IDENTIFYING THE KEY-STAGES OF RHIZOCTONIA SOLANI AG-3 PT EPIDEMICS: A CRUCIAL STEP IN DEVELOPING INTEGRATED CONTROL STRATEGIES

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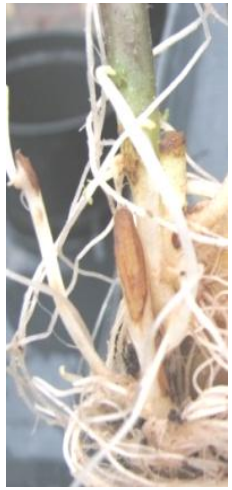
CASDAR

The aims of the study

- **I.** To describe the disease progress curves on different potato organs from planting until harvest & to provide overall picture of the disease complex
- **II.** To characterize the epidemiological traits of the pathogen
  - infection rate and its modulation by T° and plant age
  - disease spread within plants

INTRODUCTION
Diversity in symptoms on potatoes

Early sprout cutting



Stem and stolon canker

Corky blemishes

Black scurf

INTRODUCTION
Diversity of *R. solani* isolates in France

Different AGs of *R. solani* isolated from potatoes in France (2009-2011)

	Number of isolates per AG		
Geographical origin	**AG 3 PT**	**AG 5**	**AG 2-1**
Brittany			
Finistère	148	-	10
Morbihan	16	-	-
Côtes-d'Armor	3	-	-
Other origins			
Pas-de-Calais	43	-	-
Somme	10	-	-
Eure	3	-	-
Eure-et-Loir	1	-	-
Loiret	2	5	-
Total	226	5	10

(Fiers *et al*, 2012)

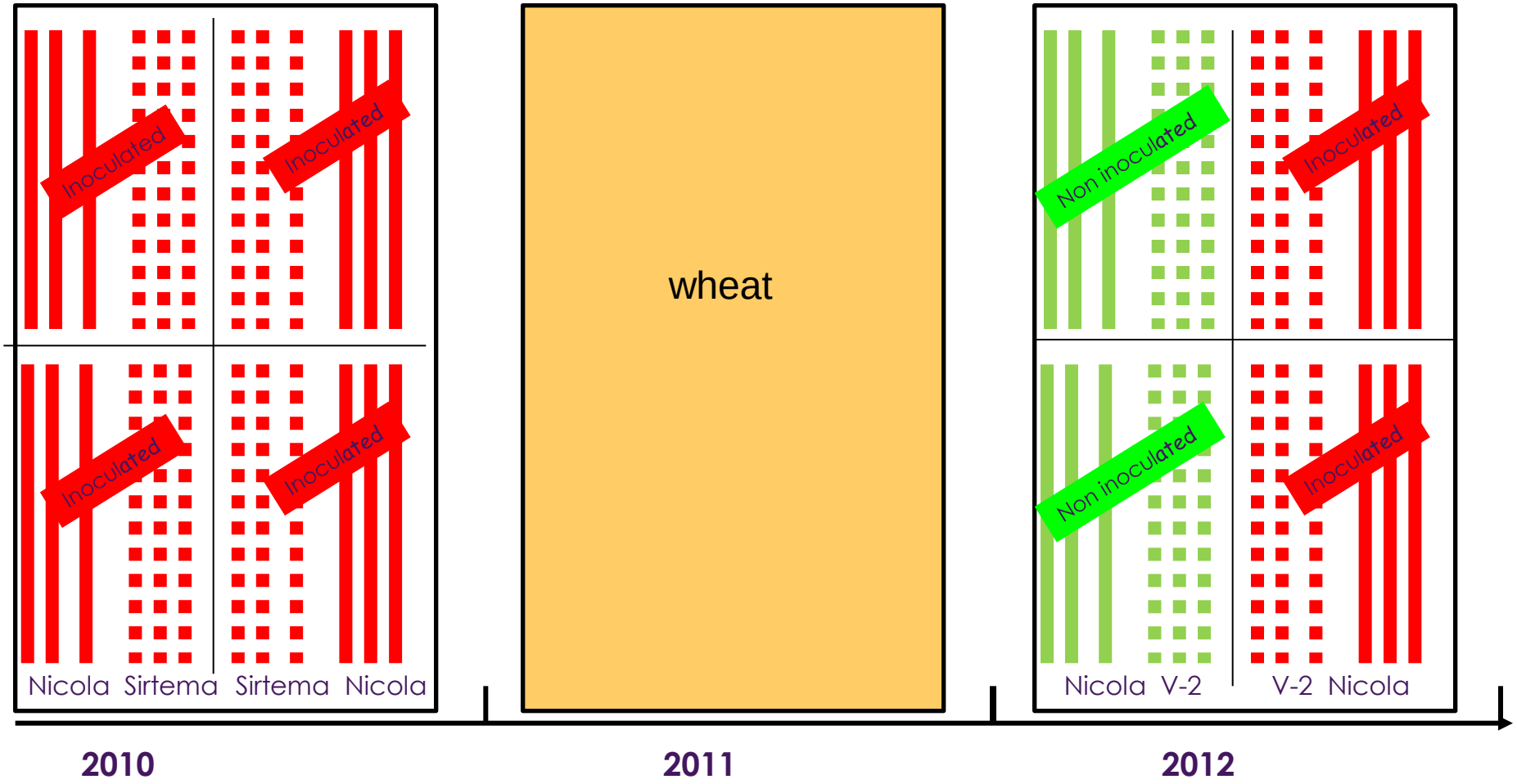
I. Monitoring the kinetics of symptoms development in the field

Important items of materials & methods

- The soil was inoculated with infested barley seeds by *R. solani* AG3 PT
  - 3 grams of contaminated barley around each seed tuber
- 2 potato varieties considered as susceptible (Nicola) and less susceptible (Sirtema or V2)
- Randomized blocks with 4 repetitions
- Plants were harvested sequentially at weekly intervals
  - 24 plants were harvested/variety/sampling date
  - Plants were scored visually for :
    - stem and stolon cankers,
    - corky blemishes and black scurf on daughter tubers
    - incidence and severity were calculated

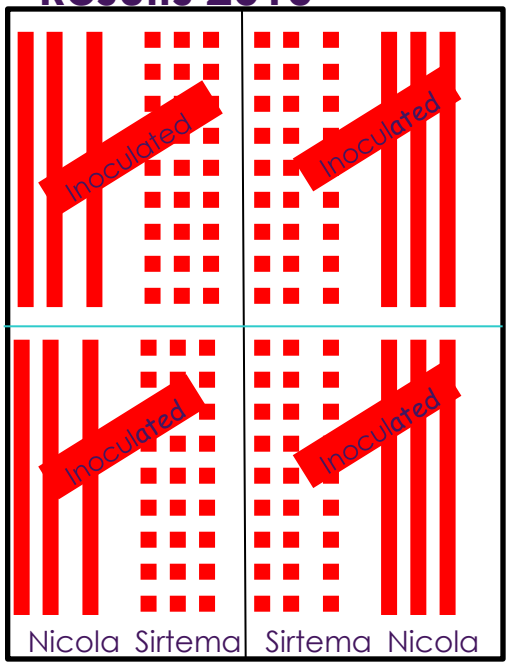
Monitoring the kinetics of symptoms development: field experiments

Experimental design 2010 - 2012

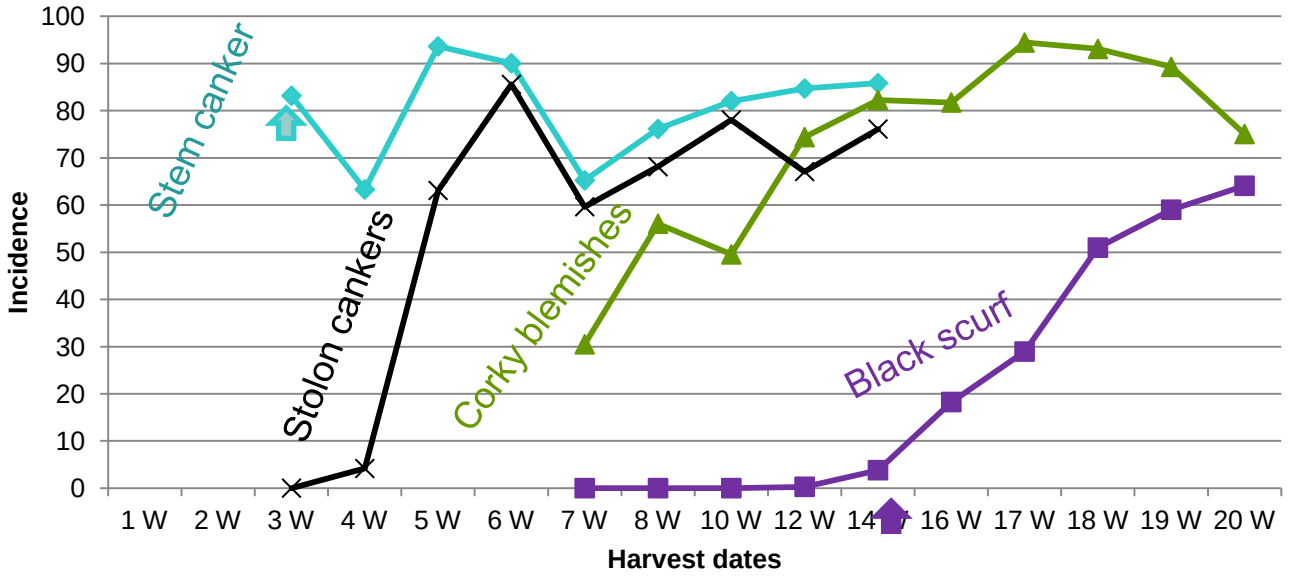


Monitoring the kinetics of symptoms development: field experiments

Results 2010



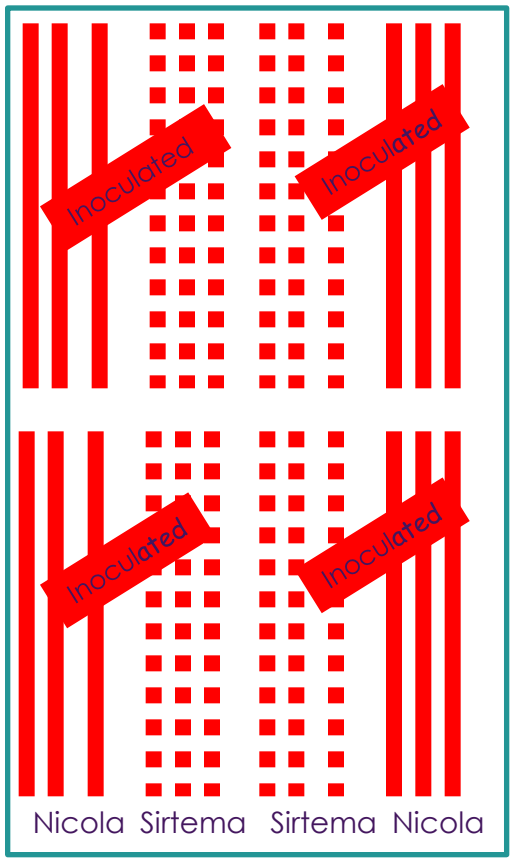
Disease progress curves on different organs of susceptible variety Nicola

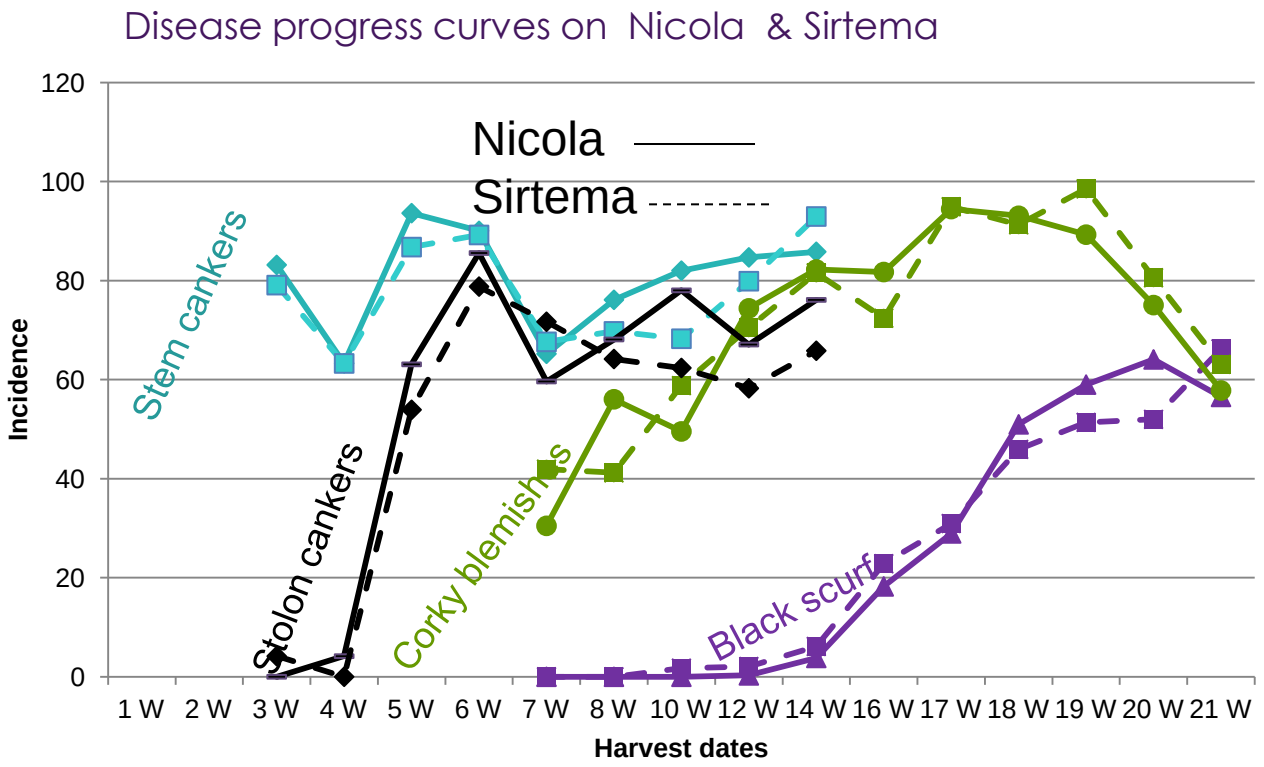


- **Stem canker :** high incidence was observed at emergence
- **The stolons** became diseased just after their formation (3 weeks after planting)
- **Corky blemishes** appeared at tuber initiation, their incidence increased over time
- **Sclerotia** , appeared at the end of the vegetation period and as expected, their incidence and severity increased fast after haulm destruction.

Monitoring the kinetics of symptoms development: on two varieties

Results 2010

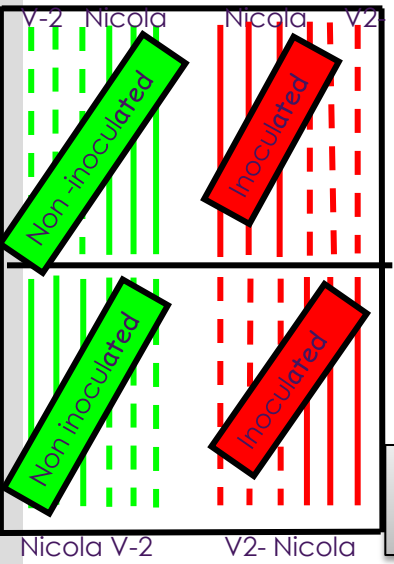




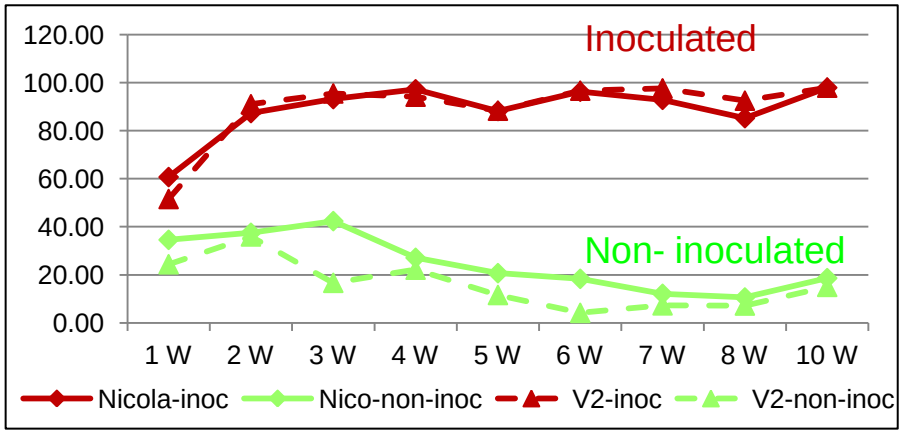
- The disease progress curves of different symptoms are similar on the two varieties

Monitoring the kinetics of symptoms development: with different inoculum levels

Results 2012

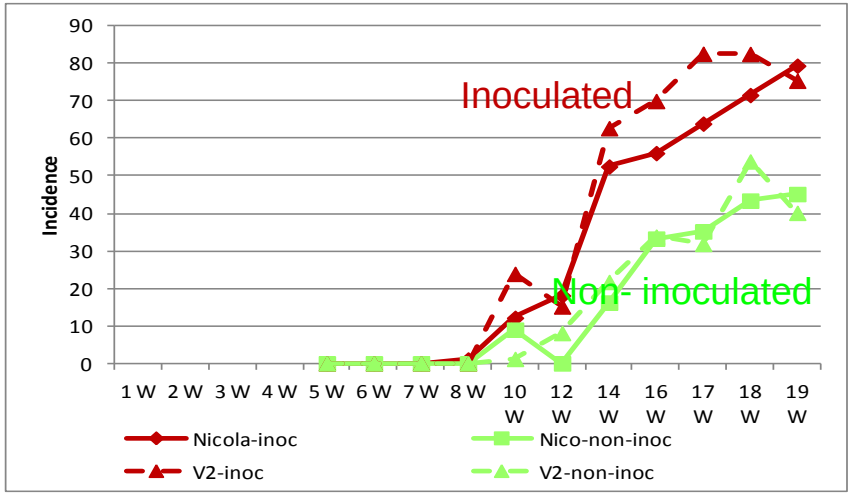


1. Incidence of stem canker over time

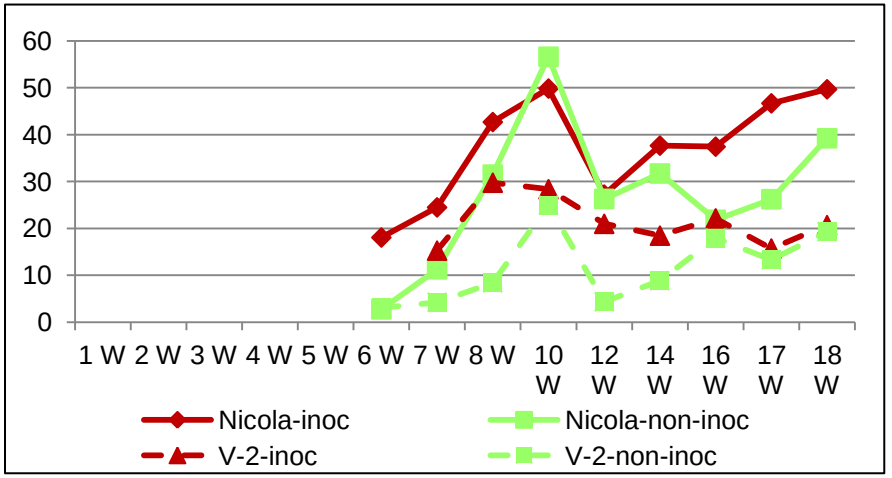


➢ Effect of level of soil inoculum on the development of stem cankers and black scurf, the two varieties behave the same

2. Incidence of black scurf over time



3. Incidence of corky blemishes over time



II. Assessment of epidemiological traits of *R. solani AG-3* PT under controlled conditions

- The effect of temperature and plant age on the rate of infection
- The disease spread within and between plants

Effect of the temperature on pathogen infection and on the fungus growth

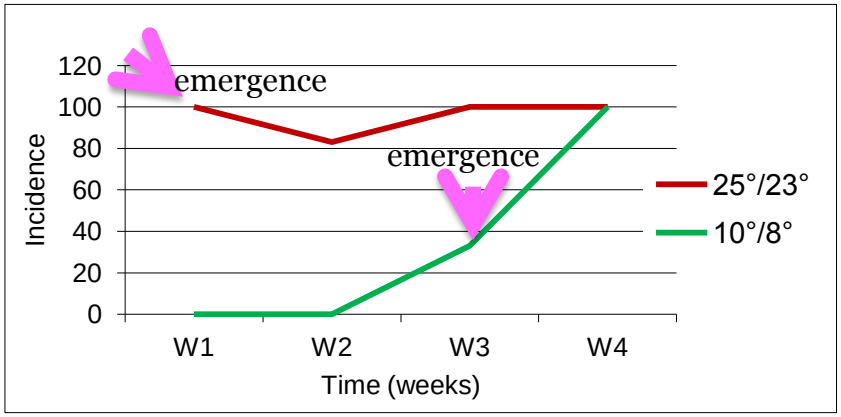
The main elements of Materials & Methods

In growth chambers : seed tubers planted in infested soil and pots were put to growth at different temperatures

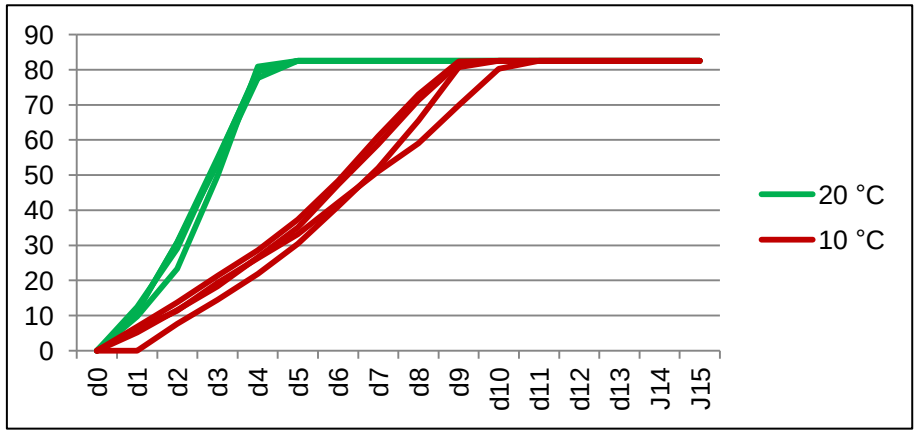
Growth in-vitro: Petrie dishes with mycelium plug placed in different T°, the mycelial growth recorded

Results

1.Effect of the T° on the incidence of stem canker



2. Effect of the T° on the AG-3 growth *in-vitro*



- Temperature affects the plant development and he fungus growth
- Black scurf on daughter tubers was observed in all temperatures tested but high incidence and severity were obtained at 18/20°C (data not shown)

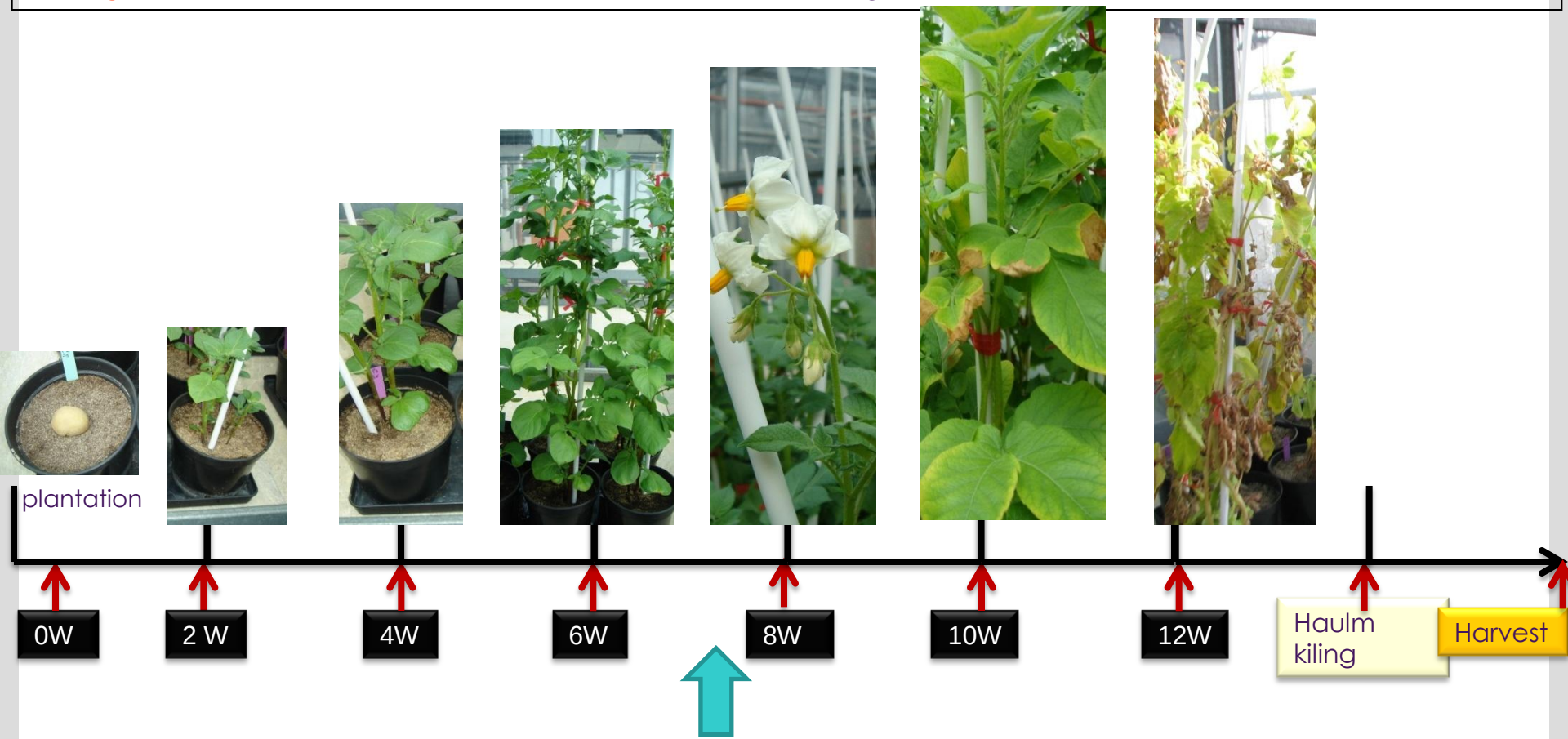
Effect of the plant age on infection

The main elements of Materiel & Methods

Inoculum: contaminated millet grain

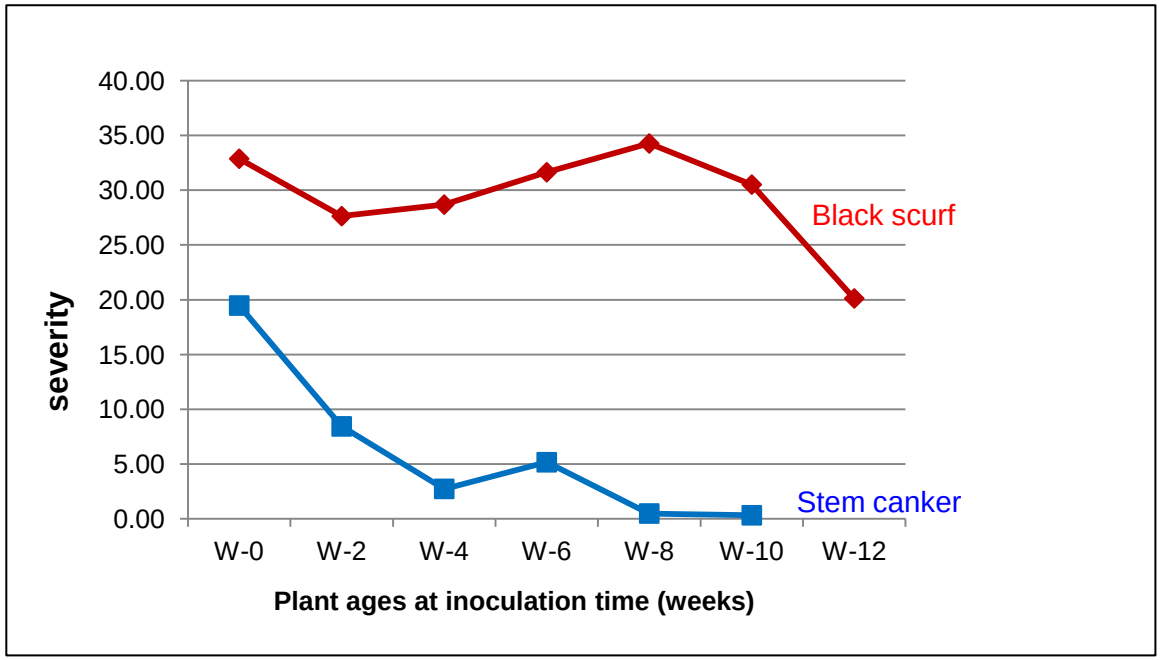
Inoculation : at different ages of the plant

Scoring : incidence et severity of stem cankers, black scurf on daughter tubers at harvest



Inoculation at different ages of the plant

Effect of plant age on stem and tuber infections



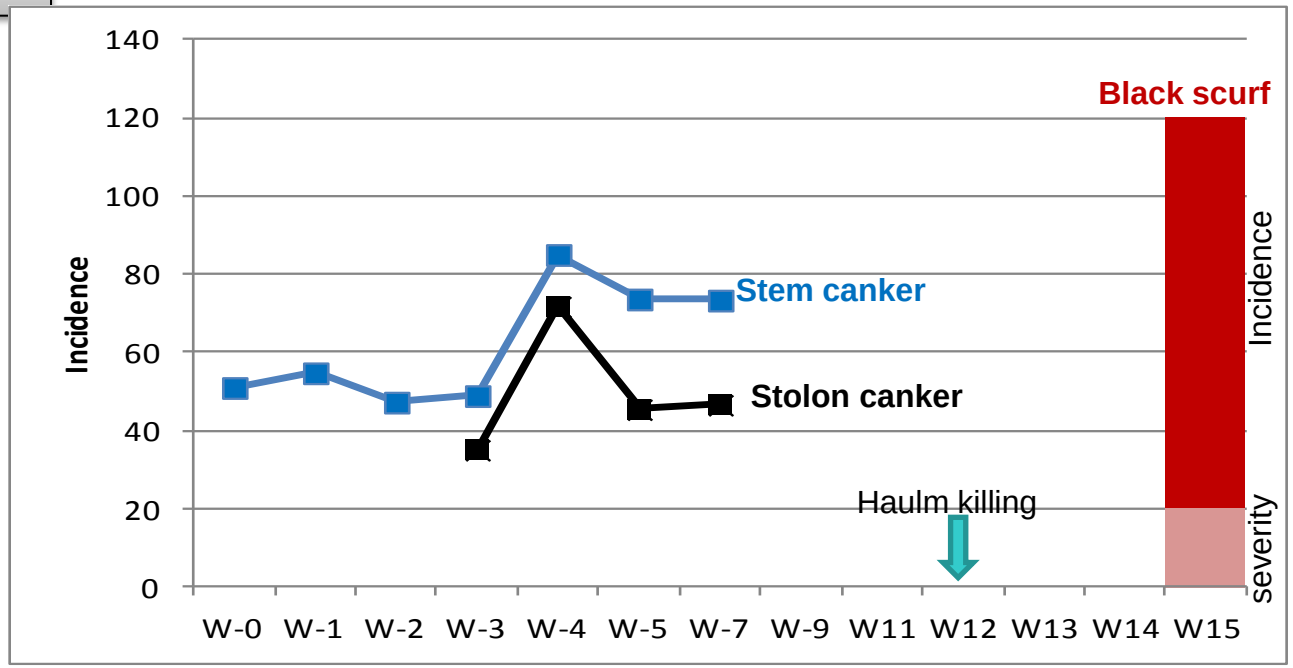
- The severity of stem cankers decreased with plant age
- The severity of black scurf on daughter tubers was high whatever the inoculation date

The disease spread within plant

The main elements of Materials & Methods

- Contaminated tubers were harvested from field experiment two weeks after plantation
- Tubers were washed and transplanted into pots filled with sterile soil mixture (sand and peat)
- The different symptoms were scored over time

Results



- Soil inoculum produce the primary infection which initiate the disease
- Secondary inoculum plays an important role on disease spread between potato organs

Conclusion

I. The main epidemiological traits of *R. solani*

- Different sources can transmit the pathogen
- Potato is susceptible in all its life cycle & all its organs are sensitive
- Susceptibility of cultivated varieties
- A wide range of temperatures are conducive to *R. solani* diseases
- Spread of the disease within and between plants

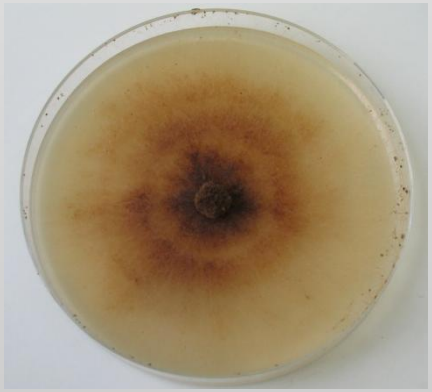
II. Development of integrated control strategies, but before we need to :

- understand the mode of action of existing and or/ innovative methods
- Know how to combine them (complementary, additive, compatible methods)
- Design and experiment integrated itineraries in different production systems

III. How we may deal with corky blemishes?

- Difficulties for isolating the pathogen(s)
- Difficulties in reproducing symptoms
- Different causes but similarity in symptoms



Thank you !