

DuPont - Nya betningsmedel mot jordburna svampsjukdomar i sockerbetor

**New seed treatments against soil borne fungi
in sugar beet**

2006

SBU Projektkod 2006-1-2-487

**SBU Sockernäringsens BetodlingsUtveckling AB är ett
kunskapsföretag som bedriver försöks- och odlings-
utveckling i sockerbetor för svensk sockernäring.**

SBU ägs till lika delar av Danisco Sugar och Betodlarna.

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Nya betningsmedel mot jordburna svampsjukdomar i sockerbeter

Sammanfattning

Syftet med denna försöksserie var att prova effekten på rotbrandssvampar av två doser hymexazol, 18 och 30 g. Resultaten jämförs med standardbetningen 14 g i Sverige.

Svampbetning bidrar till att behålla ett jämnt och högt plantantal på infekterade fält. Svampbetning ger också överlag snabbare radtäckning och sundare plantor jämfört med utan svampbetning.

Doserna 18 g och 30 g hymexazol ger ett något längre skydd mot *Aphanomyces* än standarddosen 14 g. Plantorna som betats med 18 och 30 g hymexazol hade också något större plantvikt i mitten av juni.

I genomsnitt över nio försök 2004-2006 gav svampbetningarna ett merutbyte på ca 3%-enheter oberoende av dos.

Summary

The purpose of this investigation was to compare the effect on soil borne fungi of two different doses of hymexazol, 18 and 30 g. The results were compared with the standard dose of hymexazol, 14 g.

Seed treatment with hymexazol protects the sugar beet seedlings during early growth and maintains a high and even plant stand also on fields with a high infestation level. This seed treatment also gives faster row coverage and more healthy plants in general.

The two higher doses of hymexazol, 18 and 30 g, provides longer protection to the sugar beet seedlings. Plants with these two doses of hymexazol also showed higher plant weight in the middle of June.

The average sugar yield over nine trials 2004-2006 was around 3% higher for the fungicide treatments irrespective of dose.

Introduction

A number of soil borne fungi may cause substantial damage in sugar beet fields. One of the most important fungi in Sweden is *Aphanomyces cochlioides*. Particularly in warm and wet soils, *A. cochlioides* attack young seedlings two to three weeks after emergence. The roots turn brown and in severe attacks, the entire hypocotyl (region between root and cotyledons) and cotyledons may rot and the seedling dies. Early seedling attacks of *A. cochlioides* can result in low plant numbers in the field. Later attacks reduce the root weight which decrease the sugar yield.

Another soil borne fungus is *Pythium* spp. (preemergence damping-off). *Pythium* spp. attack young seedlings within the first week after emergence. Recent inventories in Sweden have indicated that *Pythium* spp. is less common than *A. cochlioides* (L. Persson, SBU, pers. comm.).

It is important to protect the seedlings during emergence by treating the seed with hymexazol, the active ingredient of Tachigaren. The standard dose used on all seed in Sweden is 14 g. The seed treatment remains effective for four to six weeks. After that period the plants have to rely on their own tolerance. On highly infested fields it is important to use a tolerant variety in combination with hymexazol.

This trial series included four different seed treatments: one untreated control, the standard treatment (14 g hymexazol) in Sweden, 18 g and 30 g hymexazol.

One green house experiment and three field trials were performed.

The field trials were drilled on three locations (Kvistofta and Svalöv in the north west of Skåne and Skiberöd in the central part of Skåne. The trial design was a randomized complete block design with four replications. To be able to remove plants for analyses, an extra sample area was sown adjacent to the original plot.

Material and methods

In late autumn 2005, soil samples were taken from a number of different locations in the south of Sweden. The soil samples were analysed for infestation level of soil borne fungi. The soil tests were carried out by Syngenta Crop Protection (Maria Nihlgård). Sugar beet seeds were sown in pots with test soil and then put in greenhouse under conditions favourable for infection. The seedlings were evaluated every week for symptoms of damping-off (dead seedlings were removed from the pots). A soil index was then calculated according to the method by Ewaldz (1993):

$$\text{Index} = (3 * as_7 + 3 * (as_{14} - as_7) + (as_{21} - as_{14}) + 0,5 * (as_{28} - as_{21}))/3$$

where as = number of attacked seedlings at 7, 14, 21 and 28 days.

This method focuses mainly on early and predominantly lethal attacks and the number of infected plants during the first two weeks is given higher weight in the calculation of soil index. Attacks that occur at a later stage in the seedlings development are regarded as less important since the plants often survive. The evaluation of the risk of damping-off (soil index 0 – 100) is shown in table 1. The soil test also indicates the most common fungi on each location. Three trial locations were chosen on the basis of the result from the soil tests. The results of the analyses of soil type on each locality are shown in appendix 3.

Table 1. The risk of infection in soils analysed for Ewaldz (1993) index

Index	Risk	Evaluation
0 – 20	No risk	-
20 – 40	Low	Normally no problems
40 – 70	Medium	Growing sugar beets could be hazardous
70 – 100	High	Under favourable conditions, damping-off is highly likely

Plant number

The number of plants in each plot was counted three times during emergence (20%, 50% maximum and finally after inter-row cultivation (full emergence)). The results are shown in appendix 6 and 7.

Plant vigour and row coverage

Plant vigour was evaluated twice in each trial using a scale from 0 to 100 where values below 50 indicate plants in severely reduced growth (50% yield reduction), 50–79 indicates somewhat reduced growth that probably will affect yield. Values between 80 and 90 indicates that the plants only show minor damage that seldom has any effect on yield and values above 90 are nearly healthy plants.

Row coverage is measured as the average area between the plant rows that are actually covered by the leaves.

The results on plant vigour and row coverage are shown in appendix 8.

Damping-off

Evaluation of damping-off was performed twice in early spring. The first evaluation took place when the plants had just 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% (roots totally rotten, plant dead). A disease index (DSI) was calculated using the following equation developed by Larsson and Gerhardson (1990):

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

where n = number of beets in each class.

The results are shown in appendix 9 and 10.

Harvest

After harvest, the number of beets that showed symptoms of chronic root rot was counted in each plot and classified into one of three groups: 1. very weak, 2. weakly and 3. strongly infected beets, respectively. Beets classified as strongly infected are characterized by severely deformed tap roots, whereas weakly infected beets show only moderate signs of deformation. A root rot index (RI: 0 – 3) was calculated:

$$\text{RI} = (0 * n_0 + 1 * n_1 + 2 * n_2 + 3 * n_3) / \text{total no. plants in the plot}$$

where n = the number of plants in each class.

A root rot index below one indicates minor deformations on the beets whereas a root rot index close to three indicates severely deformed beets (appendix 9).

The evaluation of chronic root rot was carried out at the central tare house in Örtofta (Agri Provtvätt, Örtofta Sockerbruk, Danisco Sugar).

Green house experiment

Soil was collected from a field naturally infested with soil borne fungi. The soil was divided between six pots per treatment and replication and put in a green house in a randomized complete block design. Ten seeds of the variety Sapporo were sown in each pot. The pots were checked daily for any dying sugar beet plants. After four weeks all remaining plants were washed from soil and inspected for symptoms of root rot. A DSI was calculated according to Larsson and Gerhardson (1990). The results are shown in appendix 11.

Statistical analyses

All variables were analyzed using Proc GLM in SAS, SAS Institute Inc. All shown treatment means are adjusted means (LSmeans) unless otherwise stated. In case of no missing values in the data set, LSmeans are equal to the arithmetic means.

Results and discussion

The results from the soil tests taken before drilling showed that *A. cochlidioides* and *Pythium* occurred on all of the trial locations (appendix 4). The highest soil index was found on Skiberöd (93) and Svalöv (93). The infestation level was 79 on Kvistofta which also indicates a high risk of infection under favourable conditions.

Plant number

Emergence was slightly delayed in the treatments with 18 and 30 g hymexazol. In the counting at 20% emergence in the trial at Svalöv, 18 g had 19 800 plants/ha and 30 g hymexazol had 17 700 plants/ha. The standard dose 14 g hymexazol had 28 000 plants/ha. At 50% and full emergence there was over 90 000 plants in all the seed treatments and no significant differences between the treatments. Delayed emergence at 20% was also seen in the trial at Kvistofta.

There were significant differences in plant number at full emergence between the seed treatments at Skiberöd. All seed treatments had close to 100 000 plants/ha, the plant number without seed treatment was 83 600 plants/ha.

The average plant number in the three trials showed that the seed treatments had significantly more plants than the untreated control.

Hymexazol in the doses 14, 18 and 30 g has now been tested in a total of nine trials 2004-2006. All three doses have significantly more plants (+13 000 plants/ha) than the untreated control.

Plant vigour and row coverage

There were visible differences in plant vigour between the treatments on the one hand and the control on the other in all three trials. In the second evaluation of plant vigour at Skiberöd the fungicide treatments had significantly higher vigour than the control.

Row coverage was somewhat higher in the fungicide treatments than in the control.

Disease severity index

DSI was measured twice in each trial. In the first evaluation at Skiberöd there was a tendency (prob =0,09) that all seed treatments (DSI less than 20) were lower in DSI than the control (DSI = 29,3). In the second evaluation, only 18 g and 30 g hymexazol have had an effect on the DSI, (DSI = 30), and was significantly lower than in the control treatment (figure 1). The DSI in the lower dose, 14 g, was as high as in the control treatment (DSI = 40).

On Svalöv there were no significant differences in DSI in the two evaluations of DSI. However, there is a weak tendency for the seed treatments to have somewhat lower DSI than the control treatment.

On Kvistofta there were no differences in DSI between the seed treatments.

Average over the three trials show that there were no significant differences between the three doses of hymexazol in the first evaluation of DSI in the beginning of June. In the second evaluation, 30 g hymexazol is significantly better than 14 g. 18 g hymexazol (DSI = 20,8) is also close to significantly better than 14 g (DSI = 24,2, LSD = 3,6).

There were no significant differences between the three doses of hymexazol in plant weight at either the first or second evaluation.

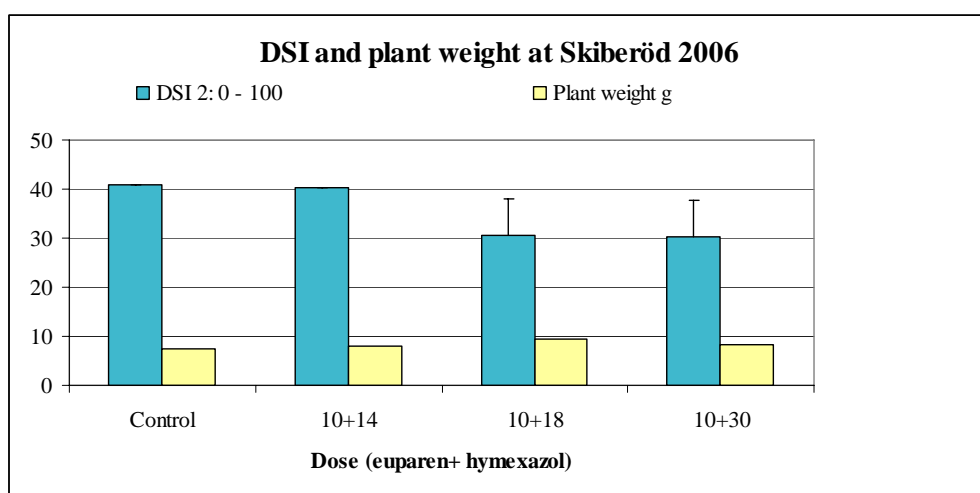


Figure 1. Second evaluation of disease severity index and plant weight at Skiberöd 2006. Bars indicate LSD=7,4 for DSI 2 (prob = 0,017). Differences in plant weight were not significant.

Disease severity index experiment in green house

Two experiments have been carried out in green house using naturally infested soil. The average over these two trials shows that 30 g hymexazol had significantly lower DSI than 14 g. 18 g had lower DSI than 14 g but the difference was not significant.

Yield and root rot after harvest

The average over three trials show that 14 and 18 g hymexazol increases yield with around 2% and 4% in 30 g hymexazol. The differences were not statistically significant. In the trial at Skiberöd, the yield increase for 30 g hymexazol compared to 18 g were close to significantly different (prob = 0,091).

The result from the soil test before drilling showed that the infestation level of *Aphanomyces* was high at Skiberöd, DSI = 93. The evaluation of root rot after harvest show that RI is low (0,15) in 14 and 30 g hymexazol. These two treatments also have the highest yield, 8,75 and 9,33 ton/ha respectively.

The root rot index was very low on the other two trial locations Kvistofta and Svalöv. RI = 0,10 indicates that only few of the beets show the typical chronic symptoms of *Aphanomyces*.

Root rot index has been evaluated in a total of nine trials during 2004-2006. RI in 30 g was 0,12 indicating only minor damage to the roots. RI was also low in the control (0,14). One explanation for this could be that plants severely infected during the seedling stage have died. The final plant number in the control is significantly lower than in the other treatments. On average, 10 000 plants have disappeared from the control compared to the treatments with hymexazol. The difference between 14 and 18 g hymexazol in RI in these nine trials is not significant.

In the trial at Skiberöd, 30 g hymexazol showed a 7% increase in sugar yield. This may suggest that on fields where the dominating soil borne fungus is *A. cochlioides* higher dose of Tachigaren may have a positive effect on sugar yield.

The average sugar yield in nine trials between 2004-2006 show that fungicide treatment generally increases sugar yield with around 3% irrespective of the dose of hymexazol. There was also a significant increase in sugar content in the fungicide treatment compared to the control.

Conclusions

Seed treatment with hymexazol protects the sugar beet seedlings during early growth and maintains a high and even plant stand also on fields with a high infestation level. This seed treatment also gives faster row coverage and more healthy plants in general.

The two higher doses of hymexazol, 18 and 30 g, provides longer protection to the sugar beet seedlings. Plants with these two doses of hymexazol also showed higher plant weight in the middle of June.

The average sugar yield over nine trials 2004-2006 was around 3% higher for the fungicide treatments irrespective of dose.

References

- Ewaldz, T. 1993. Determining the risk of damping-off in sugar beets. Växtskyddsnotiser 169 – 171.
- Larsson, M. and Gerhardson, B. 1990. Isolates of *Phytophthora cryptogea* pathogenic to wheat and some other crop plants. Journal of Phytopathology 129: 303-315.

GEP-information

Uppdragsgivare / Contractor:

DuPont Sverige AB
Jan-Åke Svensson
Box 839
201 80 Malmö

Planansvarig / Project Manager:

Åsa Olsson, SBU AB

Försöksfrö / Trial seed

Försöksfrö beställdes av SBU AB. / Trial seed was ordered by SBU AB.
Betsort / Variety: Opta

Försöksmetodik / Methodology

RCB. Beskrivning av metoder och bedömningar: se appendix 1 (fältkort) för hänvisning till PM i SBU:s kvalitetshandbok. / Description of methods and evaluations: see appendix 1 (field plan) for references to PM in SBU quality handbook.

Försöksplatser / Trial sites

Svalöv	Kjell Jacobsson, Svalövs lantbruksskola, 268 22 Svalöv
Kvistofta	Charlie Svensson, Ormastorps gård, 260 30 Vallåkra
Skiberöd	Sten Olsson, Skiberöds gård, 240 33 Löberöd

Teknisk beskrivning/Technical details:

Produkt / Product	Verksam substans / active ingredient	Dos / dose
Montur	<i>imidacloprid, tefluthrine</i>	15 g, 4 g
Euparen	<i>tolyfluanid</i>	10 g
Tachigaren	<i>hymexazol</i>	14, 18, 30 g

Avvikelser / Nonconformances

Clean weight and sugar content in plot number 6002 at Kvistofta was excluded from statistical analyses because the values deviated considerably from the other three treatment values.

Styrelsen för ackreditering och teknisk kontroll (SWEDAC)

Försöksstationer ackrediteras av Styrelsen för ackreditering och teknisk kontroll (SWEDAC) enligt svensk lag. Den ackrediterade verksamheten vid försöksstationerna uppfyller för GEP-ackreditering relevanta delar av kraven i SS-EN ISO/IEC 17025 (2000).

Test facilities are accredited by the Swedish Board for Accreditation and conformity Assessment (SWEDAC) under the terms of Swedish legislation. The accredited test facilities meet the relevant requirements for GEP accreditation in SS-EN ISO/IEC 17 025 (2000).

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Borgeby den 12 december 2006

Åsa Olsson
Project Manager, SBU AB

Robert Olsson
Managing Director, SBU AB

Betningsmedel mot jordburna svampsjukdomar

SBU projektkod 2006-1-2-487

Antal försök 1

Fältkort - Växthusförsök

GEP

Försöksvärd	SBU AB		Odlarnummer	-
Gård	Adress	Telefon		
Findus, Selleberga	Bjuv			

Syfte: Att prova Tachigaren i tre olika doser mot *Aphanomyces*. Växthusförsök.

Uppdragsgivare: DuPont

Försöksled		Dos fungicid g a.i./unit	Dos insekticid g a.i./unit
1	Kontroll obehandlad	-	-
2	Euparen+Tachigaren	DuPont 10 + 14	Montur 15 + 4 g
3	Euparen+Tachigaren	DuPont 10 + 18	Montur 15 + 4 g
4	Euparen+Tachigaren	DuPont 10 + 30	Montur 15 + 4 g

Bricknr i försöket:

-

Försökets totala yta, m²:

-

Skördeyta/parcell, m²:

-

Bruttoyta/parcell, m²:

-

Kontaktperson + telefonnr:

För försökets utförande ansvarig person + telefonnr:

Åsa Olsson 0709-53 72 62

Lotta Eriksson 0702 72 49 80

Krav på försöksplats: Jord med högt svampinfektionstryck samlas in.

Växthusförsöket omfattar ett försök på en jord. Blockförsök 4 upprepningar.

Försöksuppgifter:

Sådd, datum	
Plantor/kruka	10 st
Krukor/led	6
Replikat	4
Sort	Sapporo
Betning, produkt	enligt plan ovan

Försöksåtg.: PM

Rotbrandsbed.	2.5.8	SBU
Observation av fytotox		SBU

Datum/Sign.

5/7 LE
5/7 LE

20060221/ÅO

Försöksdata kontrollerat (datum+sign.):

Betningsmedel mot jordburna svampsjukdomar

SBU projektkod 2006-1-2-487

Antal försök 3

Fältkort - Fältförsök

GEP

Försöksvärd		Odlarnummer
Sten Olsson		52 279
Gård	Adress	Telefon
Skiberöds gård	240 33 Löberöd	0709-367698

Syfte: Att prova Tachigaren i tre olika doser mot *Aphanomyces*. Fältförsök.

Uppdragsgivare: DuPont

Försöksled	Uppdr.g	Dos fung. g a. i./unit	Dos ins. g a. i./unit
1 Kontroll	DuPont	-	-
2 Euparen+Tachigaren	DuPont	10 + 14	Montur 15 + 4 g
3 Euparen+Tachigaren	DuPont	10 + 18	Montur 15 + 4 g
4 Euparen+Tachigaren	DuPont	10 + 30	Montur 15 + 4 g

	Från	Till	
Bricknr Skiberöd	5901	-	5916
Bricknr Kvistofta	6001	-	6016
Bricknr Svalöv	6101	-	6116
Skördeyta/parcell, m²:	2 r x 10 m		
	Försökets totala yta, m²:		784
	Bruttoyta/parcell, m²:		6 r x 17 m

Kontaktperson + telefonnr:

Åsa Olsson 0709-53 72 62

För försökets utförande ansvarig person + telefonnr:

Leif Jönsson 0708-161051

Krav på försöksplats: Platser med högt svampinfektionstryck.

Provtagningsytor till alla parceller. Yta om 10 m läggs mellan block I och II samt block III och IV.

Försöksuppgifter:

Såmaskin, märke
Sådd, datum
Radavstånd, cm
Antal frö per m
Sort
Betning, produkt
Uppkomst, datum
Förfrukt 2005
År med betor 1994-04:

Monozentra SP 6r
4/5
48
5,1
Enl. plan
Enl. plan
15-maj
korn
1994, 1998, 2002
Ifylles på flik "Behandlingsdata"
Ifylles på flik "Behandlingsdata"
Ifylles på flik "Behandlingsdata"
Ifylles på flik "Behandlingsdata"

Försöksåtg.:

Generalprov 6
Utstakning i fält
Parcellvis sådd
Svampprov
Planträkning 20
Planträkning 50
Planträkning max
Planträkning slutl
Rotbrandsbed. 1
Rotbrandsbed. 2
Sundhet
Besiktning inför skörd
Lev. provtvätt
Skörd
Svampangr. e skörd
Analys

PM

2.6.1 HS
2.4.1 HS
2.4.2 HS
2.6.1 HS
2.5.4 HS
2.5.4 HS
2.5.4 HS
2.5.4 HS
2.5.8 HS
2.5.8 HS
2.5.20 SBU
SBU
2.4.7 HS
2.4.7 HS
2.5.10 SBU
- DS

Datum/Sign.

1/12-05 LJ
28/4 LJ
4/5 LJ, TB
1/12-05 LJ
15/5 LJ
16/5 LJ
14/6 LJ, AE
26/6 AE
31/5 LJ, AE
14/6 LJ, AE
11/6, 28/6 ÅO
14/9 ÅO
6/10 LJ
4/10 TB, LN
13, 16/10 ÅO
13, 16/10

20060310/ÅO

Försöksdata kontrollerat (datum+sign.): 20061207 LJ

Betningsmedel mot jordburna svampsjukdomar

SBU projektkod 2006-1-2-487

Antal försök 3

Fältkort - Fältförsök

GEP

Försöksvärd	Odlarnummer
Charlie Svensson	10 592
Gård	Adress
Kvistofta	Ormastorps gård, 260 30 Vallåkra
	Telefon
	0709-360290

Syfte: Att prova Tachigaren i tre olika doser mot *Aphanomyces*. Fältförsök.

Uppdragsgivare: DuPont

Försöksled	Uppdr.g	Dos fung. g a. i./unit	Dos ins. g a. i./unit
1 Kontroll	DuPont	-	-
2 Euparen+Tachigaren	DuPont	10 + 14	Montur 15 + 4 g
3 Euparen+Tachigaren	DuPont	10 + 18	Montur 15 + 4 g
4 Euparen+Tachigaren	DuPont	10 + 30	Montur 15 + 4 g

	Från	Till	
Bricknr Skiberöd	5901	-	5916
Bricknr Kvistofta	6001	-	6016
Bricknr Svalöv	6101	-	6116
Skördeyta/parcell, m²:	2 r x 10 m		
	Försökets totala yta, m²:		784
	Bruttoyta/parcell, m²:		6 r x 17 m

Kontaktperson + telefonnr:

Åsa Olsson 0709-53 72 62

För försökets utförande ansvarig person + telefonnr:

Leif Jönsson 0708-161051

Krav på försöksplats: Platser med högt svampinfektionstryck.

Provtagningsytor till alla parceller. Yta om 10 m läggs mellan block I och II samt block III och IV.

Försöksuppgifter:

Såmaskin, märke
Sådd, datum
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Antal frö per m
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Betning, produkt
Uppkomst, datum
Förfrukt 2005
År med betor 1994-04:

Monozentra SP 6r
8/5
48
5,1
Enl.plan
Enl.plan
17-maj
höstvete
1998, 1999
Ifylles på flik "Behandlingsdata"
Ifylles på flik "Behandlingsdata"
Ifylles på flik "Behandlingsdata"
Ifylles på flik "Behandlingsdata"

Försöksåtg.:

Generalprov 6
Utstakning i fält
Parcellvis sådd
Svampprov
Planträkning 20
Planträkning 50
Planträkning max
Planträkning slutl
Rotbrandsbed. 1
Rotbrandsbed. 2
Sundhet
Besiktning inför skörd
Lev. provtvätt
Skörd
Svampangr. e skörd
Analys

PM

2.6.1 HS
2.4.1 HS
2.4.2 HS
2.6.1 HS
2.5.4 HS
2.5.4 HS
2.5.4 HS
2.5.4 HS
2.5.8 HS
2.5.8 HS
2.5.20 SBU
SBU
2.4.7 HS
2.4.7 HS
2.5.10 SBU
- DS

Datum/Sign.

8/5 LJ
10/4 LJ
8/5 LJ, TB
1/12-05 LJ
17/5 TB
19/5 TB
21/6 AE, RHF
27/6 TB, AE
5/6 LJ, TB
22/6 LJ, AE
14/6, 3/7 ÅO
14/9 ÅO
10/10 LJ
6/10 TB, COJ
23/10 ÅO
23/10

20060310/ÅO

Försöksdata kontrollerat (datum+sign.): 20061211 LJ

Betningsmedel mot jordburna svampsjukdomar

SBU projektkod 2006-1-2-487

Antal försök 3

Fältkort - Fältförsök

GEP

Försöksvärd Kjell Jacobsson	Odlarnummer
Gård Svalövs lantbruksskola	Adress 268 22 Svalöv
	Telefon 0709-470640

Syfte: Att prova Tachigaren i tre olika doser mot *Aphanomyces*. Fältförsök.

Uppdragsgivare: DuPont

Försöksled	Uppdr.g	Dos fung. g a. i./unit	Dos ins. g a. i./unit
1 Kontroll	DuPont	-	-
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4 Euparen+Tachigaren	DuPont	10 + 30	Montur 15 + 4 g

	Från	Till	
Bricknr Skiberöd	5901	-	5916
Bricknr Kvistofta	6001	-	6016
Bricknr Svalöv	6101	-	6116
Skördeyta/parcell, m²:	2 r x 10 m		
	Försökets totala yta, m²:		784
	Bruttoyta/parcell, m²:		6 r x 17 m

Kontaktperson + telefonnr:

Åsa Olsson 0709-53 72 62

För försökets utförande ansvarig person + telefonnr:

Leif Jönsson 0708-161051

Krav på försöksplats: Platser med högt svampinfektionstryck.

Provtagningsytor till alla parceller. Yta om 10 m läggs mellan block I och II samt block III och IV.

Försöksuppgifter:

Såmaskin, märke
Sådd, datum
Radavstånd, cm
Antal frö per m
Sort
Betning, produkt
Uppkomst, datum
Förfrukt 2005
År med betor 1994-04:

Monozentra SP 6r
8/5
48
5,1
Enl.plan
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16-maj
höstvete
2003
Ifylles på flik "Behandlingsdata"
Ifylles på flik "Behandlingsdata"
Ifylles på flik "Behandlingsdata"
Ifylles på flik "Behandlingsdata"

Försöksåtg.:

Generalprov 6
Utstakning i fält
Parcellvis sådd
Svampprov
Planträkning 20
Planträkning 50
Planträkning max
Planträkning slutl
Rotbrandsbed. 1
Rotbrandsbed. 2
Sundhet
Besiktning inför skörd
Lev. provtvätt
Skörd
Svampangr. e skörd
Analys

PM

2.6.1 HS
2.4.1 HS
2.4.2 HS
2.6.1 HS
2.5.4 HS
2.5.4 HS
2.5.4 HS
2.5.4 HS
2.5.8 HS
2.5.8 HS
2.5.20 SBU
SBU
2.4.7 HS
2.4.7 HS
2.5.10 SBU
-

Datum/Sign.

8/5 LJ
11/4 LJ
8/5 LJ, TB
1/12-05 LJ
16/5 LJ, TB
19/5 LJ
21/6 AE, RHF
27/6 TB, AE
1/6 LJ, TB
22/6 LJ, AE
11/6, 3/7 ÅO
14/9 ÅO
2/10 TB
29/9 TB, COJ
4/10 ÅO
4/10

20060310/ÅO

Försöksdata kontrollerat (datum+sign.): 20061207 LJ

Fältplan 2006

Skiberöd

IV	1	3	4	2
III	4	2	3	1
II	2	4	1	3
I	3	1	2	4

Svalöv

IV	4	3	1	2
III	3	2	4	1
II	1	4	2	3
I	2	1	3	4

Kvistofta

IV	4	1	3	2
III	3	4	2	1
II	1	2	4	3
I	2	3	1	4

Brickplan 2006

Skiberöd

IV	5913	5914	5915	5916
III	5909	5910	5911	5912
II	5905	5906	5907	5908
I	5901	5902	5903	5904

Svalöv

IV	6113	6114	6115	6116
III	6109	6110	6111	6112
II	6105	6106	6107	6108
I	6101	6102	6103	6104

Kvistofta

IV	6013	6014	6015	6016
III	6009	6010	6011	6012
II	6005	6006	6007	6008
I	6001	6002	6003	6004

Betningsmedel mot jordburna svampsjukdomar

SBU projektkod

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Jordanalys / Soil analyses 2006

For definition of soil fractions and soil type see below.

		Skiberöd	Svalöv	Kvistofta			
			Klass	Klass	Klass		
pH-värde	pH	6,4		7,3		6,8	
P-AL (mg/100 g jord)		9,4	III	14	IV	5,8	III
K-AL (mg/100 g jord)		9,7	IV	10	III	7,5	II
Mg-AL (mg/10 g jord)		5,1		5,9		4,9	
K/Mg-kvot		1,9		1,7		1,5	
Ca-AL (mg/kg jord)		130		270		270	
K-HCl (mg/100 g jord)		100	3	160	3	85	2
Cu-HCl (mg/kg jord)		3,6		8,5		5,1	
P-HCL mg/100 g		68	4	48	3	43	3
Bor (mg/kg jord)	Boron	0,61		0,99		0,87	
Mullhalt (%)	Organic matter	3,1		2		3,9	
Lerhalt (%)	Clay content	10		19		17	
Finler (%)	Fine Clay	8		16		12	
Sand + grovmo (%)	Sand + fine sand	58		52		49	
Jordart	Soil type	mmhlMo		nmh saLL		mmh moLL	
Basmättnadsgrad		63,2		> 80		> 80	
S-värde (mekv/100g jord)		7,2		13,4		14,1	
T-värde (mekv/100g jord)		11,4		13,4		14,4	

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

nmhlSa = medium humus rich light sand

mmhmoLL = humus rich loamy soil

mmhlSa = humus rich light sand

mmhlMo = humus rich fine sand soil

Betningsmedel mot jordburna svampsjukdomar

Analys av marksmitta och vanligaste förekommande svampar på försöksplatserna 2006

Risk of infection and most frequently occurring fungi on the trial locations 2006

Jordprov tagna december 2005. Analys av svampinfektionstryck är utförd av Maria Nihlgård, Syngenta, enligt Ewaldz metod (1993).

Samples were collected during December 2005. Analysis of infestation risk was performed by Maria Nihlgård, Syngenta, according to the method by Ewaldz (1993).

Plats Location	Sjukdomsindex Disease index	Infektionsrisk Risk of infection	Förekommande svampar (vanligaste först) Fungi (most frequently occurring first)
Skiberöd	93	High	<i>Aphanomyces, Pythium</i>
Kvistofta	79	High	<i>Aphanomyces, Pythium</i>
Svalöv	93	High	<i>Pythium, Aphanomyces</i>

Betningsmedel mot jordburna svampsjukdomar**Behandlingsdata / Weed control and fertilization****Ogräsbekämpning / Weed control** **Skiberöd**

Datum	Produkt och dos
27/5	1,5 G + 0,5 P + 0,2 T + 1,5 B + 1 superolja
10/6	0,75 G + 0,5 P + 1,75 B + 0,15 T + 1 superolja "+0,25 Sumi-alpha

Ogräsbekämpning / Weed control **Kvistofta**

Datum	Produkt och dos
26/5	1 G + 1 P + 1,5 B + 0,12 T + 0,5 olja
9/6	1 G + 0,3 P + 1,5 B + 0,07 T + 0,5 olja
20/6	0,5 G + 2 B + 0,1 T + 30 g S + 0,5 olja

Ogräsbekämpning / Weed control **Svalöv**

Datum	Produkt och dos
31/5	1,6 B + 2 G + 0,05 T + 0,5 olja
10/6	1,5 B + 0,5 P + 0,5 G + 0,1 T + 0,5 olja

Gödsling / Fertilization **Skiberöd**

Datum	Produkt och giva	N	P	K
4/5	Probeta NPK 650 kg/ha	97	24	44

Gödsling / Fertilization **Kvistofta**

Datum	Produkt och giva	N	P	K
8/5.	Probeta NPK 700 kg/ha	105	26	47

Gödsling / Fertilization **Svalöv**

Datum	Produkt och giva	N	P	K
17/10 2005	PK 7-25 255 kg/ha		18	63
8/5	Probeta NPK 700 kg/ha	105	26	47

Betningsmedel mot jordburna svampsjukdomar

Planträknningar / Plant number

Behandling / Treatments		Planträkning / Plant number			
		1000-tal/ha / 1000nds/ha			
		20%	50%	100%	Plh slutlig after inter-row cult.
Skiberöd	Sådd/drilled	060515	060516	060614	060626
1	Kontroll obehandlad / Untreated	28,1	57,3	86,5	83,6
2	Euparen+Tachigaren 10+14	28,9	65,4	97,4	99,7
3	Euparen+Tachigaren 10+18	23,4	58,6	96,6	97,7
4	Euparen+Tachigaren 10+30	28,9	58,3	97,9	98,2
	RSQ %	58,2	64,5	75,7	71,0
	CV	15,7	8,2	3,9	5,9
	LSD 5%	6,9	7,9	6,0	9,0
	Prob.	0,2809	0,1508	0,0054	0,0093
		ns	ns	**	**
Svalöv	Sådd/drilled	060516	060519	060621	060627
1	Kontroll obehandlad / Untreated	31,3	58,6	89,8	89,1
2	Euparen+Tachigaren 10+14	28,1	59,1	96,9	96,9
3	Euparen+Tachigaren 10+18	19,8	52,9	92,2	89,3
4	Euparen+Tachigaren 10+30	17,7	51,6	96,4	94,0
	RSQ %	56,6	79,3	57,1	73,1
	CV	36,7	7,9	4,0	3,3
	LSD 5%	14,2	7,0	6,0	4,8
	Prob.	0,1660	0,0811	0,0748	0,0133
		ns	ns	ns	*
Kvistofta	Sådd/drilled	060517	060519	060621	060627
1	Kontroll obehandlad / Untreated	25,0	57,0	87,2	84,6
2	Euparen+Tachigaren 10+14	29,2	59,4	90,4	87,2
3	Euparen+Tachigaren 10+18	20,6	59,1	90,1	86,5
4	Euparen+Tachigaren 10+30	18,0	56,3	93,8	88,5
	RSQ %	62,1	41,9	46,9	40,1
	CV	28,6	18,0	5,1	6,0
	LSD 5%	10,6	16,6	7,3	8,3
	Prob.	0,1562	0,9650	0,3166	0,7621
		ns	ns	ns	ns
3 försök					
1	Kontroll obehandlad / Untreated	28,1	57,6	87,8	85,8
2	Euparen+Tachigaren 10+14	28,7	61,3	94,9	94,6
3	Euparen+Tachigaren 10+18	21,3	56,9	93,0	91,1
4	Euparen+Tachigaren 10+30	21,5	55,4	96,0	93,6
	RSQ %	23,1	11,6	47,5	49,6
	CV	30,9	14,4	4,4	5,7
	LSD 5%	6,3	6,8	3,4	4,3
	Prob.	0,0277	0,3613	<0,0001	0,0007
		*	ns	***	**

Planträkningar / Plant number 2004-2006

9 försök 2004-2006

Behandling / Treatments	Planträkning / Plant number 1000-tal/ha / 1000nds/ha			
	20%	50%	100%	Plh slutlig after inter-row cult.
1 Kontroll obehandlad / Untreated	25,3	52,9	83,4	83,1
2 Euparen+Tachigaren 10+14	26,0	61,2	96,2	96,2
3 Euparen+Tachigaren 10+18	23,2	58,6	96,9	96,5
4 Euparen+Tachigaren 10+30	20,6	54,6	96,6	96,5
RSQ %	53,8	44,8	65,4	66,3
CV	32,4	17,7	8,7	8,5
LSD 5%	5,3	7,1	5,7	5,6
Prob.	0,1443	0,0658	<0,0001	<0,0001
	ns	ns	***	***

Betningsmedel mot jordburna svampsjukdomar

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Plant vigour and row coverage

Behandling / Treatment	Sundhet1 Vigour1	Sundhet2 Vigour2	Radtäckning Row coverage
	0-100	0-100	%
Skiberöd	060611	060628	060628
1 Kontroll obehandlad / Untreated	77	78	74
2 Euparen+Tachigaren 10+14	81	86	80
3 Euparen+Tachigaren 10+18	78	85	78
4 Euparen+Tachigaren 10+30	78	89	84
RSQ %	65,4	77,9	76,3
CV	2,7	4,5	5,5
LSD 5%	3,4	6,1	7
Prob.	0,1205	0,0129	0,0557
	ns	*	ns
Svalöv	060611	060703	060703
1 Kontroll obehandlad / Untreated	73	80	65
2 Euparen+Tachigaren 10+14	78	81	66
3 Euparen+Tachigaren 10+18	75	84	74
4 Euparen+Tachigaren 10+30	75	81	71
RSQ %	50,0	63,4	50,3
CV	5,0	5,8	10,6
LSD 5%	6,0	7,5	10
Prob.	0,3641	0,7073	0,3264
	ns	ns	ns
Kvistofta	060614	060703	060703
1 Kontroll obehandlad / Untreated	76	81	69
2 Euparen+Tachigaren 10+14	80	85	71
3 Euparen+Tachigaren 10+18	84	83	71
4 Euparen+Tachigaren 10+30	80	83	71
RSQ %	49,6	14,9	5,8
CV	6,2	7,4	12,1
LSD 5%	7,9	9,8	10
Prob.	0,2273	0,8506	0,9621
	ns	ns	ns
3 försök			
1 Kontroll obehandlad / Untreated	75	80	69
2 Euparen+Tachigaren 10+14	79	84	73
3 Euparen+Tachigaren 10+18	79	84	74
4 Euparen+Tachigaren 10+30	78	84	76
RSQ %	31,7	15,2	35,0
CV	5,2	6,9	9,8
LSD 5%	3,3	4,7	6
Prob.	0,0688	0,1636	0,1719
	ns	ns	ns

Disease severity index and root rot index

Behandling / Treatment	Rotbrand		Plant weight 1 g	Plant weight 2 g	Kronisk rottröta Root rot RI 0-3
	Damping-off				
	DSI 1 0-100	DSI 2 0-100			
Skiberöd	060601	060615	060601	060615	
1 Kontroll obehandlad / Untreated	29,3	40,81	0,53	7,5	0,27
2 Euparen+Tachigaren 10+14	18,6	40,26	0,54	7,9	0,15
3 Euparen+Tachigaren 10+18	19,9	30,70	0,52	9,4	0,24
4 Euparen+Tachigaren 10+30	18,0	30,27	0,54	8,3	0,15
RSQ %	80,2	69,2	35,8	51,3	33,3
CV	28,9	13,5	8,3	12,8	52,5
LSD 5%	6,2	7,4	0,07	1,6	0,2
Prob.	0,0923	0,0170	0,8574	0,1442	0,3461
	ns	*	ns	ns	ns
Svalöv	060601	060621	060601	060621	
1 Kontroll obehandlad / Untreated	26,9	20,3	0,32	20,7	0,11
2 Euparen+Tachigaren 10+14	20,3	16,9	0,30	19,6	0,06
3 Euparen+Tachigaren 10+18	21,7	15,9	0,30	26,0	0,10
4 Euparen+Tachigaren 10+30	22,5	14,7	0,27	22,9	0,10
RSQ %	80,8	31,4	80,8	21,3	36,6
CV	17,2	26,4	12,5	31,6	72,4
LSD 5%	6,0	7,2	0,06	11,3	0,1
Prob.	0,1660	0,3776	0,3293	0,6098	0,7290
	ns	ns	ns	ns	ns
Kvistofta	060605	060622	060601	060622	
1 Kontroll obehandlad / Untreated	30,0	16,3	0,39	21,3	0,02
2 Euparen+Tachigaren 10+14	28,7	15,5	0,44	22,4	0,01
3 Euparen+Tachigaren 10+18	33,6	15,6	0,40	21,6	0,01
4 Euparen+Tachigaren 10+30	33,5	15,9	0,35	20,1	0,03
RSQ %	61,9	51,7	49,4	33,1	67,9
CV	15,0	14,7	14,3	19,2	79,4
LSD 5%	5,4	3,7	0,09	6,5	0,0
Prob.	0,3937	0,9656	0,3044	0,8878	0,1846
	ns	ns	ns	ns	ns
3 försök					
1 Kontroll obehandlad / Untreated	28,7	25,8	0,42	16,5	0,13
2 Euparen+Tachigaren 10+14	22,5	24,2	0,42	16,6	0,07
3 Euparen+Tachigaren 10+18	25,1	20,8	0,40	19,0	0,12
4 Euparen+Tachigaren 10+30	24,6	20,3	0,39	17,1	0,09
RSQ %	30	84,2	76,2	72,4	60,7
CV	32,1	18,9	14,4	24,7	65,9
LSD 5%	6,7	3,6	0,1	3,5	0,1
Prob.	0,3109	0,0071	0,4984	0,4717	0,1870
	ns	**	ns	ns	ns

Betningsmedel mot jordburna svampsjukdomar

Disease severity index and root rot index 2004-2006

Behandling / Treatment	Rotbrand / Damping-off				Kronisk rotträta
	DSI 1 0-100 9 försök 2004-2006	DSI 2 0-100 9 försök 2004-2006	DSI 1 0-100 6 försök 2005-2006 *	DSI 2 0-100 6 försök 2005-2006 *	Root rot RI 0-3 9 försök 2004-2006
1 Kontroll obehandlad / Untreated	35,2	32,4	28,4	34,5	0,14
2 Euparen+Tachigaren 10+14	31,0	28,5	24,0	27,9	0,17
3 Euparen+Tachigaren 10+18	32,7	29,9	25,3	25,4	0,23
4 Euparen+Tachigaren 10+30	33,3	32,1	26,3	26,9	0,12
RSQ %	83,2	59,2	62,0	91,8	65,5
CV	18,5	22,6	17,0	16,1	49,3
LSD 5%	5,2	5,2	5,4	5,7	0,09
Prob.	0,4109	0,3385	0,3893	0,0186	0,0449
	ns	ns	ns	*	*

* Försöken från år 2004 ej med i beräkningarna pga av låg infektionsnivå.

Betningsmedel mot jordburna svampsjukdomar

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Disease severity index in green house experiment

Behandling / Treatment	Rotbrand / Damping-off DSI 0-100			
	2005	2006	2 försök/2 trials	Treatm.1 excl.
1 Kontroll obehandlad / Untreated	68,1	65,8	66,9	-
2 Euparen+Tachigaren 10+14	64,4	55,7	57,7	57,7
3 Euparen+Tachigaren 10+18	54,2	54,4	55,1	55,1
4 Euparen+Tachigaren 10+30	51,0	52,9	53,4	53,4
RSQ %	82,2	36,1	38,4	7,7
CV	8,2	12,0	11,8	12,4
LSD 5%	7,8	3,9	4,1	4,2
Prob.	0,0022	<0,0001	<0,0001	0,0661
	**	***	***	ns

Betningsmedel mot jordburna svampsjukdomar

SBU projektkod

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Skörd / Harvest

2006

Behandling / Treatments	Ant. plantor	Renvikt	Sockershalt	Socker		Blåtal	K + Na	Utvinnbart socker			Renhet	
	No. Plants 1000-tal/ha 1000-nds/ha	Clean weight ton/ha	Sugar content %	ton/ha	rel 1	Amino-N mg/100g beta	mM/ 100 g beta	%	ton/ha	rel 1	%	
Skiberöd Drilling: 060504, Harvest: 061004												
1 Kontroll obehandlad / Untreated		83,6	53,59	15,76	8,44	100	10	4,98	87,52	7,39	100	88,65
2 Euparen+Tachigaren	10+14	99,7	54,75	15,98	8,75	104	11	4,75	88,06	7,70	104	88,01
3 Euparen+Tachigaren	10+18	97,7	53,34	15,76	8,41	100	10	4,76	87,86	7,39	100	89,07
4 Euparen+Tachigaren	10+30	98,2	58,66	15,91	9,33	111	10	4,99	87,67	8,18	111	90,28
RSQ %		71,0	43,8	57,65	52,83	-	51,3	54,96	44,08	51,69	-	32,47
CV		5,9	6,1	0,98	5,70	-	7,2	3,78	0,41	5,83	-	2,75
LSD 5%		9,0	5,3	0,25	0,80	-	1,2	0,29	0,58	0,71	-	3,92
Prob.		0,0093	0,1614	0,1743	0,0907	-	0,2995	0,1791	0,2373	0,0994	-	0,6262
Kvistofta Drilling: 060508, Harvest: 061006												
1 Kontroll obehandlad / Untreated		84,6	66,29	15,16	10,05	100	11	4,48	87,50	8,79	100	87,83
2 Euparen+Tachigaren	10+14	87,2	66,39	15,20	10,09	100	12	4,38	87,68	8,84	101	86,58
3 Euparen+Tachigaren	10+18	86,5	68,57	15,23	10,44	104	11	4,41	87,41	9,13	104	87,54
4 Euparen+Tachigaren	10+30	88,5	66,52	15,11	10,06	100	12	4,43	87,40	8,79	100	87,56
RSQ %		40,1	17,6	32,27	25,31	-	45,0	24,1	59,5	29,9	-	61,1
CV		6,0	5,0	1,85	5,34	-	9,6	5,3	0,6	5,5	-	1,8
LSD 5%		8,3	5,7	0,48	0,93	-	1,8	0,4	0,9	0,8	-	2,7
Prob.		0,7621	0,8086	0,9521	0,7773	-	0,5851	0,9363	0,8746	0,8029	-	0,7018
Svalöv Drilling: 060508, Harvest: 060929												
1 Kontroll obehandlad / Untreated		89,1	58,31	16,16	9,43	100	15	4,90	87,84	8,28	100	91,62
2 Euparen+Tachigaren	10+14	96,9	58,56	16,32	9,55	101	13	4,81	88,20	8,42	102	92,27
3 Euparen+Tachigaren	10+18	89,3	58,91	16,35	9,63	102	13	4,80	88,26	8,50	103	90,40
4 Euparen+Tachigaren	10+30	94,0	59,09	16,27	9,62	102	13	4,74	88,29	8,50	103	91,76
RSQ %		73,1	32,7	76,2	50,8	-	20,9	27,3	74,6	57,2	-	43,1
CV		3,3	5,3	1,4	5,4	-	21,3	4,3	0,3	5,2	-	1,5
LSD 5%		4,8	5,0	0,4	0,8	-	4,5	0,3	0,5	0,7	-	2,1
Prob.		0,0133	0,9843	0,6933	0,9397	-	0,6785	0,7351	0,1842	0,8840	-	0,3007
3 försök												
1 Kontroll obehandlad / Untreated		85,8	59,40	15,69	9,31	100	12	4,79	87,62	8,15	100	89,37
2 Euparen+Tachigaren	10+14	94,6	59,90	15,83	9,46	102	12	4,64	87,98	8,32	102	88,95
3 Euparen+Tachigaren	10+18	91,1	60,28	15,78	9,49	102	11	4,66	87,84	8,34	102	89,00
4 Euparen+Tachigaren	10+30	93,6	61,42	15,76	9,67	104	11	4,72	87,79	8,49	104	89,87
RSQ %		77,6	95,1	98,6	89,9	-	85,2	94,0	88,0	89,9	-	90,2
CV		4,0	2,7	0,5	3,0	-	6,6	1,6	0,2	3,0	-	0,9
LSD 5%		7,3	3,2	0,2	0,6	-	1,5	0,1	0,3	0,5	-	1,6
Prob.		0,0893	0,5093	0,2759	0,5234	-	0,7358	0,1662	0,1321	0,4775	-	0,5284

Betningsmedel mot jordburna svampsjukdomar

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Appendix 13

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Skörd / Harvest

9 försök 2004-2006

Behandling / Treatments	Ant. plantor No. plants 1000-tal/ha 1000-nds/ha	Renvikt Clean weight ton/ha	Sockerkhalt Sugar content %	Socker Sugar ton/ha rel 1		Blåtal Amino-N mg/100g beta	K + Na mM/ 100 g beta	Renhet Cleanness %
1 Kontroll obehandlad / Untreated	86,2	60,00	16,93	10,16	100	13	4,17	89,33
2 Euparen+Tachigaren 10+14	97,0	61,39	17,06	10,47	103	13	4,08	89,79
3 Euparen+Tachigaren 10+18	96,1	61,75	17,02	10,51	103	13	4,10	89,73
4 Euparen+Tachigaren 10+30	96,8	61,13	17,04	10,41	103	13	4,09	90,38
RSQ %	73,5	89,3	99,5	92,8	-	97,3	98,0	79,0
CV	6,3	3,4	0,5	3,5	-	4,9	2,2	1,2
LSD 5%	5,8	2,0	0,1	0,4	-	0,6	0,1	1,0
Prob.	0,0015	0,3332	0,0252	0,1889	-	0,1598	0,1650	0,2291
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