



# Mapping of Fusarium root rot QTL in pea

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# Fusarium root rot

## Roza Fusarium nursery



## Problem in pea production

- ▶ Several species
- ▶ *Fusarium solani* f.sp. *pisi*
  - ▶ US
  - ▶ Canada
  - ▶ New Zealand
- ▶ Solution: genetic resistance
- ▶ Quantitative: high levels of partial resistance

# QTL experiment: Baccara x PI 180693 recombinant inbred population (178 RILs)

## Phenotyping



## Greenhouse inoculations

- ▶ 3 *Fsp* isolates
- ▶ Two treatments
  - ▶ Inoculated at planting
  - ▶ Non-inoculated
- ▶ 4 replicates/genotype
- ▶ Measurements:
  - ▶ Root disease severity (0-6)
  - ▶ Plant height, inoculated % of control
  - ▶ Root/shoot dry weight



# QTL analysis



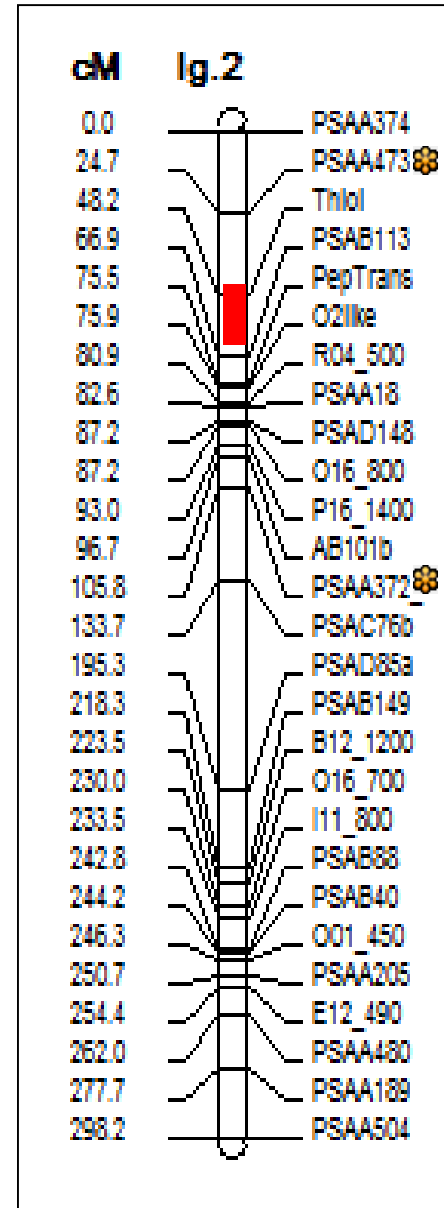
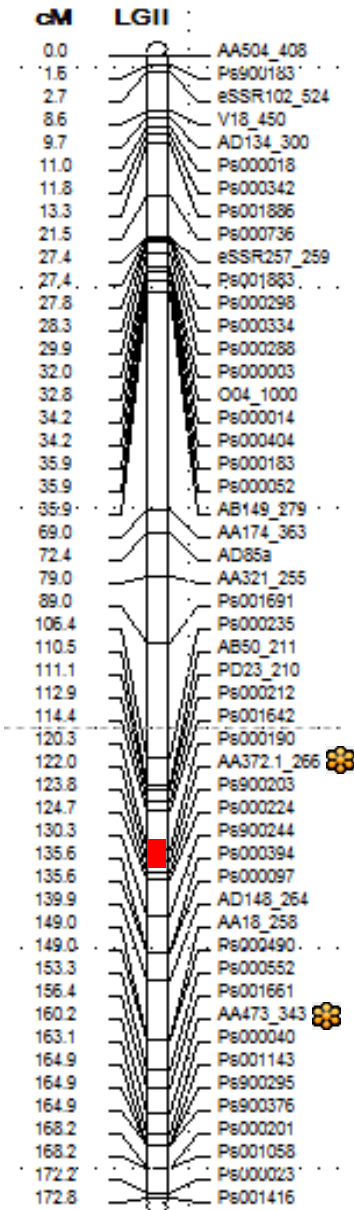
- ▶ Composite interval mapping
  - ▶ QTL Cartographer
    - ▶ Forward and backward regression
  - ▶ Two traits
  - ▶ Root rot disease severity
  - ▶ Inoculated plant height as % of non-inoculated
  - ▶ 915 SNP/SSR/morpho markers
  - ▶ Fine mapping next

# Comparative mapping, preliminary results

DSP x 90-2131 (Plant Breeding 134:446)			Baccara x PI 180693		
	LOD	R <sup>2</sup>		LOD	R <sup>2</sup>
<i>Fsp-Ps2.1</i>	11.1	72.2	<i>Fsp-Ps2.1</i>	32.4	53.8
<i>Fsp-Ps3.1</i>	3.6	9.9			
			<i>Fsp-Ps3.2</i>	3.1	3.8
<i>Fsp-Ps4.1</i>	3.4	9.6			
<i>Fsp-Ps6.1</i>	4.5	17.3			
<i>Fsp-Ps7.1</i>	3.3	8.7	<i>Fsp-Ps7.1</i>	2.8	2.9

# Comparative mapping, 2 RIL populations

Baccara x PI 180693  
Greenhouse study  
178 RILs  
915 markers



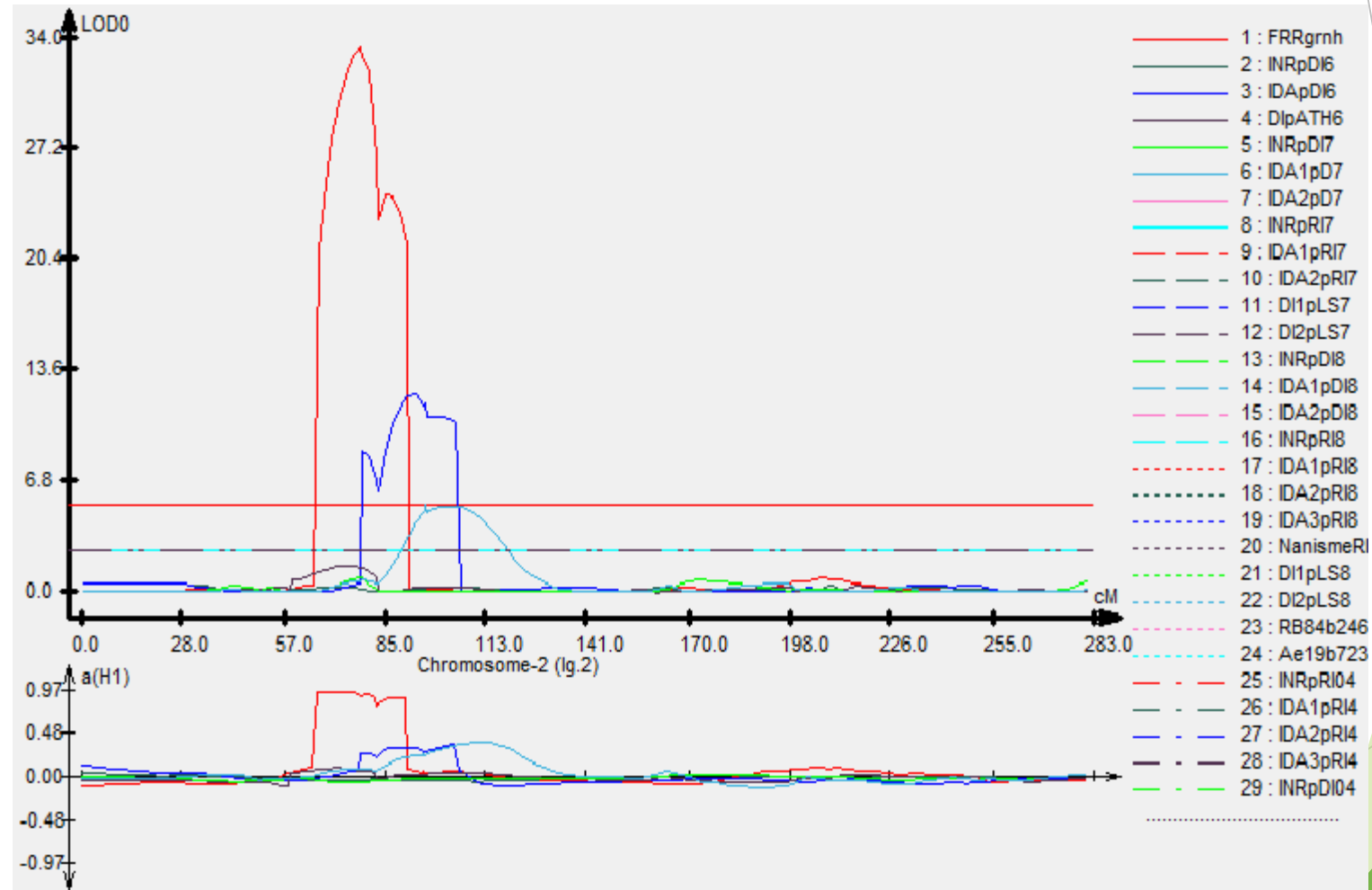
DSP x 90-2131  
Field study  
111 RILs  
168 markers

# Colocalize with Aphanomyces QTL (Hamon et al. 2001)

## Baccara x PI 180693

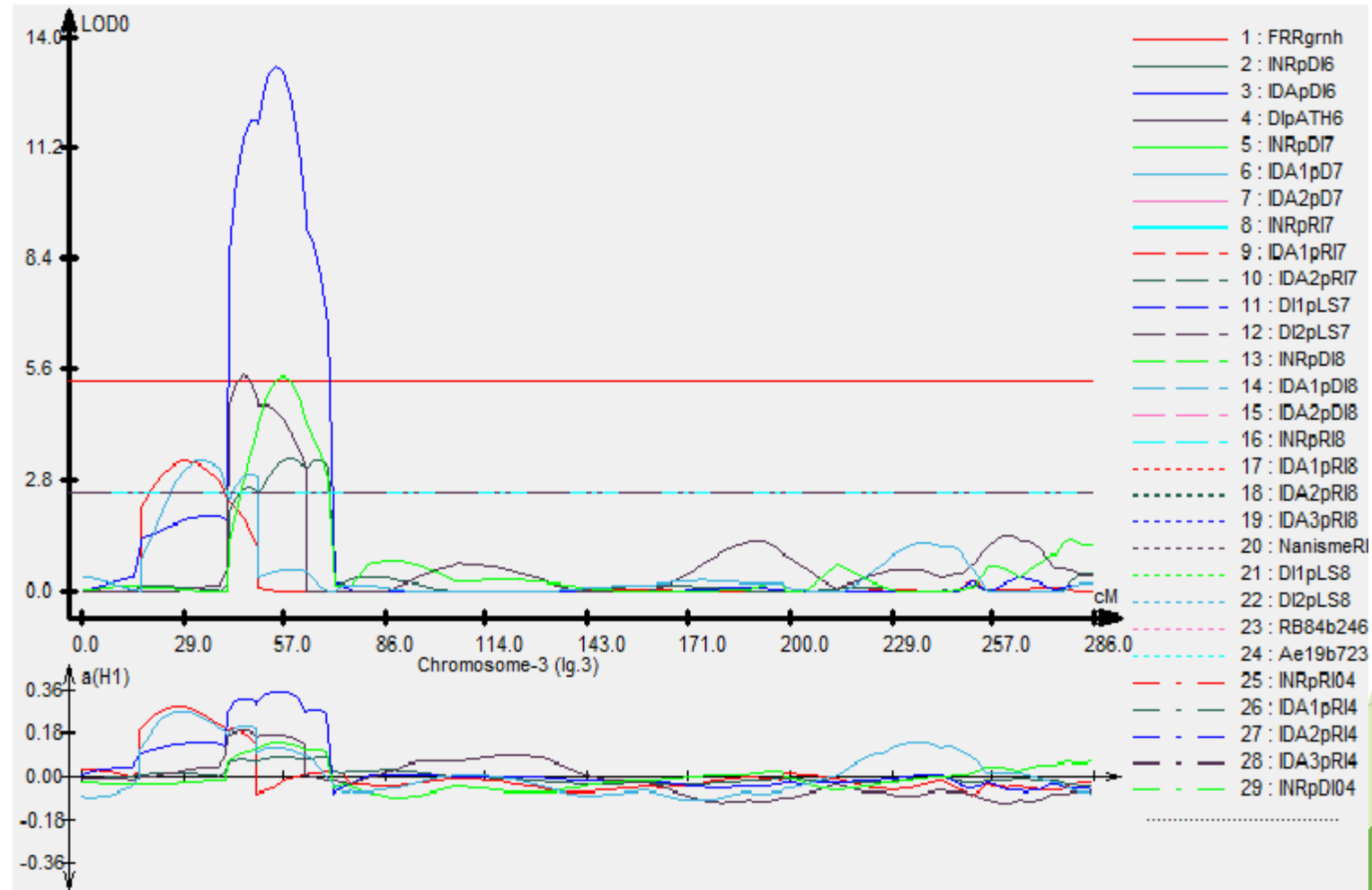
	<b>LOD</b>	<b>R<sup>2</sup></b>
<i>Fsp-Ps2.1</i>	32.4	53.8
<i>Fsp-Ps3.2</i>	3.1	3.8
<i>Fsp-Ps7.1</i>	2.8	2.9

# Overlapping QTL *Fsp-Ps2.1* and *Ae-Ps2.2*



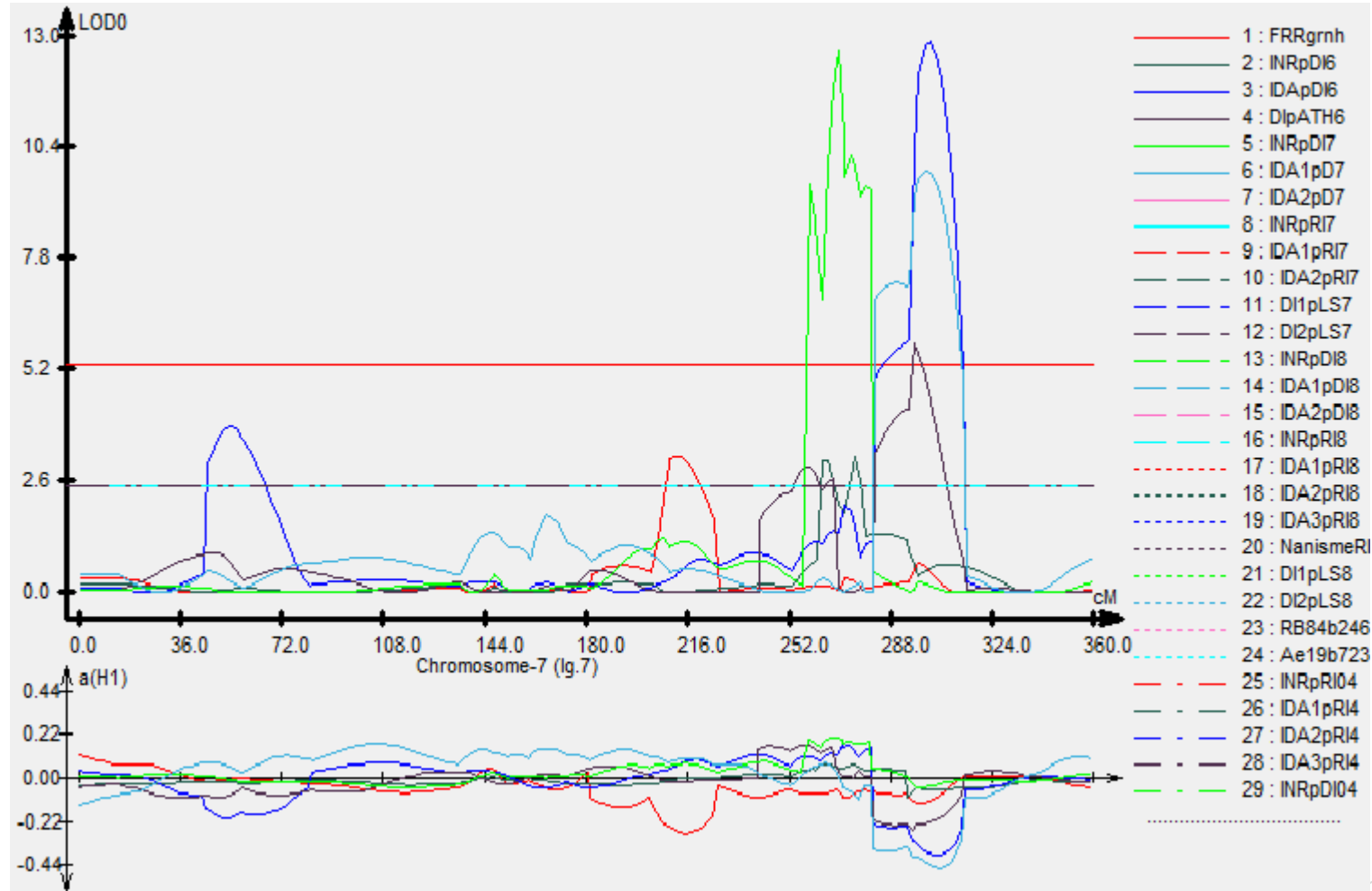


# LGIII: *Fsp-Ps 3.1* adjacent to *Ae-Ps 3.1*



LGVII: *Fsp-Ps 7.1* ( $R^2$  2.9%) separate QTL *Ae-Ps 7.6a* (Bacarra x PI 180693) but overlap in DSP x 90-2131)

\*\*  $R^2$  39% Feng et al 2011



# Future

- ▶ KASPar markers
- ▶ Fine mapping with SNPs