

Betsorters tolerans mot jordburna svampsjukdomar

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

2002-2006

2006-1-1-412

**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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Betsorters tolerans mot jordburna svampsjukdomar 2002-2006

Sammanfattning

Sockerbetor kan angripas av flera jordburna svamparter. Den kanske viktigaste i Sverige är *Aphanomyces cochlioides*. Denna svamp angriper betorna under fuktig och varm väderlek. Betornas tillväxt hämmas, de kan få deformerade rötter och i värsta fall dör plantan. Plantbortfall under uppkomsten kan förhindras genom att fröet betas med Tachigaren med den verksamma beståndsdelen hymexazol. Betningen räcker i ca fyra till sex veckor, därefter får plantorna förlita sig på sin egen motståndskraft. Bästa kontrollmetod är därför att kombinera en tolerant betsort med svampbetning. Ytterligare åtgärder kan vara att så tidigt.

Sedan några år tillbaka provas gamla och nya sorter i Sverige på naturligt infekterad mark. Resultaten från dessa försök har visat att det finns stor variation mellan sockerbetssorter vad gäller tolerans mot jordburna svampar.

Under 2006 provades totalt tio sorter på en jord i centrala Skåne där infektionsnivån uppmättes till hela 93 i jordtest före sådd. I försöket gjordes bedömningar av plantantal och rotbrandsangrepp under uppkomst, rot- och blastvikter i juli, skörd och kroniska rotskador efter skörd. Vid den första räkningen av antal plantor vid 50% uppkomst så hade Rasta, Sapporo, Annalisa och HI 0454 alla över 65 000 plantor/ha. Betydligt långsammare var Zanzibar och Julietta med endast ca 50 000 plantor/ha. Vid full uppkomst fanns det över 90 000 plantor/ha i alla sorterna.

Av de provade sorterna visade Sapporo på fortsatt god tolerans mot jordburna svampar. Sjukdomsindex under uppkomst samt även uppmätt som kronisk rotröta efter skörd visade på få skador. Sorten Rasta var också en sort som visade på mycket god tillväxt i försöket. Den hade låga rotbrandsangrepp under uppkomst, kraftig rottillväxt under hela säsongen samt en mycket hög skörd.

Några sorter som tenderar att vara mera känsliga för rotbrandsangrepp är Palace, Suez och Opta. Redan i början av juli uppvisade dessa sorter en låg rotvikt som bestod ända fram till skörd.

- Kombinera en tolerant sort med en bra svampbetning, då uppnås bra plantantal och en bra tillväxt även på smittade jordar.
- Sapporo visar på fortsatt god tolerans mot *Aphanomyces* över hela tillväxtperioden fram till skörd.
- En nyhet på sortsidan är Rasta som visat en tolerans som är lika bra eller något bättre än den för Sapporo.

Differences in tolerance against soil borne fungi in sugar beet varieties 2002-2006

Summary

- Sugar beet varieties show varying levels of tolerance to soil borne fungi.
- Soil borne fungi retards general growth and susceptible varieties show slower emergence, lower root weight in July as well as at harvest.
- Rasta shows a tolerance that is equal or somewhat better than the tolerance in Sapporo.
- Suez, Opta and Palace have the lowest root weights throughout the growing season in the trial at Skiberöd and may be somewhat more susceptible to soil borne fungi than the other varieties.

Introduction

The most important soil borne fungus in Sweden is *Aphanomyces cochlioides*. On heavily infested fields it reduces the plant number and root yield. One important control method is to use tolerant sugar beet varieties on infested soils. All sugar beet varieties in Sweden are now being tested in field trials on naturally infested soil. Combining a tolerant variety with seed treatment with hymexazol protects the plants during emergence and early growth. After 4-6 weeks when the seed treatment is no longer effective, the sugar beet plant has to rely on its tolerance.

Materials and methods

Field trial

In late autumn 2005, soil samples were taken from a number of possible locations in the south of Sweden which were known to be naturally infected with soil borne fungi. The soil samples were analysed for their infestation level. The soil tests were carried out by Syngenta Seeds (Maria Nihlgård). Sugar beet seeds were sown in pots with test soil and then put in green house 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):

DSI soil = $(3 * as_7 + 3 * (as_{14} - as_7) + (as_{21} - as_{14}) + 0,5 * (as_{28} - as_{21}))/3$
 where as = number of attacked seedlings at 7, 14, 21 and 28 days.

Table 1. The table shows the evaluation of risk of damping-off (Ewaldz 1993)

| DSI soil | 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 |

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 infestation level at Skiberöd was DSI=93 and both *Aphanomyces cochlioides* and *Pythium* spp. were found in the field. The trial was a randomised complete block design with four replications. The trial was sown on 4 May. Each plot consisted of 4 rows with length ten meters. Rows two and three were harvested. An additional five meters was sown directly after the original plot in which plants could be removed for analyses. The trial was watered twice in June to favour attacks of soil borne fungi.

The number of plants in each plot was counted three times (at 50%, max and final emergence). Plant condition was assessed once. 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% (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.

Disease severity index during emergence have been carried out in a total of three trials on infested soil during 2003 to 2006. The results are shown in appendix 4.

Root and foliage was weighed 5 July on ten plants in each plot. Root and foliage weight per plant was calculated. The results are shown in appendix 5.

After harvest, the number of beets that showed symptoms of deformation was counted in each plot (1. very weak, 2. weakly and 3. strongly infected beets, respectively). The evaluation was carried out at the central tare house in Örtöfta (Agri Provtvätt, Örtöfta Sockerbruk, Danisco Sugar). Beets classified as strongly infected are characterized by a severely deformed taproot whereas weakly infected beets show only moderate signs of deformation. A root rot index RI (0 – 3) was calculated:

RI = (0 * n₀ + 1 * n₁ + 2 * n₂ + 3 * n₃)/total no. plants in the plot where n = the number of plants in each category.

This evaluation was also carried out in one of the official variety trials 2006 (trial 101 Hagestadborg 2006). During the growing season this trial was found to be highly infested with soil borne fungi with a DSI = 97 measured in August. Results from the evaluation of root rot (RI) are shown in appendix 7.



Sugar beets showing varying degrees of deformation caused by A. cochlioides.

Statistical analyses

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

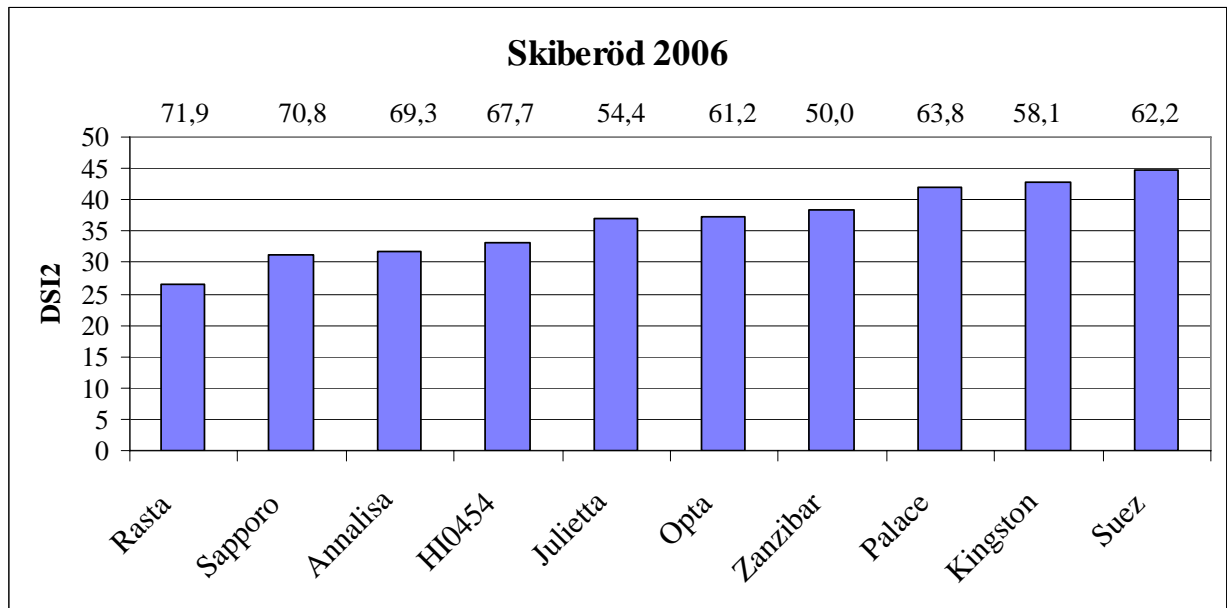
Results and discussion

Sugar beets were drilled very late in 2005 in the Swedish growing area because of the continuous snow cover from December to the end of March.

Plant number and disease severity index

There are large differences in 50% emergence between the varieties. At 50% emergence the largest number of plants was found in Sapporo and Rasta, around 70 000 plants/ha. Also Annalisa and HI 0454 had over 65 000 plants/ha. Emergence was slow in Zanzibar and Julietta with around 50 000 plants/ha at that time. At full emergence there were over 90 000 plants/ha in all varieties.

The evaluation of disease severity (DSI1) 1 June showed no significant differences between varieties. Disease severity was evaluated a second time 15 June (DSI2) and although there were no significant differences, it is possible to roughly group the varieties according to the disease severity index. Sapporo has previously shown to be tolerant to soil borne fungi and is together with Rasta, the two varieties with the lowest DSI in this trial (Rasta 26,4 and Sapporo 31,1). Three varieties had a DSI1 over 40, Palace, Kingston and Suez.



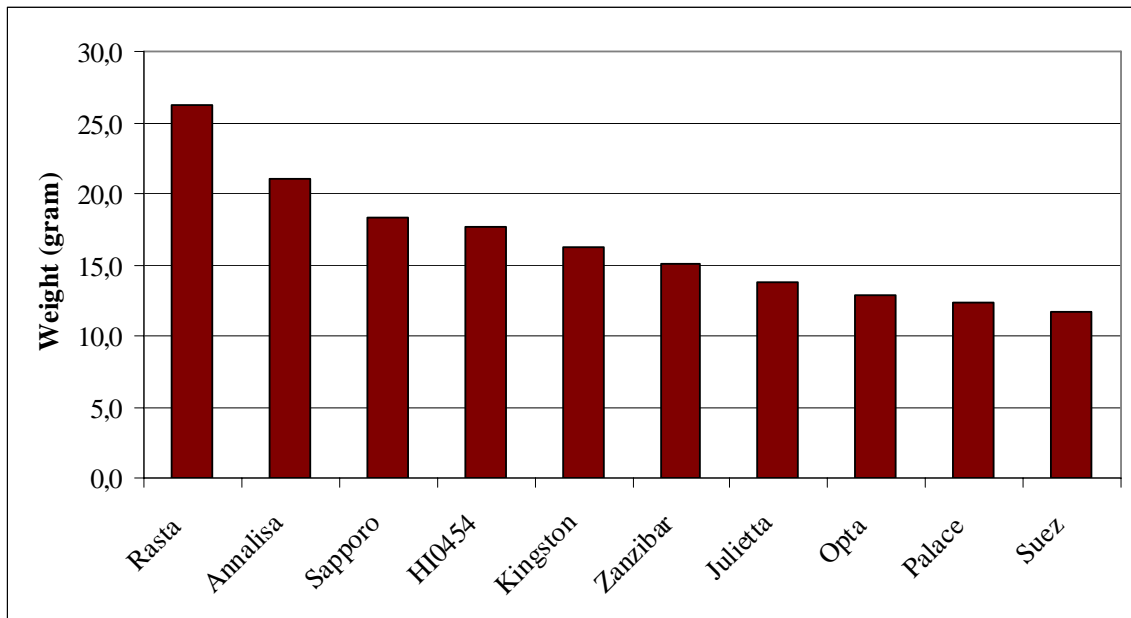
Disease severity index and plant number at 50% in sugar beet varieties tested in the field trial at Skiberöd 2006. The plants with the lowest DSI have also the highest plant number. The differences in plant number was significant with an $LSD = 7,47$. The differences in DSI2 was not significant.



Plants from the second evaluation of DSI 15 June 2006. Variety Zanzibar (DSI = 38,3) to the left, Rasta (DSI = 26,4) to the right. Drilling date was 4 May.

Weight of root and foliage in July

The first week in June there were significant differences between the varieties in root weight. Rasta had the largest root, followed by Annalisa and Sapporo. Suez, Palace and Opta had the smallest roots. There were no significant differences in weight of foliage.



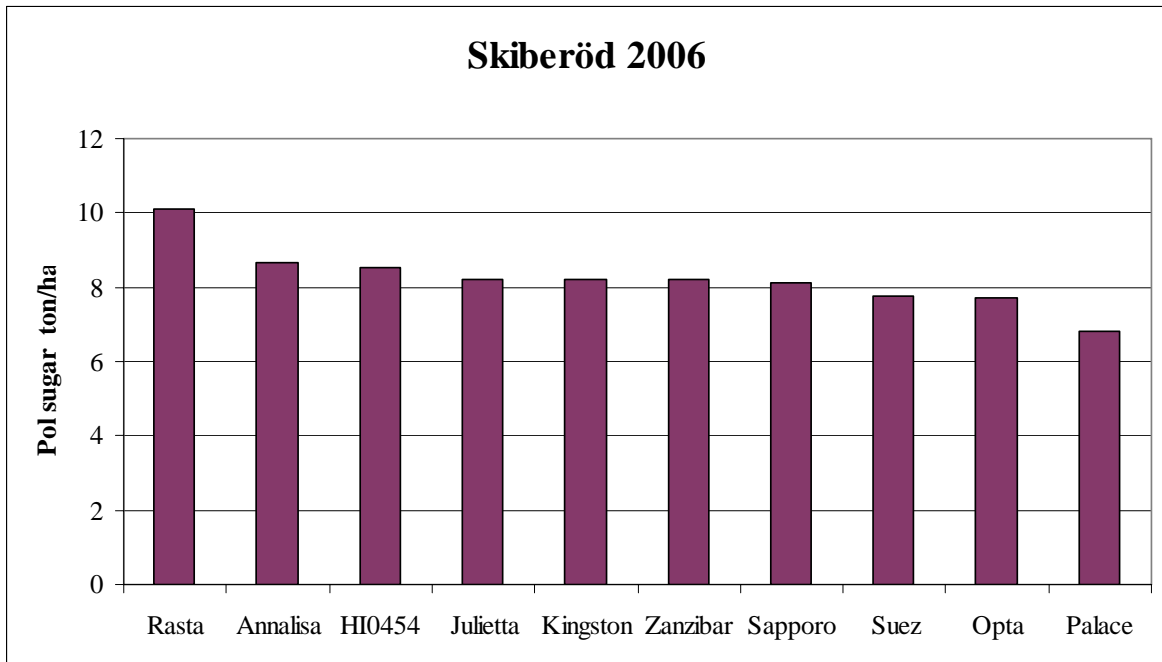
Root weight measured in June in the ten varieties tested at Skiberöd 2006, $LSD = 8,2$.

Chronical root rot

The evaluation of chronical root rot at Skiberöd showed that Rasta and Sapporo had only minor signs of root deformation. Generally they are only slightly scared on the surface of the beet. Opta, Kingston and Palace showed clear signs of rot deformation. Several plants in each plot showed the typical constriction below the beet head that is typical damage of *A. cochlioides*.

Yield

There were significant differences also in sugar yield between the varieties. Rasta had significantly higher sugar yield than all other varieties.



Sugar yield in ten tested varieties at Skiberöd 2006. The statistical analyses showed that there were significant differences between the varieties with an LSD = 1,3.

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.

General information

Uppdragsgivare / Contractor:

SBU AB

Planansvarig / Project Manager:

Åsa Olsson, SBU AB

Försöksfrö / Trial seed

Försöksfrö beställdes av SBU AB. / Trial seed was ordered by SBU AB

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

Skiberöds gård

Sten Olsson, Skiberöds gård, 240 33 Löberöd

Teknisk beskrivning / Technical details:

| Produkt / Product | Verksam substans / Active ingredient | Dos / Dose |
|-------------------|--------------------------------------|------------|
| Euparen | <i>tolyfluanid</i> | 10 g |
| Tachigaren | <i>hymexazol</i> | 14 g |

Avvikelser / Nonconformances

None registered.

Borgeby den 12 december 2006

Åsa Olsson
Project Manager, SBU AB

Robert Olsson
Managing Director, SBU AB

Motståndskraft mot jordburna svampsjukdomar

SBU projektkod 2006-1-1-412

Antal försök 1

Fältkort

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

Syfte: Att prova nya betsorters motståndskraft mot jordburna svampsjukdomar

Uppdragsgivare: SBU

| Försöksled | | | | Provn. år | ledkod |
|------------|----------|----------|--------|-----------|---------|
| 1 | Sapporo | HI 0140 | 2X | HI | 20006 |
| 2 | Opta | HI 0349 | 2X | HI | 20306 |
| 3 | Kingston | DS 2060 | 2X | DS | 20312 |
| 4 | Zanzibar | S 2363 | 2XRZ | SESVdH | 20333 |
| 5 | Julietta | KWS 3K09 | 2xRZNT | KWS | 4 20319 |
| 6 | Rasta | HI 0425 | 2XRZ | HI | 3 20409 |
| 7 | Palace | DS 2058 | 2XLA | DS | 3 20411 |
| 8 | Suez | DS 4059 | 2XRZLA | DS | 3 20415 |
| 9 | Annalisa | KWS 4K20 | 2XRZNT | KWS | 20421 |
| 10 | - | HI0454 | 2x AT | HI | 20505 |

Bricknr i försöket:

4001-4040

Försökets totala yta, m²:

2611

Skördeyta/parcell, m²:

2 r x 10 m

Bruttoyta/parcell, m²:

6 r x 17 m

Kontaktperson + telefonnr:

För försökets utförande ansvarig person + telefonnr:

Åsa Olsson 0709-53 72 62, Robert Olsson 0709-53 72 60

Leif Jönsson 0708 16 10 51

Krav på försöksplats:

På plats med mycket svampsmitta. 6 radiga parceller.

Försöket bevattnas flera gånger under uppkomsten för att gynna svampangrepp. Se PM.

Försöksuppgifter:

| Försöksuppgifter: | | Försöksåtg.: PM | Datum/Sign. | |
|-----------------------|-----------------------|--------------------|-------------|-------------|
| Såmaskin, märke | Monozentra SP 6r | Generalprov pkt 6 | 2.6.1 HS | 4/5 LJ |
| Sådd, datum | 4/5 | Utstakning i fält | 2.4.1 HS | 28/4 LJ |
| Radavstånd, cm | 48 | Parcellvis sådd | 2.4.2 HS | 4/5 LJ, TB |
| Antal frö per m | 5,1 | Svampprov | 2.6.1 HS | 1/12-05 LJ |
| Sort | Enligt plan | Planträkning 50 | 2.5.4 HS | 16/5 LJ |
| Betning, produkt | Enligt plan | Planträkning max | 2.5.4 HS | 14/6 LJ, AE |
| Uppkomst, datum | 16-maj | Planträkning slutl | 2.5.4 HS | 26/6 AE |
| Förfrukt 2005 | korn | Rotbrand 1 | 2.5.8 HS | 31/5 LJ, AE |
| År med betor 1995-05: | 1998, 2002 | Rotbrand 2 | 2.5.8 HS | 14/6 LJ, AE |
| | | Skörd | 2.4.7 HS | 5/10 TB, LN |
| Gödsling | Probeta NPK 650 kg/ha | Lev. provtvätt | 2.4.7 HS | 6/10 LJ |
| Ogräsbekämpning | se behandlingsdata | Svampangrepp | | |
| Svampbekämpningar | nej | efter skörd | 2.5.10 SBU | 16/10 ÅO |
| Insektsbekämpningar | 10/6 0,25 Sumi-alpha | Analys | - DS | 16/10 |

20060322ÅO

Försöksdata kontrollerat (datum+sign.): 20061207 LJ

Fältplan Skiberöd

| | | | | | | | | | | |
|-----|---|----|----|---|----|---|---|---|----|---|
| IV | 8 | 9 | 3 | 5 | 10 | 1 | 7 | 4 | 2 | 6 |
| III | 5 | 6 | 10 | 2 | 7 | 8 | 4 | 1 | 9 | 3 |
| II | 9 | 10 | 4 | 6 | 1 | 2 | 8 | 5 | 3 | 7 |
| I | 6 | 7 | 1 | 3 | 8 | 9 | 5 | 2 | 10 | 4 |

Brickplan Skiberöd

| | | | | | | | | | | |
|-----|------|------|------|------|------|------|------|------|------|------|
| IV | 4031 | 4032 | 4033 | 4034 | 4035 | 4036 | 4037 | 4038 | 4039 | 4040 |
| III | 4021 | 4022 | 4023 | 4024 | 4025 | 4026 | 4027 | 4028 | 4029 | 4030 |
| II | 4011 | 4012 | 4013 | 4014 | 4015 | 4016 | 4017 | 4018 | 4019 | 4020 |
| I | 4001 | 4002 | 4003 | 4004 | 4005 | 4006 | 4007 | 4008 | 4009 | 4010 |

Jordanalys / Soil analyses 2006

| Skiberöd | | |
|--------------------------|---------|----|
| <i>Klass</i> | | |
| pH-värde | 6,4 | |
| P-AL (mg/100 g jord) | 8,2 | IV |
| K-AL (mg/100 g jord) | 7,2 | II |
| Mg-AL (mg/10 g jord) | 5,2 | |
| K/Mg-kvot | 1,4 | |
| Ca-AL (mg/kg jord) | 160 | |
| K-HCl (mg/100 g jord) | 80 | 2 |
| Cu-HCl (mg/kg jord) | 3,5 | |
| P-HCL mg/100 g | 60 | 3 |
| Bor (mg/kg jord) | 0,76 | |
| Mullhalt (%) | 2,4 | |
| Lerhalt (%) | 14 | |
| Finler (%) | 11 | |
| Sand + grovmo (%) | 61 | |
| Jordart | nmh lMo | |
| Basmättnadsgrad | 74 | |
| S-värde (mekv/100g jord) | 8,6 | |
| T-värde (mekv/100g jord) | 11,6 | |

Behandlingsdata

Ogräsbekämpning / Weed control

| 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 |

Gödsling / Fertilization

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

Motståndskraft mot jordburna svampsjukdomar

Planträkningar och sundhet / Plant number and vigour

| Behandling / Treatments | | | Planträkning 1000-tal/ha | | Planträkning Plant number Plh slutlig/final | Sundhet1 Vigour1 0 - 100 | Sundhet2 Vigour2 1 - 100 |
|-------------------------|----------|----------|----------------------------------|--------|---|--------------------------------|--------------------------------|
| | | | Plant number 1000nds/ha plh50 | plh100 | | | |
| Datum | | | 060516 | 060614 | 060626 | 060613 | 060628 |
| 1 | Sapporo | HI 0140 | 70,8 | 94,8 | 93,2 | 77,5 | 78,8 |
| 2 | Opta | HI 0349 | 61,2 | 96,1 | 94,5 | 77,8 | 81,3 |
| 3 | Kingston | DS 2060 | 58,1 | 92,4 | 93,0 | 76,8 | 80,0 |
| 4 | Zanzibar | S 2363 | 50,0 | 92,4 | 94,0 | 73,3 | 66,3 |
| 5 | Julietta | KWS 3K09 | 54,4 | 96,9 | 95,1 | 75,8 | 71,3 |
| 6 | Rasta | HI 0425 | 71,9 | 100,3 | 99,5 | 82,8 | 86,3 |
| 7 | Palace | DS 2058 | 63,8 | 95,1 | 96,1 | 77,0 | 75,8 |
| 8 | Suez | DS 4059 | 62,2 | 93,2 | 93,5 | 75,3 | 68,3 |
| 9 | Annalisa | KWS 4K20 | 69,3 | 98,2 | 97,7 | 82,0 | 86,3 |
| 10 | - | HI0454 | 67,7 | 97,1 | 96,1 | 77,3 | 82,5 |
| RSQ % | | | 74,6 | 45,4 | 40,7 | 59,9 | 57,2 |
| CV | | | 8,23 | 4,1 | 3,8 | 3,8 | 10,6 |
| LSD 5% | | | 7,47 | 5,6 | 5,3 | 4,3 | 12,0 |
| Prob. | | | <0,0001 | 0,1297 | 0,2642 | 0,0033 | 0,0141 |
| | | | *** | ns | ns | ** | * |

Motståndskraft mot jordburna svampsjukdomar

SBU projektkod

2006-1-1-412

Damping-off

| Behandling / Treatments | Rotbrand | | Weight/plant | | | | Rot och blastvikt | | | Kronisk rotröta |
|-------------------------|-------------|--------|--------------|--------|--------|---------|----------------------------|--------------|---------|-----------------|
| | Damping-off | | | | | | Weight of root and foliage | | | Root rot |
| | DSI 1 | DSI 2 | 1 | 2 | Root | Foliage | Root + foliage | Root/foliage | RI | |
| | 0-100 | 0-100 | g | g | g | g | g | g | 0-3 | |
| | 060601 | 060615 | 060601 | 060615 | 060705 | 060705 | 060705 | 060705 | 061016 | |
| 1 Sapporo | HI 0140 | 22,1 | 31,1 | 0,53 | 6,23 | 18,3 | 67,8 | 86,0 | 26,8 | 0,12 |
| 2 Opta | HI 0349 | 22,6 | 37,3 | 0,58 | 6,45 | 12,8 | 60,1 | 73,0 | 21,3 | 0,52 |
| 3 Kingston | DS 2060 | 23,9 | 42,9 | 0,50 | 5,67 | 16,2 | 72,1 | 88,3 | 22,8 | 0,54 |
| 4 Zanzibar | S 2363 | 19,9 | 38,3 | 0,45 | 6,39 | 15,1 | 52,8 | 67,9 | 29,1 | 0,22 |
| 5 Julietta | KWS 3K09 | 22,1 | 37,1 | 0,50 | 6,03 | 13,8 | 47,6 | 61,4 | 29,0 | 0,33 |
| 6 Rasta | HI 0425 | 22,6 | 26,4 | 0,61 | 9,06 | 26,2 | 84,7 | 110,9 | 30,6 | 0,10 |
| 7 Palace | DS 2058 | 24,1 | 42,1 | 0,58 | 6,49 | 12,4 | 62,8 | 75,2 | 19,4 | 0,40 |
| 8 Suez | DS 4059 | 22,2 | 44,8 | 0,54 | 6,07 | 11,7 | 45,3 | 57,0 | 25,7 | 0,12 |
| 9 Annalisa | KWS 4K20 | 22,7 | 31,9 | 0,57 | 7,25 | 21,1 | 62,2 | 83,3 | 33,9 | 0,31 |
| 10 - | HI0454 | 29,1 | 33,0 | 0,50 | 6,83 | 17,7 | 58,6 | 76,3 | 30,1 | 0,14 |
| RSQ % | | 60,8 | 60,4 | 55,8 | 46,4 | 46,7 | 32,9 | 34,2 | 88,0 | 75,9 |
| CV | | 17,4 | 23,9 | 11,8 | 20,4 | 34,4 | 32,0 | 32,3 | 7,3 | 40,4 |
| LSD 5% | | 5,8 | 12,7 | 0,1 | 2,0 | 8,2 | 28,5 | 36,5 | 2,9 | 0,16 |
| Prob. | | 0,2288 | 0,1121 | 0,0393 | 0,0829 | 0,0314 | 0,2289 | 0,1996 | <0,0001 | <0,0001 |
| | | ns | ns | ns | ns | * | ns | ns | *** | *** |

Motståndskraft mot jordburna svampsjukdomar

SBU projektkod 2006-1-1-412

| | | | Skiberöd | | Sandby gård | | Skiberöd | |
|----|---------------|----------|----------|--------|-------------|--------|----------|--------|
| | | | DSI 1 | DSI 2 | DSI 1 | DSI 2 | DSI 1 | DSI 2 |
| | | | 060601 | 060615 | 040514 | 040602 | 030514 | 030603 |
| 1 | Sapporo | HI 0140 | 22,1 | 31,1 | 37,8 | 49,1 | 27,0 | 4,2 |
| 2 | Opta | HI 0349 | 22,6 | 37,3 | - | - | - | - |
| 3 | Kingston | DS 2060 | 23,9 | 42,9 | - | - | - | - |
| 4 | Zanzibar | S 2363 | 19,9 | 38,3 | - | - | - | - |
| 5 | Julietta | KWS 3K09 | 22,1 | 37,1 | 42,6 | 55,8 | - | - |
| 6 | Rasta | HI 0425 | 22,6 | 26,4 | - | - | - | - |
| 7 | Palace | DS 2058 | 24,1 | 42,1 | - | - | - | - |
| 8 | Suez | DS 4059 | 22,2 | 44,8 | - | - | - | - |
| 9 | Annalisa | KWS 4K20 | 22,7 | 31,9 | - | - | - | - |
| 10 | - | HI0454 | 29,1 | 33,0 | - | - | - | - |
| | Philippa | KWS | - | - | 42,8 | 49,8 | 39,4 | 5,5 |
| | Envol | HI | - | - | 36,8 | 48,8 | 28,8 | 6,5 |
| | Jakarta | HI | - | - | 47,6 | 49,4 | 43,7 | 7,2 |
| | Saigon | DS | - | - | 44,9 | 48,1 | 40,6 | 5,3 |
| | Avance | HI | - | - | 44,7 | 46,8 | 37,9 | 6,7 |
| | Anemona | KWS | - | - | 37,7 | 48,9 | 28,8 | 7,8 |
| | Fidelia | KWS | - | - | 41,5 | 45,1 | 36,3 | 3,5 |
| | Nemakill | HI | - | - | 46,5 | 50,2 | 33,1 | 12,5 |
| | Etna | DS | - | - | 44,0 | 48,1 | - | - |
| | Belmonte | DS | - | - | 38,4 | 48,8 | 39,2 | 8,5 |
| | Ballade | STR | - | - | 41,9 | 44,8 | 30,2 | 3,5 |
| | Arcanta | HI 0041 | - | - | 45,0 | 45,4 | - | - |
| | Kulta | HI 0105 | - | - | 41,3 | 42,9 | - | - |
| | Linnea | KWS 2S37 | - | - | 47,3 | 46,4 | - | - |
| | Tuva | KWS 2S39 | - | - | 45,8 | 51,0 | - | - |
| | Malin | H 46505 | - | - | 36,0 | 41,1 | - | - |
| | Achat | STR 1903 | - | - | 45,8 | 41,6 | - | - |
| | KWS Aph-res | KWS | - | - | 46,1 | 51,9 | - | - |
| | Ymer | | - | - | - | - | 43,8 | 8,7 |
| | Pernilla | | - | - | - | - | 34,9 | 9,0 |
| | Ariana | | - | - | - | - | 33,8 | 6,9 |
| | Avista | | - | - | - | - | 36,5 | 6,2 |
| | Medina | | - | - | - | - | 34,3 | 13,3 |
| | RSQ % | | 60,8 | 60,4 | 61,8 | 55,6 | 55 | 57,1 |
| | CV | | 17,4 | 23,9 | 13,2 | 11,5 | 20,1 | 49,5 |
| | LSD 5% | | 5,8 | 12,7 | 8,0 | 7,8 | 10,1 | 5,1 |
| | Prob. | | 0,2288 | 0,1121 | 0,0606 | 0,0666 | 0,0280 | 0,0104 |

Motståndskraft mot jordburna svampsjukdomar

Betplantan / Beet plant

Aphanomyces cochlioides

| Sort / Variety | Root rot index (RI) at harvest | | | | | | | | |
|----------------|--------------------------------|---------------------|--------------------|------------------|--------------------|-----------------------|--------------|--------------------|------|
| | 0-3 | | | | | | | | |
| | Försöksserie: | SLU_2002 | 412_2003 | 101_2003 | 412_2004 | 101_2006 | 101_2006 | 412_2006 | |
| | DSI in field: | Sandby gård High | Skiberöd Medium | Fjärestad Low | Sandby gård Low | Hagestad High (97) | Hurva Low | Skiberöd * High | |
| 1 | Sapporo | HI 0140 | - | 0,05 | 0,04 | 0,04 | 0,05 | 0,01 | 0,12 |
| 2 | Opta | HI 0349 | - | - | - | - | 0,16 | 0,06 | 0,52 |
| 3 | Kingston | DS 2060 | - | - | - | - | 0,14 | 0,04 | 0,54 |
| 4 | Zanzibar | S 2363 | - | - | - | - | 0,17 | 0,14 | 0,22 |
| 5 | Philippa | KWS 0126 | - | 0,19 | 0,10 | 0,06 | 0,70 | 0,10 | - |
| 6 | Kulta | HI 0105 | 0,52 | - | 0,07 | 0,11 | 0,14 | 0,04 | - |
| 7 | Julietta | KWS 3K09 | - | - | - | - | 0,08 | 0,12 | 0,33 |
| 8 | Arcanta | HI 0041 | 0,23 | - | 0,06 | 0,02 | 0,06 | 0,02 | - |
| 9 | Malin | VdH 46505 | 0,40 | - | 0,08 | 0,09 | 0,36 | 0,15 | - |
| 10 | Achat | STR 1903 | 0,20 | - | 0,03 | - | 0,31 | 0,14 | - |
| 11 | | HI 0421 | - | - | - | - | 0,06 | 0,02 | - |
| 12 | Rasta | HI 0425 | - | - | - | - | 0,07 | 0,02 | 0,10 |
| 13 | Palace | DS 2058 | - | - | - | - | 0,15 | 0,03 | 0,40 |
| 14 | Suez | DS 4059 | - | - | - | - | 0,01 | 0,00 | 0,12 |
| 15 | Annalisa | KWS 4K20 | - | - | - | - | 0,14 | 0,06 | 0,31 |
| 16 | | KWS 4S58 | - | - | - | - | 0,06 | 0,01 | - |
| 17 | | HI 0333 | - | - | - | - | 0,26 | 0,02 | - |
| 18 | | HI 0447 | - | - | - | - | 0,24 | 0,08 | - |
| 19 | | HI 0468 | - | - | - | - | 0,12 | 0,05 | - |
| 20 | | HI 0472 | - | - | - | - | 0,04 | 0,02 | - |
| 21 | | HI 0473 | - | - | - | - | 0,04 | 0,11 | - |
| 22 | Belize | DS 2043 | - | - | - | - | 0,25 | 0,08 | - |
| 23 | Pondus | DS 2066 | - | - | - | - | 0,05 | 0,03 | - |
| 24 | | DS 2074 | - | - | - | - | 0,29 | 0,06 | - |
| 25 | | DS 4099 | - | - | - | - | 0,07 | 0,02 | - |
| 26 | | DS 4115 | - | - | - | - | 0,10 | 0,03 | - |
| 27 | | DS 4117 | - | - | - | - | 0,14 | 0,02 | - |
| 28 | | KWS 5R02 | - | - | - | - | 0,08 | 0,05 | - |
| 29 | | KWS 5R09 | - | - | - | - | 0,41 | 0,26 | - |
| 30 | | KWS 5S83 | - | - | - | - | 0,04 | 0,05 | - |
| 31 | | KWS 5S85 | - | - | - | - | 0,07 | 0,06 | - |
| 32 | | SR-27 | - | - | - | - | 0,23 | 0,07 | - |
| 33 | | SR-28 | - | - | - | - | 0,35 | 0,14 | - |
| 34 | Lessing | D 0102 | - | - | - | - | 0,37 | 0,21 | - |
| 35 | | HI 0402 | - | - | - | - | 0,03 | 0,04 | - |
| 36 | | HI 0532 | - | - | - | - | 0,23 | 0,05 | - |
| 37 | | HI 0533 | - | - | - | - | 0,10 | 0,03 | - |
| 38 | | HI 0537 | - | - | - | - | 0,11 | 0,05 | - |
| 39 | | HI 0541 | - | - | - | - | 0,06 | 0,05 | - |
| 40 | | HI 0547 | - | - | - | - | 0,15 | 0,04 | - |
| 41 | | HI 0549 | - | - | - | - | 0,10 | 0,03 | - |
| 42 | | HI 0550 | - | - | - | - | 0,17 | 0,05 | - |
| 43 | | HI 0569 | - | - | - | - | 0,07 | 0,05 | - |
| 44 | | HI 0579 | - | - | - | - | 0,38 | 0,04 | - |
| 45 | | HI 0590 | - | - | - | - | 0,02 | 0,00 | - |
| 46 | | DS 2077 | - | - | - | - | 0,10 | 0,04 | - |
| 47 | | DS 4123 | - | - | - | - | 0,06 | 0,01 | - |
| 48 | | DS 4124 | - | - | - | - | 0,14 | 0,10 | - |
| 49 | | DS 4126 | - | - | - | - | 0,13 | 0,05 | - |
| 50 | | DS 4127 | - | - | - | - | 0,29 | 0,07 | - |
| 51 | | KWS 6K54 | - | - | - | - | 0,05 | 0,06 | - |
| 52 | | KWS 6K56 | - | - | - | - | 0,02 | 0,04 | - |

| | | | | | | | | | |
|--------------------------|--------|----------|---|---|---|---|---------|---------|---------|
| 53 | | KWS 6R24 | - | - | - | - | 0,13 | 0,10 | - |
| 54 | | KWS 6R37 | - | - | - | - | 0,03 | 0,05 | - |
| 55 | | KWS 6R39 | - | - | - | - | 0,25 | 0,08 | - |
| 56 | | KWS 6R45 | - | - | - | - | 0,02 | 0,01 | - |
| 57 | | KWS 6R49 | - | - | - | - | 0,15 | 0,03 | - |
| 58 | | KWS 6S92 | - | - | - | - | 0,00 | 0,01 | - |
| 59 | | SR-70 | - | - | - | - | 0,09 | 0,04 | - |
| 60 | | SR-72 | - | - | - | - | 0,05 | 0,03 | - |
| 61 | | SR-95 | - | - | - | - | 0,14 | 0,04 | - |
| 62 | | SR-120 | - | - | - | - | 0,53 | 0,16 | - |
| 63 | | SR-121 | - | - | - | - | 0,74 | 0,51 | - |
| 64 | Marcel | D 0201 | - | - | - | - | 0,16 | 0,10 | - |
| 65 | Tibor | STR 2206 | - | - | - | - | 0,31 | 0,14 | - |
| 66 | Markus | STR 2306 | - | - | - | - | 0,23 | 0,07 | - |
| Rel. precision, % | | | | | | | 131,1 | 100,5 | - |
| CV | | | | | | | 73,2 | 80,5 | 40,4 |
| LSD 5% | | | | | | | 0,26 | 0,11 | 0,2 |
| RSQ % RCB | | | | | | | 64,8 | 68,8 | 75,9 |
| Prob. | | | | | | | <0,0001 | <0,0001 | <0,0001 |

* SBU trial 412 Skiberöd 2006

Motståndskraft mot jordburna svampsjukdomar

Skörd / Harvest

Skiberöd

| Sort / Variety | | | Antal plantor No of plants 1000-tal/ha 1000nds/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 | Sapporo | HI 0140 | 93,2 | 49,4 | 16,47 | 8,14 | 100 | 8 | 4,4 | 87,1 |
| 2 | Opta | HI 0349 | 94,5 | 48,4 | 15,95 | 7,72 | 95 | 8 | 4,9 | 88,5 |
| 3 | Kingston | DS 2060 | 93,0 | 51,7 | 15,86 | 8,20 | 101 | 9 | 5,1 | 88,2 |
| 4 | Zanzibar | S 2363 | 94,0 | 50,3 | 16,28 | 8,19 | 101 | 7 | 4,6 | 84,0 |
| 5 | Julietta | KWS 3K09 | 95,1 | 52,2 | 15,71 | 8,21 | 101 | 11 | 4,6 | 89,1 |
| 6 | Rasta | HI 0425 | 99,5 | 60,0 | 16,84 | 10,11 | 124 | 8 | 3,7 | 88,7 |
| 7 | Palace | DS 2058 | 96,1 | 42,1 | 16,20 | 6,82 | 84 | 8 | 4,9 | 87,0 |
| 8 | Suez | DS 4059 | 93,5 | 46,3 | 16,71 | 7,74 | 95 | 8 | 4,2 | 87,2 |
| 9 | Annalisa | KWS 4K20 | 97,7 | 52,7 | 16,40 | 8,65 | 106 | 10 | 5,3 | 88,0 |
| 10 | - | HI0454 | 96,1 | 51,1 | 16,64 | 8,51 | 105 | 9 | 4,4 | 87,3 |
| RSQ % | | | 40,7 | 56,6 | 68,3 | 60,4 | - | 73,3 | 94,3 | 50,8 |
| CV | | | 3,8 | 9,8 | 1,9 | 10,1 | - | 11,2 | 3,0 | 3,2 |
| LSD 5% | | | 5,3 | 7,5 | 0,5 | 1,3 | - | 1,4 | 0,2 | 4,2 |
| Prob. | | | 0,2642 | 0,0075 | 0,0005 | 0,0030 | - | <0,0001 | <0,0001 | 0,4388 |
| | | | ns | ** | ** | ** | | *** | *** | ns |