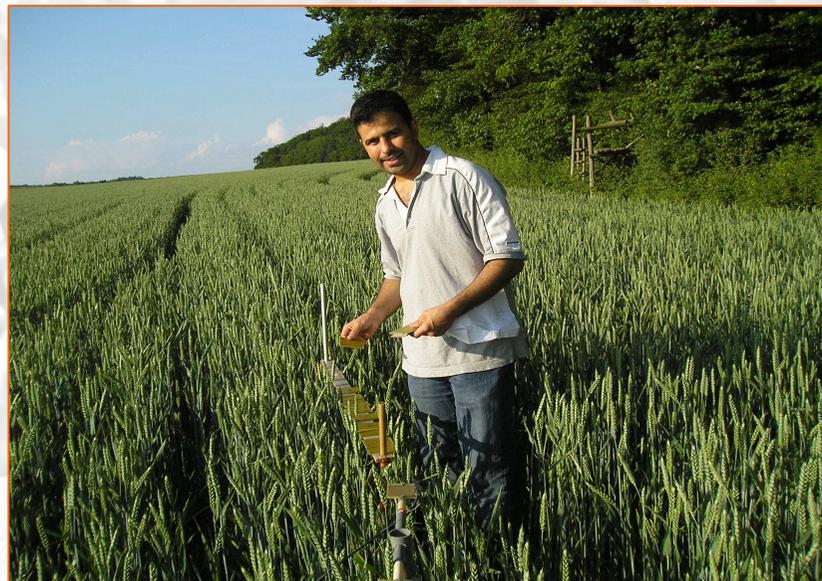
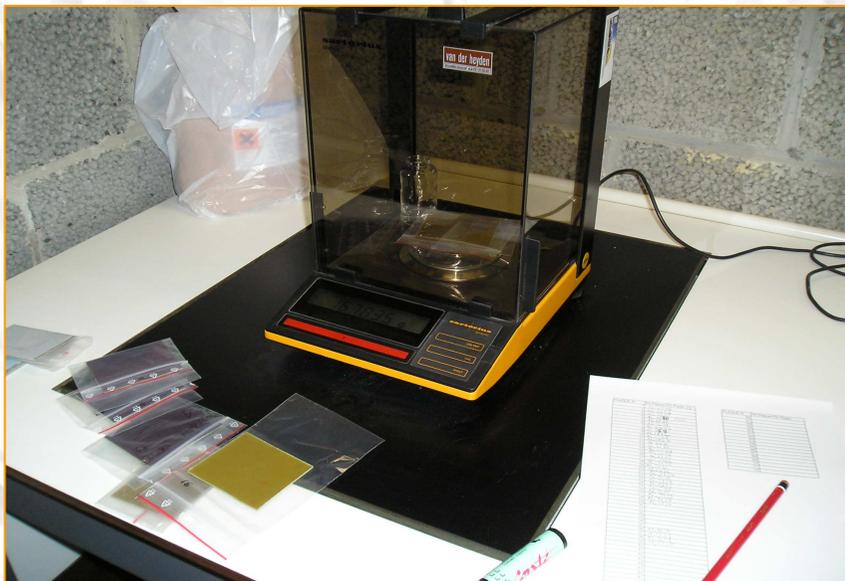
Location of field-site experiments in Belgium, for the two growing seasons 2006 and 2007.



- LWD measurements were made using a set of flat plate sensors deployed at five different distances from a 18 m high hedge (5, 10, 20, 50, 100 m).
- Each set of two sensors was placed horizontally close the flag leaf.

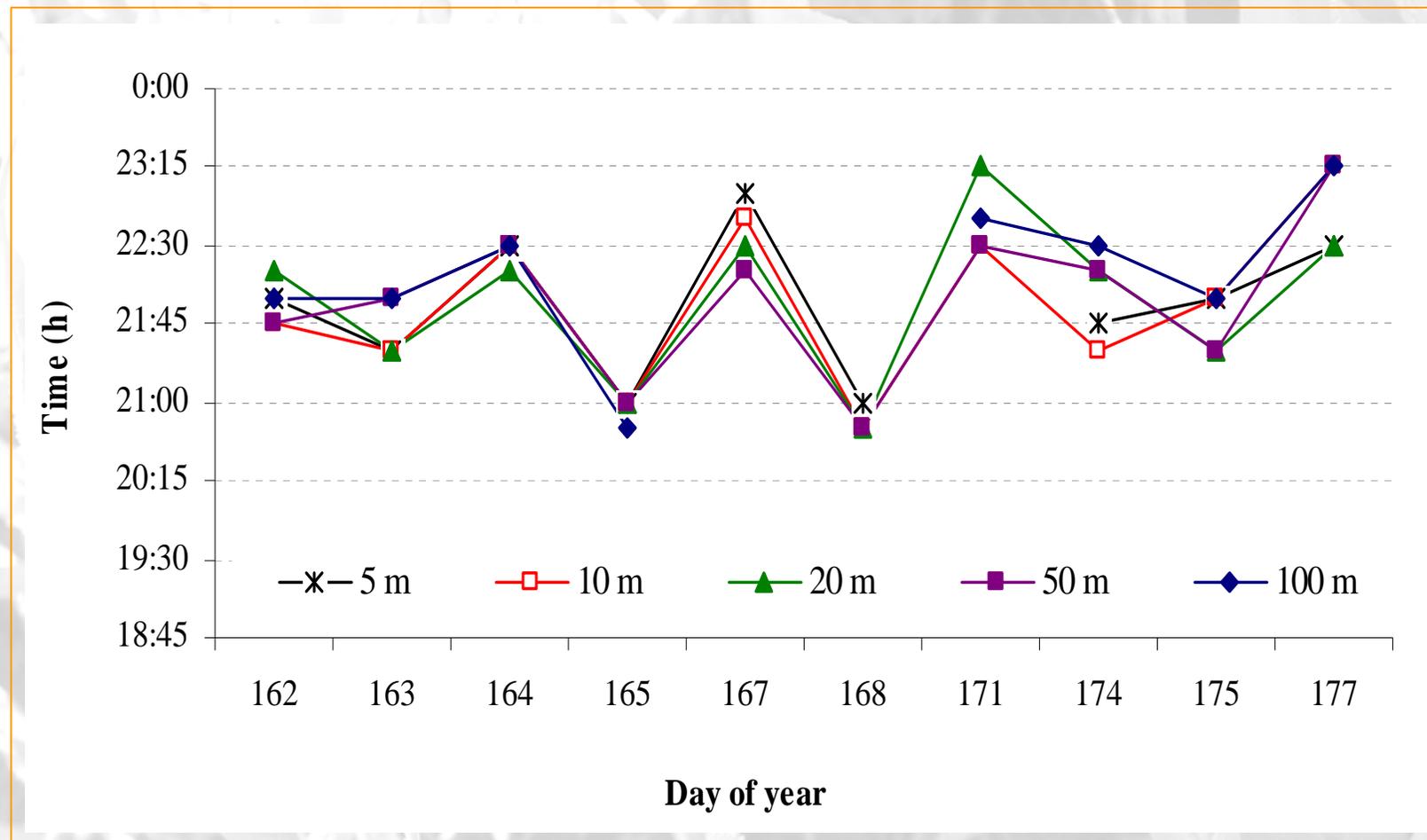


Field site characteristics – experimental device



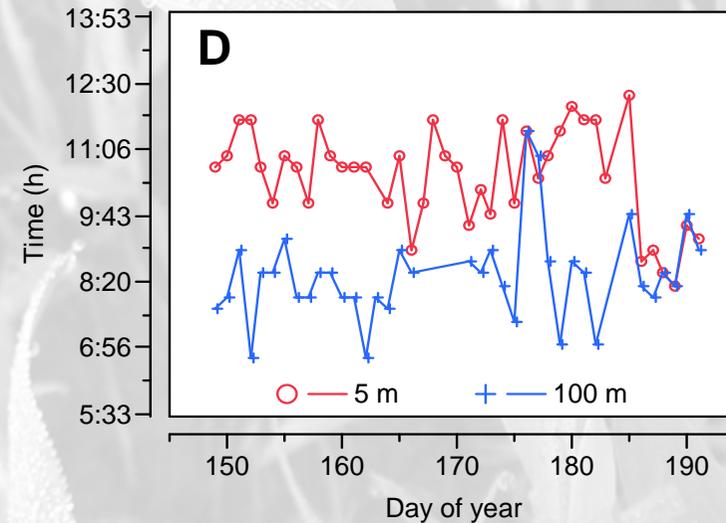
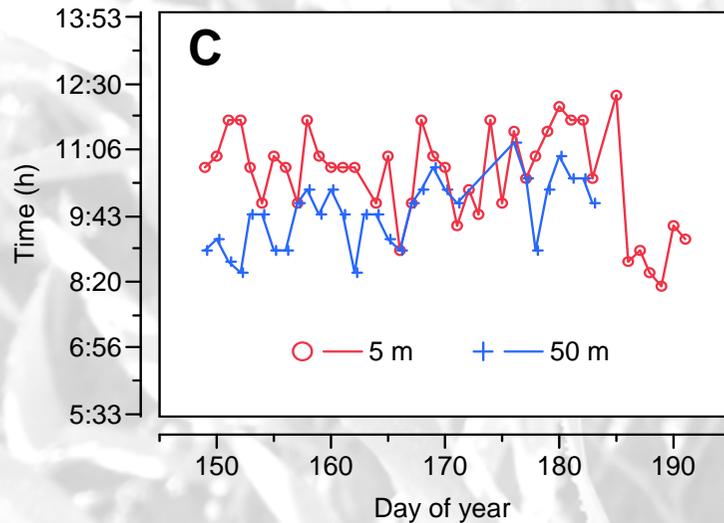
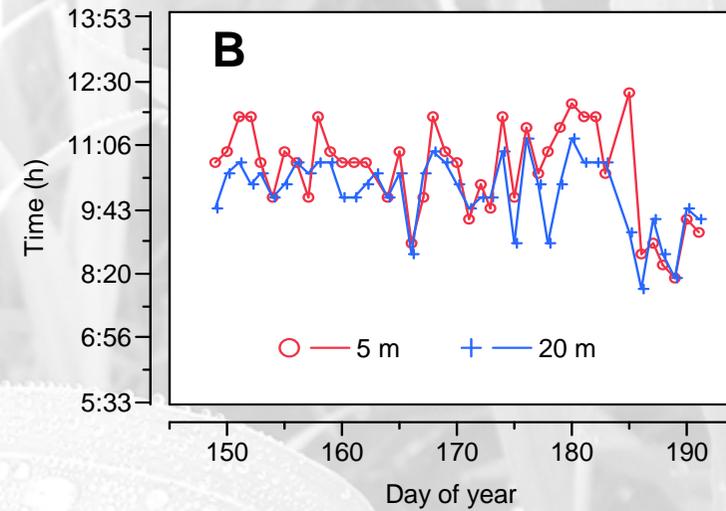
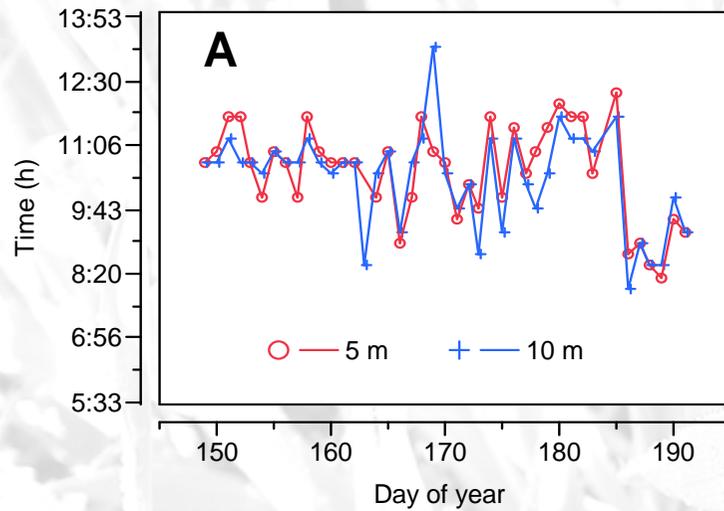
Collect the amount of dew water that deposited on rigid epoxy plates placed next to each sensors.

Results and discussion (1/5)

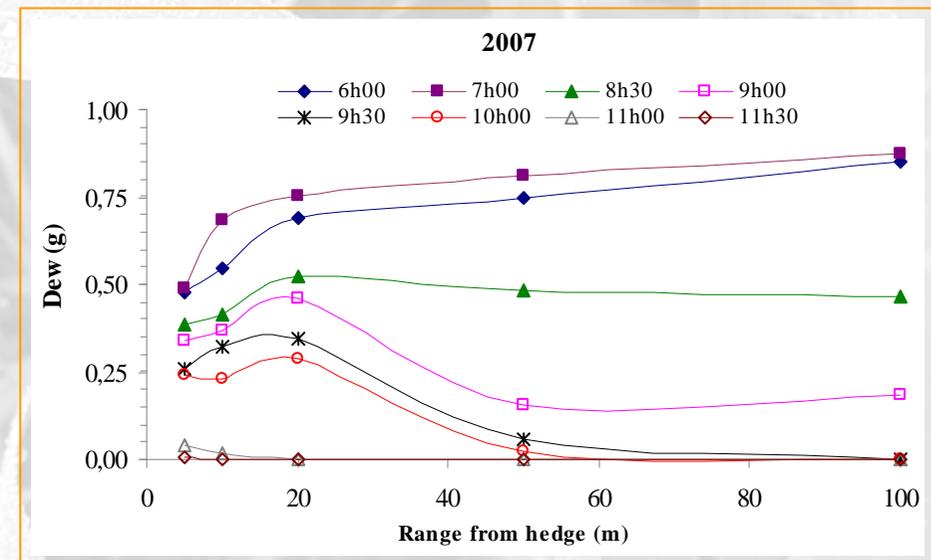
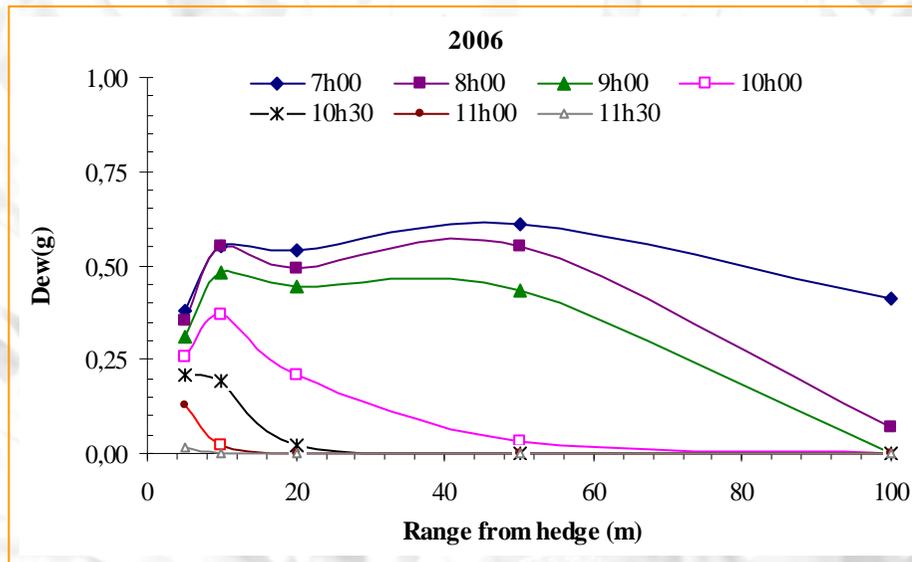


Comparison between dew onset measured by sensors deployed a five distances from hedge in 2006: 5 m , 20 m, 50 m and 100 m.

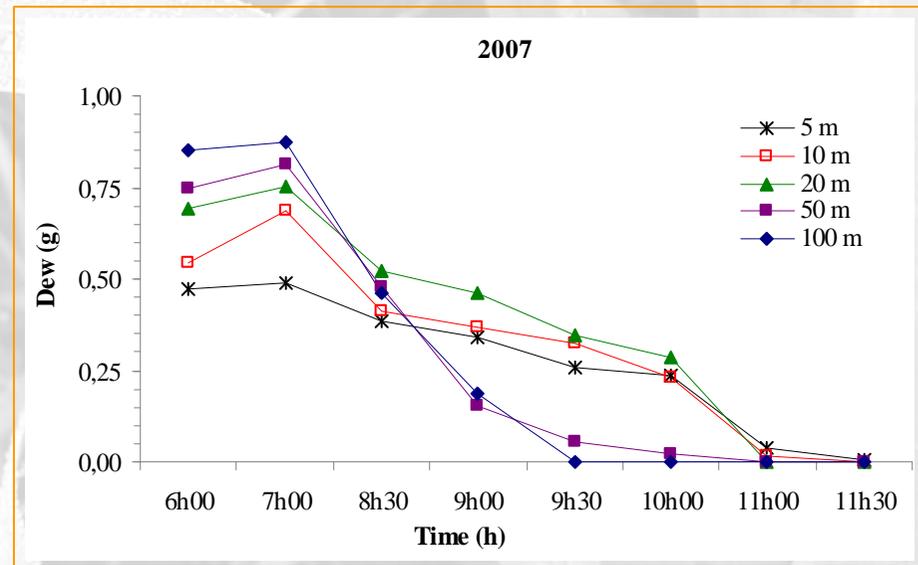
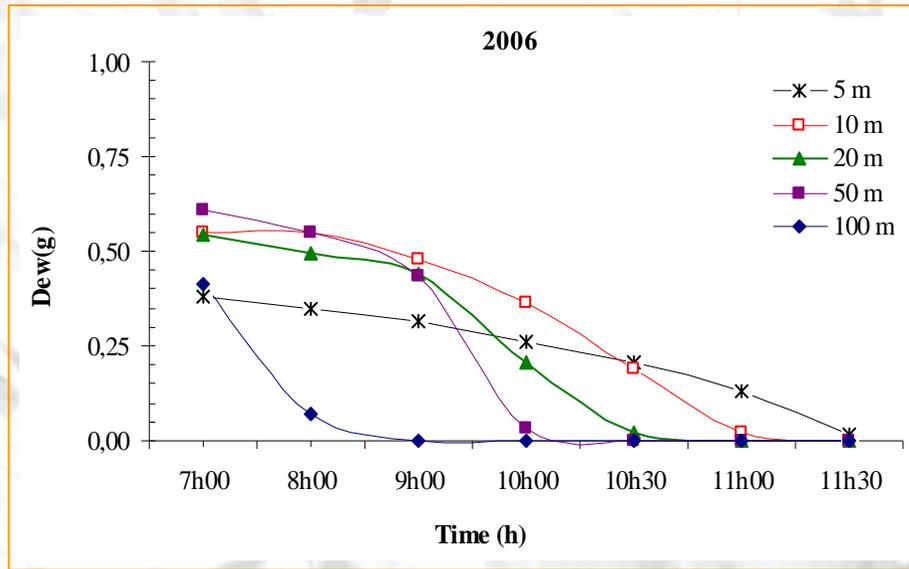
Results and discussion (2/5)



Comparison between dew dry-off measured by sensors deployed a five distances from hedge in 2006: A= 5 m- 10 m; B= 5 m- 20 m; C= 5 m- 50 m and D= 5 m- 100 m



Variation of dew amount (gram) that deposited on rigid epoxy plates placed next to each sensors with range from the hedge (collected after sunrise).



Variation of dew amount (gram) as function of time after sunrise at different distances from the hedge.

- ✓ LWD measurements revealed substantial heterogeneity among sensor positions:
 - ➔ LWD is longer for sensors closer to the hedge mainly because of its shadowing effect:
 - ➔➔ 3 to 4 hours of difference was observed between sensors located at 5 m and those located at 100 m.
- ✓ A significant quantitative difference ($p < 0.0001$) of dew deposit was observed between area beside hedge and those placed at 100 m.

Conclusions

- ✓ This study provides new information on how wetness is distributed on wheat eaves according to the distance from a hedge.
- ✓ This leads to local microclimate conditions that will contribute to the disease spatial heterogeneity.

Perspectives

- The above study should provide a solid base of knowledge to simulate leaf wetness in a heterogeneous landscape.
- This research project aims at better understanding the leaf wetness duration variability and its influence in winter wheat disease. The first perspective of this research is to simulate this variability by LWD model.

Annexe 1/4



Leaf wetness and leaf wetness duration are the visible presence and duration of wetness on a leaf surface, respectively.





Septoriosis
Septoria tritici



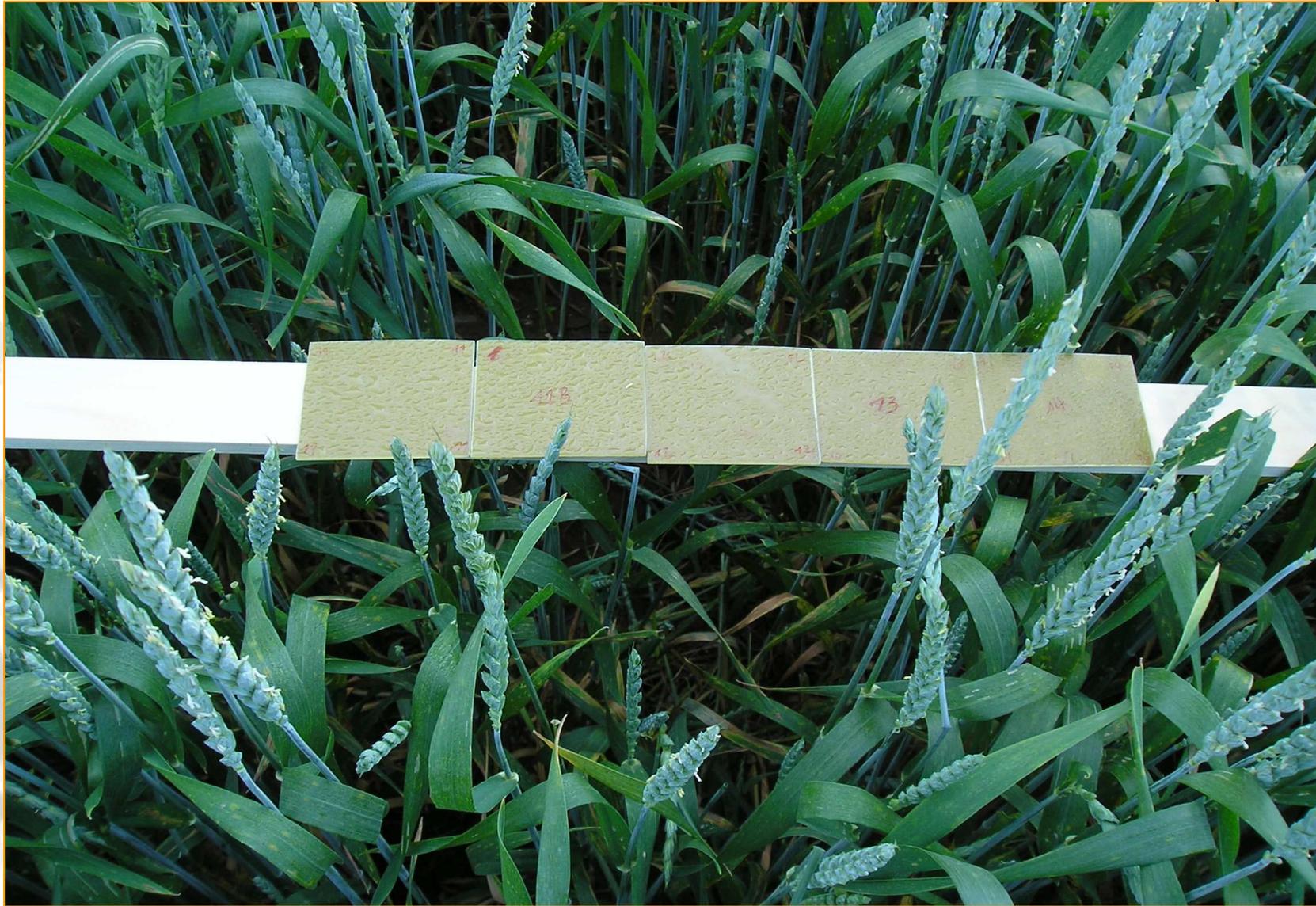
Yellow rust
Puccinia striiformis



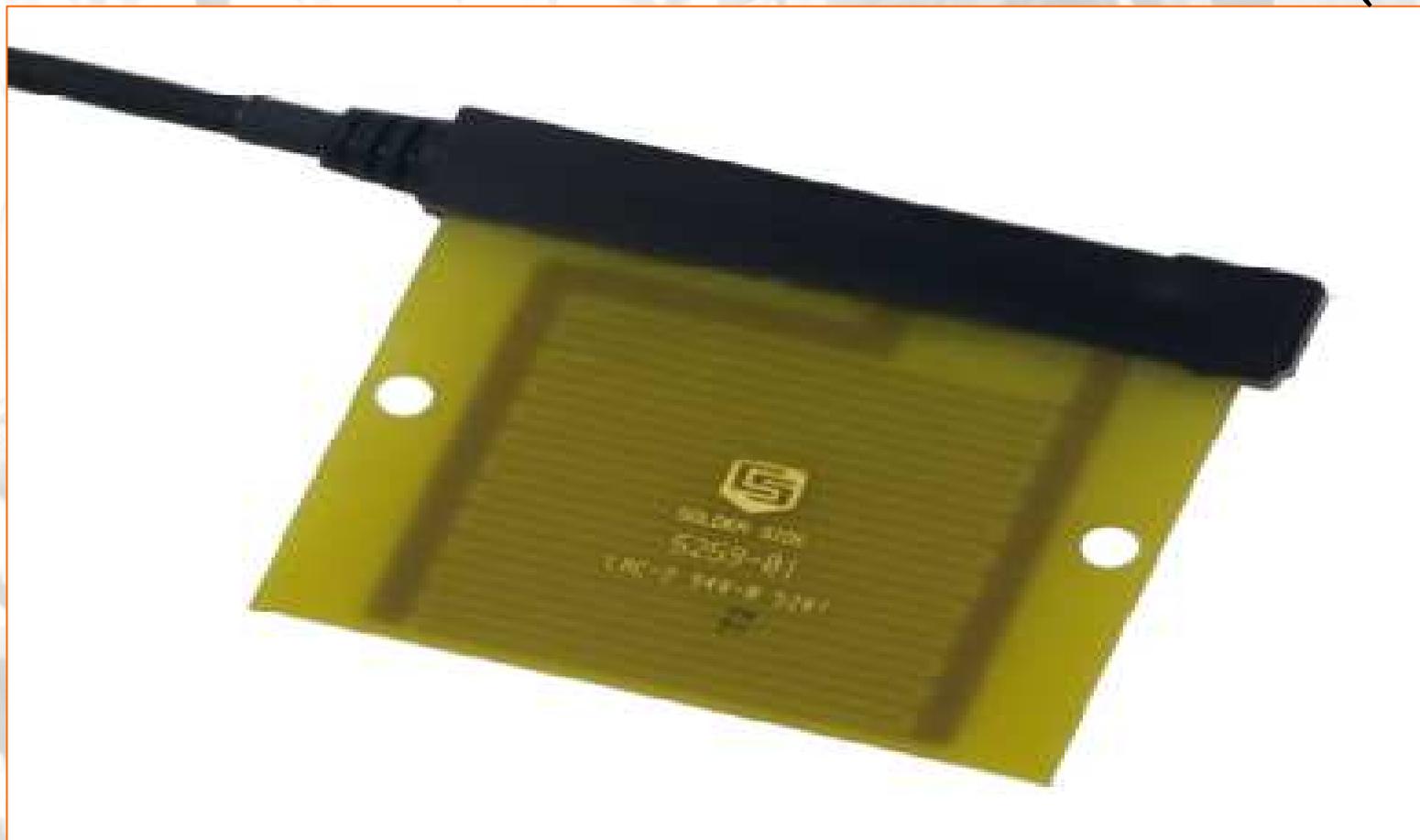
Brown rust
Puccinia triticina

Leaf wetness duration is an important factor influencing the occurrence of winter wheat disease epidemiology.

(3/4)



(4/4)



Model 237 Leaf Wetness Sensor (Campbell Scientific, Inc.)

