



Disease screening in Phaseolus hybrids



- Plants growing in the soil glasshouse at NIAB Cambridge.
- Jute webbing to support the plants on wires.
- Drip irrigation.
- Temperature maintained at approx. 12-20°C with supplemental light.
- 30 plants per genotype in 3 reps, 10 plants per plot.
- Resistant and susceptible control plants included for each disease.



Sclerotinia (white mold) – widespread and severe.



Rhizoctonia Solani – encouraged by warming climate. Foliar and Root infecting forms.

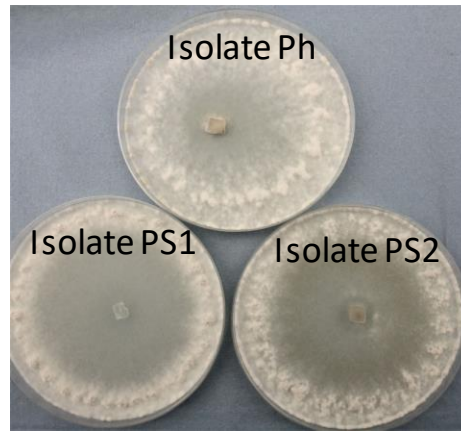


Colletotrichum (Anthracnose) widespread and severe.

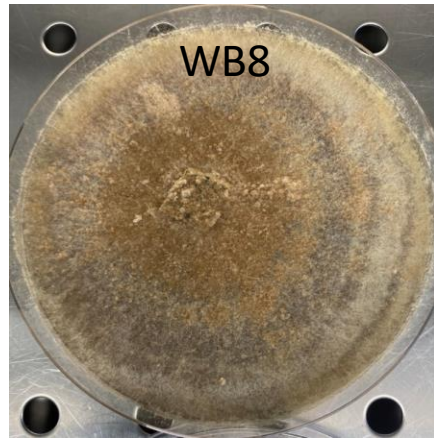
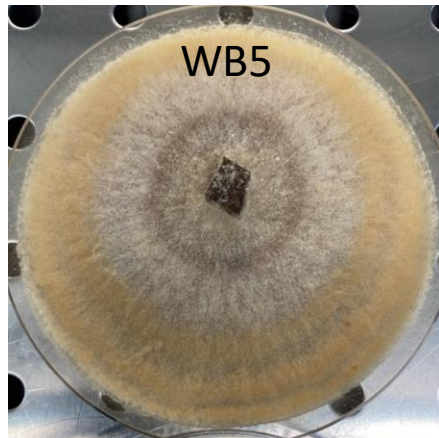
Disease	Planting location	Assay	Inoculation
Sclerotinia	Glasshouse	Detached leaf	Growth room
Web blight	Glasshouse	Detached leaf	Growth room
Anthracnose	Glasshouse	Detached leaf	Growth room
Root rot	Growth room	Seedling test	Growth room

Growth room inoculations: Detached leaf

Leaves arranged in corning bioassay trays containing wetted filter paper and plastic mesh.



- Three sclerotinia isolates; wide host range: brassica and legumes; pea, beans, oilseed rape, carrots, lettuce etc. Two pea isolates and one Phaseolus sclerotinia (isolate Ph). All originated in the UK.
- Web blight isolates obtained from CIAT, Colombia.
- 5mm mycelial plug from a 5 day old plate transferred to adaxial side of each leaflet just off centre.
- Drop of water added to prevent agar disc drying out.
- Both sclerotinia and web blight isolates grown on PDA.
- Assessments 3-7 dai. Measure lesions size and photograph for image analysis

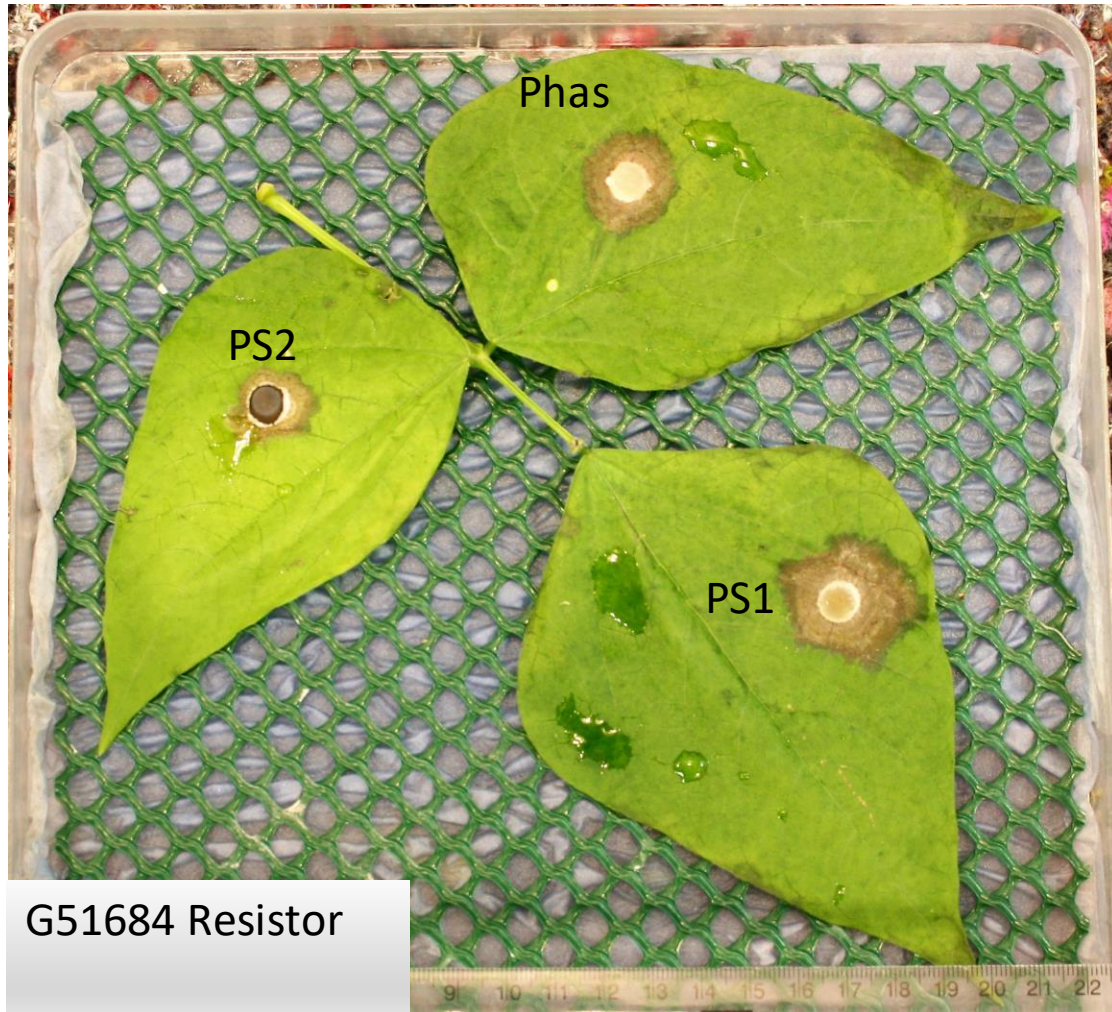


Detached leaf assay

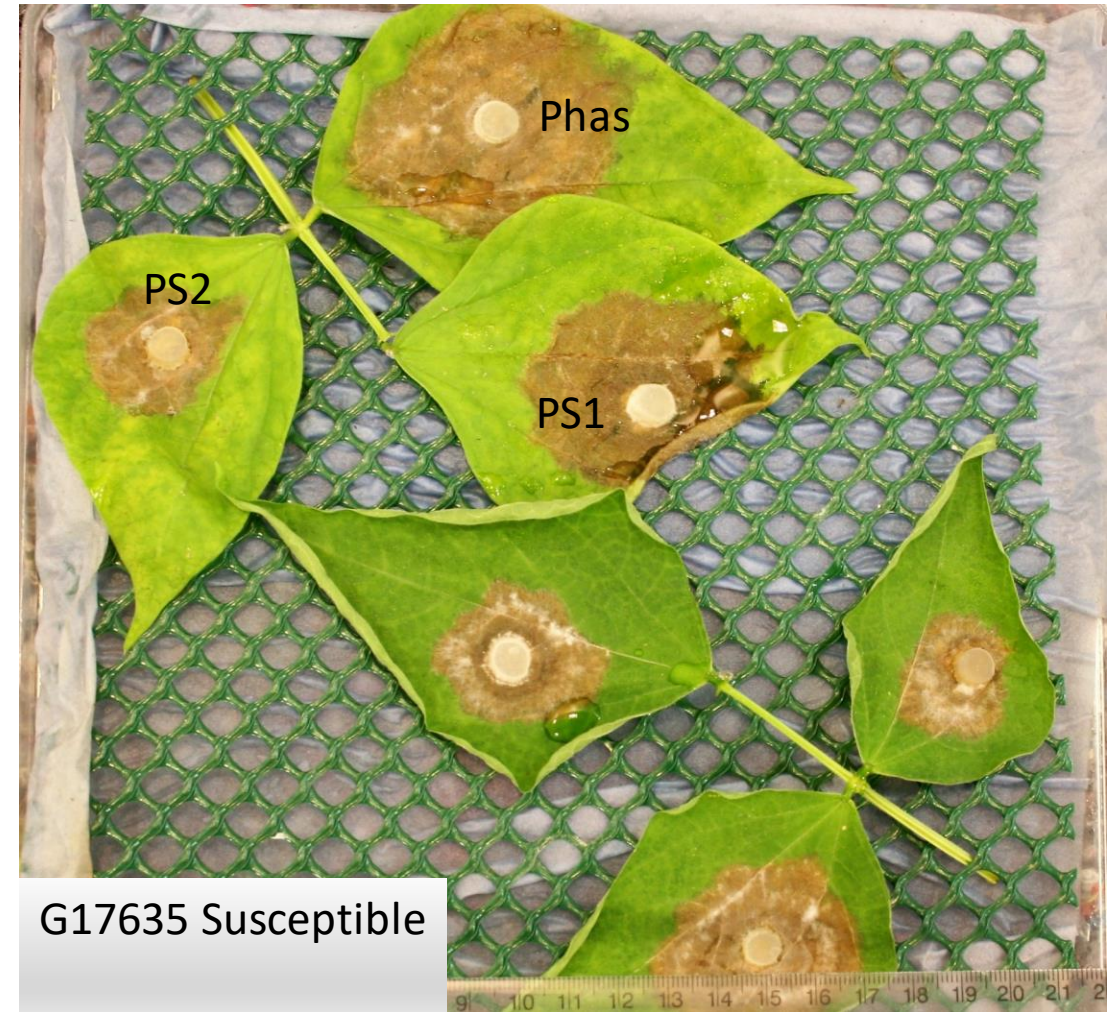
- Harvest 3rd-5th fully expanded leaf.
- Leaves transferred to corning boxes in controlled environment. chambers for inoculations.
- Petiole of each trifoliolate leaf makes contact with damp filter paper.
- Sclerotinia inoculated leaves incubated at 22°C day and Web blight 27°C.
- Advantages:
 - Comparing large numbers of individuals
 - Trifoliolate leaf allows for three isolates per disease
 - Each plant can be resampled
 - Can be resampled to allow for more than one disease per plant.
 - Non-destructive so can obtain seed for future crossing
- Disadvantage:
 - Disease response may differ in whole plant



Disease screening: *Sclerotinia sclerotiorum*

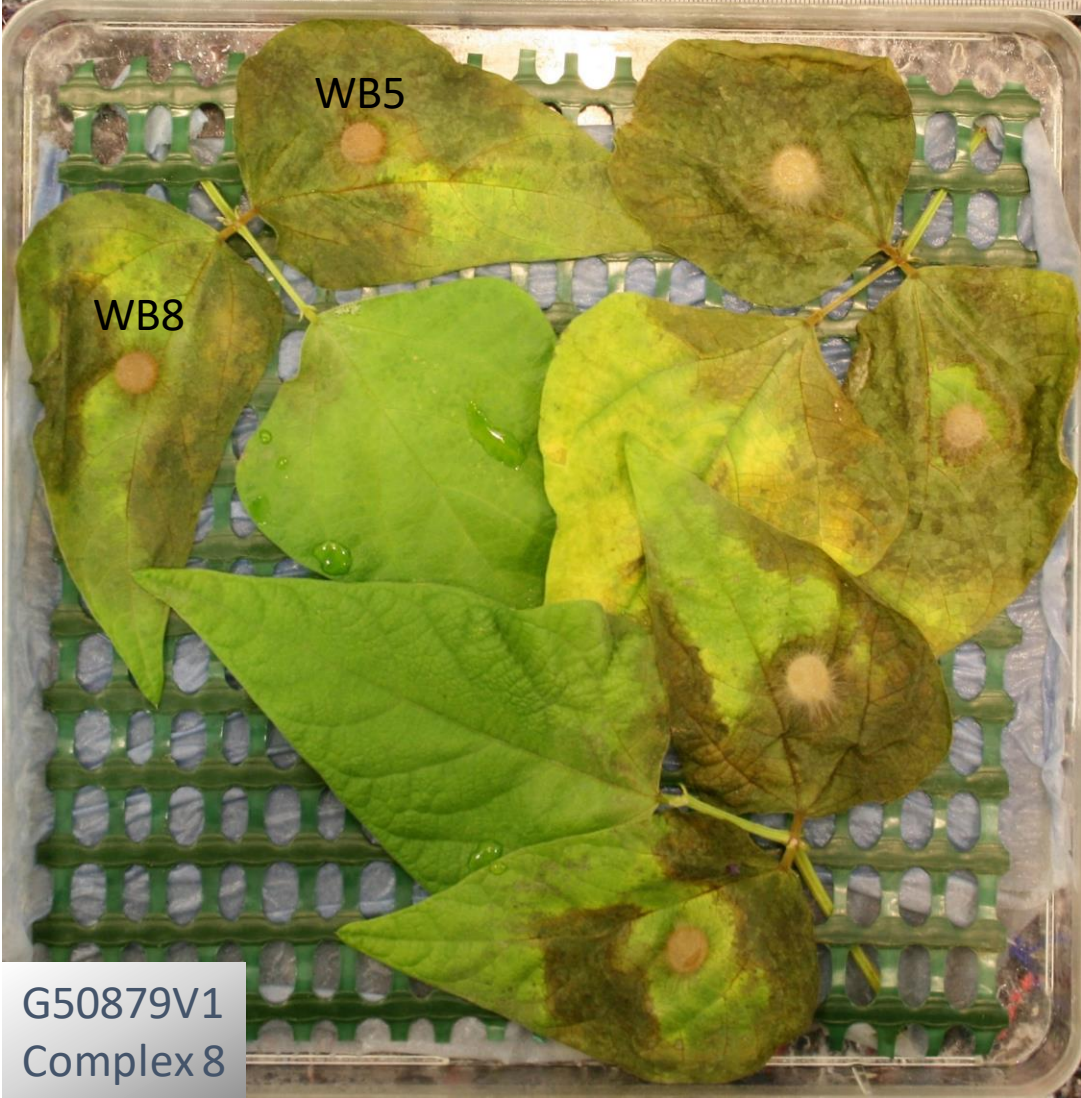
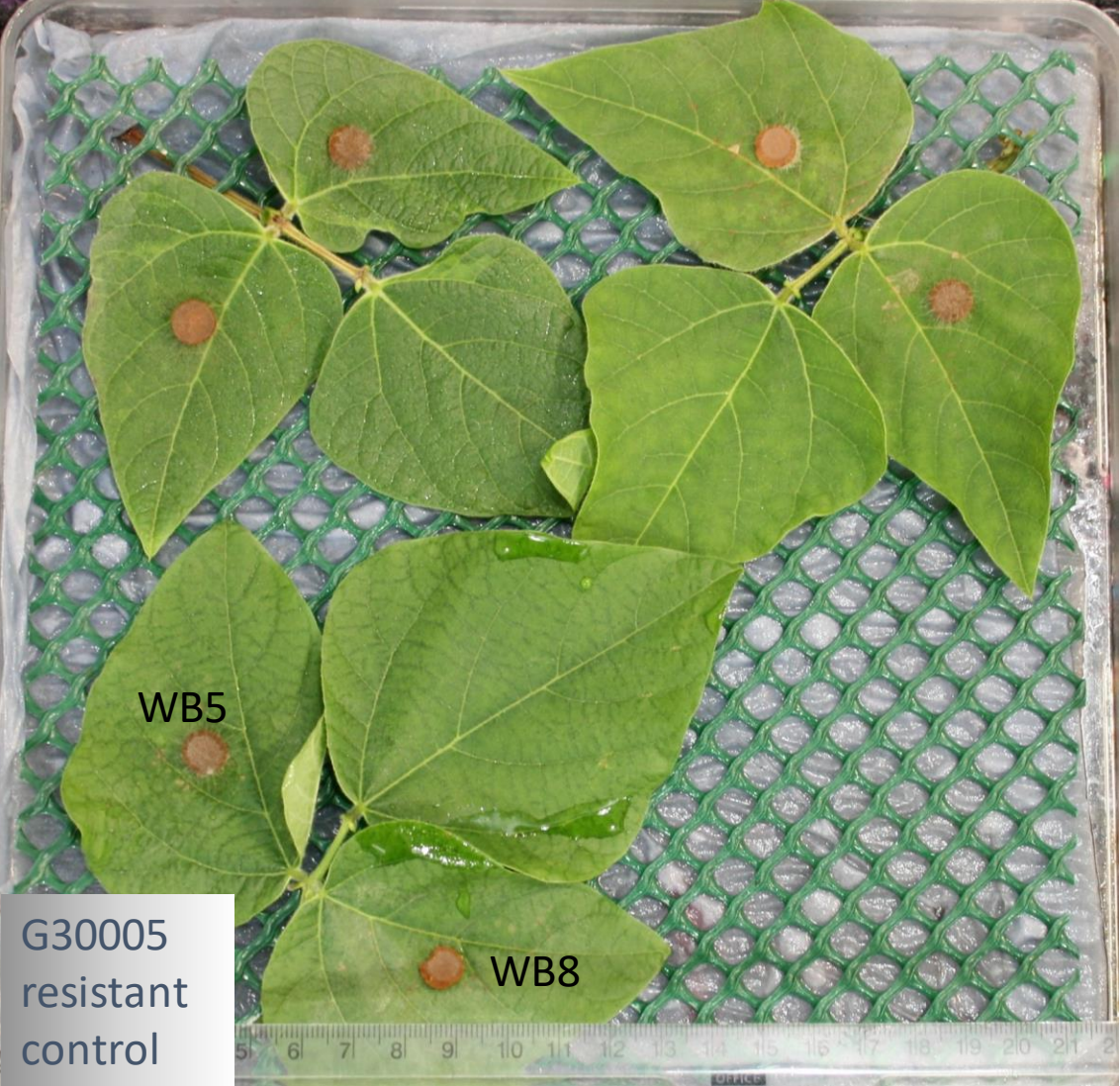


Mild disease symptoms on resistant plants



Severe disease symptoms on susceptible plants

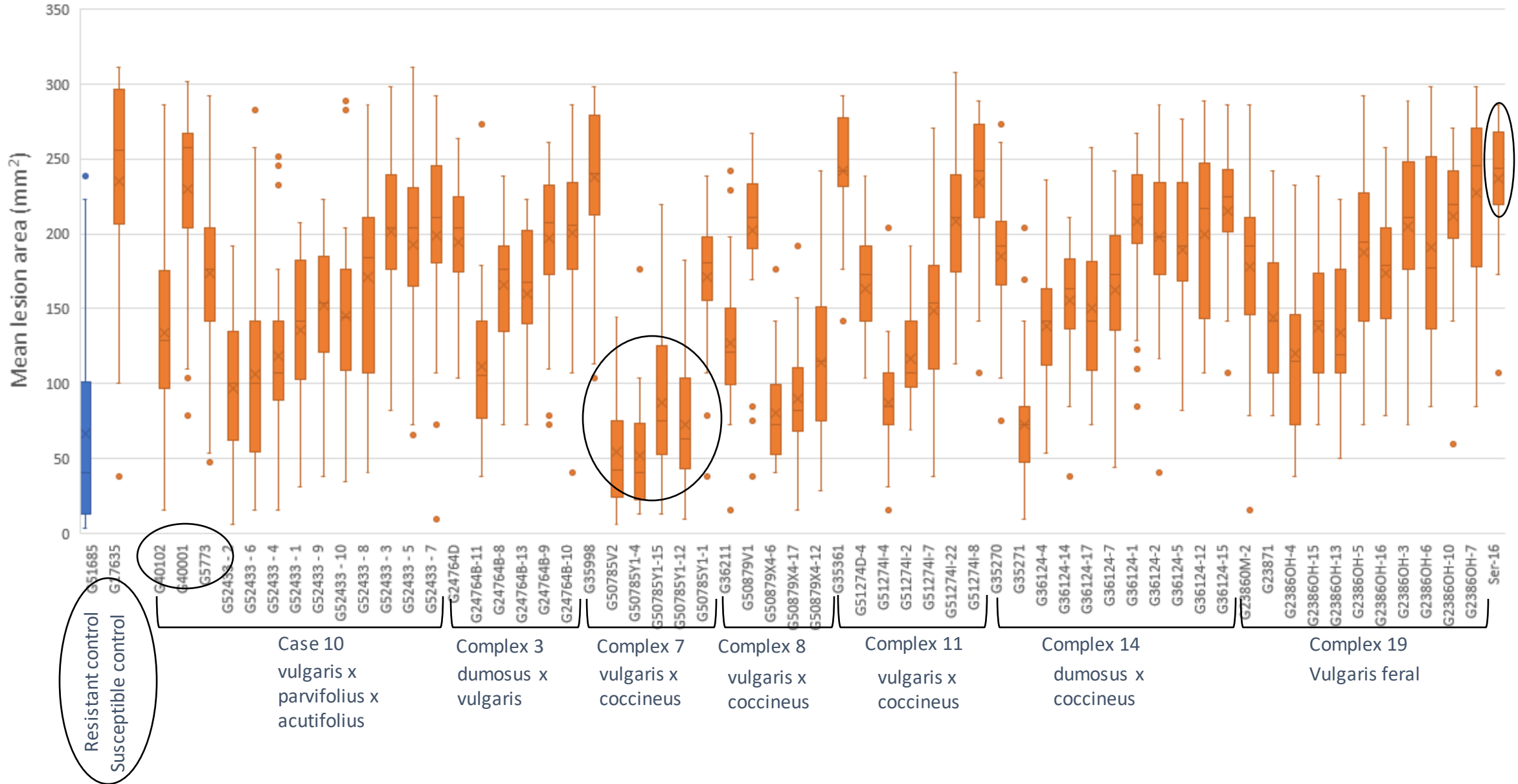
Disease screening: Web blight *Rhizoctonia solani*.



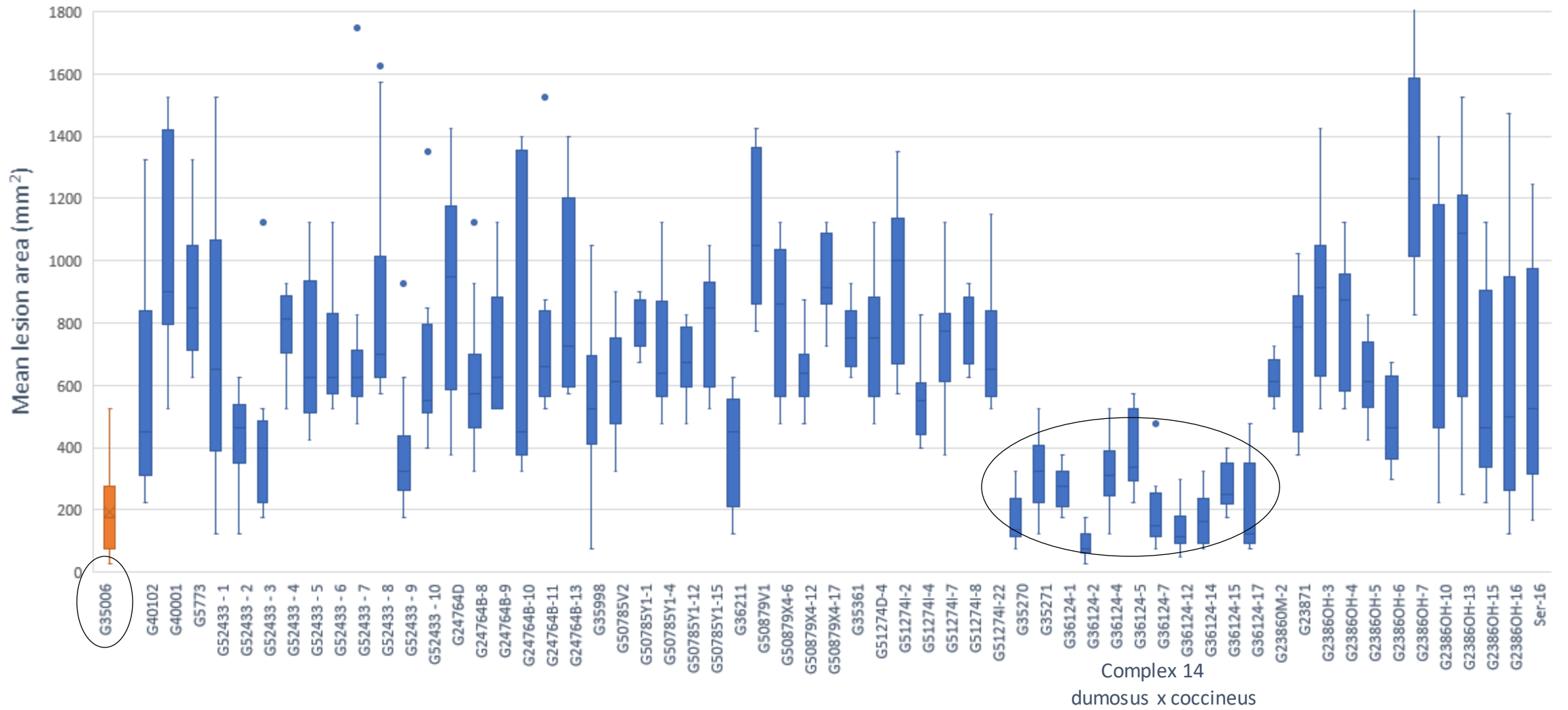
Mild Web blight symptoms

Severe Web blight symptoms

White Mold (*Sclerotinia sclerotiorum*) mean score of all three isolates



Web blight mean disease both isolates



Disease screening: *Rhizoctonia Solani* root rot

- Two *Rhizoctonia Solani* isolates (Colombia) Rh-5 and Rh-17
- Two reps per isolate
- 10 seeds per trays per rep
- Isolates inoculate at a concentration of 1.5% (w/w by soil volume)
- Three resistant controls
- G881 (Mexico)
- G1540 (Sweden)
- G3151 (Guatemala)
- Disease assessed 14-28 days after inoculation (dai)



Disease index		Symptoms around hypocotyl
0	No disease	No symptoms present
1	<5%	Lesion appearing
2	10%	Lesion present <2.5mm
3	25%	Lesions 2.5 to 5mm, plant healthy but disease beginning to penetrate stem
4	50%	Lesions >5mm, disease penetrating stem
5		Disease penetrating stem, some stunting
6	>75%	Disease lesion significant around and within stem
7		Lesions severe, plants stunted
8	>90%,	Withered and dying
9		Plant dead

Rhizoctonia root and stem lesions assessed around hypocotyl

G881 Resistant



No Symptoms



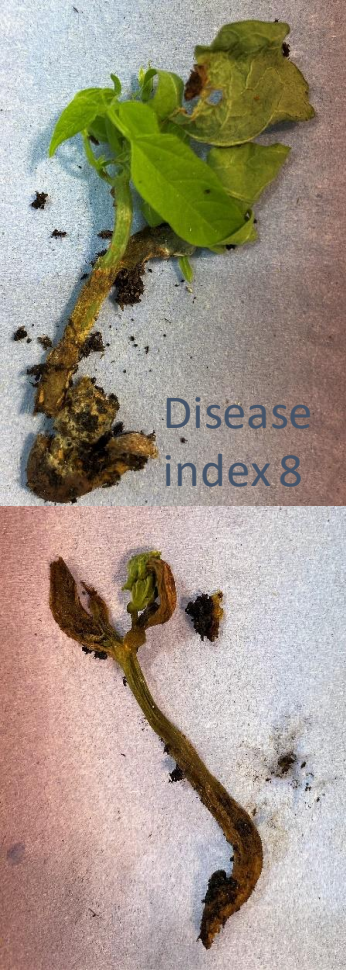
Disease index 3



Disease Index 5



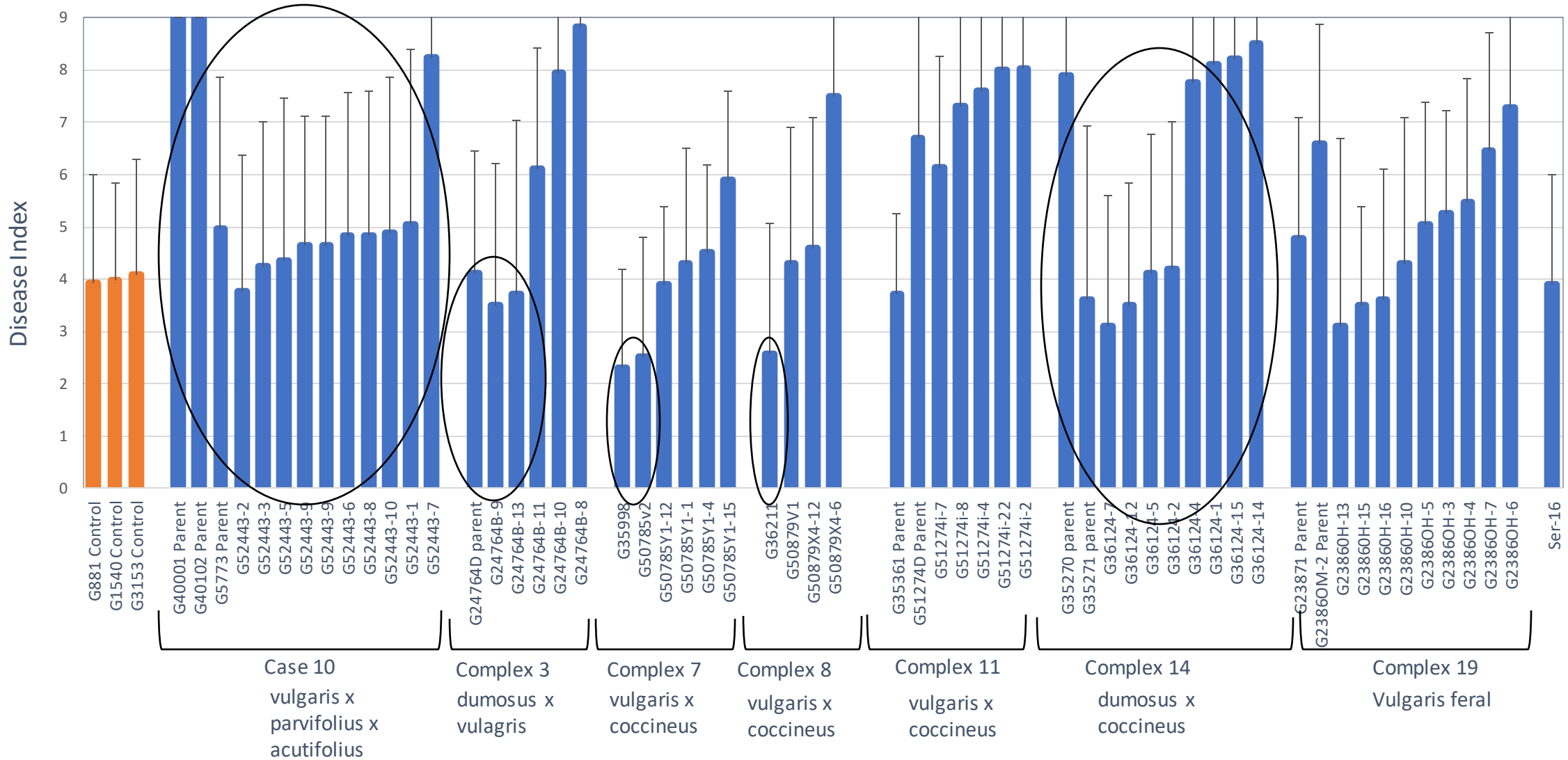
Disease Index 7



Disease Index 9

Disease index 8

Rhizoctonia root rot (mean scores for both isolates Rh-5 & Rh-17)

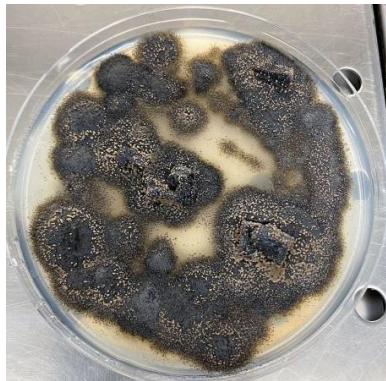


Disease screening: Anthracnose

Colletotrichum lindemuthianum Isolates

- Detached leaf assay protocol as before.
- Inoculate with a filtered spore suspension at 2×10^6
- Assess 7-10 dai.

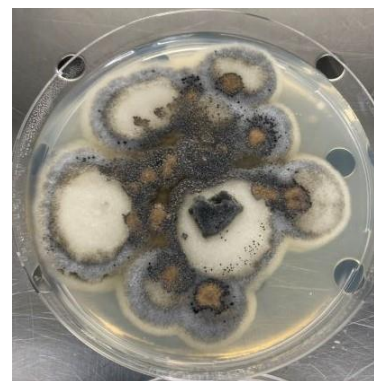
Isolate	Origin	Sporulation on PDA	Typical Spore count/ml	Vein symptoms on susceptible control G1149	Media
CL638	Colombia	Yes	5×10^6	high	PDA
KIS02	Uganda	Yes	1×10^6	low	MM/PDA
RA-9B	Uganda	Yes	3×10^6	v.low	MM/PDA
KB011	Uganda	low	$<10^3$	low	MM/PBA



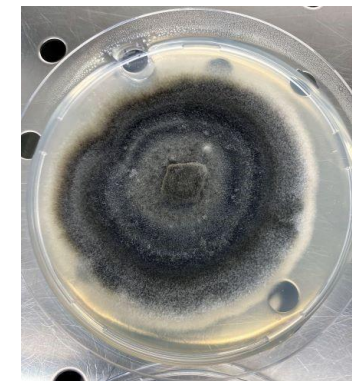
CL-638



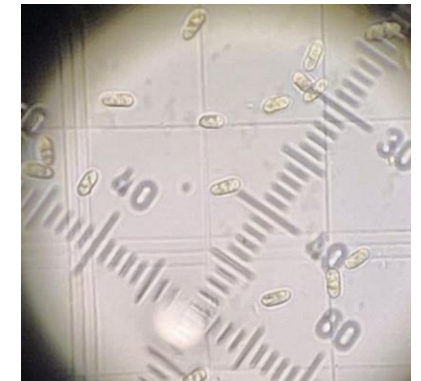
KIS02



RA-9B

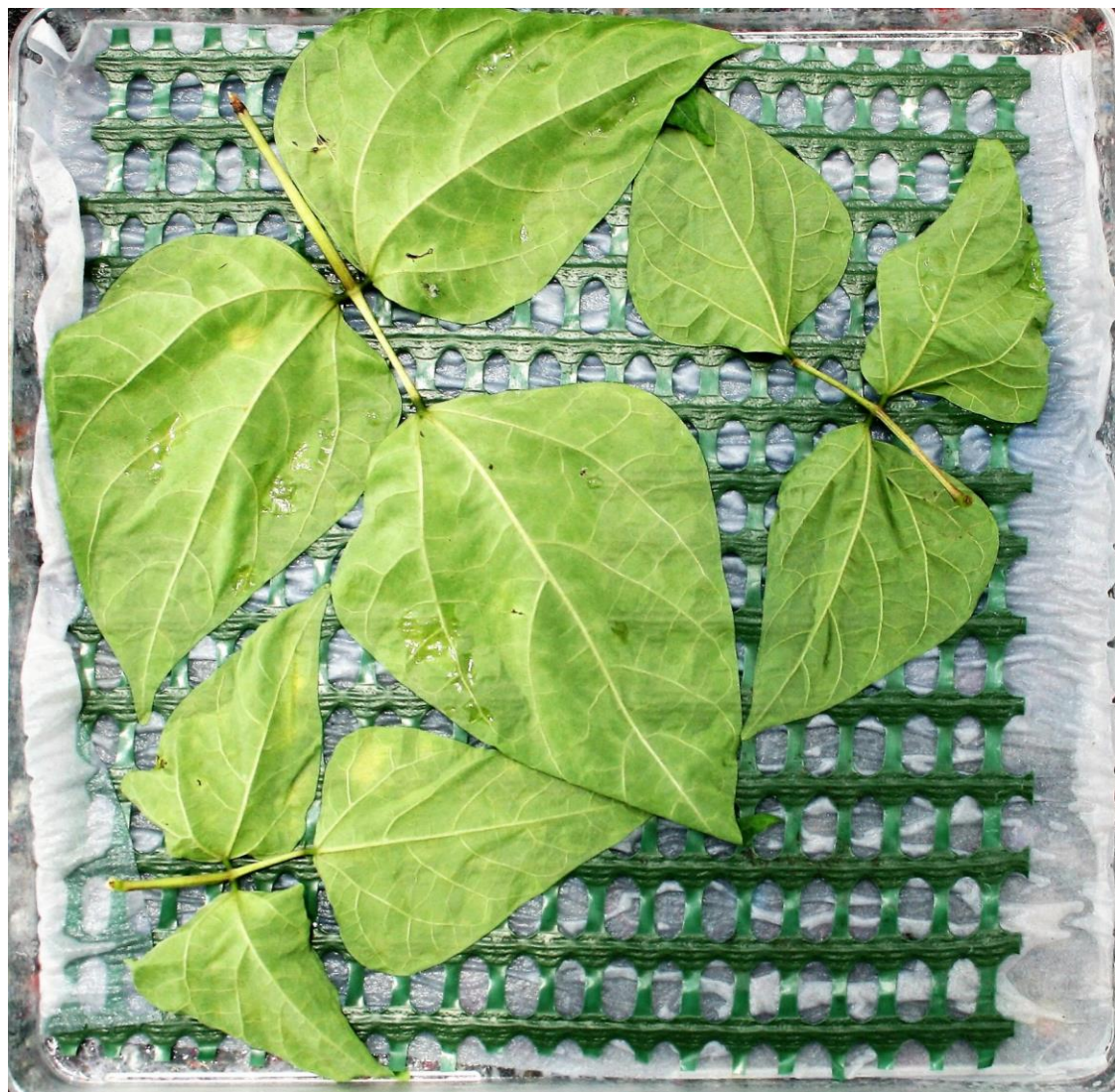


KB011



Conidia

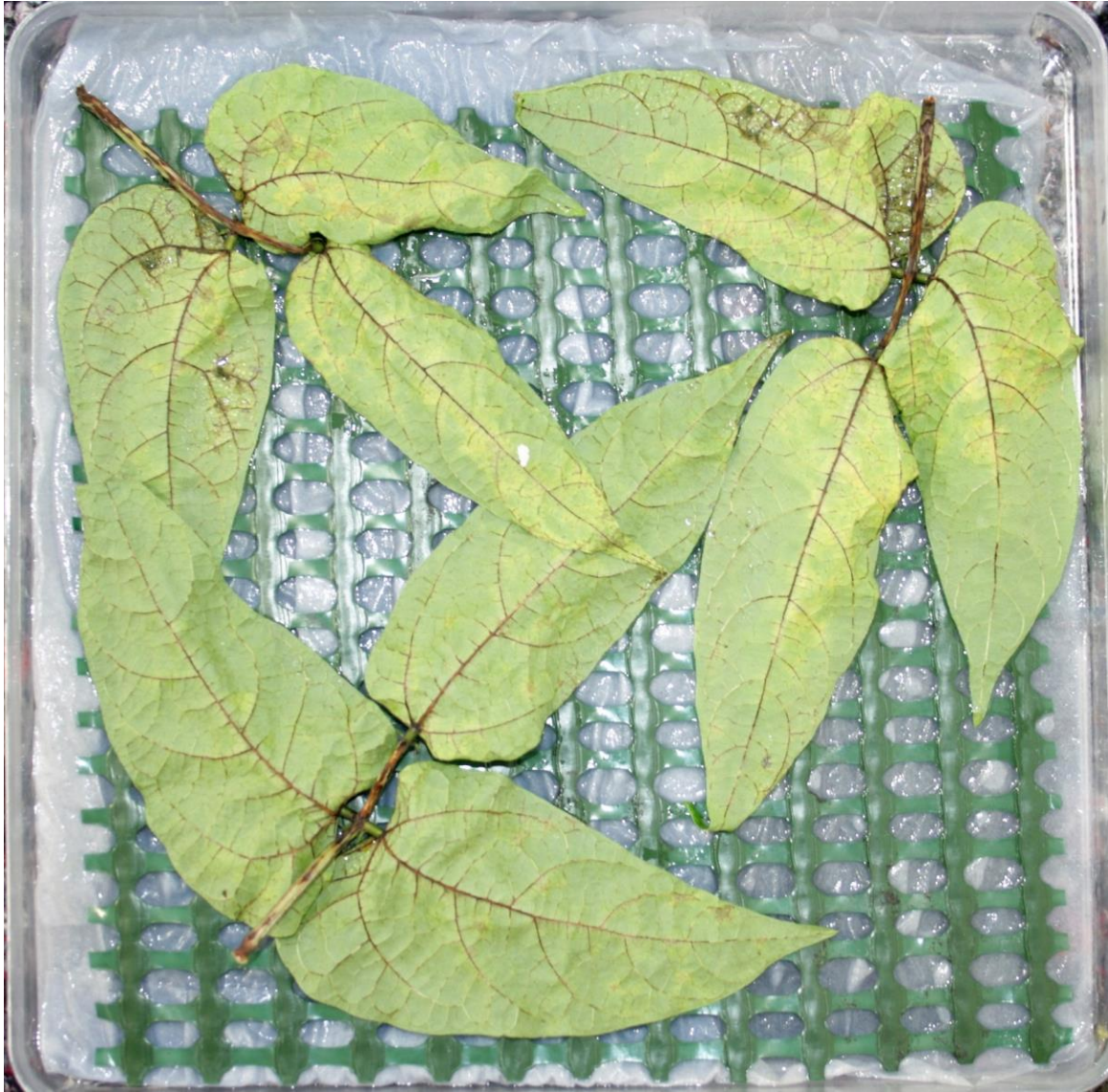
Anthracnose disease symptoms



G2338 Resistant control



G1149 Susceptible control

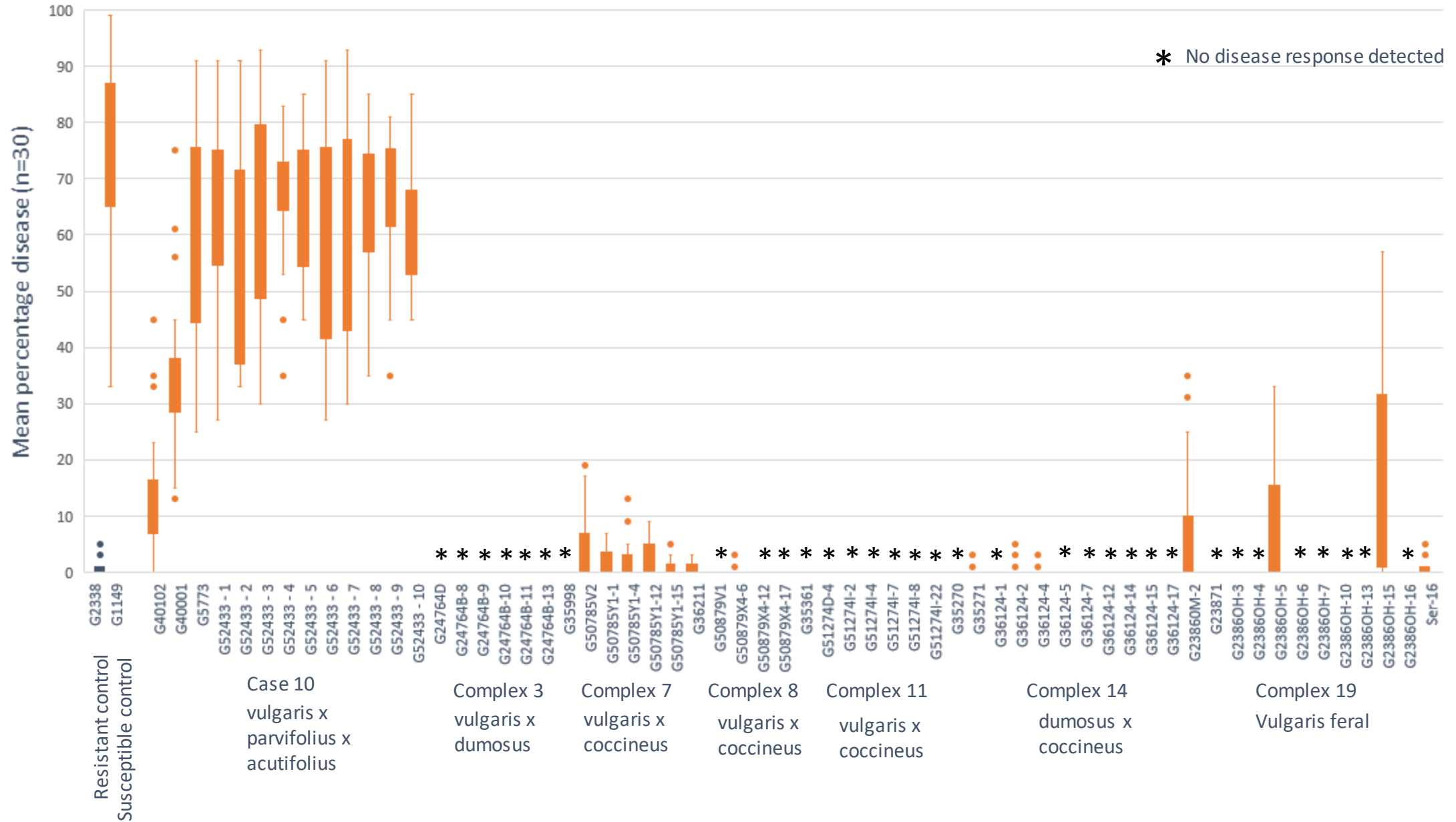


G52443-10 Case 10



G36124-5 Complex 14

Anthracnose mean percentage disease CL638



Summary

Good levels of resistance or tolerance discovered for all diseases screened.

Each accession was also scored for vigor i.e leaf or seedling integrity following disease inoculation to give an overall disease rating for each complex.

Disease profile has now been established for all accessions screened.

Disease profiles of putative parents and hybrids shown to match that observed in situ.

Disease resistance of accessions tested in end-user environment would complement the disease profile from this screening programme.

