116-2013
Report

Differences in tolerance to soil borne pathogens in sugar beet varieties 2013

Provning av betsorters toleransnivå mot jordburna patogener 2013

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Differences in tolerance to soil borne pathogens in sugar beet varieties 2013

Sammanfattning

Syftet med detta försök var att prova betsorter för deras tolerans mot *Aphanomyces cochlioides*.

Tolerant kontroll: SY Muse

Mottaglig kontroll: Rosalinda KWS.

Provade sorttyper

AT: 11 sorter

RZ: 11 sorter

RZNT: 8 sorter

RZNTAT: 1 sort

Försöksplats: Skibaröd, Skåne.

Sockerskörden för den toleranta kontrollen SY Muse var 12,4 ton per hektar och för den mottagliga kontrollen Rosalinda 11,6 – en skillnad på 810 kg socker per hektar.

Den sort som hade den högsta sockerskörden var 3K408 (RZAT) med 13,0 ton per hektar. Den kan vara en lovande sort för *Aphanomyces*-infekterade fält. Ytterligare en lovande sort kan vara 3K436 med en sockerskörd på 12,60 ton per hektar.

En NT-sort som kan vara ett alternativ för fält som är infekterade med både *A. cochlioides* och betcystnematoder är HI1326 (RZNTAT). Sorten uppvisade symptom på kroniska skador men sockerskörden var 12,61 ton per hektar. Sorten provar första året i officiella försök.

Elora KWS kan också vara ett alternativ för fält som är infekterade med både *A. cochlioides* och betcystnematoder. DSI var bland de högsta värdena men sorten hade inga symptom på kroniska skador. Elora KWS testas tredje året i officiella försök.

I medeltal för 2012–2013 hade Stinger den högsta sockerskörden med 11,91 ton per hektar, Muse hade 11,55 och Rosalinda KWS 11,09. Skillnaden i sockerskörd mellan den toleranta sorten Stinger och den mottagliga kontrollen Rosalinda KWS var 820 kg socker per hektar.

Summary

Tolerant control: SY Muse

Susceptible control: Rosalinda KWS.

Tested variety types

AT:	11 varieties
RZ:	11 varieties
RZNT:	8 varieties
RZNTAT:	1 variety

Trial location: Skibaröd, Skåne.

The sugar yield 2013 for the tolerant control SY Muse was 12.4 ton/ha and for the susceptible control Rosalinda 11.6 ton/ha, a difference of 810 kg sugar/ha.

The variety with the highest sugar yield 2013 was 3K408 (RZAT) which may be promising for *A. cochlioides* infected fields. Another promising variety is 3K436 (RZAT) with 12.60 ton sugar/ha. Both varieties are tested for the first year in official variety trials.

One NT-variety may be an alternative on fields infected with beet cyst nematodes and *A. cochlioides*: HI1326 (RZNTAT). This variety had symptoms of chronic root rot but the sugar yield was 12.61 ton/ha. It is tested for the first year in official variety trials.

Elora KWS may be an alternative on fields infected with beet cyst nematodes and *A. cochlioides.* DSI was among the highest but no severe symptoms of chronic root rot were observed. Elora KWS is tested for the third year in official variety trials.

On average 2012–2013, Stinger had the highest sugar yield with 11.91 ton/ha. SY Muse had 11.55 ton/ha and Rosalinda KWS 11.09 ton/ha. The difference in sugar yield between the tolerant variety Stinger and the susceptible control Rosalinda KWS was 820 kg sugar/ha.

Aim

To test sugar beet varieties on soil infected with *Aphanomyces cochlioides*.

Material and methods

Tolerant control: SY Muse

Susceptible control: Rosalinda KWS.

Tested variety types

AT:	11 varieties
RZ:	11 varieties
RZNT:	8 varieties
RZNTAT:	1 variety

Trial location: Skibaröd, Skåne.

Results and conclusions

Plant number and vigour

Final plant number was high in all entries, range from 93.1 in Gondola KWS to 105 in HI1293.

Plant vigour was 87 in the tolerant control SY Muse; and 72 in the susceptible control Rosalinda.

The number of small plants (defined as plants having at least one leaf pair less than the largest plants) at final emergence was 10.1% in Gondola KWS and 8.8 in Barents. The tolerant control SY Muse had 2.7% % small plants (“pellar” at Plh100) and the susceptible Rosalinda 3.9%.

Disease severity

Disease severity (DSI) was related to plant vigour and the number of small plants at final emergence (figure 1 and 2).

Varieties with high DSI showed low vigour and had a high percentage of small plants.

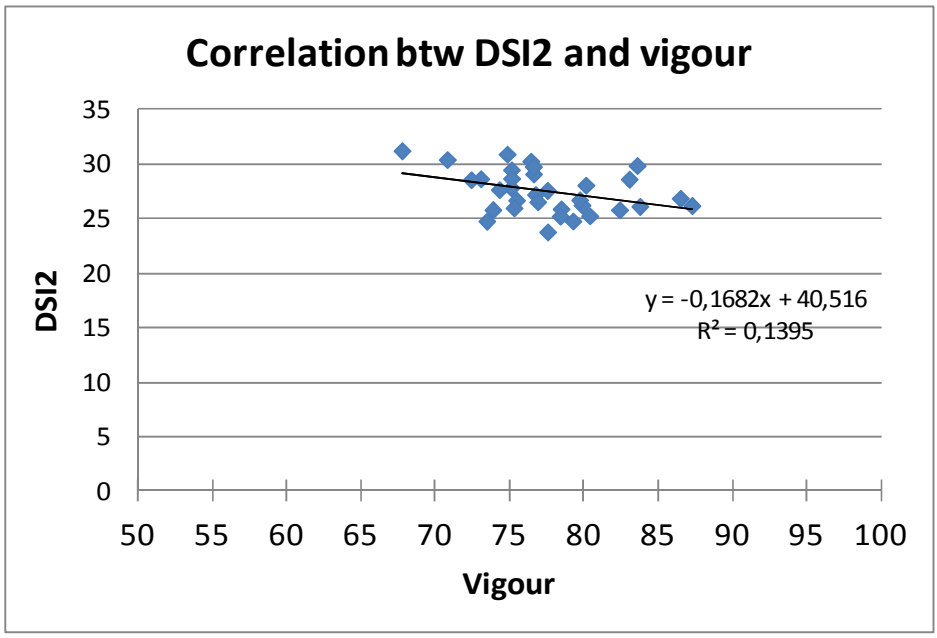

Figure 1. Relationship between disease severity and vigour.

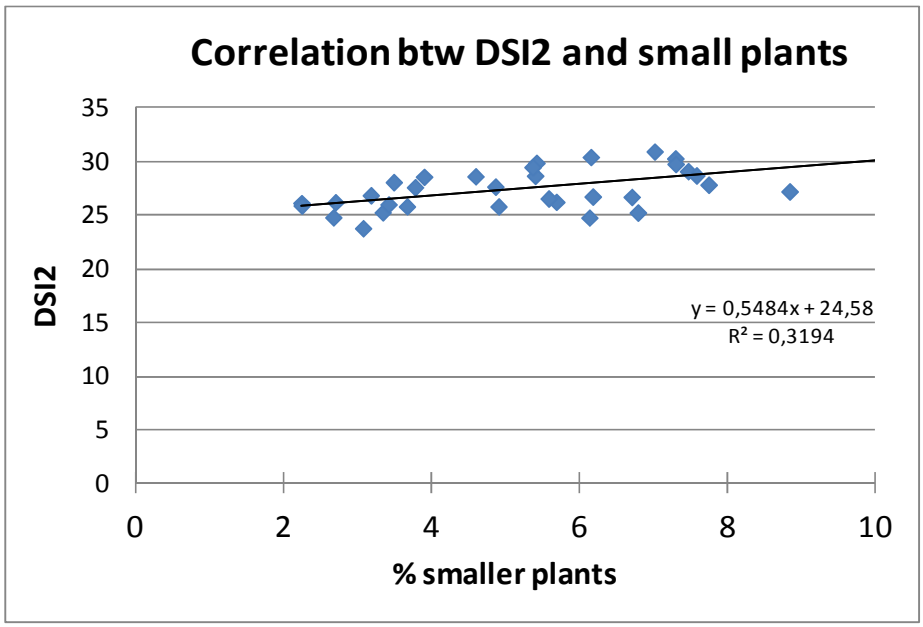

Figure 2. Relationship between disease severity and the number of small plants at final emergence.

The second evaluation of DSI (4 June 2013) is shown in figure 3. The range in DSI was 24 to 31 (LSD 5% = 5.8, Prob. < 0.0240).

The relationship between DSI2 and sugar yield was weak (figure 4).

There was a relationship between RI evaluated in the tare house 27 September 2013 and sugar yield (figure 5).

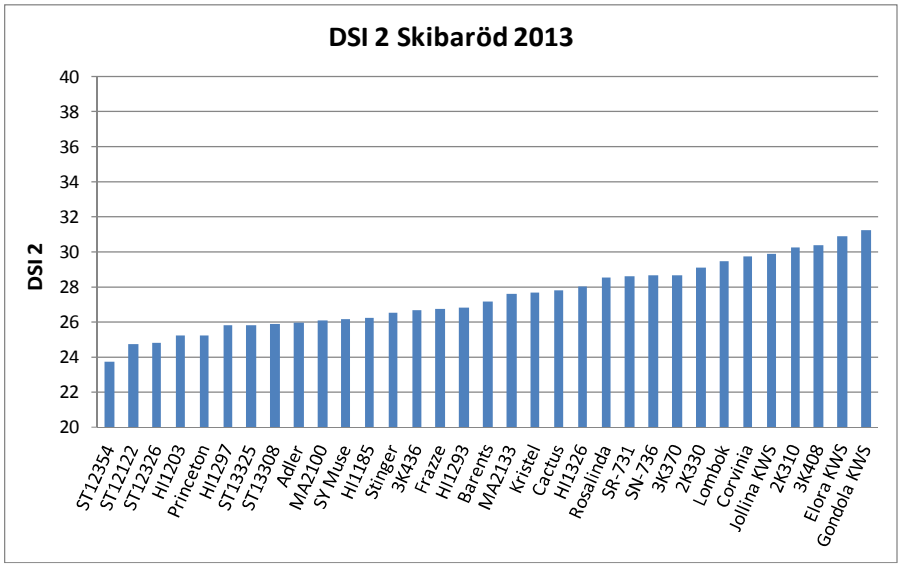

Figure 3. Disease severity at Skibaröd 4 June 2013. LSD 5% = 5.8, Prob. < 0.0240.

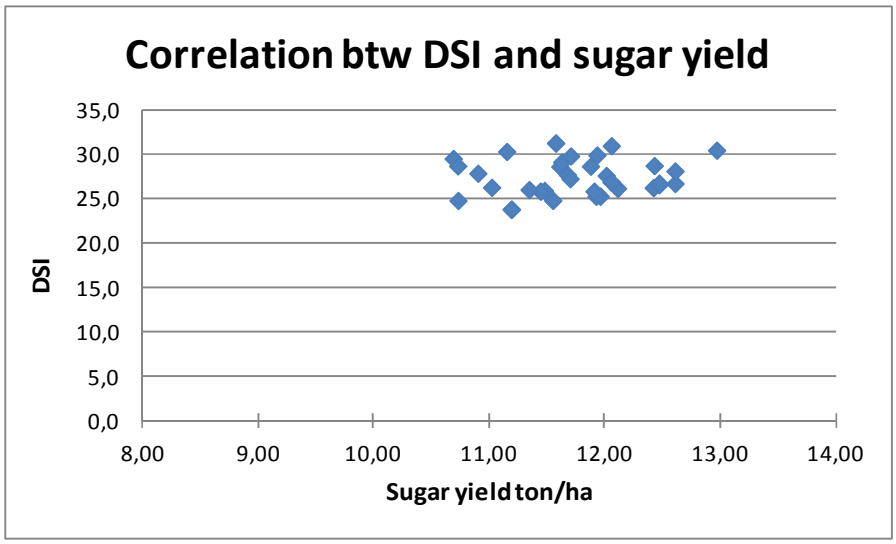

Figure 4. Correlation between DSI 4 June 2013 and sugar yield at Skibaröd.

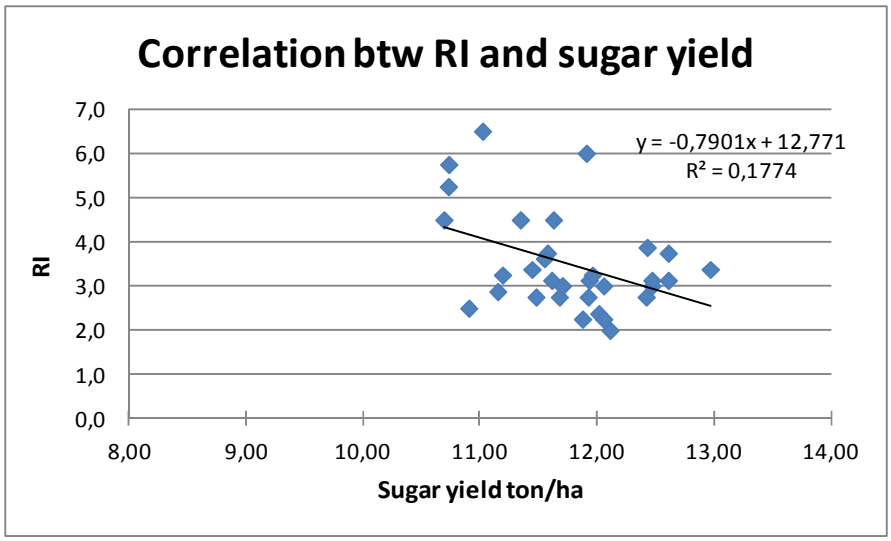

Figure 4. Correlation between RI 27 September 2013 and sugar yield at Skibaröd.

Sugar yield 2013

The sugar yield for the tolerant control SY Muse was 12.4 ton/ha and for the susceptible control Rosalinda 11.6 ton/ha, a difference of 810 kg sugar/ha.

Three varieties had higher sugar yield than SY Muse:
3K408 13.0 ton/ha, 3K436 12.6 and HI1326 12.6 ton/ha.

Three varieties had the same sugar yield as SY Muse:
Stinger 12.47, 3K370 12.42 and Frazze 12.47.

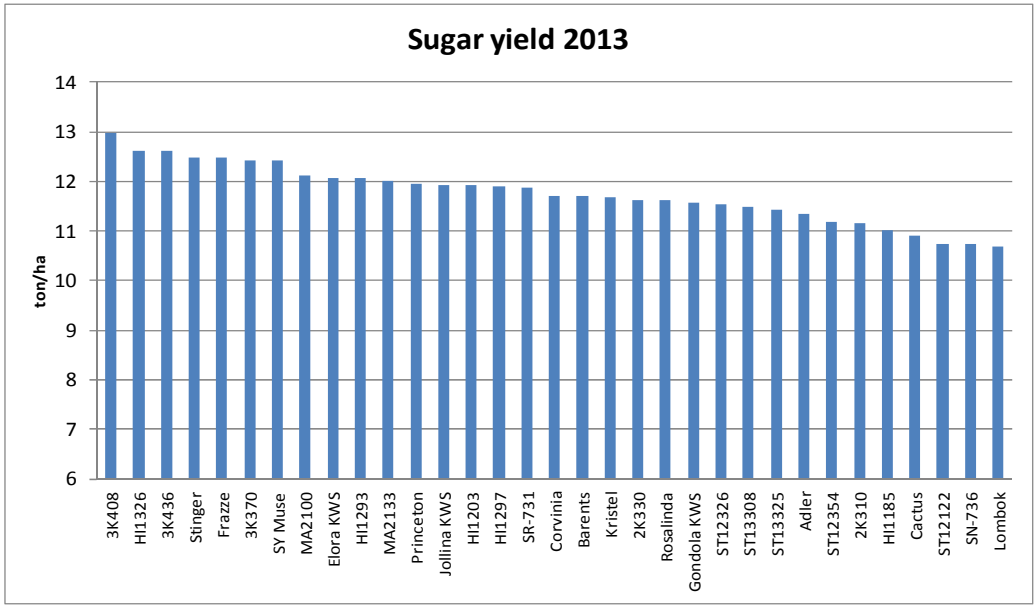

Figure 4. Sugar yield for 33 varieties at Skibaröd 2013. Prob < 0.0001, LSD = 1.2.

Varieties tested in 2012 and 2013

The infection of *A. cochlioides* in 2013 was higher than in 2012.

Varieties that showed a similar level of chronic root rot in both years were Princeton (RI 3 = some deformations on the roots), 2K330 (RI 4 = almost 50% of the roots with deformations) and HI1185 (RI 5 = 50% of the roots with deformations).

On average over the two years, Stinger had the highest sugar yield with 11.91 ton/ha. SY Muse had 11.55 ton/ha and Rosalinda KWS 11.09 ton/ha.

The difference in sugar yield between the tolerant variety Stinger and the susceptible control Rosalinda KWS was 820 kg sugar/ha (average two trials 2012–2013).

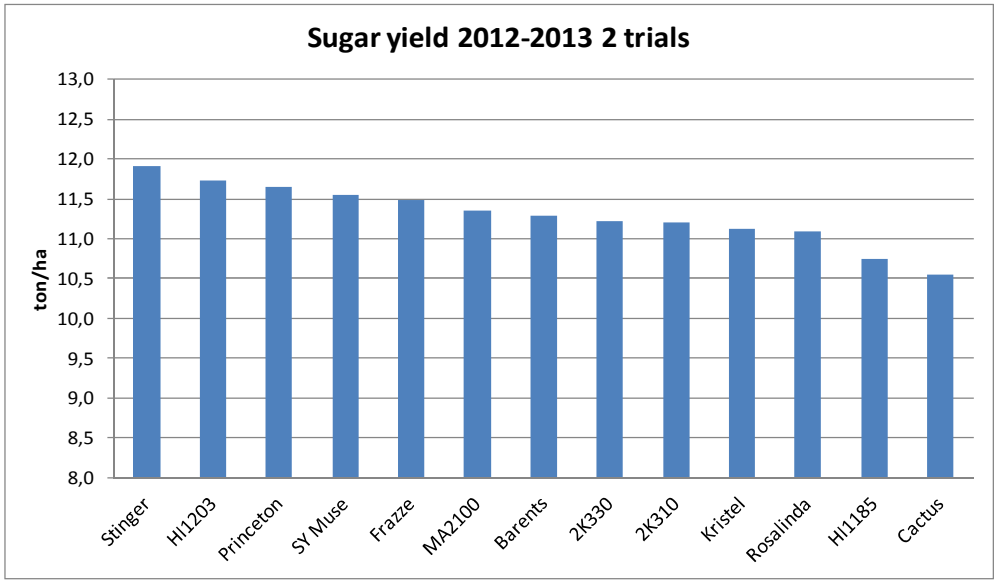

Figure 5. Sugar yield for 13 varieties at Skibaröd 2012–2013.

Classification of varieties

A variety is classified as *tolerant* if it combines high yield with fast and early emergence, low DSI, few or no chronic symptoms on the roots.

A variety is classified as *susceptible* if it combines low yield with slow emergence, high DSI and chronic symptoms on the roots.

Several varieties that are nematode tolerant are also tested in this trial. As they often show lower yield on fields without nematodes, it is difficult to use yield level to evaluate tolerance to *A. cochlioides* for these varieties.

AT-varieties

SY Muse combines low DSI2 with low percentage of roots with chronic root rot symptoms.

The variety with the highest relative sugar yield compared to SY Muse was 3K408 with relative sugar yield 104. 3K408 had somewhat higher DSI2 and higher percentage of roots with symptoms than SY Muse.

In the AT-variety, 2K330, almost half of the beets had weak symptoms of chronic root rot and 6% had severe symptoms. The relative sugar yield was 94 compared to SY Muse (100).

In the AT-variety 3K370, 4% of the roots had severe symptoms on the roots. Despite this, the relative sugar yield was 100.

Table 1. AT-varieties 2013. [1]SY Muse = tolerant control. Green = tolerant, red = susceptible, orange = moderate/further tests needed

Type	Variety	DSI2	RI 0–9	Weak symptoms %	Strong symptoms %	Rel sugar yield
RZAT	SY Muse[1]	26	2.8	26	2	100
RZAT	3K408	30	3.4	31	1	104
RZAT	3K436	27	3.1	36	0	102
RZNTAT	HI1326	28	3.8	41	3	102
RZAT	Stinger	27	3.0	28	0	100
RZAT	3K370	29	3.9	35	4	100
RZAT	MA2100	26	2.0	20	0	98
RZAT	HI1293	27	2.3	19	1	97
RZAT	MA2133	28	2.4	19	1	97
RZAT	HI1203	25	2.8	24	0	96
RZAT	Princeton	25	3.3	39	2	96
RZAT	2K330	29	4.5	48	6	94
RZAT	Kristel	28	2.8	25	2	94

RZ-varieties

One variety, Frazze, had similar yield level as SY Muse. All other RZ-varieties had relative sugar yield less than 96 compared to SY Muse (= 100).

Four varieties had more than 3% of the roots with severe symptoms of chronic root rot: ST12122, ST12326, ST13325 and ST13326.

ST13308 had low DSI2, only 25% of the roots with weak symptoms and no roots with severe symptoms. The yield level (92) was low compared to SY Muse (100).

Table 2. RZ-varieties 2013. [1]Rosalinda = susceptible control. Green = tolerant, red = susceptible, orange = moderate/further tests needed

Type	Variety	DSI2	RI 0–9	Weak symptoms %	Strong symptoms %	Rel sugar yield
RZ	Frazze	27	3.1	34	1	100
RZ	SR-731	29	2.3	22	1	96
RZ	Jollina KWS	30	3.1	35	0	96
RZ	Corvinia KWS	30	3.0	30	1	94
RZ	Barents	27	3.0	29	1	94
RZNE	Rosalinda[1]	29	3.1	40	1	93
RZ	Gondola KWS	31	3.8	49	1	93
RZ	ST12326	25	3.6	40	5	93
RZ	ST13325	26	3.4	55	3	92
RZ	ST13308	26	2.8	25	0	92
RZ	2K310	30	2.9	39	0	90
RZ	ST12354	24	3.3	25	4	90
RZ	ST12122	25	5.8	63	12	86

NT-varieties

One NT-variety may be an alternative on fields infected with beet cyst nematodes and *A. cochlioides*: HI1326 (RZNTAT). This variety had symptoms of chronic root rot but the sugar yield was 12.61 ton/ha. It is tested for the first year in official variety trials.

Elora KWS may also be an alternative on fields infected with beet cyst nematodes and *A. cochlioides.* DSI was among the highest but no severe symptoms of chronic root rot were observed.

Few chronic symptoms were observed in Cactus but he sugar yield was low.

Table 3. NT-varieties 2013. Green = tolerant, red = susceptible, orange = moderate/further tests needed

Type	**Variety**	**DSI2**	**RI 0–9**	**RI** Weak symptoms %	**RI** Strong symptoms %	**Rel sugar yield**
RZNTAT	HI1326	28	3.8	41	3	102
RZNT	HI1297	26	6.0	63	11	97
RZNT	Elora KWS	31	3.0	35	0	97
RZNT	Adler	26	4.5	65	8	91
RZNT	HI1185	26	6.5	75	16	89
RZNT	Cactus	28	2.5	20	0	88
RZNT	Lombok	29	4.5	53	5	88
RZNT	SN-736	29	5.3	63	8	86

Comparison between series 116 at Skibaröd and the official variety trial series 102 2013

There is a good correlation between the percentage of roots with symptoms of *A. cochliodes* at Skibaröd (project 116) and the official variety trial (102) at Äspinge 2013 (figure 6).

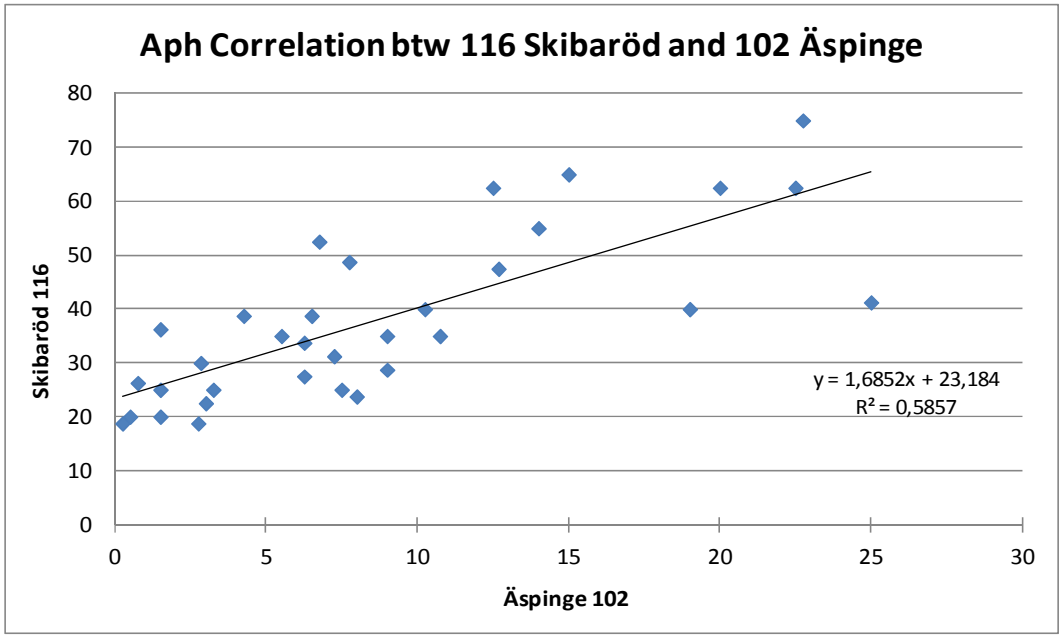

Figure 6. Correlation between the percentage roots with symptoms of A. cochliodes *at Skibaröd (project 116) and the official variety trial (102) at Äspinge 2013.*

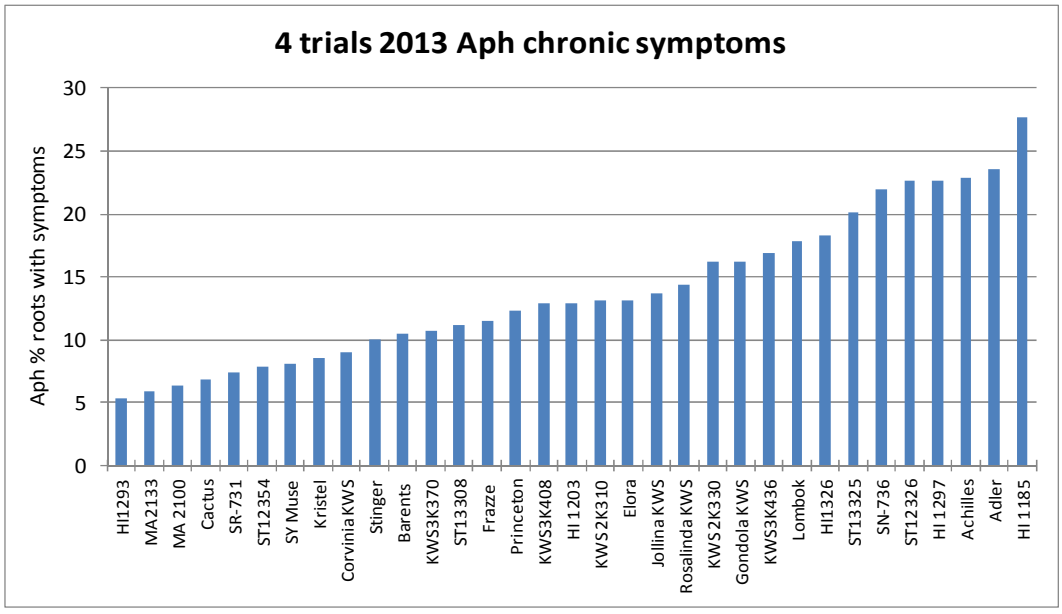

Figure 7. The percentage roots with symptoms of A. cochliodes *in 4 trials 2013 (Skibaröd, Östrabo, Äspinge, Eriksfält).*

The difference in sugar yield between the plus- and minus-group in series 102 is 725 kg sugar (table 4).

The difference between SY Muse and Rosalinda KWS in series 116 is 810 kg sugar.

Table 4. Comparison between series 116 at Skibaröd and the official variety trial series 102 2013. Group with 6 good AT-varieties compared to group with 6 less good

Varieties		Root yield ton/ha		Sugar yield ton/ha	Rel.	Diff. kg sugar
Sugar yield series 102, 6 trials						
Plus	1,2,4,5,7,8,	89,8	6	14,97	100	
Minus	9,17,20,25,41,3	89,6	6	14,93	100	40
Plus	1,2,4,5,7,8,	89,8	6	14,97	100	
Sugar yield series 116						
Plus	1,2,4,5,7,8,	71,64	6	11,94	100	
Minus	9,17,20,25,41,3	67,29	6	11,22	94	**725**
Sugar yield series 102 Äspinge						
Plus	1,2,4,5,7,8,	71,9	6	11,98	100	
Minus	9,17,20,25,41,3	71,7	6	11,95	100	
Sugar yield series 102 Kvistofta – no symptoms						
Plus	1,2,4,5,7,8,	92,5	6	15,42	100	
Minus	9,17,20,25,41,3	94,6	6	15,77	102	
Sugar yield series 102 Lönnstorp – few symptoms						
Plus	1,2,4,5,7,8,	80,9	6	13,48	100	
Minus	9,17,20,25,41,3	78,9	6	13,15	98	

Plus group	**Minus group**
1. SY Muse	9. HI1185
2. Corvinia KWS	17. Lombok
4. Stinger	20. Adler
5. Barents	25. HI1297
7. Frazze	41. SN-736
8. Cactus	3. Rosalinda KWS

Conclusions

The sugar yield 2013 for the tolerant control SY Muse was 12.4 ton/ha and for the susceptible control Rosalinda 11.6 ton/ha, a difference of 810 kg sugar/ha. The difference in sugar yield between the plus- and minus-group in series 102 is 725 kg sugar.

The three varieties Adler, Lombok, HI1185 show 3% (400 kg) lower sugar yield than Elora KWS in series 102 but 9% (900 kg) in series 116 at Skibaröd.

The variety with the highest sugar yield 2013 was 3K408 (RZAT) which may be promising for *A. cochlioides* infected fields. Another promising variety is 3K436 (RZAT) with 12.60 ton sugar/ha. Both varieties are tested for the first year in official variety trials.

One NT variety may be an alternative on fields infected with beet cyst nematodes and *A. cochlioides*: HI1326 (RZNTAT). This variety had symptoms of chronic root rot but the sugar yield was 12.61 ton/ha. It is tested for the first year in official variety trials.

Elora KWS may be an alternative on fields infected with beet cyst nematodes and *A. cochlioides.* DSI was among the highest but no severe symptoms of chronic root rot were observed. Elora KWS is tested for the third year in official variety trials.

On average 2012–2013, Stinger had the highest sugar yield with 11.91 ton/ha. SY Muse had 11.55 ton/ha and Rosalinda KWS 11.09 ton/ha. The difference in sugar yield between the tolerant variety Stinger and the susceptible control Rosalinda KWS was 820 kg sugar/ha.

Less good varieties among the first year varieties are: HI1185, Adler, Lombok and Gondola KWS.

Chronic symptoms of Aphanomyces root rot in the trial at Skibaröd, Hurva 2013:

Borgeby in December 2013

Åsa Olsson
Project Manager
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NBR Nordic Beet Research Foundation