Rhynchosporium secalis

resistance in barley –

from mapping

to marker development

and pre-breeding material

Kerstin Hofmann
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LfL Pflanzenbau

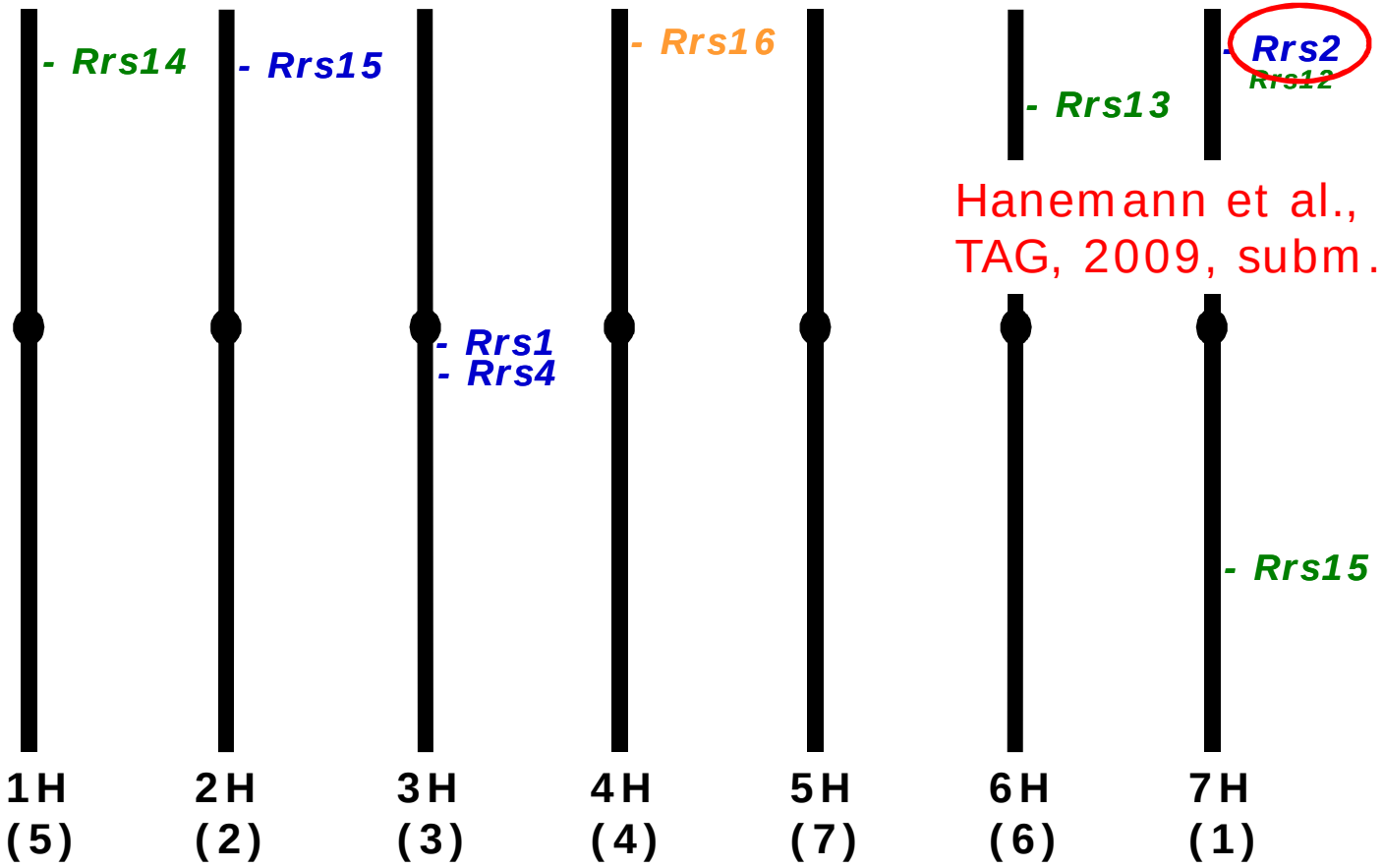
Rhynchosporium secalis

- ***R. secalis*** is the causal agent of leaf scald and a common disease in nearly all barley growing regions over the world
- Consequences: yield loss and impaired quality of grains
- ***R. secalis*** is characterized by an extensive genetic variability, a moderate gene flow and regular recombination events (Xi et al., Mc Donald et al.)

➢ Combination of different resistance loci for durable resistance

Consensus map of identified resistance genes

Overview of identified resistance genes against scald



■ = from H. bulbosum
■ = from H. spontaneum

Rrs1 = Barua et al. 1993, Penner et al. 1996, Graner et al. 1996, Williams et al. 1999
Rrs2 = Schweizer et al. 1995, 2000, 2004
Rrs4 = Patil et al. 2003
Rrs12 = Yun et al. 2005
Rrs13 = Abbott et al. 1995
Rrs14 = Garvin et al. 1997
Rrs15 = Genger et al. 2003, 2005
Rrs15 = Schweizer et al. 2004
Rrs16 = Pickering et al. 2006

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Scald at the LfL

- Schweizer et al. 1995 – Rh2 (Rrs2)
- Schweizer et al. 2004 – $Rrs15_{Clho8288}$
- Extensive set of resistance donors
- > 50 segregating populations
- > 25 single spore isolates
- Well established greenhouse test

Resistance Donor	Susceptible parent	DH-lines
11258 W	Steffi	335
Abessinian	Steffi	83
Atlas 46	Steffi	156
Brier	Steffi	115
Camelot	Steffi	82
Clho 1225	Steffi	88
Clho 2235	Steffi	152
Clho 2376	Steffi	140
Clho 3515	Steffi	65
Clho 4364	Steffi	306
Clho 5831	Steffi	49
Clho 8288	Steffi	160
Clho 8618	Steffi	99
Jet	Steffi	77
Kitchin	Steffi	120
Modoc	Steffi	168
Nigrinudum	Steffi	21
Osiris	Steffi	446
PI 452395	Steffi	272
Psaknon	Steffi	33
Steudelli	Steffi	163
Sultan	Steffi	131
Trebi	Steffi	133
Turk	Steffi	91
W W Glabron	Steffi	207
West China	Steffi	97
		3789

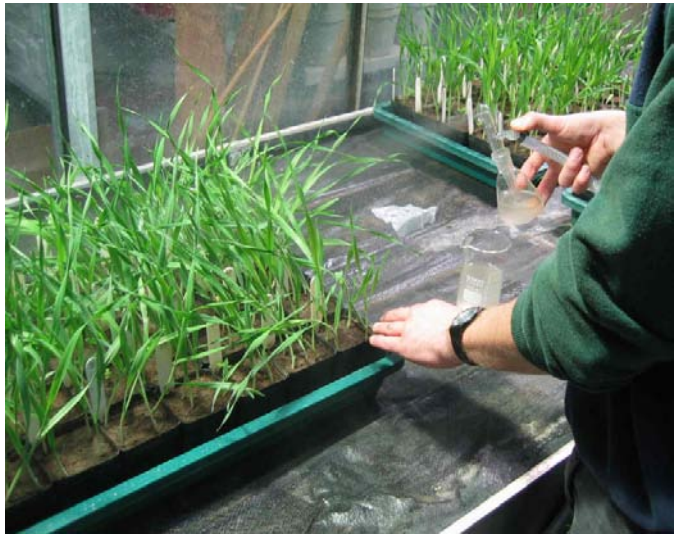
Resistance assessment - greenhouse

1. Growing:

3 weeks

Plants: 4 seeds/pot, 40 pots/tray, 18°C/12°C, 16h light

Rhyncho: 3-4 pea-sized pieces of mycel on LB agar (16°C, dark)



2. Inoculation:

Early 3-leaf-stage

single spore isolate

100 ml / tray, 250-300.000 spores per ml

48h dark, 100% humidity

Resistance assessment - greenhouse

3. Rating

2 weeks after inoculation

3 rating dates

Scale 0-4, second leaf, third leaf as control

Seed leaf shows atypical reaction

Objective

- Identification of resistance loci against ***Rhynchosporium secalis***
- Fine mapping
- Development of diagnostic markers
- Validation of these markers
- Integration of the identified resistance loci into adapted breeding material via MAS

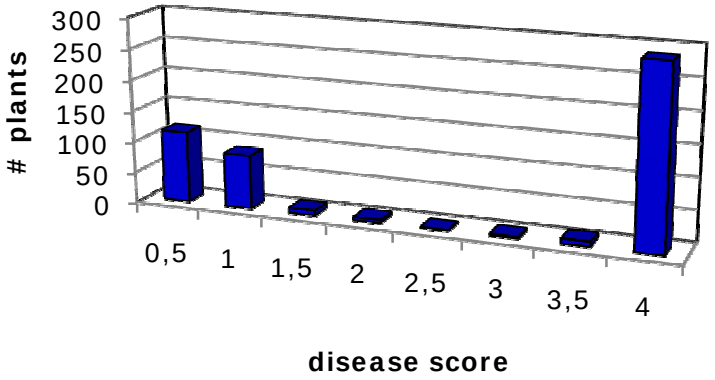
Enhancing the resistance level of the adapted barley germplasm pool against ***Rhynchosporium secalis*** by means of integrating new and known major resistance genes.

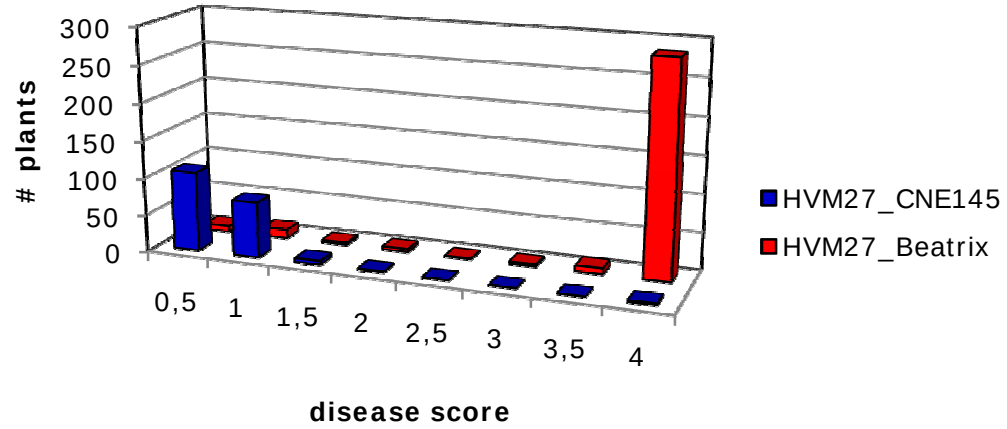
Plant material

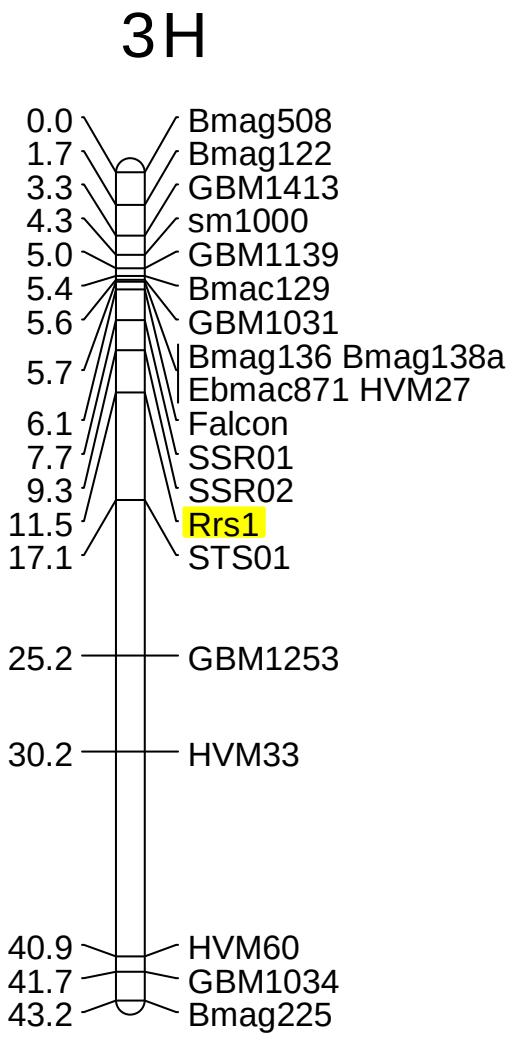
- Mapping population 1: CNE145 x Beatrix (523 DH-lines)
  - CNE145: 6-rowed Spanish landrace from SBCC
  - Beatrix: 2-rowed spring barley variety, brewing quality, Nordsaat

- Mapping population 2: CIho3515 x Steffi (65 DH-lines)
  - CIho3515: 6-rowed accession from USDA world barley collection, Spanish origin
  - Steffi: 2-rowed spring barley variety, brewing quality, SZ Ackermann

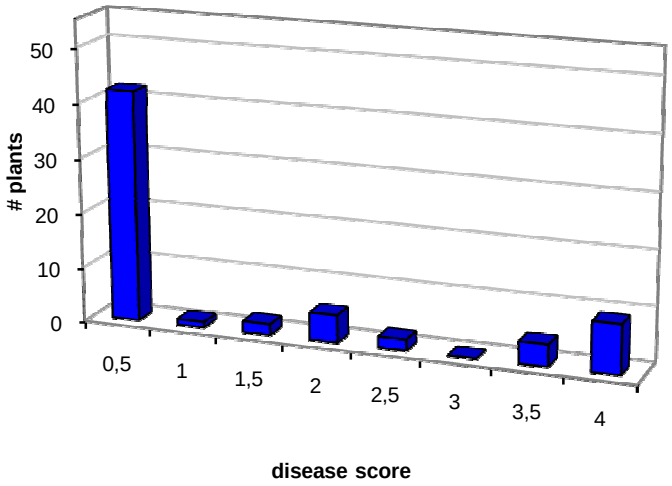
CNE145 x Beatrix

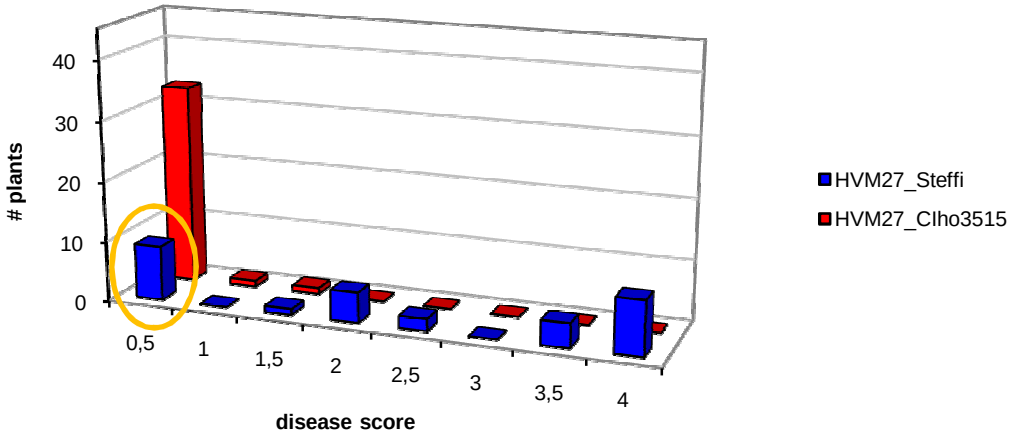






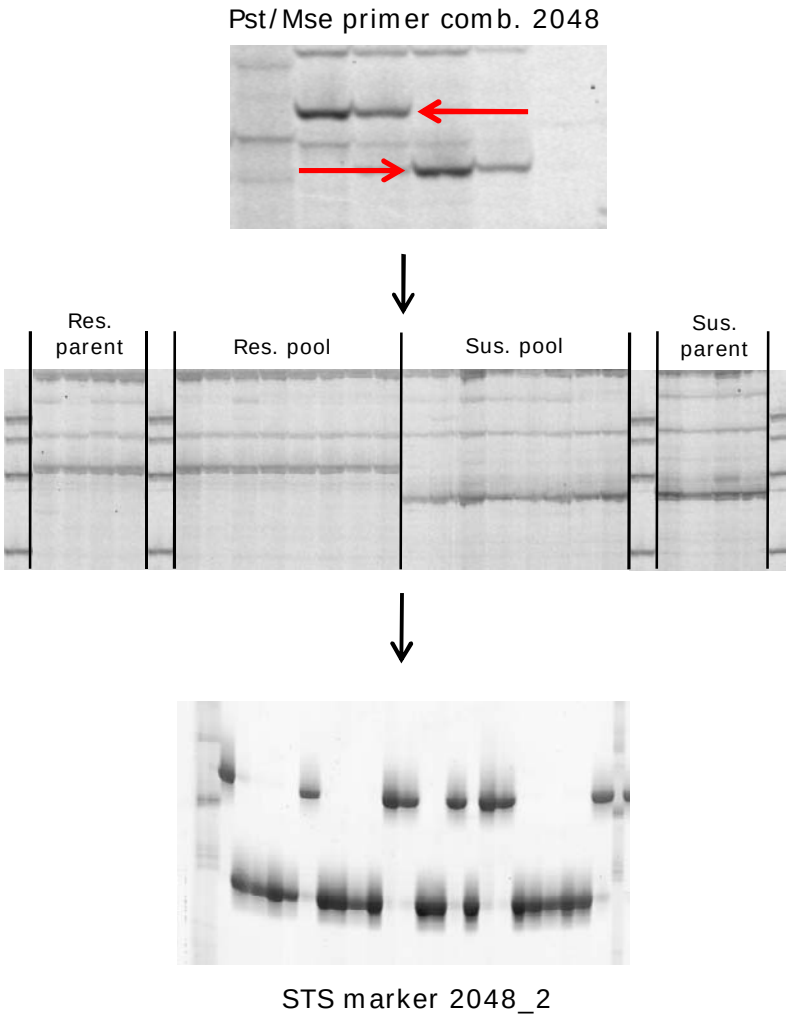
Clho3515 x Steffi



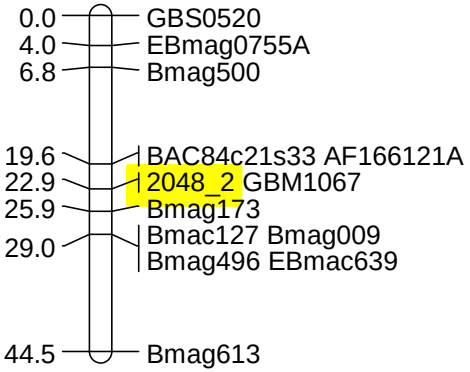


Rrs1 & ?

Clho3515 x Steffi



6HS

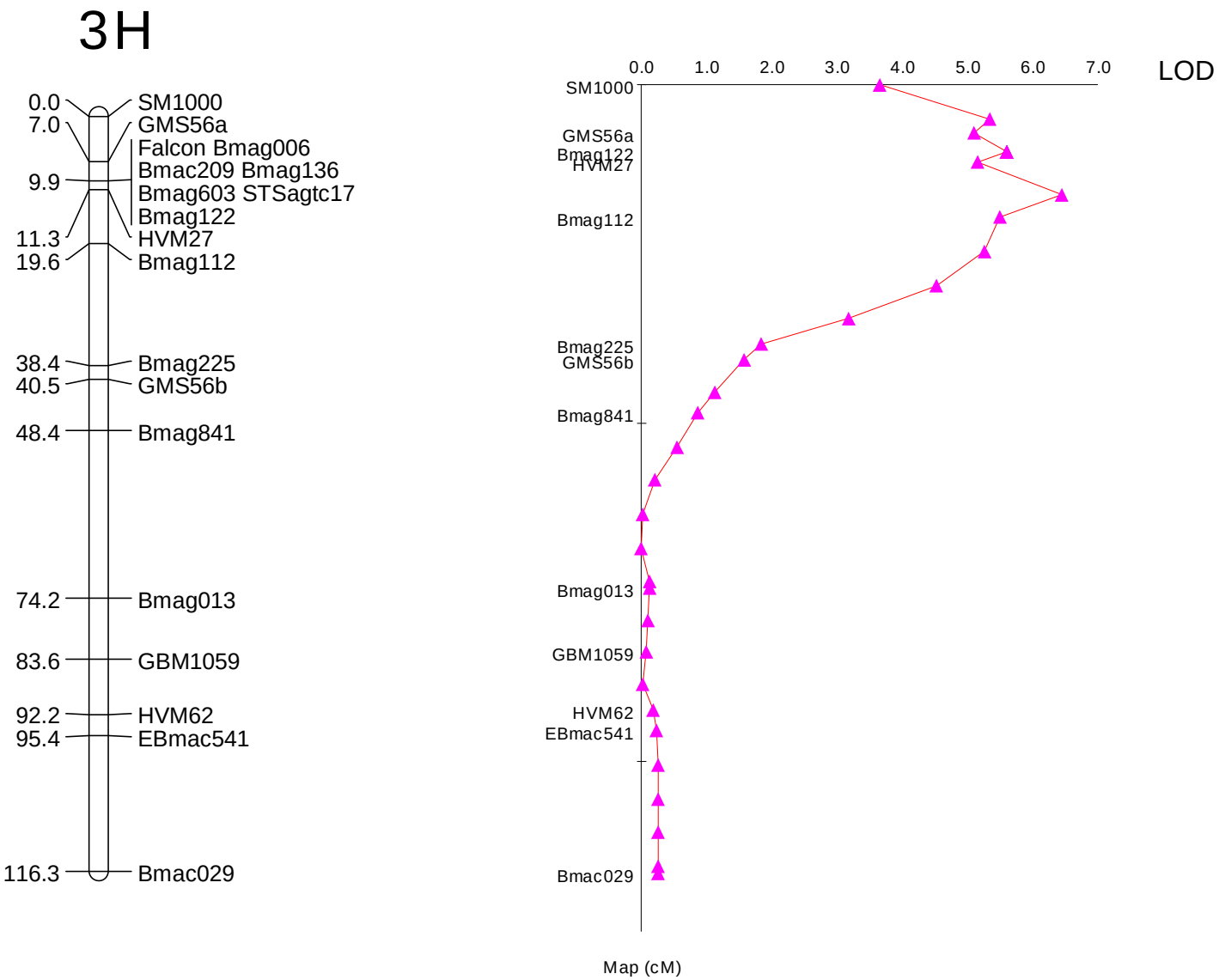


Rrs13?

Abbott et al. 1995

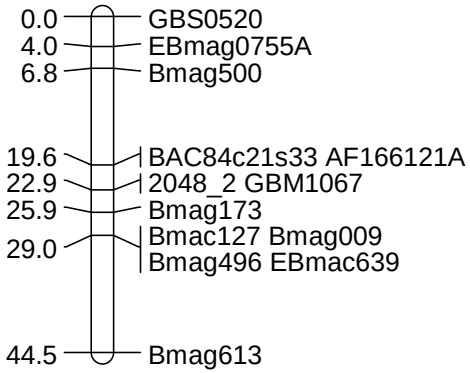
H. vulgare ssp. ***spontaneum***

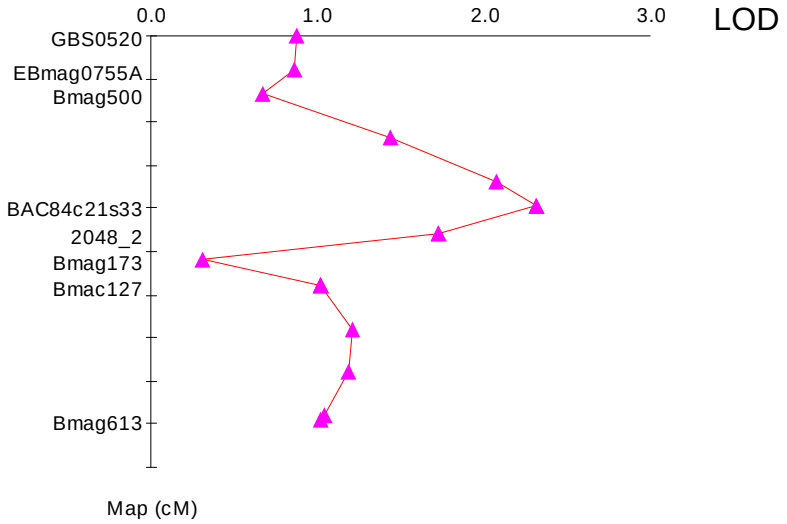
Clho3515 x Steffi



Clho3515 x Steffi

6HS





Rrs13 in ***H. vulgare*** ssp. ***vulgare***

Outlook

- CNE 145 x Beatrix (***Rrs1***):
  - Further fine mapping in the DH population
  - F2 population > 15.000 seeds

- CIho3515 x Steffi (***Rrs13***):
  - New DH population for fine mapping
  - F2 population in production

- Both: Poolscreening, chromosome walk

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Thank you

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