

# Differences in tolerance to soil borne fungi in sugar beet varieties 2009

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## Differences in tolerance to soil borne fungi in sugar beet varieties 2009

### Sammanfattning

Sockerbetor kan angripas av flera jordburna svamparter. Den viktigaste i Sverige är *Aphanomyces cochlioides*. Plantbortfall under uppkomsten kan förhindras genom att fröet betas med Tachigaren med den verksamma beståndsdelan hymexazol. Denna betning räcker i cirka fyra till sex veckor. Senare angrepp kan ge kroniska skador på rötterna. Sedan några år tillbaka provas nya sorter i Sverige på naturligt infekterad mark. Resultaten från dessa försök har visat att det finns stor variation mellan sockerbetsorter vad gäller tolerans mot jordburna svampar. Under 2009 provades totalt 17 sorter i två försök i Skåne. I försöket gjordes bedömningar av plantantal och rotbrandsangrepp under uppkomst samt skörd och kroniska rotskador efter skörd.

Båda försöksplatserna hade en mycket hög smittograd i marken men vädret gjorde att angreppen under året blev mycket små. Redan vid detta låga sjukdomstryck, tyder resultaten på att det finns signifikanta sortskillnader i sjukdomsindex. Men, sorterna måste också testas vid högre infektionstryck för att med säkerhet kunna avgöra deras toleransnivå.

HI0813, Plexus, Rosalinda KWS, Mixer och HI0870 hade signifikant högre skörd än Silotta, Julietta KWS, Theresa KWS, ST\_S\_APH3, Emilia KWS, ST\_S\_APH1 och ST\_S\_APH2.

### Summary

One of the most important soil borne fungi in Sweden is *Aphanomyces cochlioides*. The disease occurs in two phases, one early causing damping-off after emergence and one later chronic phase which may cause severe root deformations. New varieties are routinely tested every year in Sweden on naturally infested soil. Disease severity during emergence, plant number and yield was evaluated in two trials 2009, at Skiberöd and Ekeberg in Skåne.

Both sites had a very high level of infestation, but the weather during this year was not favorable for disease development and the infection level was very low. However, despite the low infection, there were significant differences between the varieties in disease severity. The varieties needs to be tested also under more severe conditions.

HI0813, Plexus, Rosalinda KWS, Mixer and HI0870 showed significantly higher yield than Silotta, Julietta KWS, Theresa KWS, ST\_S\_APH3, Emilia KWS, ST\_S\_APH1 and ST\_S\_APH2.

## Introduction

One of the most important soil borne fungi in Sweden is *Aphanomyces cochlioides*. The disease occurs in two phases, one early causing damping-off after emergence and one later chronic phase. Resulting problems are reduced plant number and root yield. Identification of high risk fields is important and control methods include seed treatment with hymexazol, growing tolerant varieties and liming. New varieties are routinely tested every year in Sweden on naturally infested soil.

## Materials and methods

### Field trials

Two field trials, one at Ekeberg and one at Skiberöd, were sown on naturally infested soil. Rasta was used as tolerant control and Zanzibar with and without hymexazol as sensitive control. The trial design was a random complete block design with four replications.

### Evaluations

The number of plants in each plot was counted four times (at 20%, 50%, max and final emergence). Plant vigour was evaluated once. Evaluation of damping-off was performed twice in early spring. The first evaluation took place when the plants had developed cotyledons and the second evaluation two weeks later. In the sample area 20 randomly chosen plants were dug up and each plant was evaluated for symptoms of damping-off and classified into one of six groups: 0 (healthy), 10, 25, 50, 75 and 100% (dead plants). A disease index was calculated using the following equation developed by Larsson and Gerhardson (1990):

$$DSI = ((n_0 * 0 + n_{20} * 20 + n_{50} * 50 + n_{75} * 75 + n_{100} * 100) / \text{plant number})$$

where n = number of beets in each class.

After harvest, the beets in each plot were evaluated for symptoms of chronic root rot using a scale from 1–7 (table 1). The evaluation of chronic root rot was carried out at the central tare house in Örtofta (Agri Provtvätt, Örtofta Sockerbruk, Nordic Sugar).

*Table 1. Scale for evaluation of chronic symptoms of root rots*

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Scale	
1	Weak symptoms on max. 25% of the beets
2	Weak symptoms on max. 50% of the beets
3	Weak symptoms on max. 75% of the beets
4	Strong symptoms on 25% of the beets
5	Strong symptoms on 50% of the beets
6	Strong symptoms on 75% of the beets
7	Severe symptoms on all beets

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## Statistical analyses

All variables measured in the field trial were analyzed using analysis of variance (Proc GLM, SAS) and pair wise differences were analyzed with Fischer's LSD test.

## Results and discussion

Sugar beets were drilled from the end of March to the mid of April in the Swedish growing area. Problems with damping-off during emergence were generally low due to very low rainfall both in the spring and in the summer. Only weak symptoms of *Aphanomyces* root rot were observed in the trials and almost no chronic symptoms.

### Plant number

Plant numbers at 50% emergence, at Skiberöd are shown in figure 1.

Plexus, ST\_S\_APH3 and Mixer had the highest number of plants (between 42 800 and 63 700).

ST\_S\_APH1, Theresa KWS and Zanzibar (without hymexazol), ST\_S\_APH2 and Silotta all had less than 20 000 plants at the same time.

The plant numbers at Ekeberg were higher than at Skiberöd. Also in this trial Plexus had the highest plant number (more than 100 000) and ST\_S\_APH1 and ST\_S\_APH2 were the varieties with the lowest plant numbers (less than 70 000).

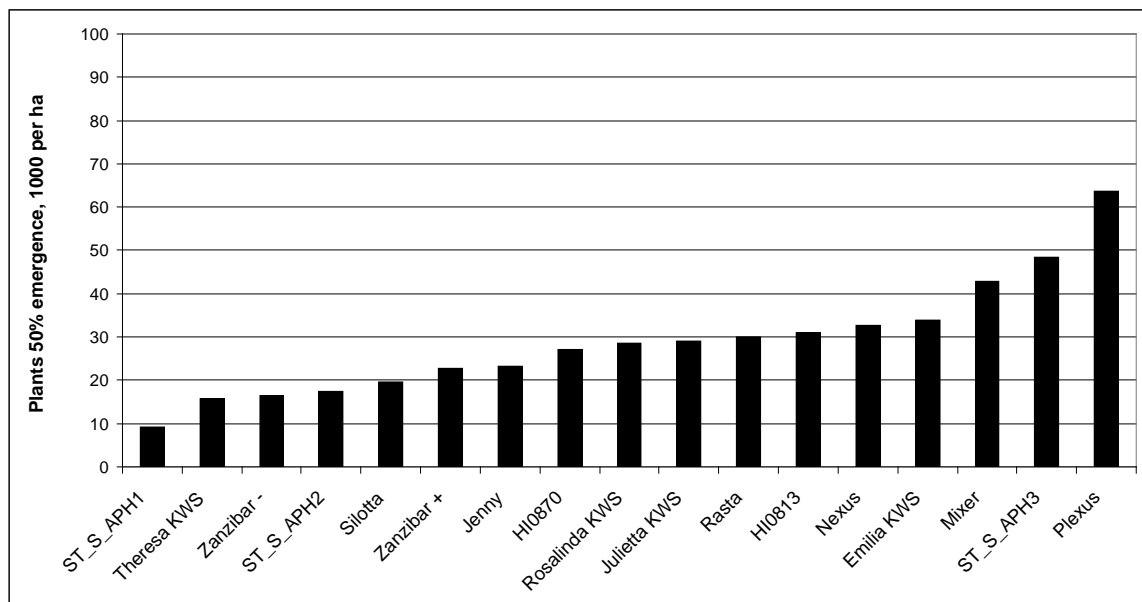


Figure 1. Plant number (1000 per ha) at 50% emergence, 20 April, Skiberöd. Prob = <0,0001, LSD = 11,7.

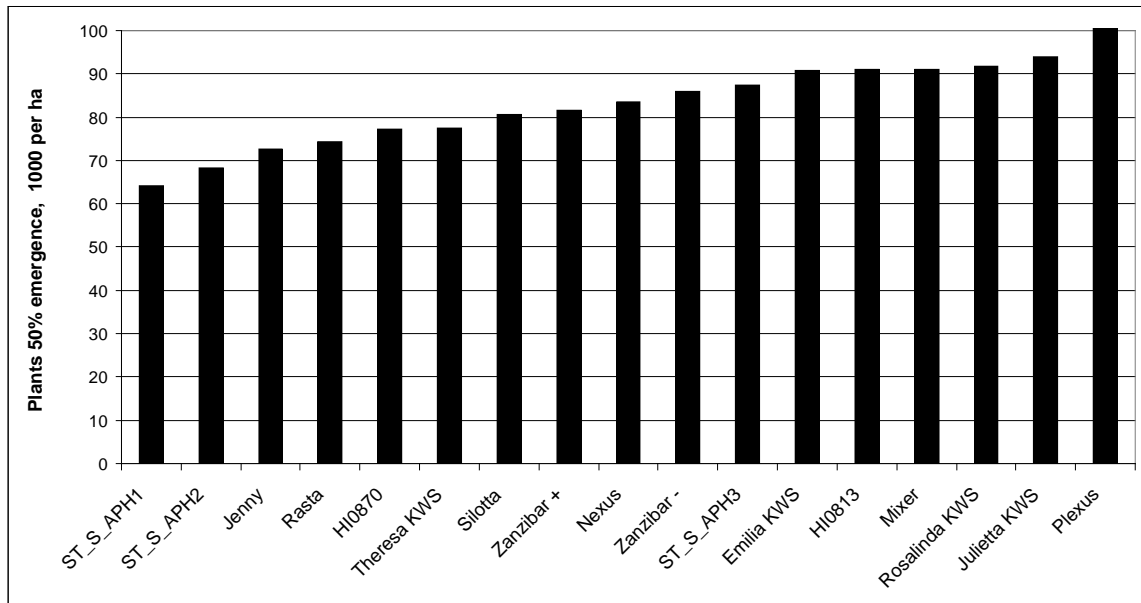


Figure 2. Plant number (1000 per ha) at 50% emergence, 28 April, Ekeberg. Prob = <0,0002, LSD = 14,8.

### Disease severity – early phase

Root rot infections were generally low 2009, mainly because of the dry weather after drilling. The typical symptoms of *Aphanomyces* root rot, thread like and discoloured hypocotyls, were rare. However, significant differences in DSI between varieties were measured in the second evaluation of DSI at Ekeberg.

ST\_S\_APH3, Nexus and Theresa KWS showed significantly lower DSI at Ekeberg (figure 3), than Silotta, Emilia KWS and Zanzibar (without hymexazol).

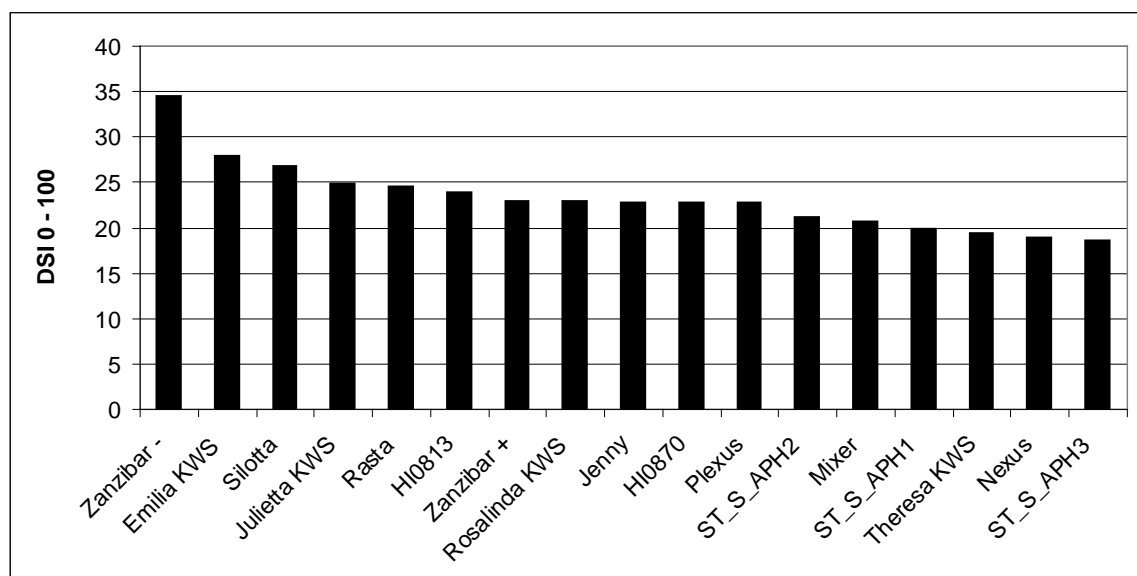


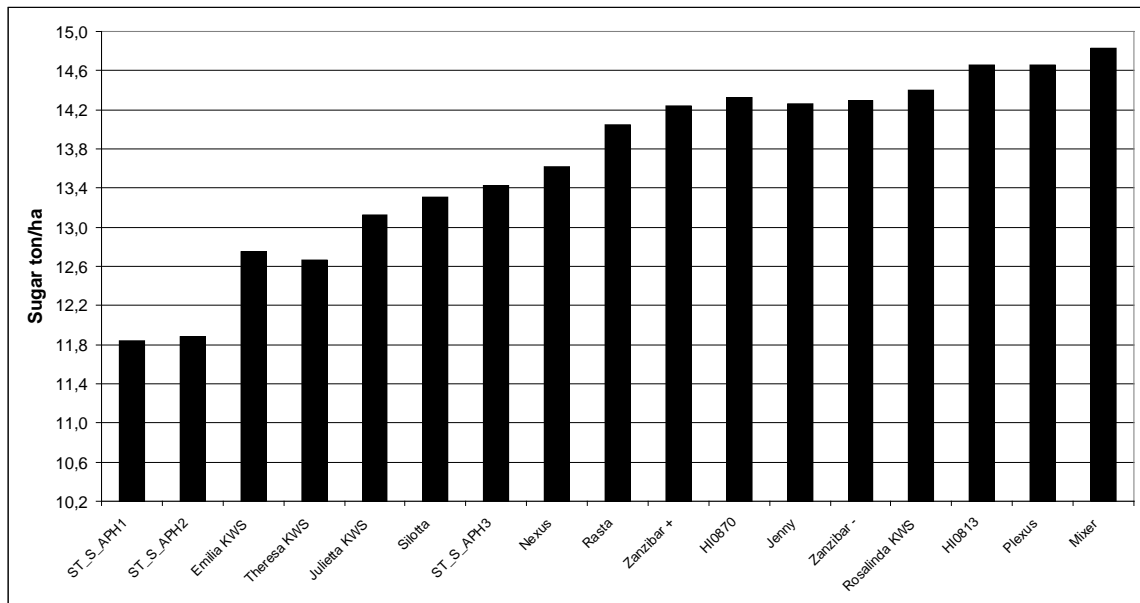
Figure 3. Disease severity, 20/5 2009, Ekeberg. Prob = 0,0146, LSD = 7,4.

## Yield

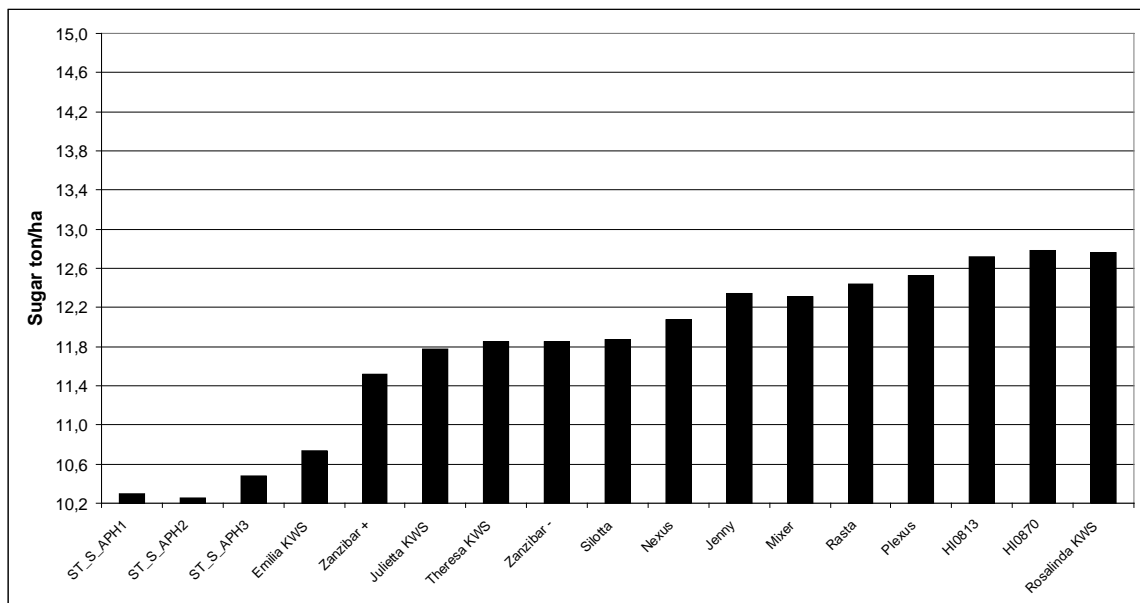
ST\_S\_APH1, ST\_S\_APH2, Emilia and Theresa KWS showed significantly lower yield than Rosalinda KWS, HI0813, Plexus and Mixer at Skiberöd.

At Ekeberg ST\_S\_APH1, ST\_S\_APH2, ST\_S\_APH3 and Emilia KWS showed significantly lower yield than all of the other varieties in the trial.

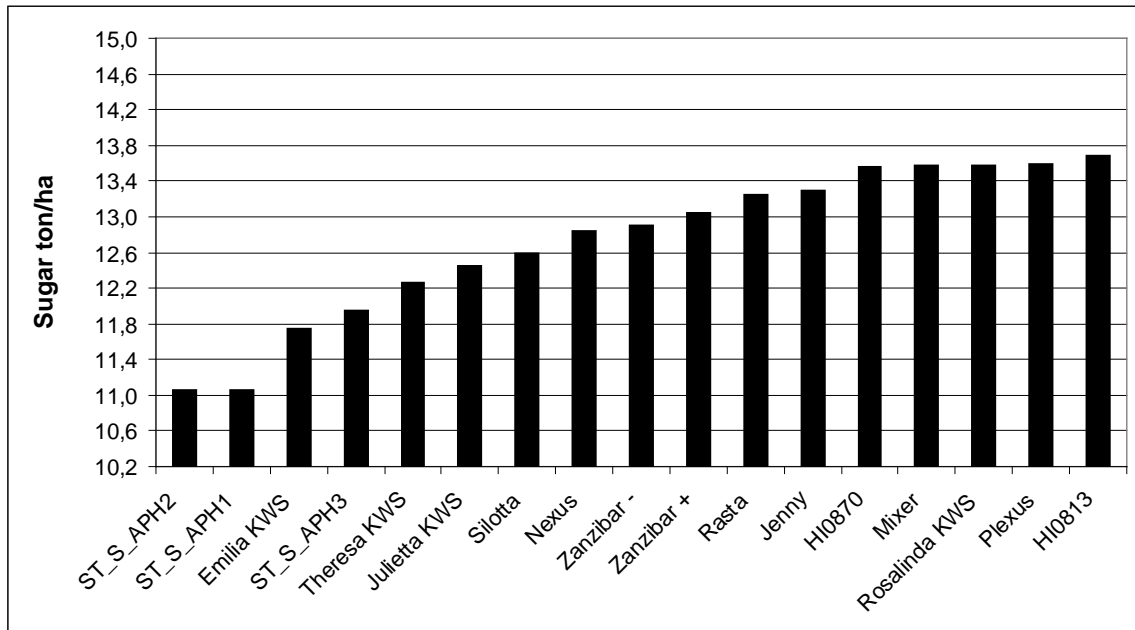
The average yields over the two trials 2009 are shown in figure 6. HI0813, Plexus, Rosalinda KWS, Mixer and HI0870 showed significantly higher yield than Silotta, Julietta KWS, Theresa KWS, ST\_S\_APH3, Emilia KWS, ST\_S\_APH1 and ST\_S\_APH2.



Figur 4. Sugar yield, ton/ha, Skiberöd. Prob = 0,0003, LSD = 1,4.



Figur 5. Sugar yield, ton/ha, Ekeberg. Prob = <0,0001, LSD = 0,9.



Figur 6. Sugar yield, ton/ha, 2 trials 2009. Prob =>0,0001, LSD = 0,8, R<sup>2</sup> = 95,1%.

### Chronic symptoms

No chronic symptoms of root rot were observed in the trials after harvest.

### Conclusions

ST\_S\_APH3, Nexus and Theresa KWS showed significantly lower DSI at Ekeberg, than Silotta, Emilia KWS and Zanzibar (without hymexazol).

HI0813, Plexus, Rosalinda KWS, Mixer and HI0870 showed significantly higher yield than Silotta, Julietta KWS, Theresa KWS, ST\_S\_APH3, Emilia KWS, ST\_S\_APH1 and ST\_S\_APH2.

### References

Larsson, M., and Gerhardson, B. 1990. Isolates of *Phytophthora cryptogea* pathogenic to wheat and some other crop plants. *Journal of Phytopathology* 129: 303-315.

*Borgeby in April 2010*

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**Differences in tolerance to soil borne fungi in sugar beet varieties**

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**Syfte/aim:**

Att prova nya lovande betsorter vad gäller betkvalitet, renhet, sjukdomsresistens, avkastning och odlingssäkerhet. /

To compare sugar beet varieties for their beet quality and yield, level of resistance to diseases and growing characteristics.

<b>Led, sort</b>	<b>Företag</b>	<b>Land</b>	<b>Betning</b>
Entry, variety	Company	Country	Seed treatment
1 Rasta	Syngenta	SE, NL	14 g a. i. hymexazol
2 Zanzibar	SES	SE, NL	Utan/without hymexazol
3 Zanzibar	SES	SE, NL	Med/with hymexazol
4 Emilia KWS	KWS	SE, NL	14 g a. i. hymexazol
5 Silotta	Syngenta	SE, NL	14 g a. i. hymexazol
6 Jenny	Maribo Seeds	SE, NL	14 g a. i. hymexazol
7 Rosalinda KWS	KWS	SE, NL	14 g a. i. hymexazol
8 Mixer	Syngenta	SE, NL	14 g a. i. hymexazol
9 Plexus	Syngenta	SE, NL	14 g a. i. hymexazol
10 Nexus	Syngenta	SE	14 g a. i. hymexazol
11 Julietta KWS	KWS	SE	14 g a. i. hymexazol
12 Theresa KWS	KWS	SE	14 g a. i. hymexazol
13 HI0813	Syngenta	SE	14 g a. i. hymexazol
14 HI0870	Syngenta	SE	14 g a. i. hymexazol
15 ST_S_APH1	Strube Saat	SE	14 g a. i. hymexazol
16 ST_S_APH2	Strube Saat	SE	14 g a. i. hymexazol
17 ST_S_APH3	Strube Saat	SE	14 g a. i. hymexazol



## Differences in tolerance to soil borne fungi in sugar beet varieties

Plats / Site	Försöksvärd (namn, adress o telefon)	
Ekeberg	Lennart Nilsson, Ekebergs gård, Ekebergsv. 12, 291 92 Kristianstad	0702-45 54 27
Skibaröd	Sten Ohlsson, Skibaröds gård, 240 33 Löberöd	0709-36 70 69

## Försöksplan / Trial plan

## Ekeberg

IV	3	17	13	7	11	6	10	15	2	12	5	14	1	8	16	9	4
	4052	4053	4054	4055	4056	4057	4058	4059	4060	4061	4062	4063	4064	4065	4066	4067	4068
III	9	4	13	2	17	12	1	6	8	3	16	11	5	7	14	15	10
	4035	4036	4037	4038	4039	4040	4041	4042	4043	4044	4045	4046	4047	4048	4049	4050	4051
II	7	2	11	15	10	14	4	6	17	1	9	3	5	12	16	13	8
	4018	4019	4020	4021	4022	4023	4024	4025	4026	4027	4028	4029	4030	4031	4032	4033	4034
I	5	15	9	13	16	8	12	2	4	14	7	17	1	3	10	11	6
	4001	4002	4003	4004	4005	4006	4007	4008	4009	4010	4011	4012	4013	4014	4015	4016	4017

## Skibaröd

IV	15	2	14	4	3	11	7	17	8	5	9	10	6	12	13	1	16
	4120	4121	4122	4123	4124	4125	4126	4127	4128	4129	4130	4131	4132	4133	4134	4135	4136
III	10	14	9	16	15	6	2	12	3	17	4	5	1	7	8	13	11
	4103	4104	4105	4106	4107	4108	4109	4110	4111	4112	4113	4114	4115	4116	4117	4118	4119
II	6	10	5	12	11	2	15	8	16	13	17	1	14	3	4	9	7
	4086	4087	4088	4089	4090	4091	4092	4093	4094	4095	4096	4097	4098	4099	4100	4101	4102
I	13	17	12	2	1	9	5	15	6	3	7	8	4	10	11	16	14
	4069	4070	4071	4072	4073	4074	4075	4076	4077	4078	4079	4080	4081	4082	4083	4084	4085

 Provtagningsyta / sampling area



# Differences in tolerance to soil borne fungi in sugar beet varieties

Appendix 4 a

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Skibaröd

Analys och bedömningar	Tid	PM	Kommentarer	Utförare	Datum	Signatur
Analysis and evaluations	Time	PM	Comments	Responsible	Date	Signature
Generalprov 6		2.6.1		HS	22/1	JM
Svampprov	jan-febr	2.6.1	Soil test DSI. NBR L. Eriksson	HS	22/1	JM
Utstakning i fält		2.4.1		HS	22/1	JM
Parcellvis sådd		2.4.2		HS	3/4	JE,HJ
Planräkning 20		2.5.4		HS	17/4	JM,HJ
Planräkning 50		2.5.4		HS	20/4	JE
Planräkning max		2.5.4		HS	18/5	JE,MW
Planräkning slutl		2.5.4		HS		
Rotbrandsbed. 1	BBCH 10-11	2.5.8	In sampling area	HS	5/5	JM,JE, MW
Rotbrandsbed. 2	BBCH 14-15	2.5.8	In sampling area. Two weeks after first evaluation	HS	18/5	JE,MW
Sundhet	BBCH 10-19	2.5.20		NBR		
Radtäckning	BBCH 10-19	2.5.6		NBR		
Besiktning inför skörd				NBR		
Skörd		2.4.7		HS	19/10	JM,OK,DR
Leverans till provtvätt		2.4.7		HS	19/10	DR
Svampangrepp efter skörd		2.5.10		NBR		
Analys av skördevariabler		-		DS		
Bevattnat av Sten Ohlsson	Mängd 20 mm			Sten Ohlsson	14/5	

## Differences in tolerance to soil borne fungi in sugar beet varieties

Ekeberg

<b>Analyser och bedömningar</b>	<b>Tid</b>	<b>PM</b>	<b>Kommentarer</b>	<b>Utförare</b>	<b>Datum</b>	<b>Signatur</b>
Analysis and evaluations	Time	PM	Comments	Responsible	Date	Signature
Generalprov 6		2.6.1		HS	22/1	JM
Svampprov	jan-febr	2.6.1	Soil test DSI. NBR L. Eriksson	HS	22/1	JM
Utstakning i fält		2.4.1		HS	22/1	JM
Parcellvis sådd		2.4.2		HS	15/4	JE,HJ
Planträkning 20		2.5.4		HS	27/4	JM, RM
Planträkning 50		2.5.4		HS	28/4	JM, RM
Planträkning max		2.5.4		HS	9/6	MW, UDM
Planträkning slutl		2.5.4		HS		
Rotbrandsbed. 1	BBCH 10-11	2.5.8	In sampling area	HS	7/5	MW, JE, ÅO, SH
Rotbrandsbed. 2	BBCH 14-15	2.5.8	In sampling area. Two weeks after first evaluation	HS	19/5	JM, SH, RM
Sundhet	BBCH 10-19	2.5.20		NBR		
Radtäckning	BBCH 10-19	2.5.6		NBR		
Besiktning inför skörd				NBR		
Skörd		2.4.7		HS	17/9	JM, OK,
Leverans till provtvätt		2.4.7		HS	24/9	JM
Svampangrepp efter skörd		2.5.10		NBR		
Analys av skördevariabler		-		DS		

## Differences in tolerance to soil borne fungi in sugar beet varieties

## Fertilizer and plant protection

Datum	Produkt och dos / Product and dose					
Date	G	B	T	S	Olja / oil	
	Goltix	Betanal	Tramat	Safari (g)		
<b>Skibaröd</b>						
24/4	1,0	1,5		10	1	
8/5	0,5 Pyramin	2,0	1,5	0,15	25	0,7
<b>Ekeberg</b>						
24/4	1,7	1,7			0,5	
5/5	2,0	2,0			0,5	
13/5	1,0	2,0		20	0,3	
25/5	1,0 Pyramin	1,0	2,0	30	0,3	

## Gödning / Fertilization

Datum	Produkt och giva / Product and dose			
Date	Product	N	P	K
<b>Skibaröd</b>				
2/4	650 kg/ha	Probeta		
<b>Ekeberg</b>				
14/4	375 kg/ha	N27		
14/4	175 kg/ha	Besal		

## Bladsvampar / Leaf diseases

Datum	Produkt och giva / Product and dose
Date	
<b>Skibaröd</b>	
15/8	0,5 Comet
<b>Ekeberg</b>	
	-

## Försöksinformation / Trial info

	Förfrukt	Radavstånd	Antal frö/m
	Precrops	Row spacing	Seed distance
<b>Skibaröd</b>	Höstvete	48 cm	5,4 frö/m
<b>Ekeberg</b>	Höstvete	48 cm	5,4 frö/m

**Differences in tolerance to soil borne fungi in sugar beet varieties****Jordanalyser / Soil analyses**

		Skibaröd		Ekeberg	
		<i>Klass</i>		<i>Klass</i>	
pH-värde		6,4		6,8	
P-AL (mg/100 g jord)		11	<i>IVA</i>	12	<i>IVA</i>
K-AL (mg/100 g jord)		22,0	<i>IV</i>	16,0	<i>III</i>
Mg-AL (mg/100 g jord)		6,8		16,0	
K/Mg-kvot		3,2		1,0	
Ca-AL (mg/100 g jord)		130		740	
K-HCl (mg/100 g jord)		100	2	280	4
Cu-HCl (mg/kg jord)		4,6		21,0	
P-HCL (mg/100 g jord)		74	4	96	5
Bor (mg/kg jord)	Boron mg/kg soil				
Mullhalt (%)	Organic matter (%)	2,6		10,1	
Lerhalt (%)	Clay (%)	10		25	
Sand + grovmo (%)	Sand+fine sand (%)	59		25	
Jordart	Soil type	nmh Imo		mr ML	

**Particle size**

Sand	Sand = 2-0,2 mm
Grovmo	Fine sand = 0,02-0,06 mm
Finmo	Coarse silt = 0,06-0,02 mm
Mjåla	Silt = 0,02-0,002
Lera	Clay = <0,002 mm
Finler	Fine clay = <0,0006

**Soil type**

nmhSa = medium humus rich light sand  
 mmhSa = humus rich light sand  
 mmhImo = humus rich fine sand soil  
 mmhmoLL = humus rich loam soil  
 mfsaLL = humus poor sandy loam soil  
 mflSa = humus poor clay sand soil  
 mf Imo = humus poor fine sand  
 mf moLL = humus poor loam soil  
 nmhsaLL = medium humus rich sandy loam soil

## Differences in tolerance to soil borne fungi in sugar beet varieties

Sort / Variety	Plantor / Plants 1000/ha			Sundhet	Radtäckn.
	20%	50%	Max	Vigour 0-100	Row cov %
<b>Skibaröd</b>	<i>090417</i>	<i>090420</i>	<i>090518</i>	<i>090624</i>	<i>090624</i>
1 Rasta	11,3	30,1	88,3	94,5	81,3
2 Zanzibar -hymexazol	5,8	16,5	92,6	92,0	80,2
3 Zanzibar +hymexazol	6,1	22,9	98,4	90,8	74,0
4 Emilia KWS	14,5	33,9	88,5	90,0	59,9
5 Silotta	7,8	19,7	85,6	94,5	81,8
6 Jenny	4,6	23,1	90,9	94,0	81,8
7 Rosalinda KWS	13,0	28,6	97,2	91,3	72,4
8 Mixer	14,8	42,8	96,9	96,5	82,8
9 Plexus	35,6	63,7	98,4	97,8	87,0
10 Nexus	6,7	32,7	92,6	90,0	66,1
11 Julietta KWS	13,0	28,9	95,8	94,8	77,6
12 Theresa KWS	5,5	15,6	88,3	94,0	66,1
13 HI0813	8,4	31,0	87,1	91,8	75,0
14 HI0870	7,5	27,2	91,1	89,0	68,2
15 ST_S_APH1	2,6	9,3	96,6	93,3	81,8
16 ST_S_APH2	5,5	17,4	87,4	89,5	71,4
17 ST_S_APH3	21,4	48,3	89,7	95,8	83,3
RSQ	85,1	78,2	85,5	34,5	52,8
CV	36,8	28,5	6,3	5,6	12,8
LSD	5,7	11,7	8,2	7,4	13,8
Prob	<0,0001	<0,0001	0,0155	0,4702	0,0091
<b>Ekeberg</b>	<i>090427</i>	<i>090428</i>	<i>090609</i>	<i>090624</i>	<i>090624</i>
1 Rasta	34,4	74,4	96,9	94,5	71,4
2 Zanzibar -hymexazol	21,1	85,9	102,4	91,5	66,1
3 Zanzibar +hymexazol	18,5	81,6	102,1	92,0	67,7
4 Emilia KWS	45,1	90,9	99,2	88,3	42,7
5 Silotta	23,7	80,7	103,0	94,5	78,1
6 Jenny	17,7	72,6	102,4	95,8	72,9
7 Rosalinda KWS	46,3	91,7	96,6	92,0	61,5
8 Mixer	45,4	91,1	105,3	95,5	72,9
9 Plexus	67,7	101,6	105,0	97,3	81,8
10 Nexus	24,0	83,6	99,8	94,0	63,5
11 Julietta KWS	46,0	94,0	101,0	95,3	72,4
12 Theresa KWS	27,2	77,5	102,1	93,3	74,5
13 HI0813	41,4	91,1	104,5	95,3	71,4
14 HI0870	21,4	77,3	103,6	95,3	77,1
15 ST_S_APH1	17,7	64,2	101,0	95,3	70,3
16 ST_S_APH2	14,8	68,3	102,1	90,5	66,1
17 ST_S_APH3	48,3	87,4	104,7	94,0	71,4
RSQ	79,0	58,6	83,0	53,9	43,2
CV	27,9	12,5	4,4	3,5	17,6
LSD	13,1	14,8	6,3	4,6	17,4
Prob	<0,0001	0,0002	0,2658	0,0414	0,0346

## Differences in tolerance to soil borne fungi in sugar beet varieties

Sort / Variety	Plantor / Plants 1000/ha			Sundhet Vigour 0-100	Radtäckn. Row cov %
	20%	50%	Max		
<b>Average</b>					
1 Rasta	22,9	52,2	92,6	94,5	76,3
2 Zanzibar -hymexazol	13,5	51,2	97,5	91,8	73,2
3 Zanzibar +hymexazol	12,3	52,2	100,3	91,4	70,8
4 Emilia KWS	29,8	62,4	93,9	89,1	51,3
5 Silotta	15,8	50,2	94,3	94,5	79,9
6 Jenny	11,1	47,9	96,6	94,9	77,3
7 Rosalinda KWS	29,7	60,2	97,1	91,6	66,9
8 Mixer	30,1	67,0	101,1	96,0	77,9
9 Plexus	51,6	82,6	101,7	97,5	84,4
10 Nexus	15,3	58,2	96,2	92,0	64,8
11 Julietta KWS	29,5	61,5	98,4	95,0	75,0
12 Theresa KWS	16,3	46,6	95,2	93,6	70,3
13 HI0813	24,9	61,1	95,8	93,5	73,2
14 HI0870	14,5	52,2	97,4	92,1	72,7
15 ST_S_APH1	10,1	36,7	98,8	94,3	76,0
16 ST_S_APH2	10,1	42,8	94,8	90,0	68,8
17 ST_S_APH3	34,9	67,9	97,2	94,9	77,3
RSQ	80,0	90,3	20,6	20,5	35,0
CV	38,1	18,3	12,0	4,9	15,7
LSD	8,3	10,1	11,5	4,5	11,3
Prob	<0,0001	<0,0001	0,984852	0,0345	<0,0001



## Differences in tolerance to soil borne fungi in sugar beet varieties

## Plantvikt och sjukdomsindex / Plant weight and Disease Severity Index

Variety	Weight g/pl	DSI 1	Weight g/pl	DSI 2
<b>Skibaröd</b>	<i>090508</i>	<i>090508</i>	<i>090519</i>	<i>090519</i>
1 Rasta	0,4	17,3	2,0	37,7
2 Zanzibar	0,3	11,1	1,7	18,7
3 Zanzibar	0,4	14,4	1,6	27,3
4 Emilia KWS	0,4	17,2	1,8	36,5
5 Silotta	0,4	17,2	2,0	36,7
6 Jenny	0,5	15,4	1,9	31,1
7 Rosalinda KWS	0,4	22,0	1,9	34,0
8 Mixer	0,4	20,1	2,3	34,7
9 Plexus	0,5	18,3	2,5	29,8
10 Nexus	0,4	16,7	1,9	31,1
11 Julietta KWS	0,4	16,0	2,1	37,7
12 Theresa KWS	0,4	17,1	1,7	27,8
13 HI0813	0,4	16,6	1,9	28,2
14 HI0870	0,4	16,3	1,7	30,3
15 ST_S_APH1	0,3	16,3	1,9	28,7
16 ST_S_APH2	0,3	17,4	1,4	28,3
17 ST_S_APH3	0,5	15,7	2,1	28,8
RSQ	56,0	84,2	41,6	68,1
CV	15,8	24,8	20,5	23,7
LSD	0,1	5,9	0,6	10,5
Prob	0,0003	0,2956	0,0624	0,0701
<b>Ekeberg</b>	<i>090507</i>	<i>090507</i>	<i>090520</i>	<i>090520</i>
1 Rasta	0,2	27,8	1,0	24,5
2 Zanzibar	0,2	24,2	0,9	34,6
3 Zanzibar	0,1	23,9	0,8	23,0
4 Emilia KWS	0,2	26,1	1,0	28,0
5 Silotta	0,2	27,2	0,9	26,8
6 Jenny	0,2	21,8	1,0	22,8
7 Rosalinda KWS	0,2	23,4	1,0	23,0
8 Mixer	0,2	23,9	1,0	20,7
9 Plexus	0,2	23,1	1,2	22,8
10 Nexus	0,2	25,1	1,0	18,9
11 Julietta KWS	0,2	28,5	1,0	24,9
12 Theresa KWS	0,1	25,6	0,9	19,4
13 HI0813	0,2	25,5	0,9	24,0
14 HI0870	0,2	26,5	0,9	22,8
15 ST_S_APH1	0,2	25,9	0,8	20,0
16 ST_S_APH2	0,1	19,4	0,8	21,3
17 ST_S_APH3	0,2	22,4	1,0	18,7
RSQ	73,0	74,7	59,3	47,0
CV	9,2	16,8	17,7	22,2
LSD	0,0	5,9	0,2	7,4
Prob	0,0000	0,2830	0,1127	0,0146

## Differences in tolerance to soil borne fungi in sugar beet varieties

## Plantvikt och sjukdomsindex / Plant weight and Disease Severity Index

Variety		Weight g/pl	DSI I	Weight g/pl	DSI II	
<b>Medel 2 försök / Average 2 trials</b>						
1	Rasta	0,3	21,5	1,5	31,8	
2	Zanzibar	-hymexazol	0,2	15,8	1,3	23,0
3	Zanzibar	+hymexazol	0,2	18,6	1,2	24,5
4	Emilia KWS	0,3	20,5	1,4	31,8	
5	Silotta	0,3	20,9	1,5	31,5	
6	Jenny	0,3	17,6	1,5	26,9	
7	Rosalinda KWS	0,3	22,3	1,4	28,9	
8	Mixer	0,3	22,1	1,7	28,4	
9	Plexus	0,4	20,3	1,9	26,2	
10	Nexus	0,3	19,5	1,4	25,3	
11	Julietta KWS	0,3	20,4	1,6	31,9	
12	Theresa KWS	0,2	20,8	1,3	23,7	
13	HI0813	0,3	19,8	1,4	25,7	
14	HI0870	0,3	20,6	1,3	26,6	
15	ST_S_APH1	0,3	19,7	1,4	24,3	
16	ST_S_APH2	0,2	18,4	1,1	25,2	
17	ST_S_APH3	0,3	18,5	1,5	24,1	
	RSQ	85,2	14,9	72,4	23,7	
	CV	16,8	44,5	21,2	32,6	
	LSD	0,0	6,6	0,3	7,1	
	Prob	<0,0001	0,9493	<0,0001	0,1091	

## Differences in tolerance to soil borne fungi in sugar beet varieties

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## Sjukdomsindex 2008-2009 / Disease Severity Index 2008-2009

Sort / Variety		DSI 2 2009	DSI 2 2009	DSI 2 2008	DSI 2 2008
		<b>Ekeberg</b>	<b>Skibaröd</b>	<b>Videröra</b>	<b>Åkerslätt</b>
1	Rasta	24,5	37,7	37,9	29,6
2	Zanzibar	34,6	18,7	-	-
3	Zanzibar	23,0	27,3	-	-
4	Emilia KWS	28,0	36,5	-	-
5	Silotta	26,8	36,7	-	-
6	Jenny	22,8	31,1	37,4	29,1
7	Rosalinda KWS	23,0	34,0	-	-
8	Mixer	20,7	34,7	-	-
9	Plexus	22,8	29,8	41,6	30,3
10	Nexus	18,9	31,1	33,7	29,4
11	Julietta KWS	24,9	37,7	-	-
12	Theresa KWS	19,4	27,8	37,4	36,7
13	HI0813	24,0	28,2	-	-
14	HI0870	22,8	30,3	-	-
15	ST_S_APH1	20,0	28,7	-	-
16	ST_S_APH2	21,3	28,3	-	-
17	ST_S_APH3	18,7	28,8	-	-
	Sophia	-	-	35,3	32,2
	Gunilla	-	-	31,4	34,1
	RSQ	47,0	68,1	80,9	70,0
	CV	22,2	23,7	13,1	13,9
	LSD	7,4	10,5	9,8	6,3
	Prob	0,0146	0,0701	0,0307	0,2193

## Differences in tolerance to soil borne fungi in sugar beet varieties

## Skörderesultat / Yield

Treatment		Plh slutl	Betor	Socker / Sugar			Amino-N	K+Na	Renhet
		Plh final	Roots	%	t/ha	Rel	mg/100 g	mM/100 g	Cleanness
		1000/ha	t/ha				beet	beet	%
<b>Skibaröd</b>									
1	Rasta	88,3	75,8	18,52	14,0	100	6,0	3,5	93,7
2	Zanzibar -hymexazol	92,6	78,4	18,19	14,3	102	4,3	3,9	92,5
3	Zanzibar +hymexazol	98,4	78,4	18,15	14,2	101	5,5	3,8	93,0
4	Emilia KWS	88,5	67,0	19,01	12,7	91	6,8	4,0	92,5
5	Silotta	85,6	69,4	19,17	13,3	95	6,3	3,6	92,4
6	Jenny	90,9	77,8	18,32	14,3	102	6,3	3,9	93,0
7	Rosalinda KWS	97,2	77,7	18,54	14,4	103	4,3	3,7	93,1
8	Mixer	96,9	79,8	18,59	14,8	106	7,3	4,0	93,7
9	Plexus	98,4	81,8	17,94	14,7	104	6,3	3,9	93,7
10	Nexus	92,6	73,5	18,51	13,6	97	6,3	4,5	91,6
11	Julietta KWS	95,8	71,9	18,26	13,1	93	6,8	4,2	93,7
12	Theresa KWS	88,3	66,0	19,20	12,7	90	6,3	3,7	91,3
13	HI0813	87,1	79,1	18,52	14,7	104	5,3	3,7	94,1
14	HI0870	91,1	76,2	18,79	14,3	102	5,0	3,8	93,1
15	ST_S_APH1	96,6	68,0	17,42	11,8	84	6,5	3,9	90,2
16	ST_S_APH2	87,4	63,2	18,80	11,9	85	5,5	4,0	92,4
17	ST_S_APH3	89,7	69,2	19,39	13,4	96	5,0	3,7	90,9
	RSQ	85,5	64,1	91,5	59,0	-	49,8	73,4	56,5
	CV	6,3	7,0	0,9	7,3	-	17,3	4,2	1,2
	LSD	8,2	7,3	0,2	1,4	-	1,4	0,2	1,6
	Prob	0,0155	<0,0001	<0,0001	0,0003	-	0,0020	<0,0001	0,0002
<b>Ekeberg</b>									
1	Rasta	96,9	68,5	18,18	12,4	100	9	3,8	94,0
2	Zanzibar -hymexazol	102,4	66,5	17,64	11,5	93	10	5,5	93,0
3	Zanzibar +hymexazol	102,1	67,9	17,37	11,8	95	11	5,7	92,8
4	Emilia KWS	99,2	58,5	18,37	10,7	86	11	4,6	90,9
5	Silotta	103,0	62,7	18,94	11,9	95	12	4,2	92,7
6	Jenny	102,4	68,2	18,12	12,3	99	9	4,7	94,0
7	Rosalinda KWS	96,6	71,7	17,77	12,8	103	10	4,6	92,6
8	Mixer	105,3	67,6	18,25	12,3	99	10	4,8	93,5
9	Plexus	105,0	71,3	17,61	12,5	101	10	4,7	93,5
10	Nexus	99,8	66,6	18,16	12,1	97	10	5,2	94,2
11	Julietta KWS	101,0	65,8	17,84	11,8	95	15	5,3	93,5
12	Theresa KWS	102,1	63,1	18,84	11,8	95	12	4,6	91,7
13	HI0813	104,5	72,8	17,47	12,7	102	10	4,5	93,5
14	HI0870	103,6	69,8	18,32	12,8	103	10	4,5	93,5
15	ST_S_APH1	101,0	58,6	17,65	10,3	83	12	4,7	89,8
16	ST_S_APH2	102,1	54,8	18,73	10,3	82	10	4,6	91,5
17	ST_S_APH3	104,7	54,9	19,10	10,5	84	10	4,3	90,6
	RSQ	83,0	84,8	81,6	81,8	-	61,5	91,1	70,5
	CV	4,4	5,6	1,8	5,2	-	12,4	3,7	1,1
	LSD	6,3	5,5	0,5	0,9	-	1,9	0,2	1,5
	Prob	0,2658	<0,0001	<0,0001	<0,0001	-	<0,0001	<0,0001	<0,0001

## Differences in tolerance to soil borne fungi in sugar beet varieties

## Skörderesultat, medel 2 försök / Yield, average 2 trials

Sort / Variety	Plh slutl	Betor	Socker / Sugar			Amino-N	K+Na	Renhet	
	Plh final	Roots	%	t/ha	Rel	mg/100 g	mM/100 g	Cleanness	
	1000/ha	t/ha				beet	beet	%	
<b>Medel 2 försök / Average 2 trials</b>									
1 Rasta	92,6	72,2	18,3	13,2	100	7,4	3,6	93,9	
2 Zanzibar	-hymexazol	97,5	72,5	17,9	12,9	98	7,3	4,7	92,8
3 Zanzibar	+hymexazol	100,3	73,2	17,8	13,0	99	8,3	4,8	92,9
4 Emilia KWS		93,9	62,8	18,7	11,7	89	8,8	4,3	91,7
5 Silotta		94,3	66,1	19,1	12,6	95	8,9	3,9	92,6
6 Jenny		96,6	73,0	18,2	13,3	101	7,8	4,3	93,5
7 Rosalinda KWS		96,9	74,7	18,2	13,6	103	7,0	4,1	92,8
8 Mixer		101,1	73,7	18,4	13,6	103	8,6	4,4	93,6
9 Plexus		101,7	76,5	17,8	13,6	103	8,1	4,3	93,6
10 Nexus		96,2	70,1	18,3	12,8	97	8,3	4,8	92,9
11 Julietta KWS		98,4	68,9	18,0	12,5	94	10,6	4,8	93,6
12 Theresa KWS		95,2	64,5	19,0	12,3	93	9,0	4,1	91,5
13 HI0813		95,8	76,0	18,0	13,7	104	7,5	4,1	93,8
14 HI0870		97,4	73,0	18,6	13,6	103	7,4	4,2	93,3
15 ST_S_APH1		98,8	63,3	17,5	11,1	84	9,0	4,3	90,0
16 ST_S_APH2		94,8	59,0	18,8	11,1	84	7,8	4,3	91,9
17 ST_S_APH3		97,2	62,1	19,2	12,0	91	7,5	4,0	90,8
RSQ		83,3	96,0	93,0	95,7	-	94,3	89,0	86,2
CV		3,7	2,9	1,1	3,1	-	11,0	6,3	0,7
LSD		7,6	4,3	0,4	0,8	-	1,9	0,6	1,3
Prob		0,5003	<0,0001	<0,0001	<0,0001	-	0,0821	0,0205	0,0003

## Differences in tolerance to soil borne fungi in sugar beet varieties

## 3 försök 2008-2009 / 3 trials 2008-2009

Sort / Variety		Plh slutl	Betor	Socker / Sugar			Amino-N	K+Na	Renhet
		Plh final	Roots			mg/100 g	mM/100 g	Cleanness	
		1000/ha	t/ha	%	t/ha	Rel	beet	beet	%
<b>3 trials 2008-2009</b>									
1 Rasta	20409	93,7	73,1	18,2	13,34	100	7,8	3,5	94,03
2 Plexus	20503	98,4	75,6	17,7	13,40	100	8,7	4,1	93,78
3 Nexus	20607	97,5	71,9	18,2	13,07	98	9,4	4,5	93,27
4 Jenny	20616	95,1	73,9	18,0	13,29	100	8,6	4,1	93,75
5 Theresa KWS	20617	95,6	65,7	18,9	12,37	93	9,2	4,0	91,77
RSQ		71,2	81,4	78,8	89,1		80,4	47,2	76,9
CV		3,8	3,8	1,7	2,8		16,4	11,4	0,8
LSD		6,8	5,1	0,6	0,7		2,9	0,9	1,3
Prob		0,5646	0,0131	0,0172	0,0380		0,7541	0,2318	0,0228

## 4 försök 2008-2009 / 4 trials 2008-2009

Sort / Variety		Plh20	Plh50	Plh100	Radtäckn.	Vigour	DSI 1	DSI 2
		1000/ha			Row cov	0-100	0-100	0-100
					%			
<b>4 trials 2008-2009</b>								
1 Rasta	20409	20,1	51,7	92,3	76	94,5	26,6	32,2
2 Plexus	20503	34,9	71,8	98,4	84	97,5	23,7	30,1
3 Nexus	20607	19,1	64,7	97,0	65	92,0	23,8	28,0
4 Jenny	20616	14,4	50,6	95,3	77	94,9	23,4	29,6
5 Theresa KWS	20617	18,8	45,8	95,9	70	93,6	24,7	29,8
RSQ		56,1	65,7	24,1	36,5	28,7	12,8	17,1
CV		53,0	24,8	9,7	13,2	3,3	33,4	29,7
LSD		9,3	11,2	7,1	10,0	3,2	6,3	6,6
Prob		0,0005	0,0000	0,5130	0,0048	0,0239	0,8497	0,8051