



Assesement of soil contamination by *Spongospora subterranea* using DAS-ELISA

Brice Dupuis

30.07.2014



Material and method

- Location: La Fretaz (Bullet, VD, Switzerland) 1'202m a.s.l.
- Years: 2008; 2009; 2010; 2011
- Cultivars: Agria; Estima; Gladiator; Kennebec; Markies
- Replications: 4
- Weekly samplings: 5 to 6 (50-60 until 80-90 DAP)
- Nb. of plants/sample: 4



La Fretaz





Observations

- Galls on roots:
 - 0 = non galls
 - 1 = 1 or 2 galls
 - 2 = 3 - 10 galls
 - 3 = >10 galls
 - 4 = >many galls

- Lesions on each tuber (same scale)

- Soil sampling at planting and harvest → analysis by DAS-ELISA (Complete Kit Bioreba Sss – Ueli Merz procedure)

- Meteo datas: temperature and rainfall (more to come)





Data analysis

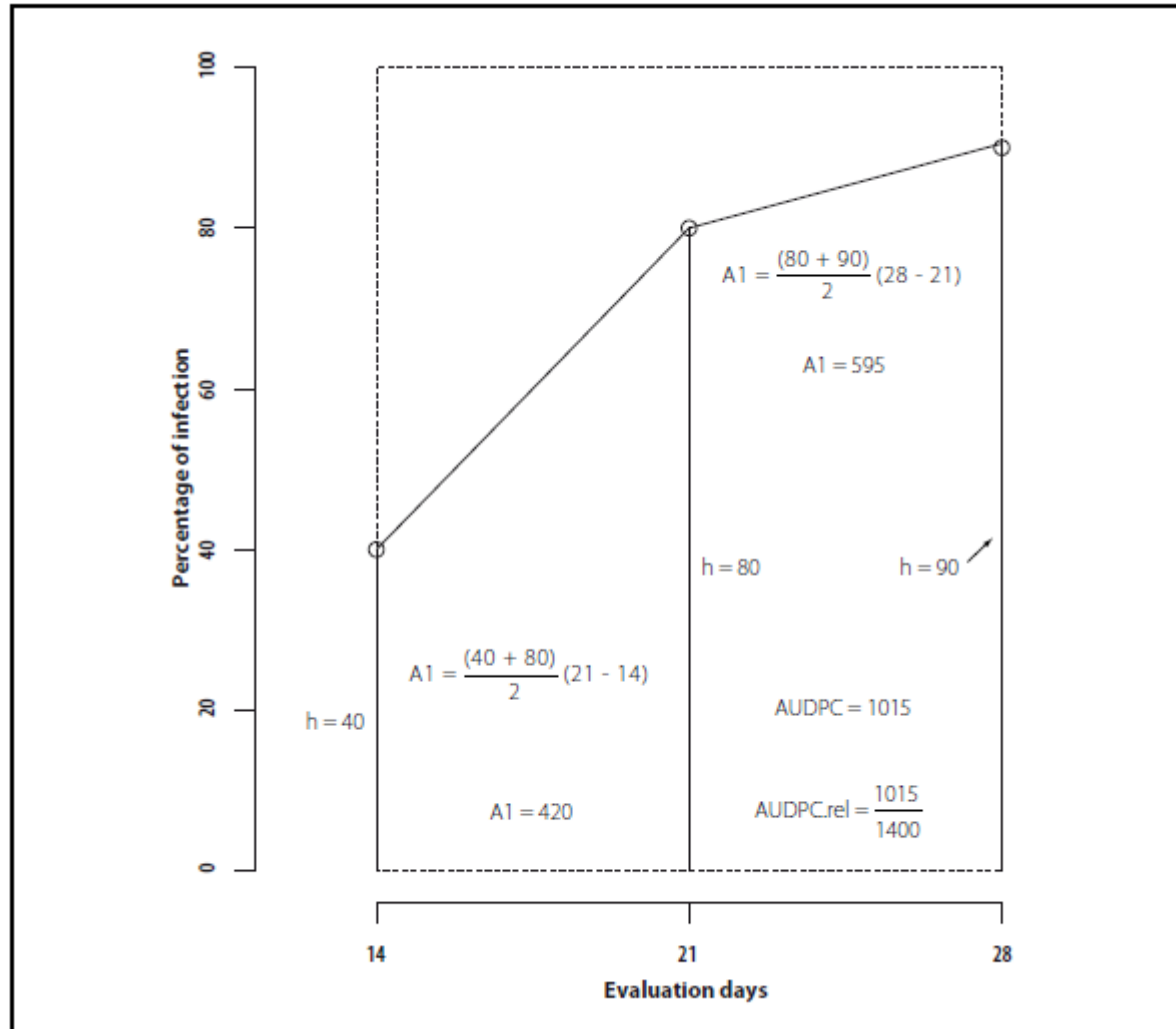
- Calculation of the roots and tubers infection index:
 - $Tubers\ index = \sum(score * nb.tubers)$
- Calculation of the rAUDPC for symptoms development on roots and tubers:

- $AUDPC = \sum_{i=1}^{i=n-1} \left(\frac{y_i + y_{i+1}}{2} \right) (t_{i+1} - t_i)$

- $rAUDPC = \frac{AUDPC}{t_{n-1} - t_1}$



rAUDPC calculation





Results: cultivar effect

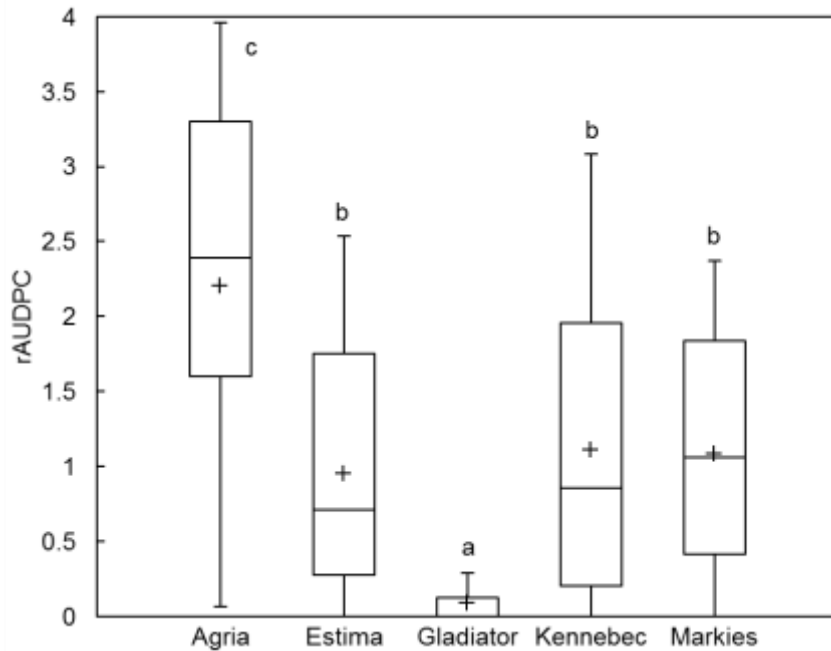


Fig. 1: cultivar effect on roots galls

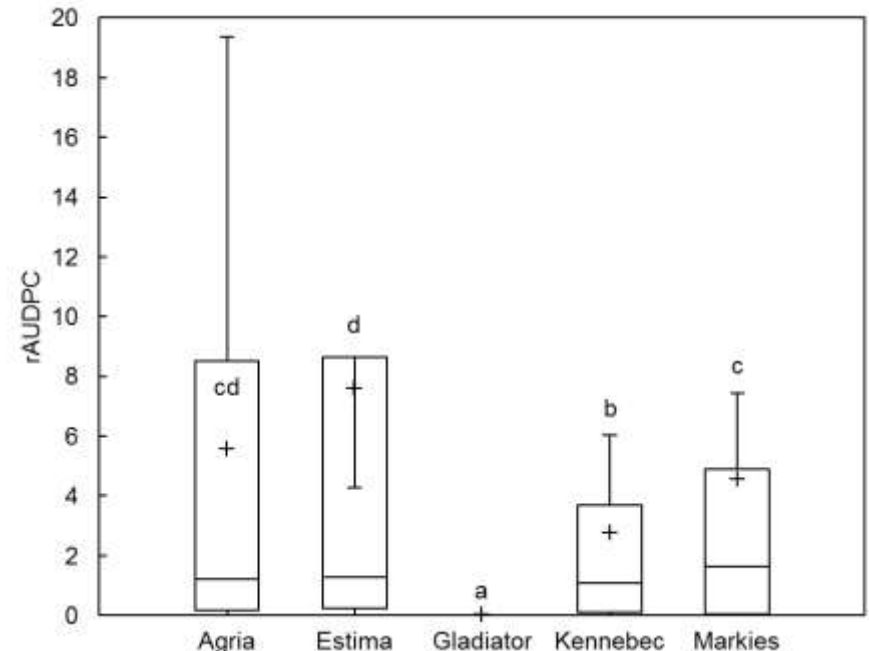


Fig. 2: cultivar effect on tubers lesions

- Cv. Agria is highly susceptible to roots galls
- No lesions on tubers for cv. Gladiator but few root galls were observed



Results: year effect

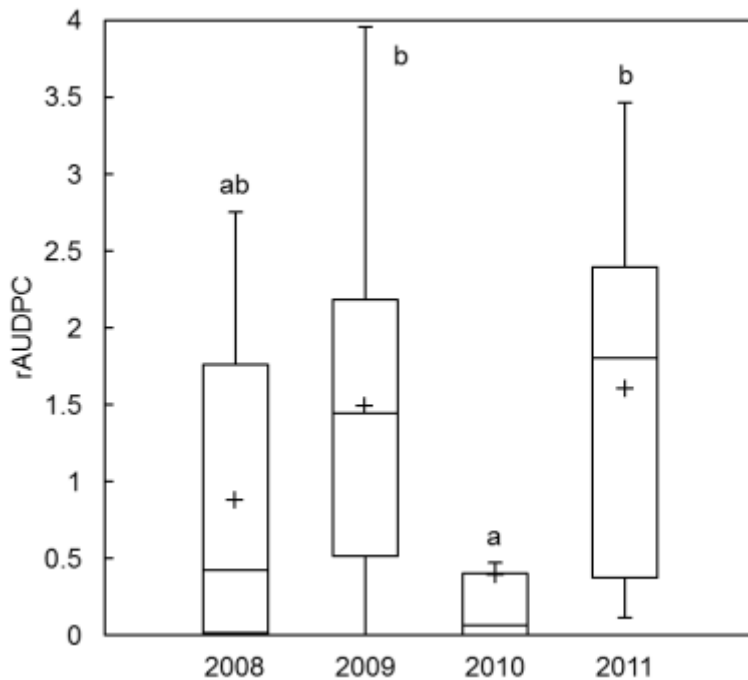


Fig. 3: year effect on roots galls

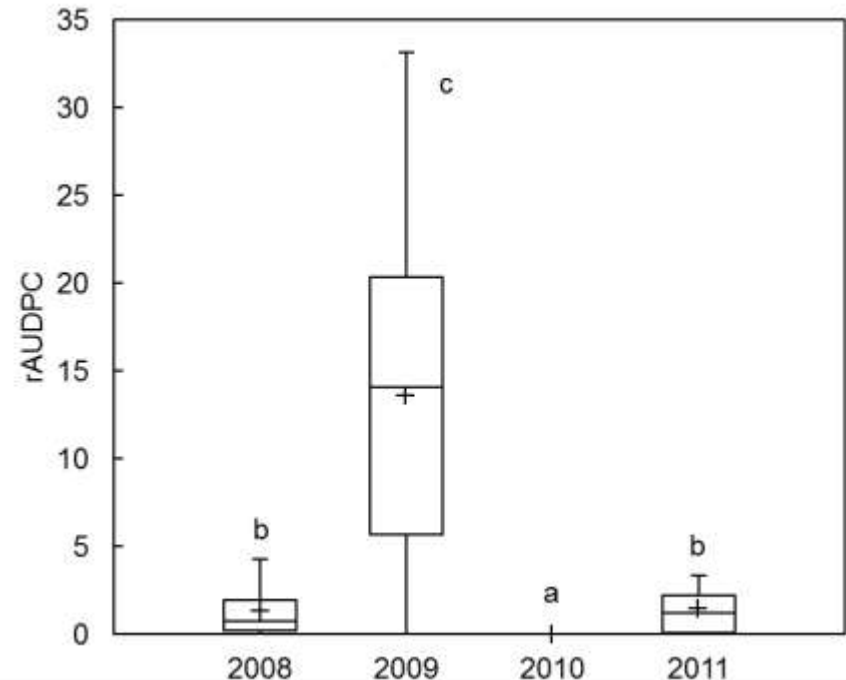


Fig. 4: year effect on tuber lesions

- Lot of roots galls in 2008;2009 and 2011 but low symptoms on tubers in 2008 and 2011
- Few root galls in 2010 and no lesions on tubers

Results: year*cultivar interaction for tuber lesions

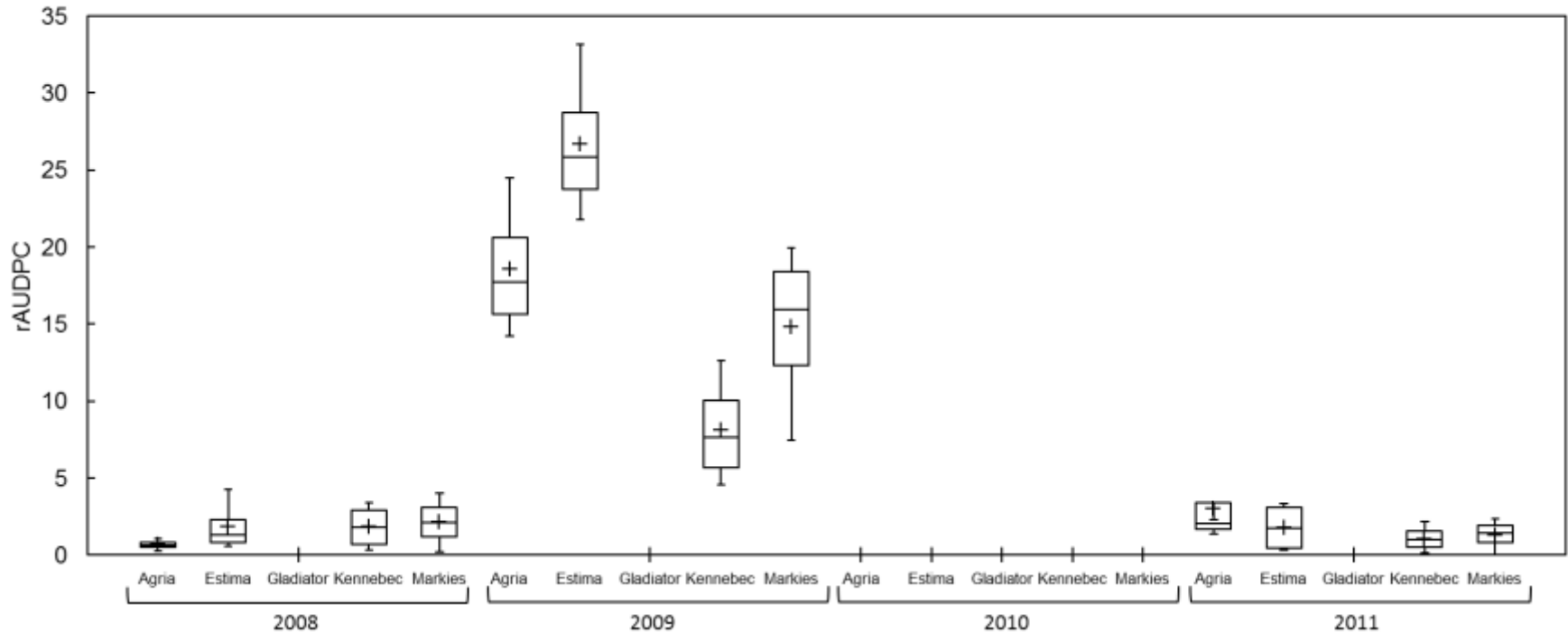


Fig. 5: interaction between year and cultivar for tuber lesions



Results: weather conditions (1)

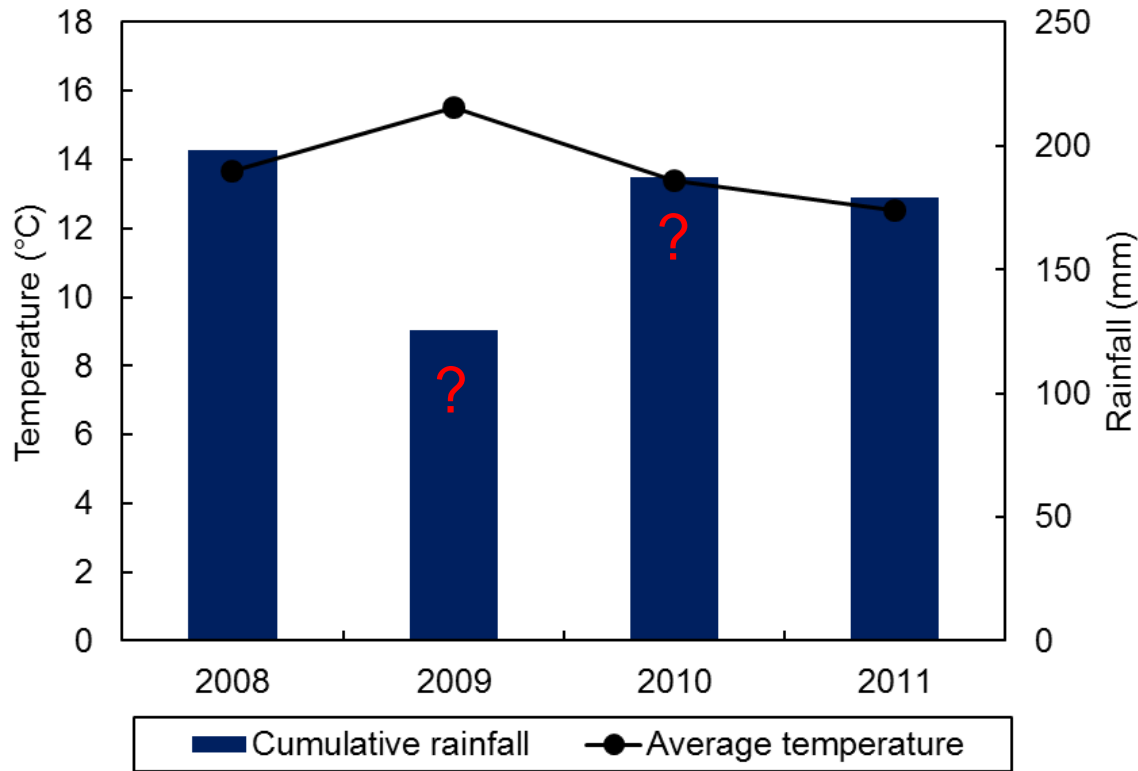


Fig. 6: Weather conditions during the sampling period

➔ Symptoms expression can not be explained by the weather conditions

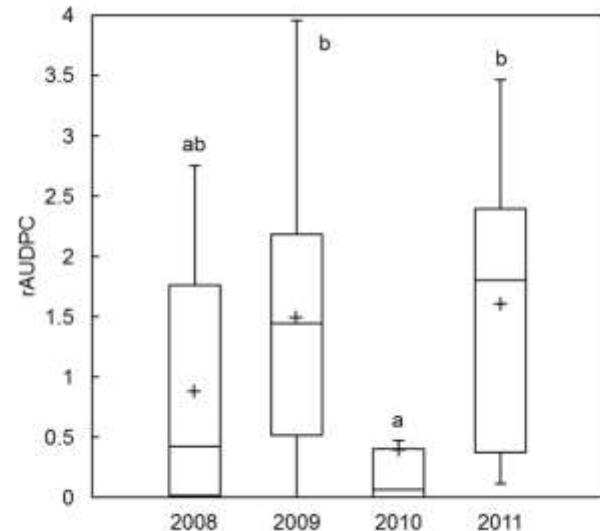


Fig. 4: year effect on roots galls

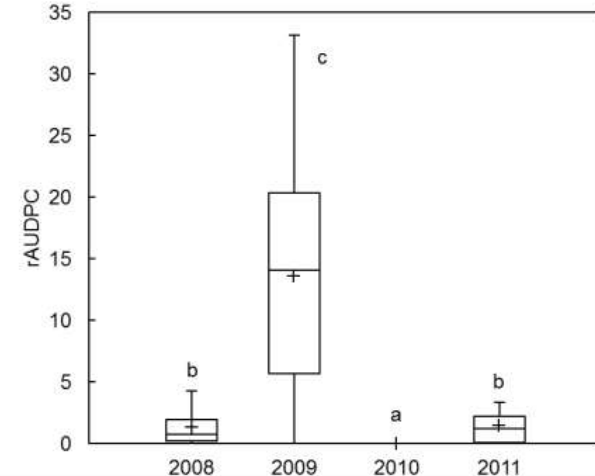


Fig. 5: year effect tuber lesions

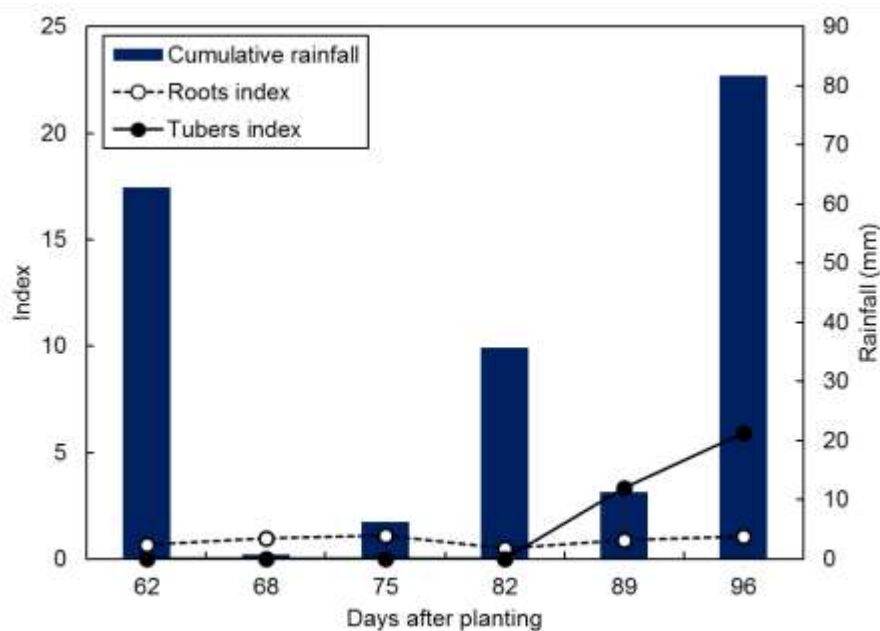


Fig. 7: evolution of infections in 2008

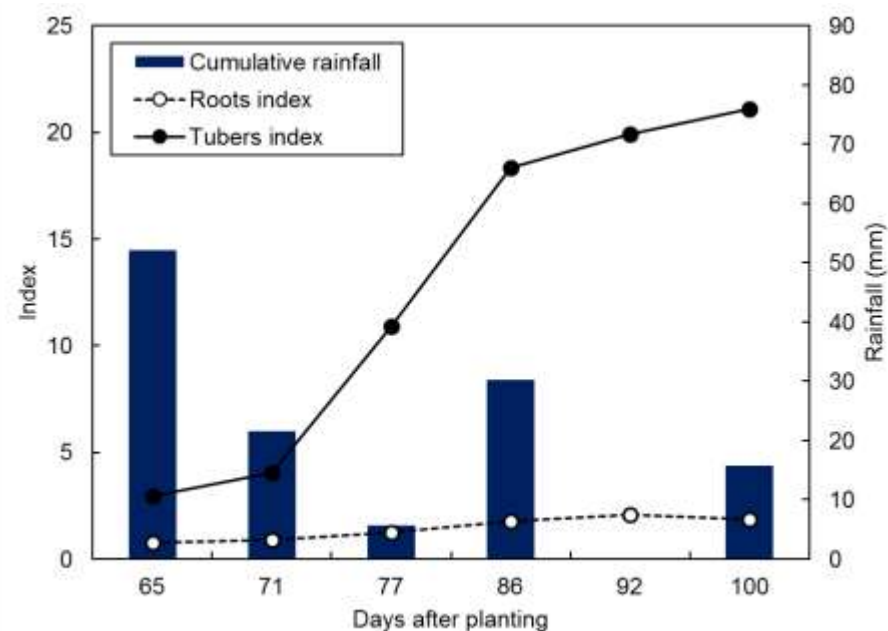


Fig. 8: evolution of infections in 2009

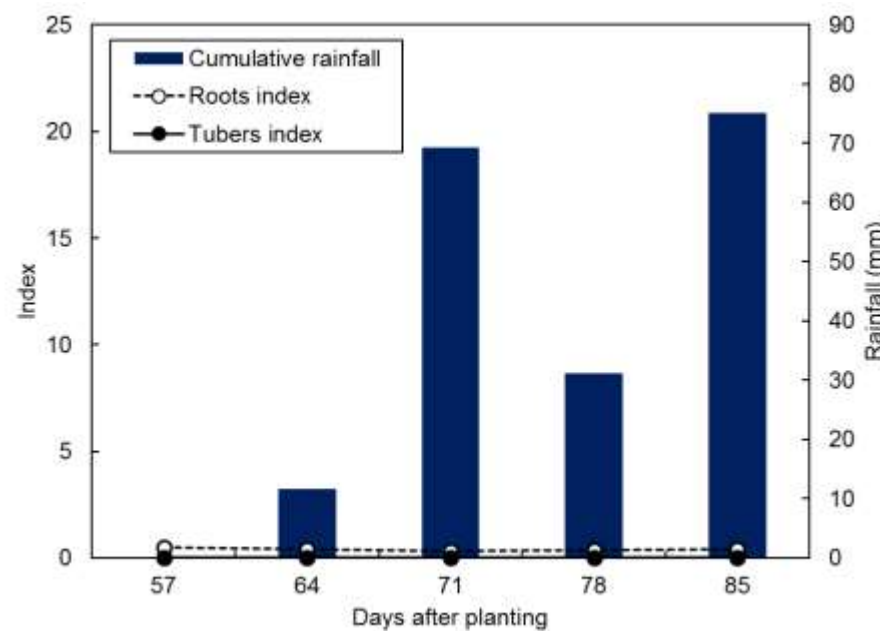


Fig. 9: evolution of infections in 2010

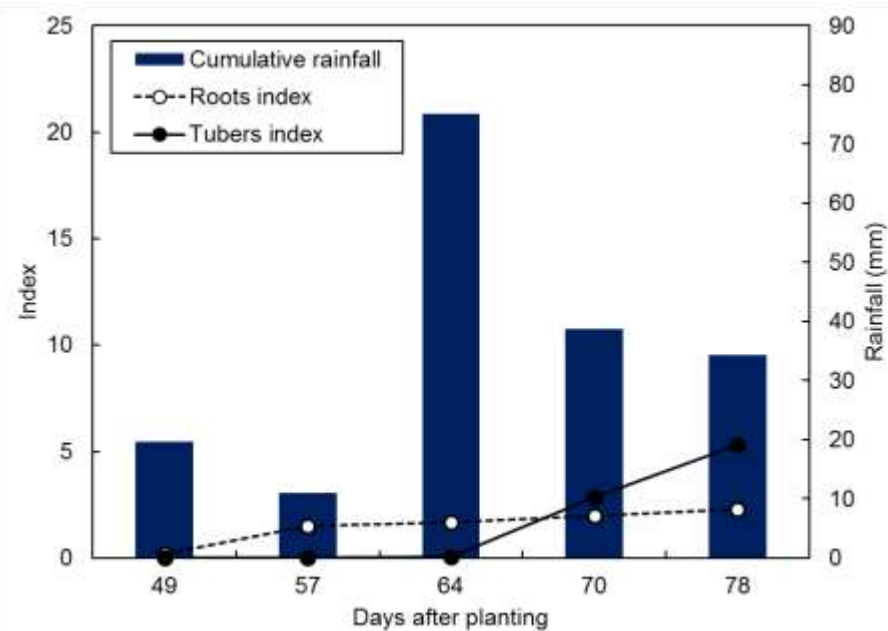


Fig. 10: evolution of infections in 2011



Results: weather conditions (3)

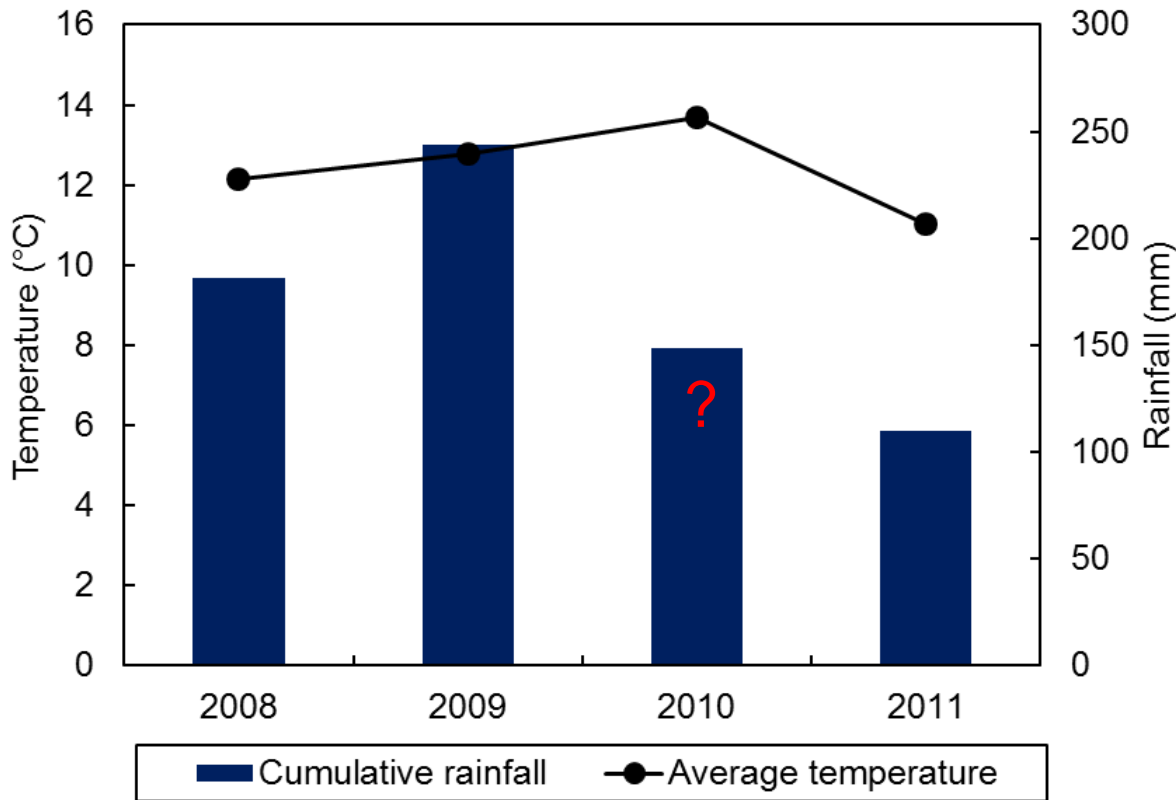


Fig. 11: Weather conditions the sampling period before (from planting until first sampling)

➔ 2010 situation is to be clarified

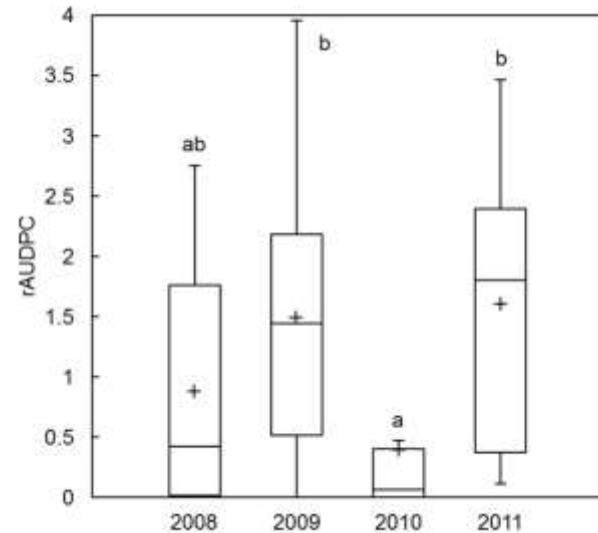


Fig. 4: year effect on roots galls

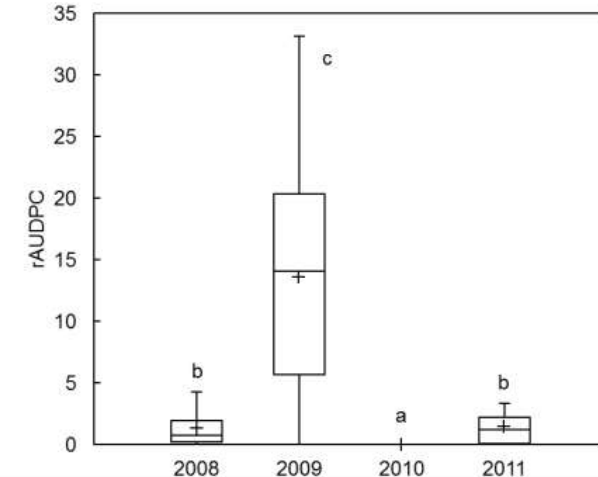


Fig. 5: year effect tuber lesions



Results: weather conditions (4)

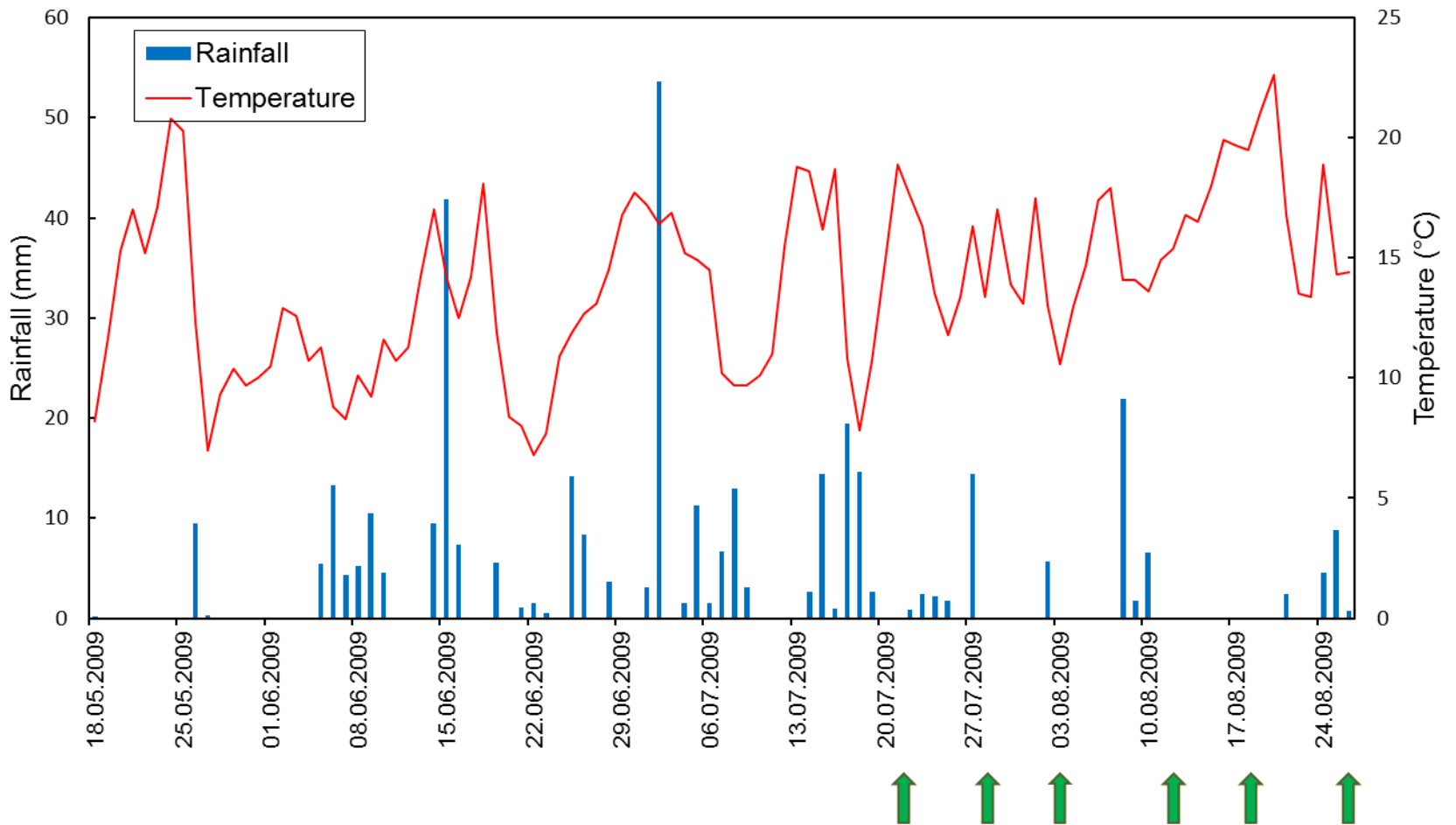


Fig. 12: Weather in 2009 during the cropping period in La Fretaz



Results: weather conditions (5)

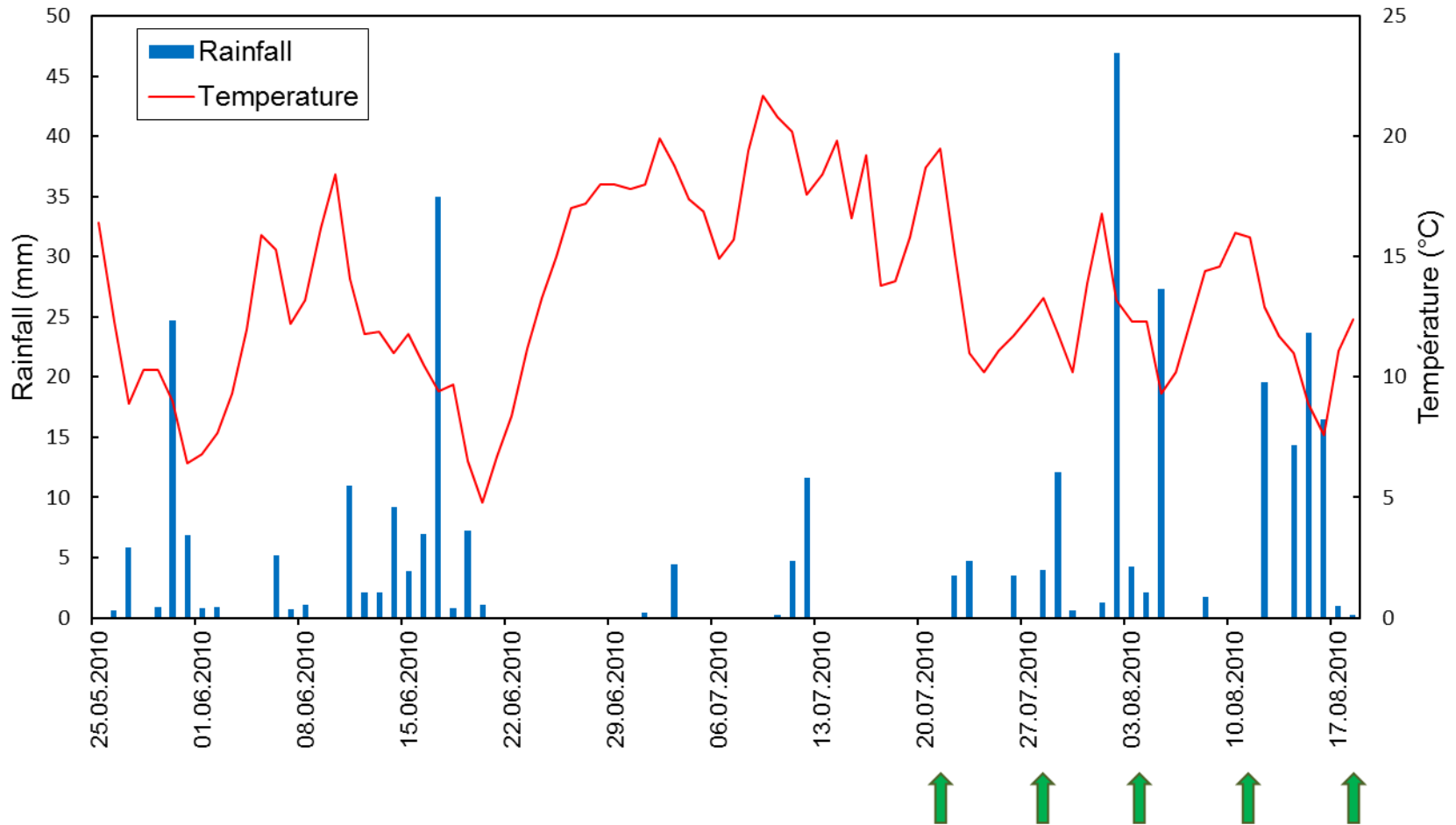
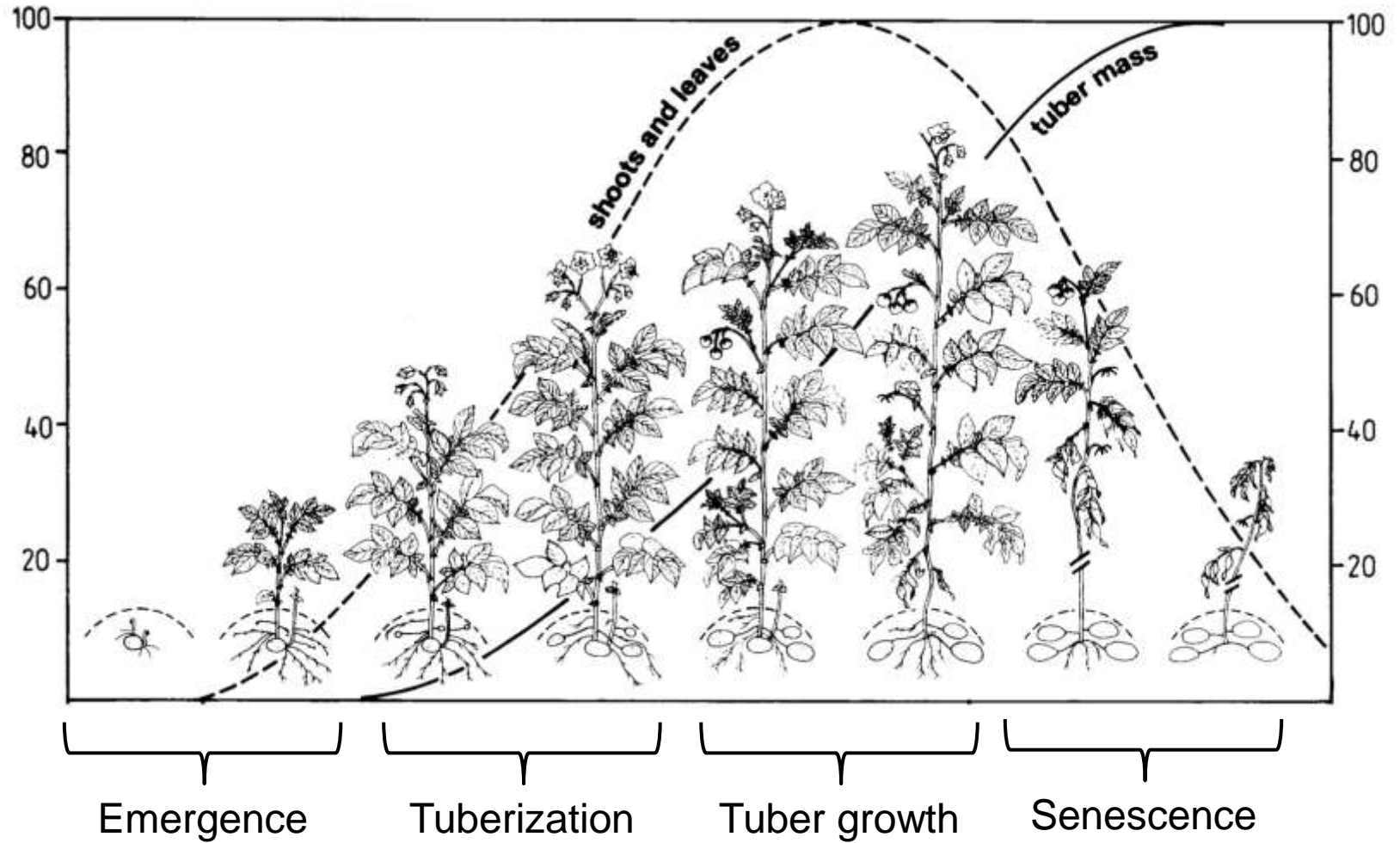


Fig. 13: Weather in 2010 during the cropping period in La Fretaz



Landmarks of potato physiology





Results: weather conditions (6)

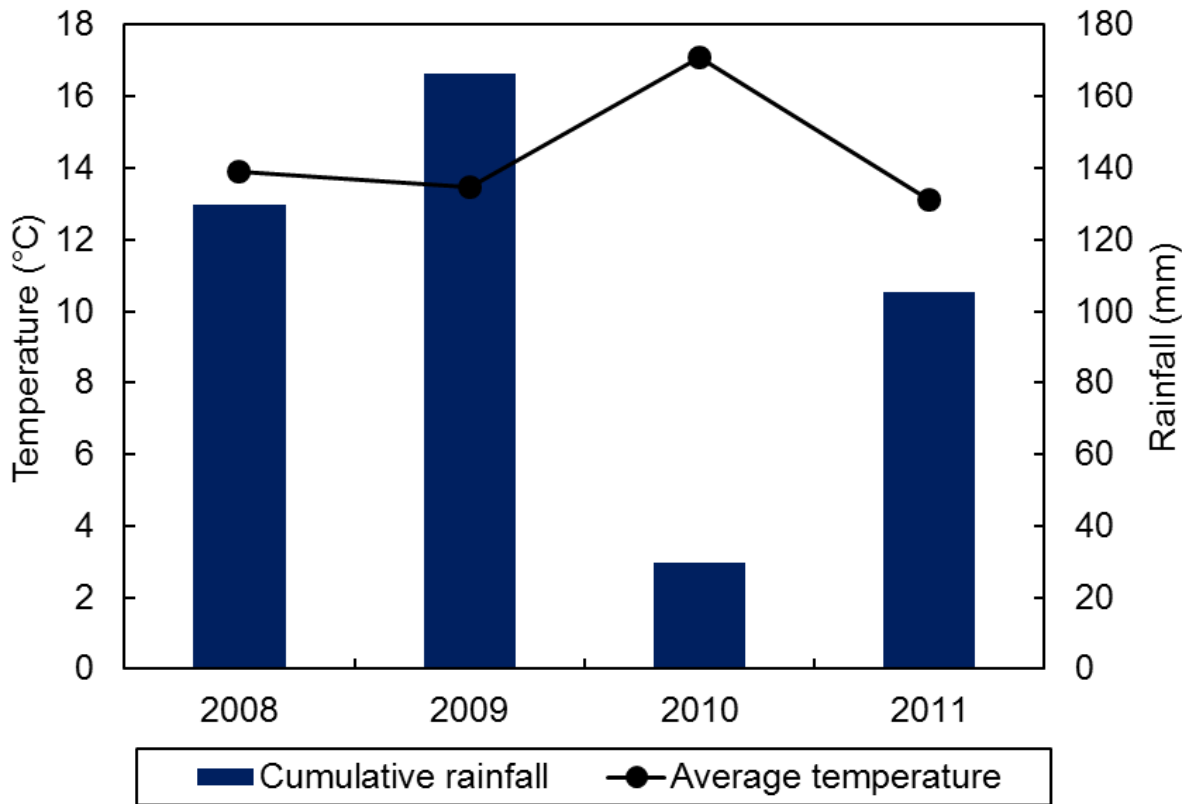


Fig. 14: Weather conditions from 30 until 60 DAP

➔ In this trial, rainfall between 30 and 60 DAP was a good indicator

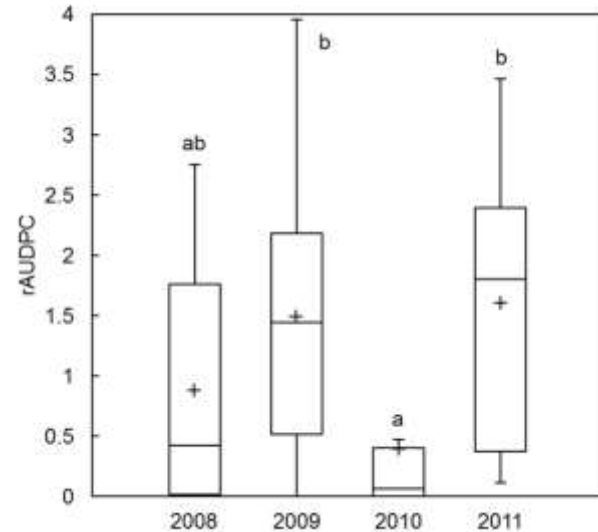


Fig. 4: year effect on roots galls

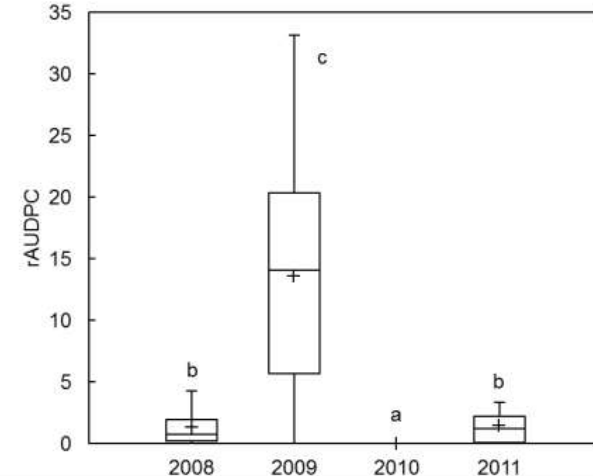


Fig. 5: year effect tuber lesions



ELISA soil samples analysis

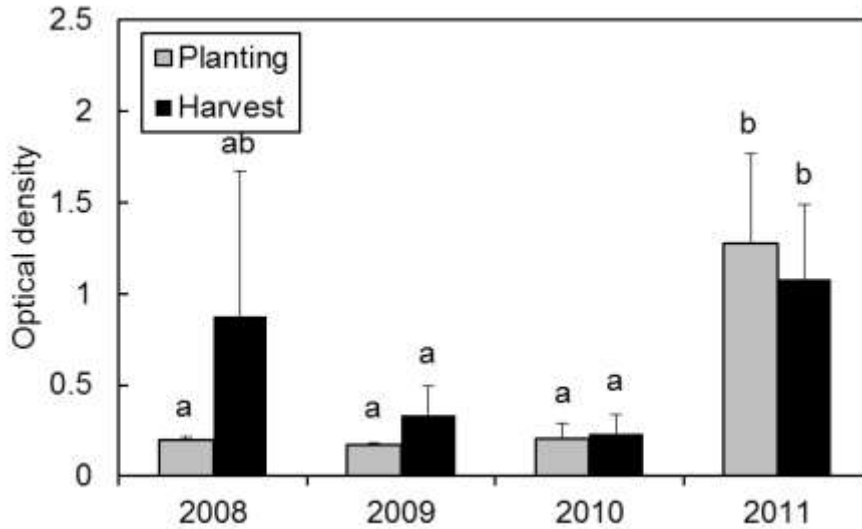


Fig. 15: year effect on OD's

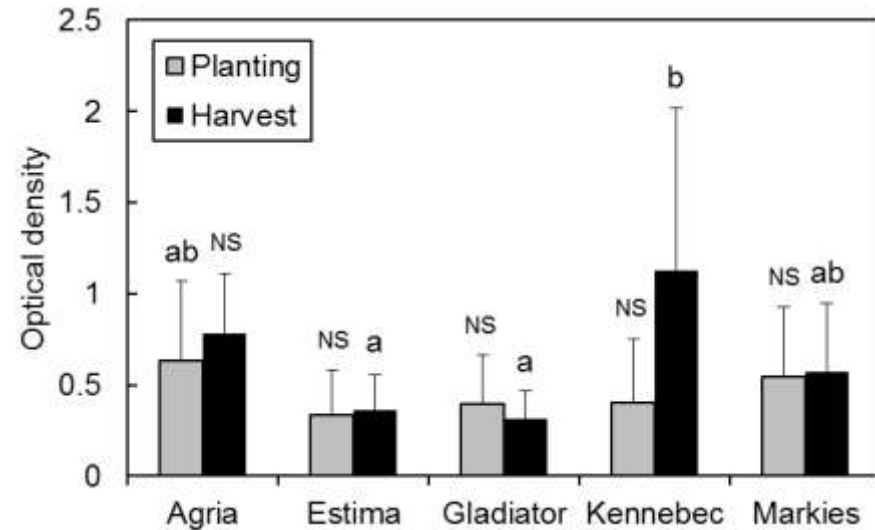


Fig. 16: cultivar effect on OD's

- OD level very low
- Method has to be improved for better sensitivity



Conclusions for discussion

- There is no strict relationship between roots galls and tuber symptoms.
- Weather conditions during initiation of tuberization could have a significant impact on tubers symptoms development.
- The DAS-ELISA method we used is not sensitive enough to forecast symptoms development.
- Need for many others field data with different agro-climatic conditions for a complete epidemiological study.



Acknowledgments

- Ruedi Schwaerzel
- Ueli Merz
- Maud Tallant
- Laurence Mader
- Louis Rousseau
- Etienne Thevoz
- Walter Herren
- Solène Pierucci
- and many others...

Thank you for your attention!

