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# Nya rotsjukdomar i korn och vete okända hot mot svensk spannmålsodling

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*Agro Plantarum*

**Brandsberga gård**



# Nya rotsjukdomar i korn och vete

- Fokus på algsvampar som angriper rotsystemet i många grödor
- Ökar vid höga nederbördsmängder, simmande sporer
- Jordburna patogener som ger dålig uppkomst och rotröta
- Viktiga släkten:
- *Pythium*, *Aphanomyces*
- Inventera förekomsten
- Vilka andra grödor infekteras
- Projektets bakgrund:
  - *Pythium* i korn och höstvete i långliggande försök med kalk (Nordic Beet Research 2014-2022)
  - *Aphanomyces* i växtföljder med spenat (Mariann Wikström, 1993)



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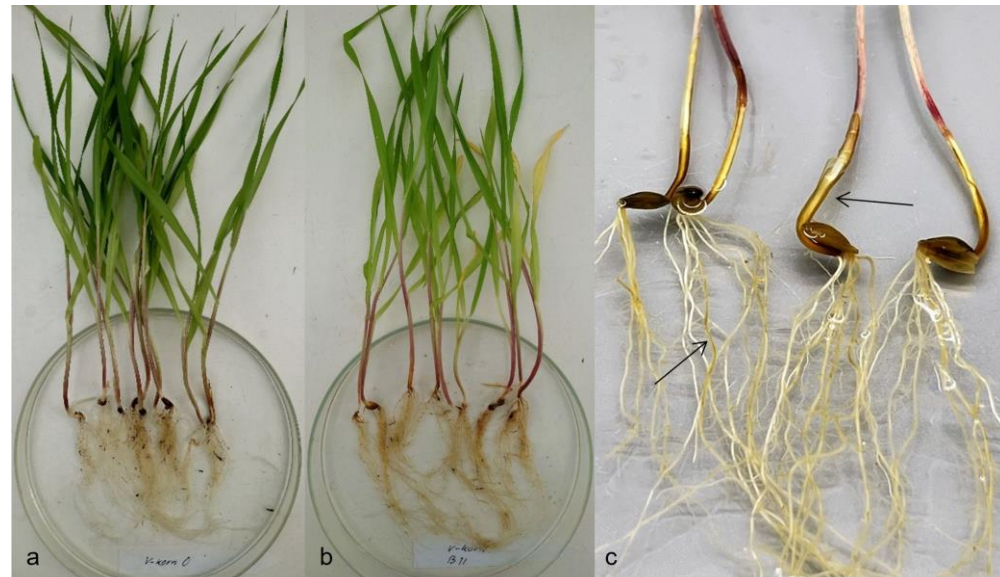
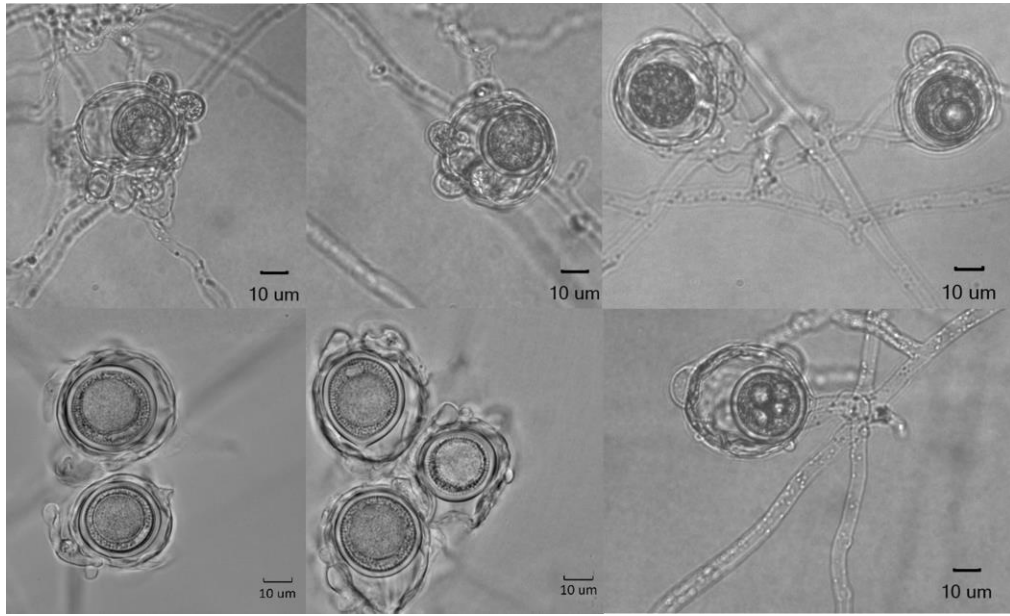
Vårkorn i maj 2021



Foto: Lars Persson

Höstkorn i november 2023

Symptom i fält i vårkorn och höstkorn efter regniga förhållanden



Foton: L. Persson, M. Wikström  
Wikström, M., Persson, L., and Fatehi, J., 2023.

# Pathogenicity, morphology and isozyme variability among isolates of *Aphanomyces* spp. from weeds and various crop plants

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In a root disease survey in the west part of Scania in southern Sweden, *Aphanomyces* spp. were obtained from roots of spinach, sugar beet, red beet, barley, oats, pea, and also from eight weed species found in spinach and pea fields. Morphological studies, pathogenicity tests performed on spinach, sugar beet, pea, barley, oats, tomato and radish, and isozyme analysis revealed four distinct groups or species. *A. euteiches* was isolated from pea and *Lamium amplexicaule*. The isolates were highly pathogenic on peas, but also slightly pathogenic on spinach. *A. cochlioides* was found on roots of sugar beet, red beet, spinach and *Chenopodium album*. This species was highly pathogenic on sugar beet and somewhat less so on spinach. The *Aphanomyces* sp. most frequently found on spinach roots, but also isolated from roots of sugar beet, red beet, barley, oats, *C. album*, *Polygonum convolvulus*, *Senecio vulgaris*, *Stellaria media*, *Urtica urens*, *Veronica agrestis* and *Viola arvensis* was identified as *A. cladogamus*. These isolates were, however, not pathogenic on tomato. They were moderately to highly pathogenic on spinach and weakly pathogenic on sugar beet. The fourth group of isolates had considerably larger oogonia and oospores than the other three groups. This unidentified *Aphanomyces* species was isolated from roots of spinach and barley. It was moderately pathogenic on spinach and sugar beet, and weakly pathogenic on barley. Several isolates from each group were compared by isozyme analysis. The intraspecific variation was low, and two enzymes, glucose-6-phosphate dehydrogenase and malate dehydrogenase, clearly differentiated between the four species.

Publikation i Marianns  
doktorsavhandling 1993

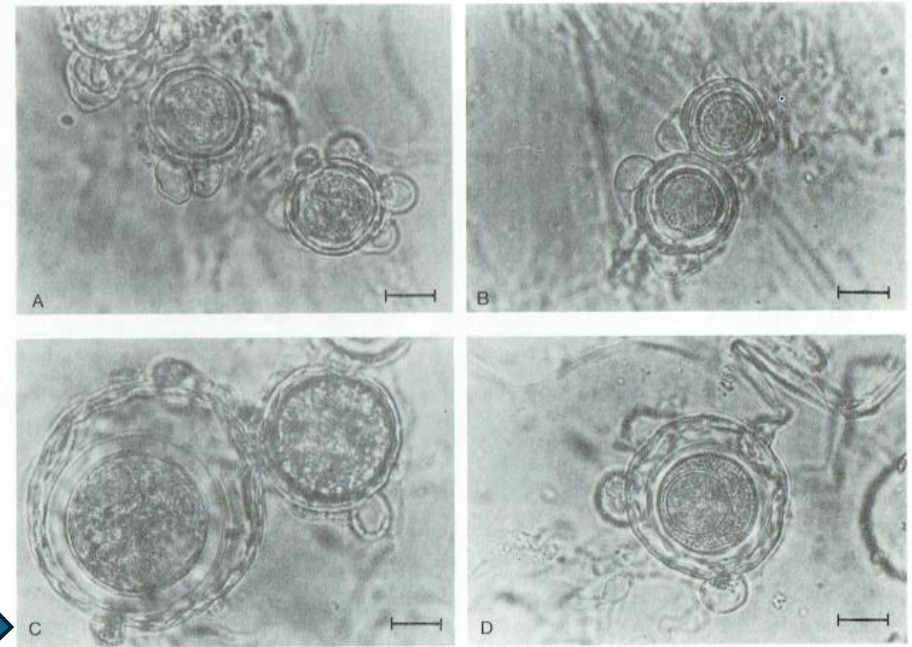


Fig. 2. Oogonia, oospores and antheridia of four *Aphanomyces* spp.: *A. cladogamus* isolate "A sp 1 K" (A), *A. cochlioides* isolate "A sp 2 BL" (B), the unidentified *Aphanomyces* sp. 3 isolate "A sp 3 BA" (C), and *A. euteiches* isolate "Ae R" (D). Bar = 10  $\mu$ m.

weakly pathogenic on sugar beet. The fourth group of isolates had considerably larger oogonia and oospores than the other three groups. This unidentified *Aphanomyces* species was isolated from roots of spinach and barley. It was moderately pathogenic on spinach and sugar beet, and weakly pathogenic on barley. Several isolates from each

# Kornfält i Västergötland 2011



Foto: Mariann Wikström

- En ny art: *Aphanomyces macrosporus*
- Hittades av Mariann för 30 år sedan i spenat och kornplantor
- Publicerad inom projektet finansierat av SLF
- Projektet tar slut 2024-12-31
- Publicerad:
- Wikström, Mariann, Lars Persson, and Jamshid Fatehi. 2023. "Aphanomyces macrosporus sp. nov. Causing Root Rot in Barley and Some Other Plants" Journal of Fungi 9, no. 12: 1144. <https://doi.org/10.3390/jof9121144>

Open Access Article

## *Aphanomyces macrosporus* sp. nov. Causing Root Rot in Barley and Some Other Plants

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### Abstract

In recent years, a new root rot disease in barley, which is caused by an *Aphanomyces* species, was found in field surveys in Southern Sweden and Denmark. Its symptoms occurred at the early tillering stage, around the BBCH 21 growth stage, and included the yellowing of leaves, brown coleoptiles, and the discolouration of roots. Prolonged soil wetness after rainfall favoured disease development, which sometimes advanced the yellowing patches to entire fields, resulting in lower yields. Oospores were found in the fine roots of diseased plants, and *Aphanomyces* isolates were obtained from these roots, as well as from the roots of barley plants grown in the greenhouse in soil samples from infected fields. Based on morphological analysis, we found that the new isolates were similar to those already obtained from barley and spinach roots in the 1990s in the same growing area. The morphological and molecular analyses performed in this study clearly separated and distinguished these barley isolates from other known *Aphanomyces*, and hereby *Aphanomyces macrosporus* sp. nov. is proposed as a new plant pathogenic species. It has larger oogonia and oospores than *A. euteiches*, *A. cochlioides*, and *A. cladogamus*, with one up to eight diclinous antheridia per oogonium. The phylogenetic analysis of the ITS rDNA region sequences grouped these new *Aphanomyces* isolates in a monophyletic clade, which was clearly distinguished from other plant pathogenic *Aphanomyces* species. The further pathogenicity of *A. macrosporus* on other plants is currently under investigation, but it is clear that it can at least infect barley, spinach, and sugar beet, indicating a wide host range for this species. The widespread presence and presumably broad host range of this new pathogenic *Aphanomyces* species must be considered in crop rotations.

**Keywords:** *Aphanomyces* sp.; Sweden; Denmark; root disease; *Hordeum vulgare*; *Spinacia oleracea*; *Beta vulgaris*

# Vårkorn angripet av *Aphanomyces macrosporus* 2024





## Aphanomycesrotröta i korn *Aphanomyces macrosporus*



## Ärtrotröta *Aphanomyces euteiches*



## Ärtotröta *Aphanomyces euteiches*

Aphanomyces-smitta i  
jorden  
Sjukdomsindexindex 16

Ingen smitta i jorden



Foto: L. Persson



Foto: L. Persson



Foto: L. Persson

Rotbrand i sockerbetor:  
*Aphanomyces cochlioides*  
*Aphanomyces cladogamus*  
*Aphanomyces macrosporus*



Foto: L. Persson



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## Vårkorn angripet av *Aphanomyces macrosporus*



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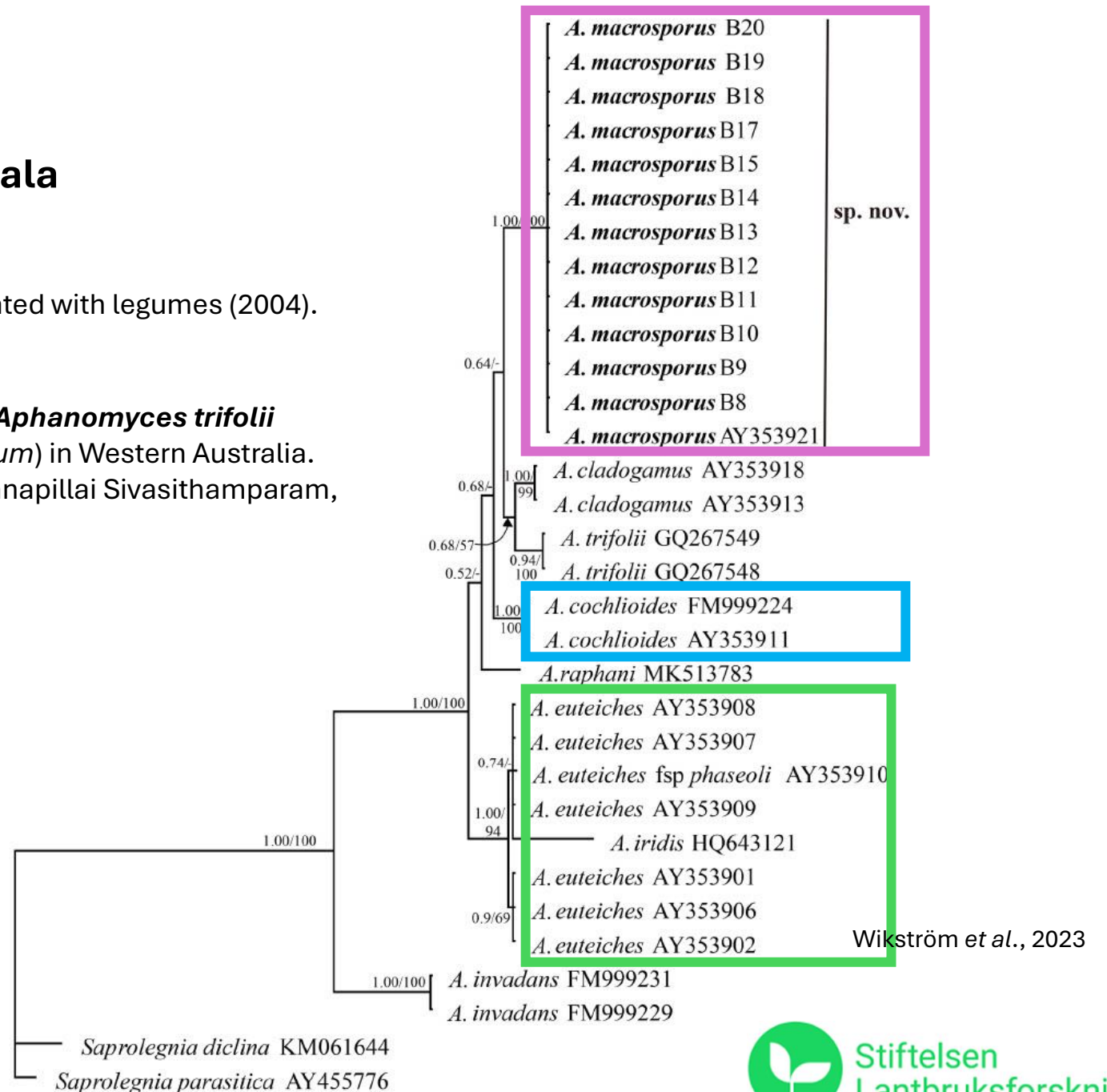
Foto: L. Persson

## Molekylära studier av *Aphanomyces*:

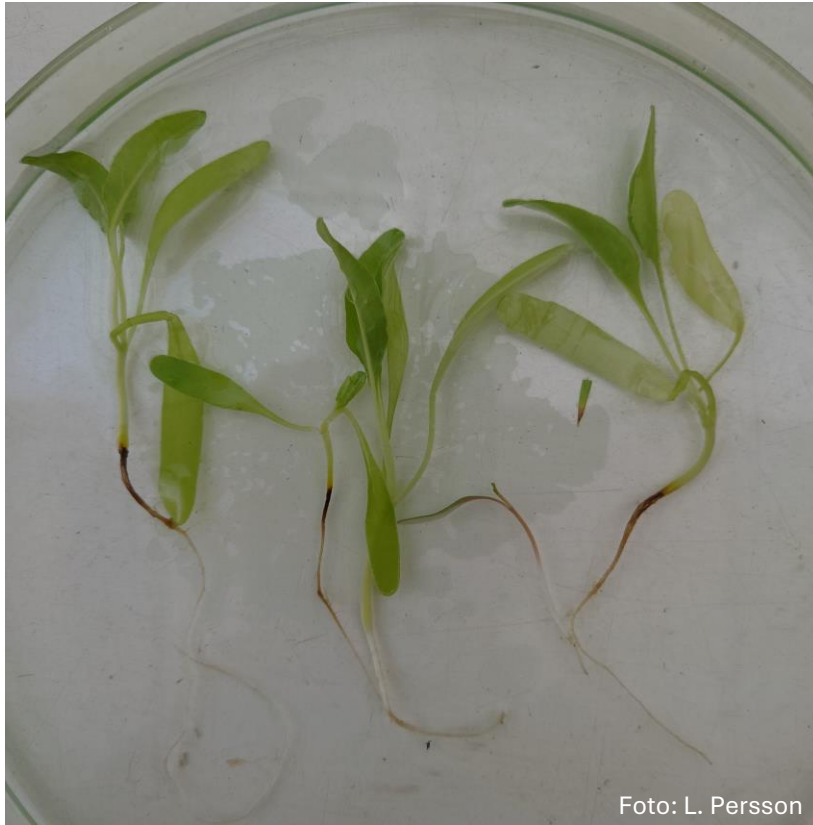
### Jamshid Fatehi, Lantmännen Bioagri, Uppsala

#### Tidigare studier:

- Molecular characterization of *Aphanomyces* species associated with legumes (2004).  
Jens P Levenfors, Jamshid Fatehi
- Taxonomic and pathogenic characteristics of a new species ***Aphanomyces trifolii*** causing root rot of subterranean clover (*Trifolium subterraneum*) in Western Australia.  
Tiernan A. O'Rourke, Megan H. Ryan, Hua Li, Xuanli Ma, Krishnapillai Sivasithamparam, Jamshid Fatehi and Martin J. Barbetti



## Andra värdväxter för *Aphanomyces macrosporus*:



Foton: Lars Persson, Mariann Wikström

- Infekterar även sockerbetor och spenat
- Fler försök för att utreda andra värdväxter i växtföljden

# Inventering 2021-2024

- Stora angrepp i Nordvästra Skåne och Halland 2024

Fynd i:

- Västra Sverige
- Östergötland
- Flera platser i Danmark





# Sortskillnader

- Fältförsök på smittad mark
- Test i växthus med såjord och tillsats av oosporer

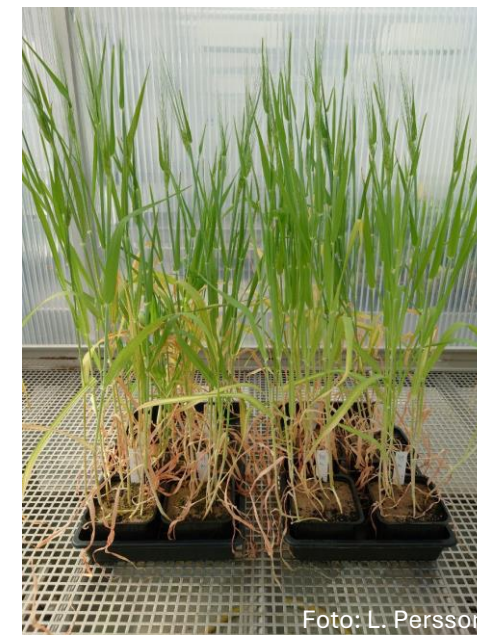
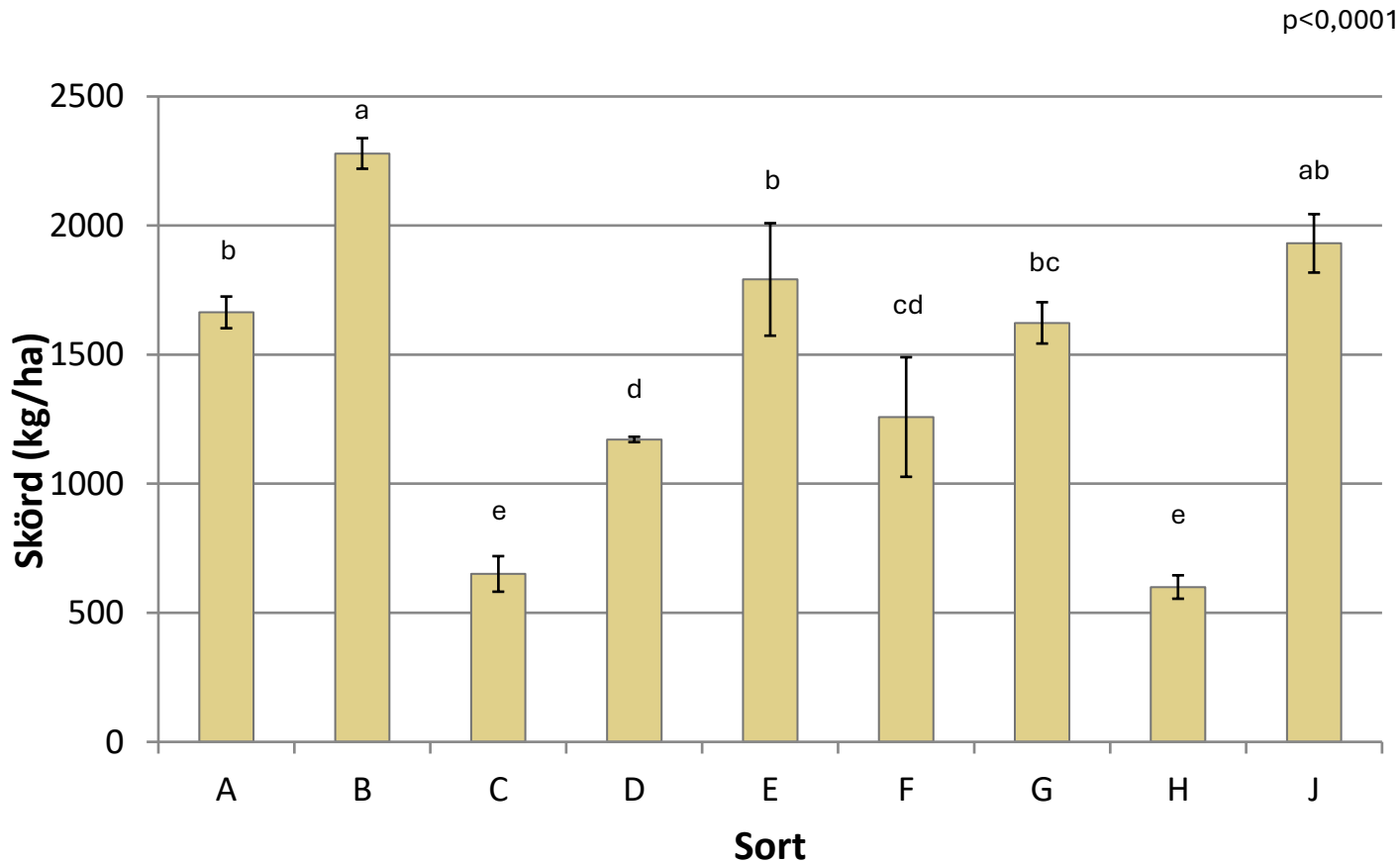


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Obehandlad inokulerad  
500 oosporer/ml

**Sort B:** sjukdomsindex 15

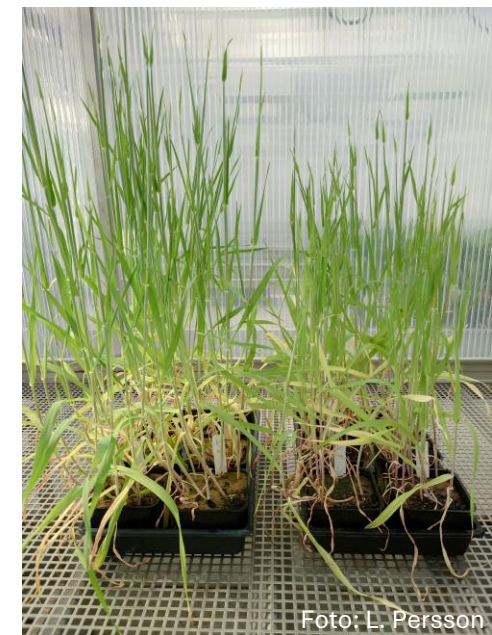


Foto: L. Persson

Obehandlad inokulerad  
500 oosporer/ml

**Sort H:** sjukdomsindex 46

# Sammanfattning-viktigaste slutsatser från projektet

- Vårkorn och höstkorn kan infekteras av *Aphanomyces macrosporus* och ge gulnande plantor
  - En nyligen beskriven algsvamp som gynnas av vatten
  - Rotsystemet förstörs och transport av vatten och näring påverkas
  - Har troligtvis funnits länge i våra fält
- *Pythium* i vårkorn och höstvetete gav en tidig infektion, men utan skördepåverkan av kalkning
- Grundförutsättningarna i fältet viktiga för att minska infektion av algsvampar
  - Effektiv dränering för att minska tiden med vattenmättnad i jordprofilen
  - Bra struktur -undvik markpackning
- Vilka grödor är värdväxter för *Aphanomyces macrosporus*?
  - Vår- och höstkorn, spenat och sockerbeta
- Se upp med:
  - Korn efter korn i växtföljden i synnerhet om det funnits tendens till dålig tillväxt
- Eventuella sortskillnader i vårkorn men fler tester behöver göras
- Var finns den?
  - Resultat hittills: södra Sverige och Danmark

