

Evaluation of Wild Sunflower Species for Resistance to Sclerotinia Wilt

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Why look at wild sunflowers for stalk and root rot resistance?

- Wild species have provided useful genes for many other traits.
- Relatively unexplored for *Sclerotinia* resistance.
- Many species of untested germplasm are readily available.



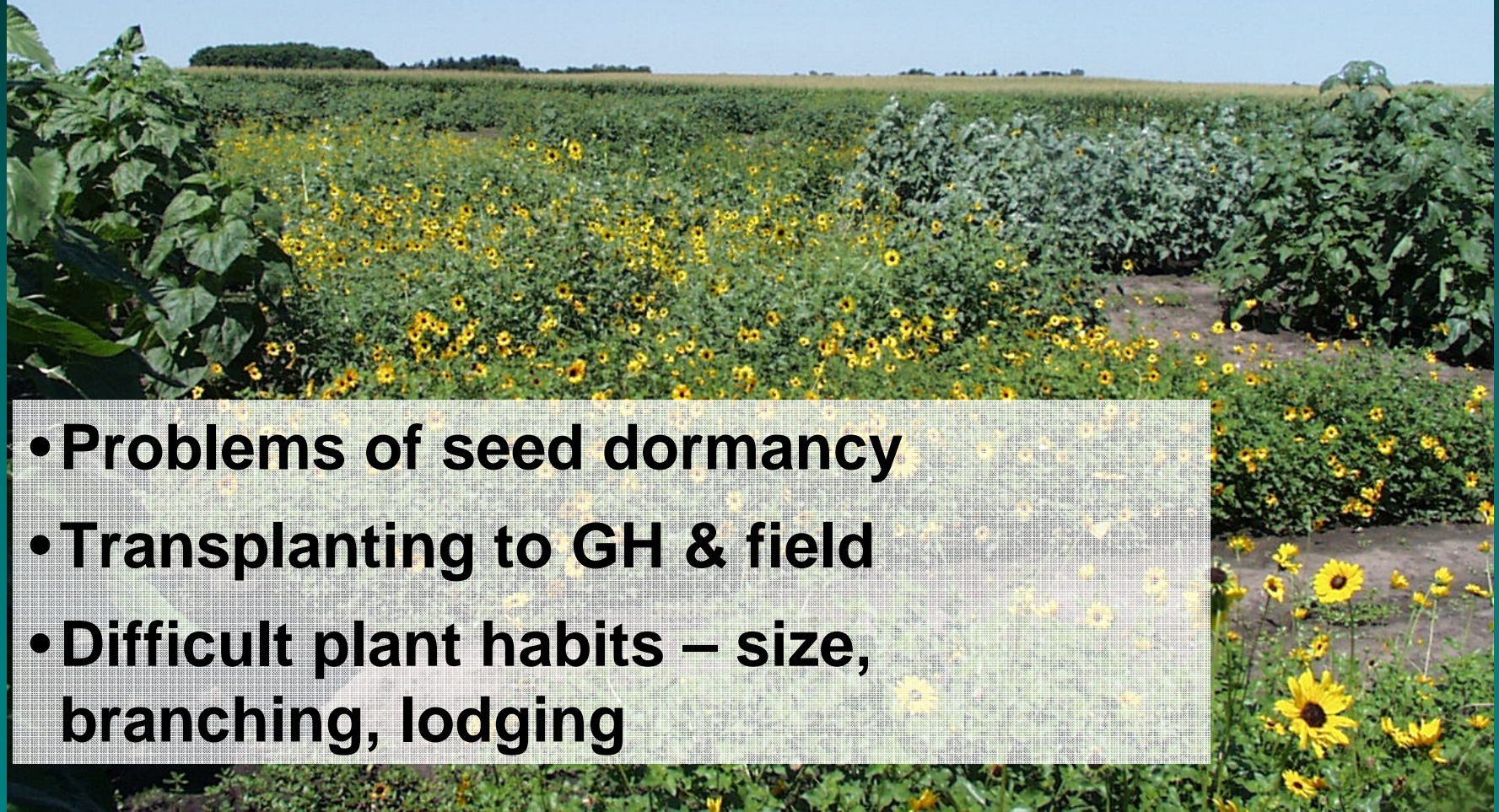
Annual Species	Total Acc.	Avail. Acc.
H. annuus	932	904
H. agrestis	5	2
H. anomalus	8	3
H. argophyllus	49	29
H. bolanderi	8	4
H. debilis ssp. cucumerifolius	8	8
H. debilis ssp. debilis	16	14
H. debilis ssp. silvestris	22	22
H. debilis ssp. tardiflorus	5	4
H. debilis ssp. vestitus	3	3
H. deserticola	22	15
H. exilis	31	25
H. neglectus	28	28
H. niveus ssp. canescens	19	13
H. niveus ssp. tephrodes	12	6
H. paradoxus	10	0
H. petiolaris ssp. fallax	35	35
H. petiolaris ssp. petiolaris	103	103
H. porterii	8	8
H. praecox ssp. hirtus	7	7
H. praecox ssp. praecox	9	9
H. praecox ssp. runyonii	25	25
TOTAL	1365	1267 (93% available)

Objectives

1. Develop a greenhouse screening method that correlates well with field results.
2. Evaluate a wide array of sunflower germplasm to identify potentially resistant material.
3. Verify resistance of selected accessions in field trials.

Why not screen in the field as done with cultivated sunflower?

- **Problems of seed dormancy**
- **Transplanting to GH & field**
- **Difficult plant habits – size, branching, lodging**





Greenhouse offers potential to evaluate many more plants and accessions quickly.

Methods

1. Sclerotinia-infested millet inoculum.
2. Incubate at 22-24C.
3. Resistant and susceptible checks - controls.
4. Count days to first wilt and permanent wilt for each plant.
5. At end of test (21 days), count survivors and calculate percentage survival. Compare survival with checks.

Inoculation

Sclerotinia infested millet inoculum

- cover bottom of pot or flat with measured amount.
- transplant seedling at 6 to 8 leaf stage into pot.



Method development - many pot sizes tested



2 1/4" sq.



3" sq.



4" sq.



Stem rot

5" and 1 gal.

Method development (cont.) - large flats

- Advantage – uniform soil moisture.
- Disadvantages – uses more inoculum, more escapes?

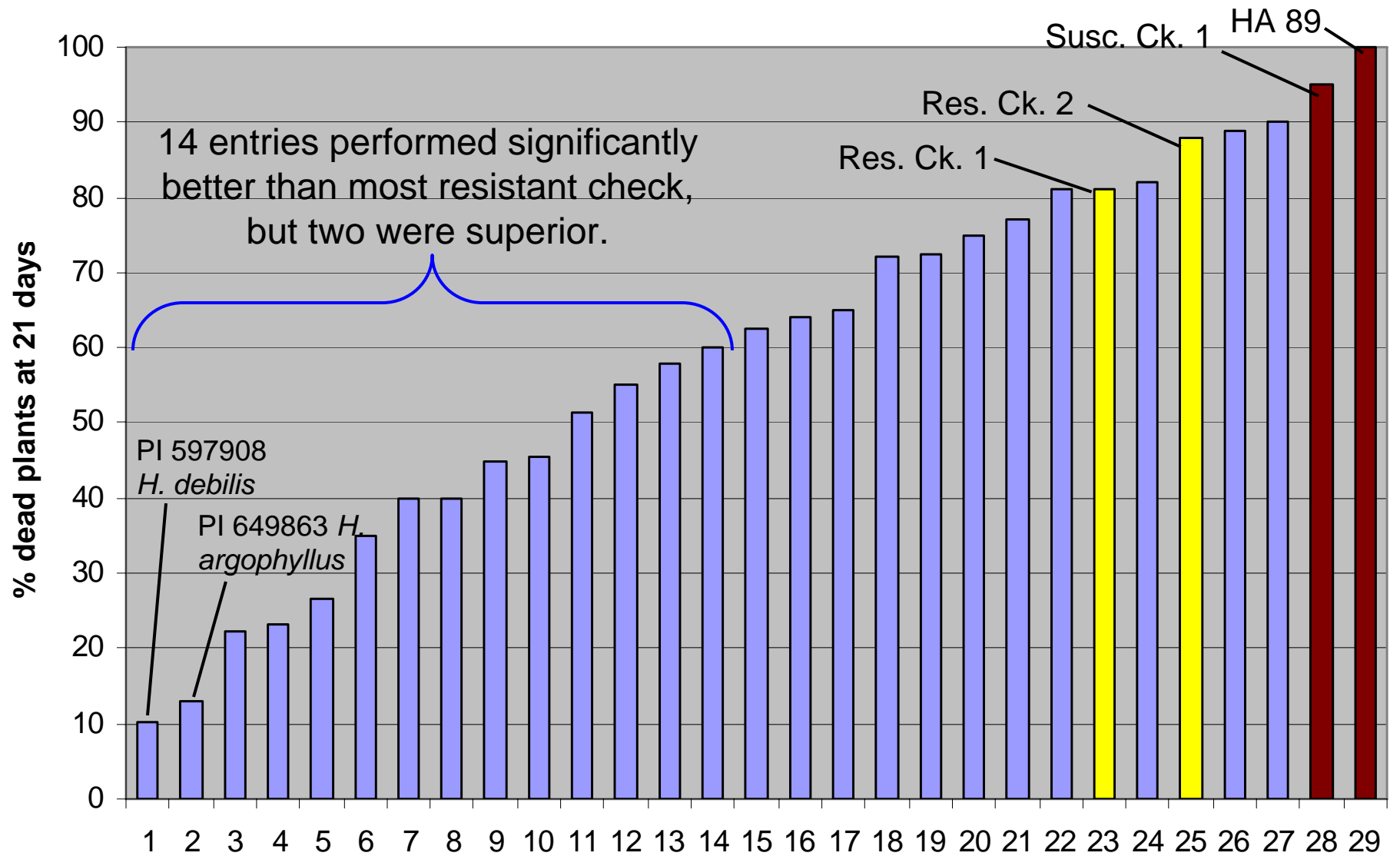


Screening Method Development

- Temperature was the most critical factor. Best conditions were between 21C and 25C.
- More escapes occur with warm temps (27-30C).
Escapes: susc. plants that seem to be resistant.
- Smaller pots (under 3") with one plant each seem to handle GH temperature fluctuations better.
- Current screening method used: 2 ¼ " pots with one plant incubated at 22-24C.

Sclerotinia wilt rankings – assorted species

(red bars are susc. checks; yellow bars are mod. resistant checks)



Top entries from previous slide

Entry	ID	SPECIES	% surviving plants after 21 days
1	PI 597908	H. debilis subsp. cucumerifolius	90
2	PI 649863	H. argophyllus	87
3	PI 494586	H. debilis subsp. silvestris	78
4	PI 494573	H. argophyllus	77
5	PI 435625	H. argophyllus	73
6	PI 468774	H. neglectus	65
7	PI 649866	H. argophyllus	60
8	PI 435417	H. annuus	60
9	PI 494570	H. argophyllus	55
10	PI 468775	H. neglectus	55
<u>CHECKS</u>			
23	Res. Ck. 1	H. annuus (resist. hybrid)	19
25	Res. Ck. 2	H. annuus (resist. hybrid)	12
28	Susc. Ck. 1	H. annuus (susc. hybrid)	5
29	HA 89	H. annuus (susc. Inbred)	0

Two species that merit further evaluation

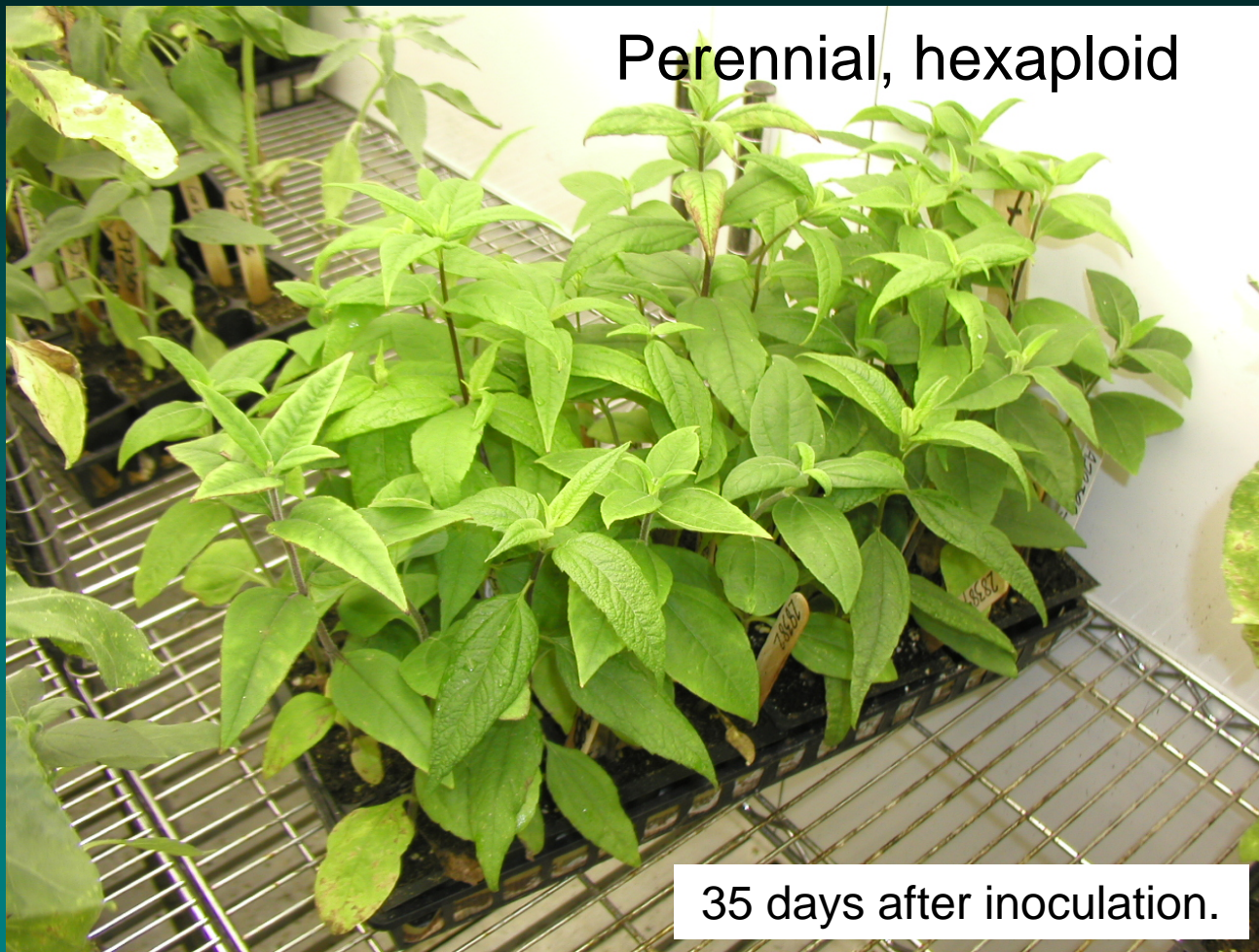


Helianthus argophyllus, a silver-leaved annual found along the coasts of TX and FL has been a source of rust and downy mildew resistance.



Helianthus debilis ssp. *cucumerifolius*, whose native habitat is seaside dunes in Florida, has contributed genes for resistance to downy mildew, rust and powdery mildew.

Helianthus resinosus – impressive!



Perennial, hexaploid

35 days after inoculation.

2007 Field vs. GH comparison

Species	Entry	% survival in GH (21 days)	% survival in field
H. resinosus	PI 650079	100	96
H. resinosus	PI 650080	95	93
H. resinosus	PI 650081	95	87
H. resinosus	PI 650082	100	93
H. resinosus	PI 650083	79	85
Hel. hybrid	PI 597912	72	50
Res. Ck. 1	Res. hybrid	52	18
Susc. Ck. 1	Susc. hybrid	10	21

Final Comments

- Standardized screening conditions were developed.
- More accessions will be field-tested in 2008.
- Screening continues in greenhouse – current focus on *H. argophyllus* and *H. debilis* groups.
- Survival analysis statistics being used to better assess where resistance lies.
- Key question - Would resistance in *H. resinosus* transfer effectively into cultivated sunflower?