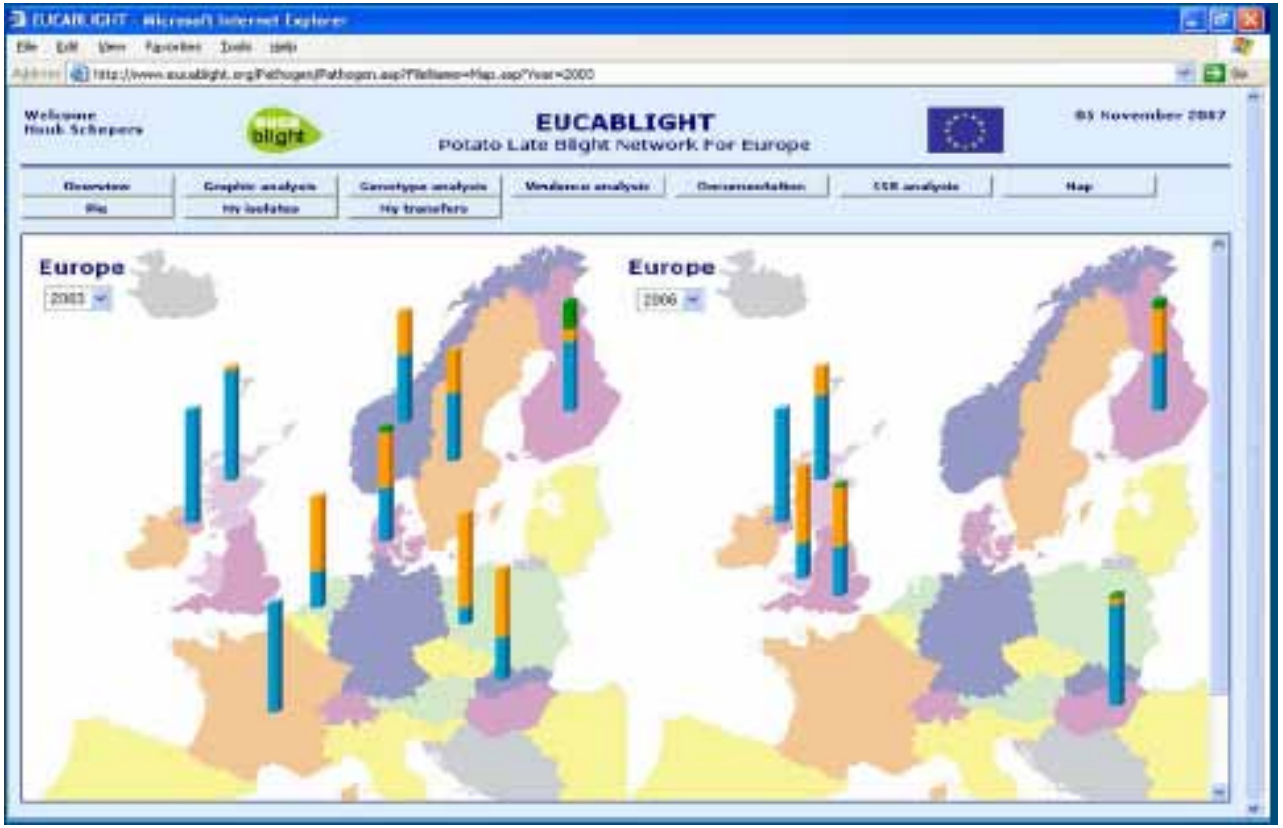
Phenotypic characteristics of Finnish and North-Western Russian populations of *Phytophthora infestans* in 2006-2007

Asko Hannukkala, Marika Rastas and Antti Hannukkala

MTT, Plant Protection

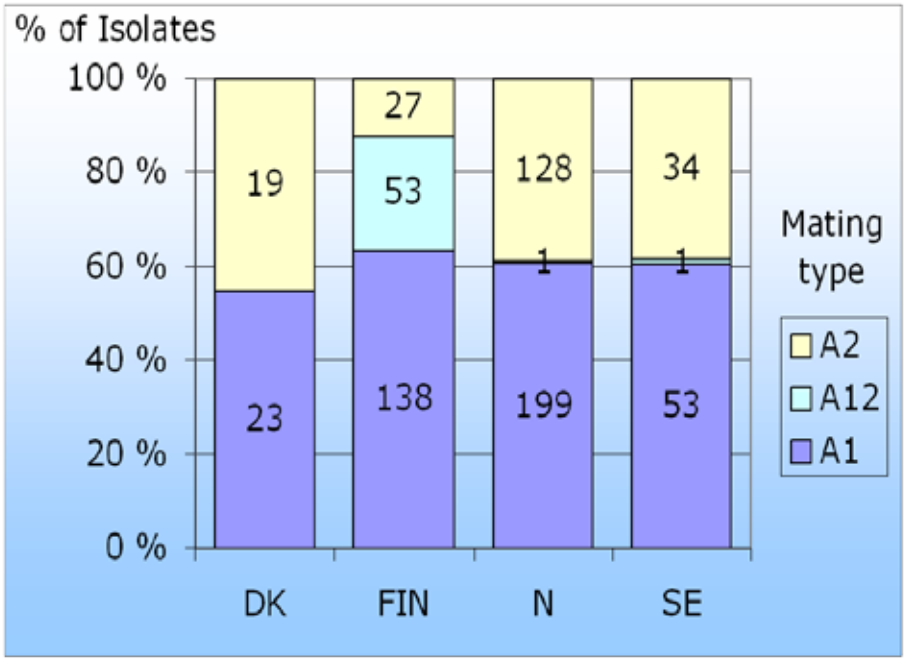
Introduction

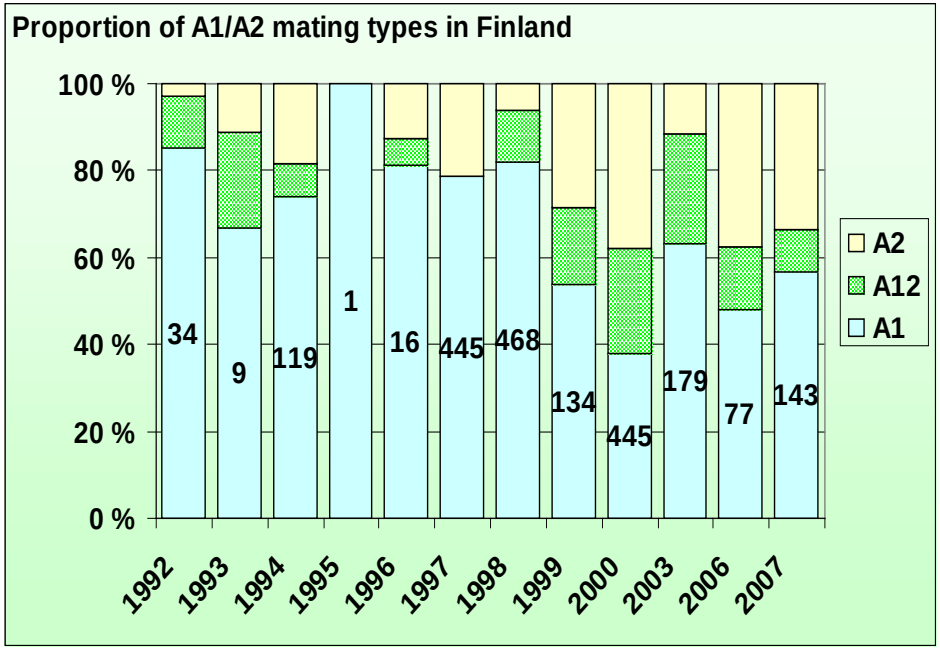
- Replacement of the old clonal A1 mating type population by sexually reproducing A1/A2 mating type population in Europe during 1980s and 1990s



Introduction

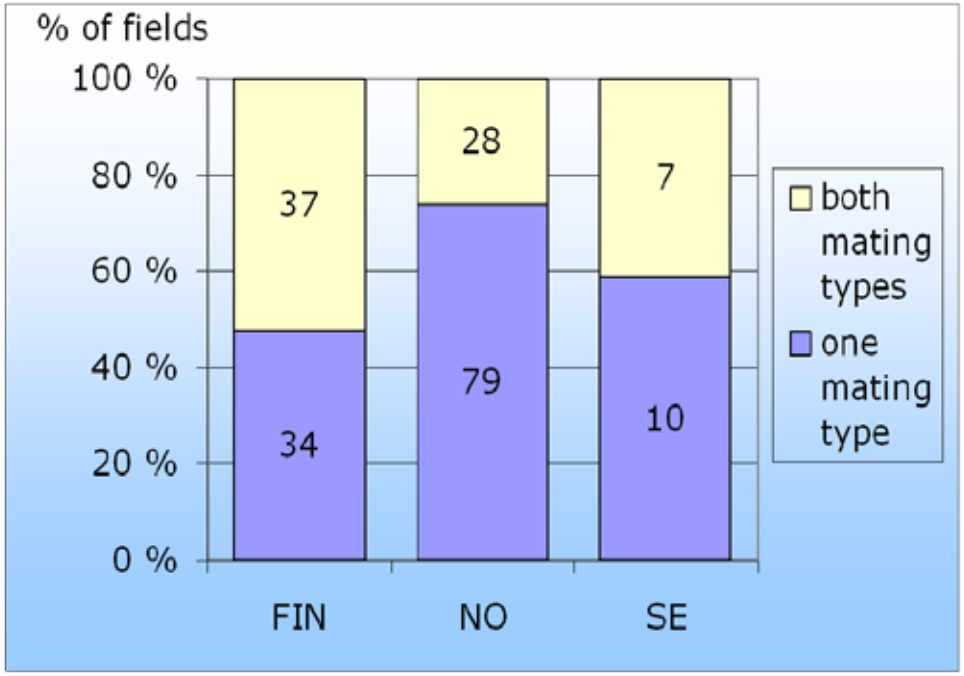
- Replacement of the old clonal A1 mating type population by sexually reproducing A1/A2 mating type population in Scandinavia and Finland during 1980s and 1990s

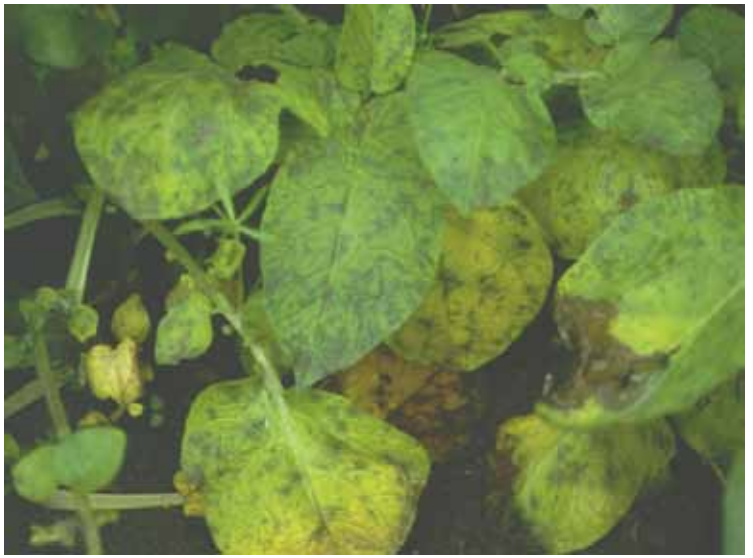




Introduction

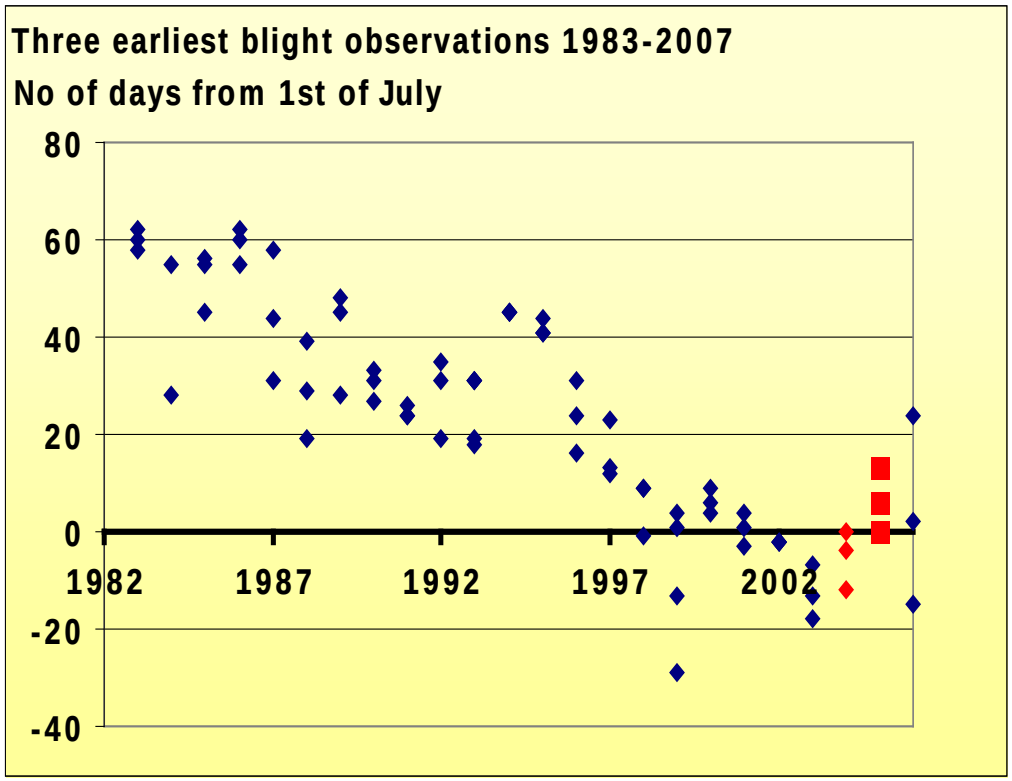
- Oospores as a primary source of inoculum
- Soil derived early epidemics are common in Finland

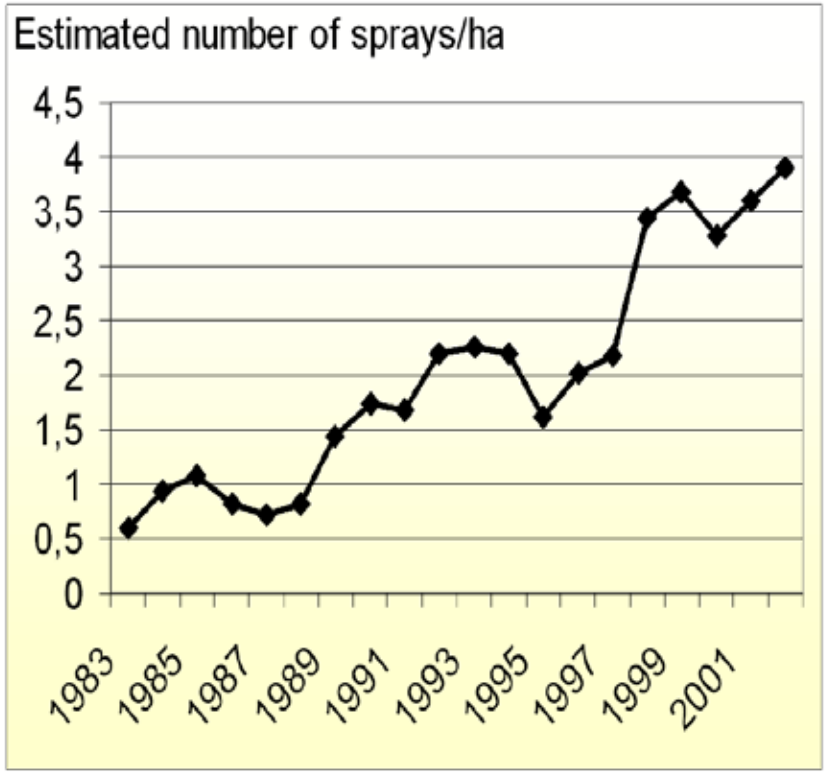




Introduction

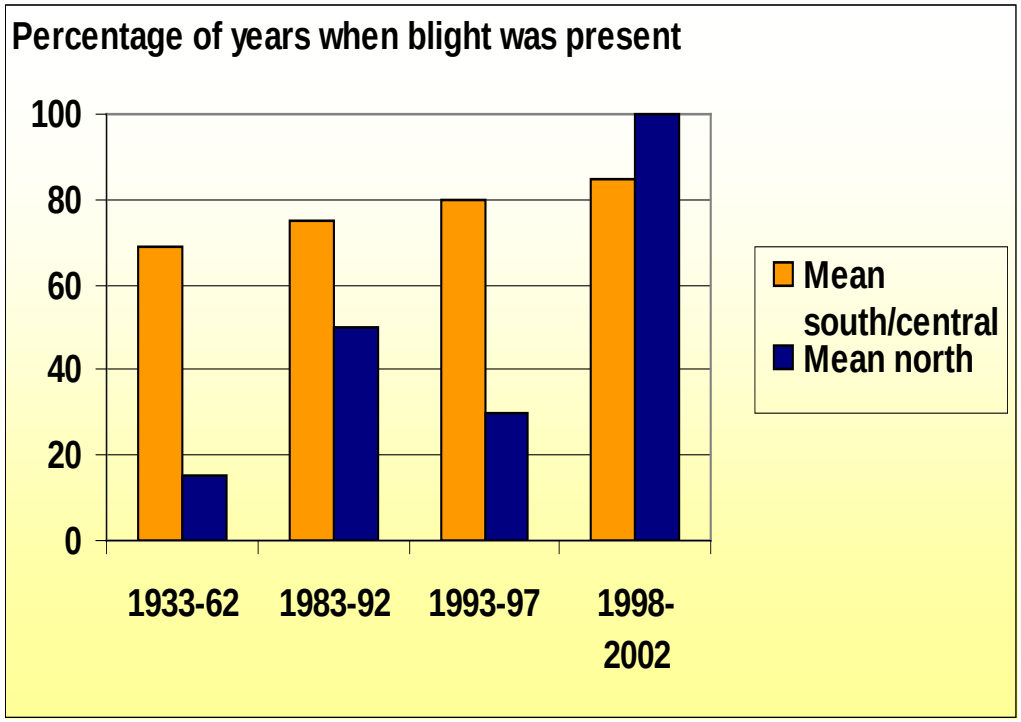
- Epidemics start one month earlier than in 1980s or earlier
- Fungicide use has increased four fold





Introduction

- Blight epidemics were rare in Northern parts of Finland
- In 2000s blight present each year



Objective

- To study the properties of *P. infestans* populations in Kola and Karelia in comparison to Finnish populations in 2006-2007
- To improve local blight management practises for North-Western parts of Russia

- Funded by the Finnish Ministry of Foreign Affairs

Sampling

- Leaflets containing single lesions
- At the stage when 5-20% of the leaf area was affected

- Russia mainly allotment gardens
- Finland mostly normal production fields or untreated trial plots

Number of isolates collected

year	Finland	Russia
2006	86	32
2007	114	131

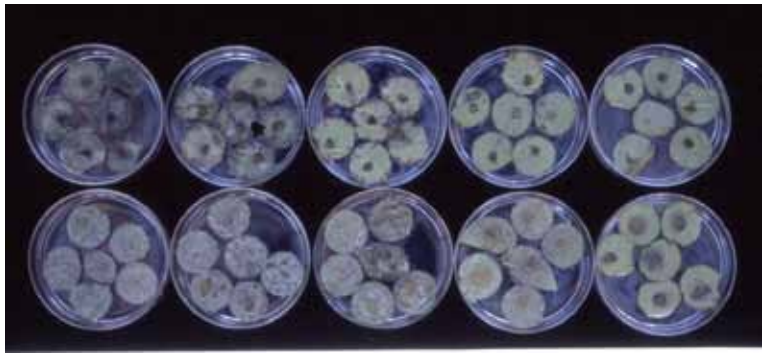
Sampling

- In Finland by the personnel of MTT and regional potato advisors
  - Directly to Petri dishes on moist filter paper
  - Small plastic bags containing grass leaves
  - Mailed to MTT

- In Russia by the personnel of local research institutes
  - All samples at each region were collected within 2 days into plastic bags
  - Finnish partners picked the samples across the Russian border to Finland
  - Mailed to MTT in Finland

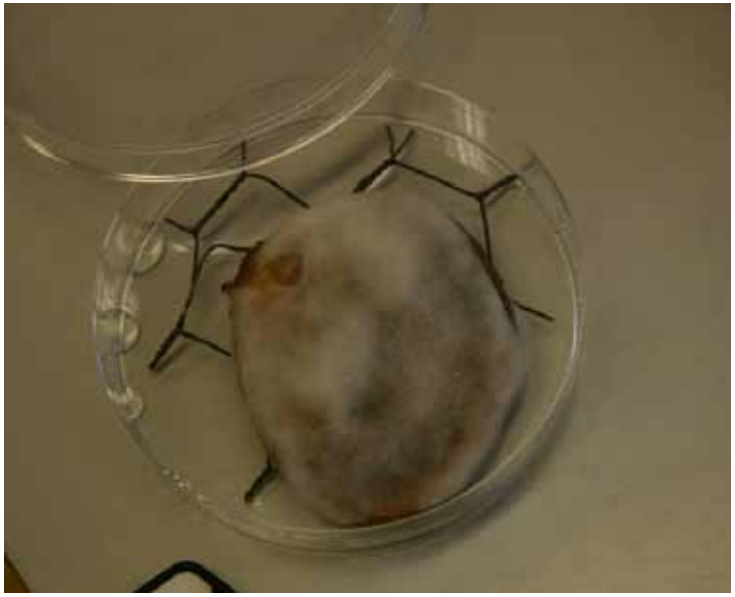
Virulence and fungicide resistance

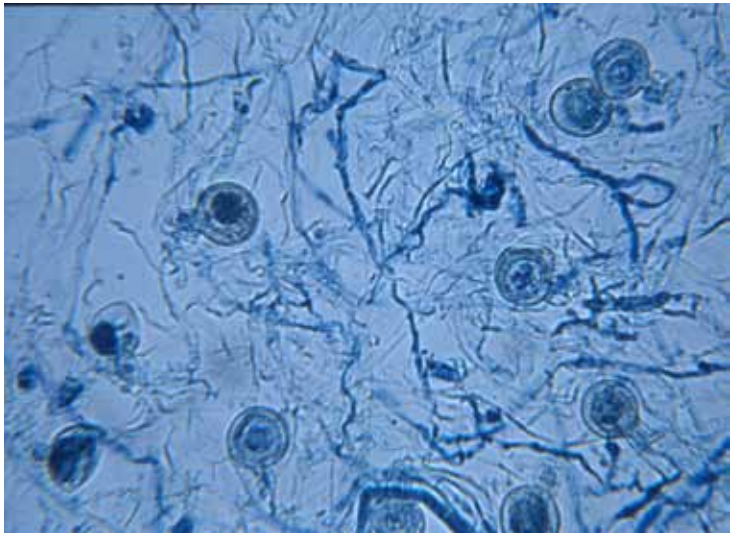
- Floating leaf disks immediately after sampling
  - 100 000 spores/ml
  - Chilling at 4˚C for 2 hours
  - 20 µl/leaf disk
  - Incubation at 90% RH for 7 days



Mating type determination

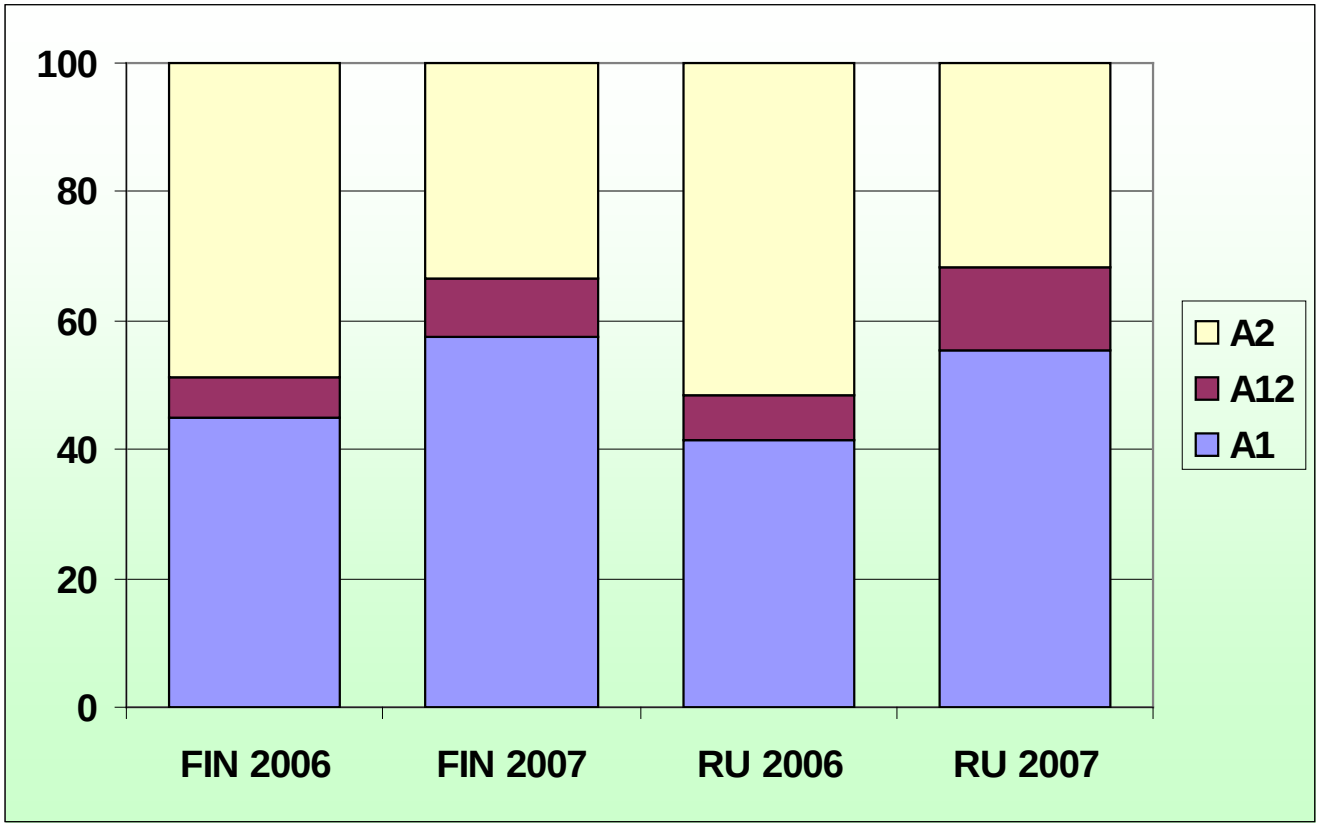
- Rye agar
  - Pure cultures via tuber slices
  - Pairing with known A1 and A2 isolates
  - Incubation at 18-20 ˚C for 3 weeks
  - Examination under microscope





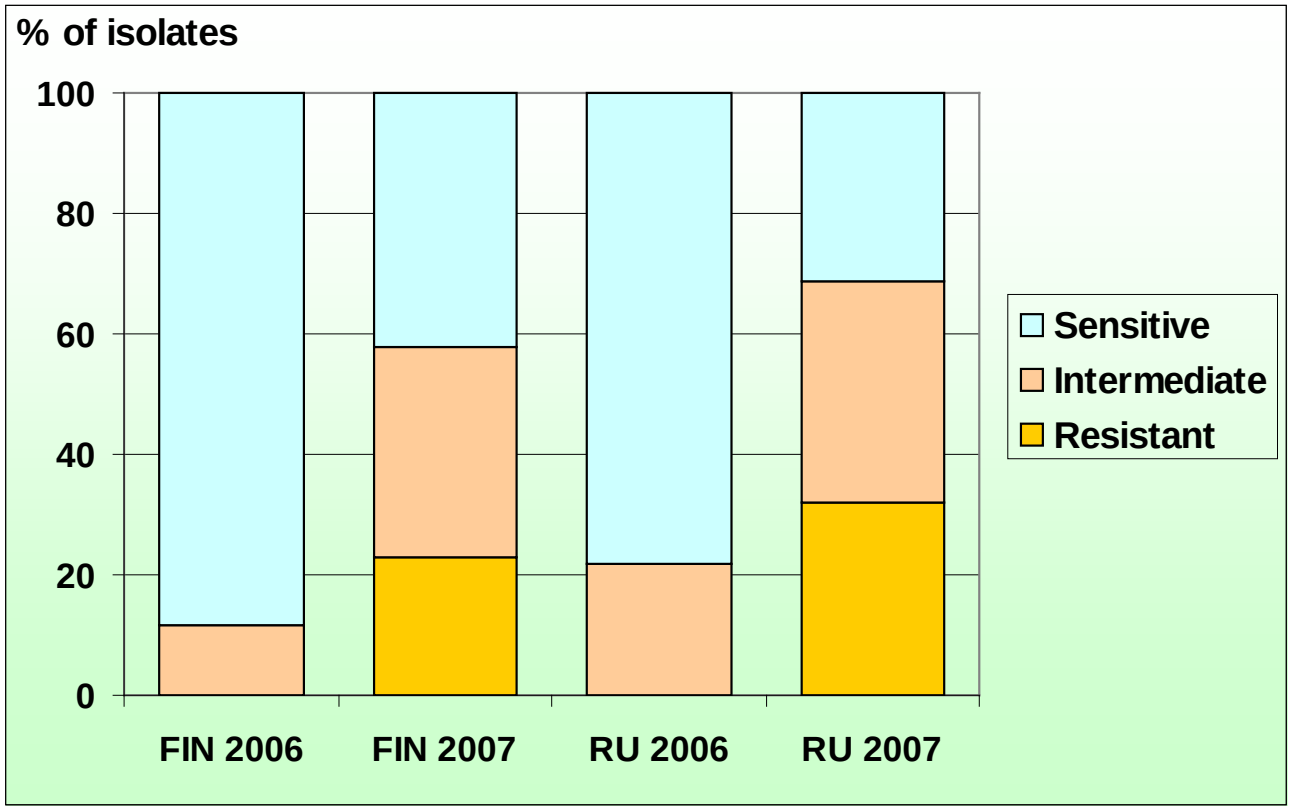
Results and discussion

- Mating types
  - Both mating types were present at close to 50/50% proportion in both countries and years



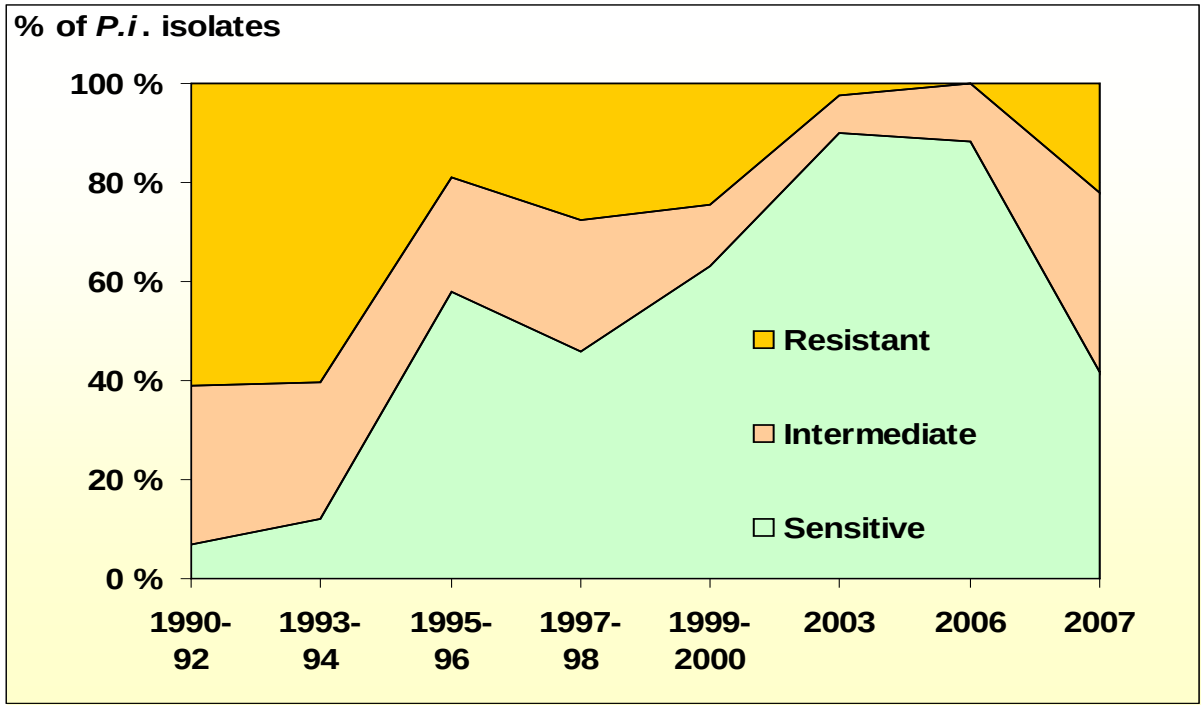
Results and discussion

- Response to metalaxyl-M
  - Resistance was not present in 2006 while in 2007 over 20% of the isolates were highly resistant to metalaxyl in both countries



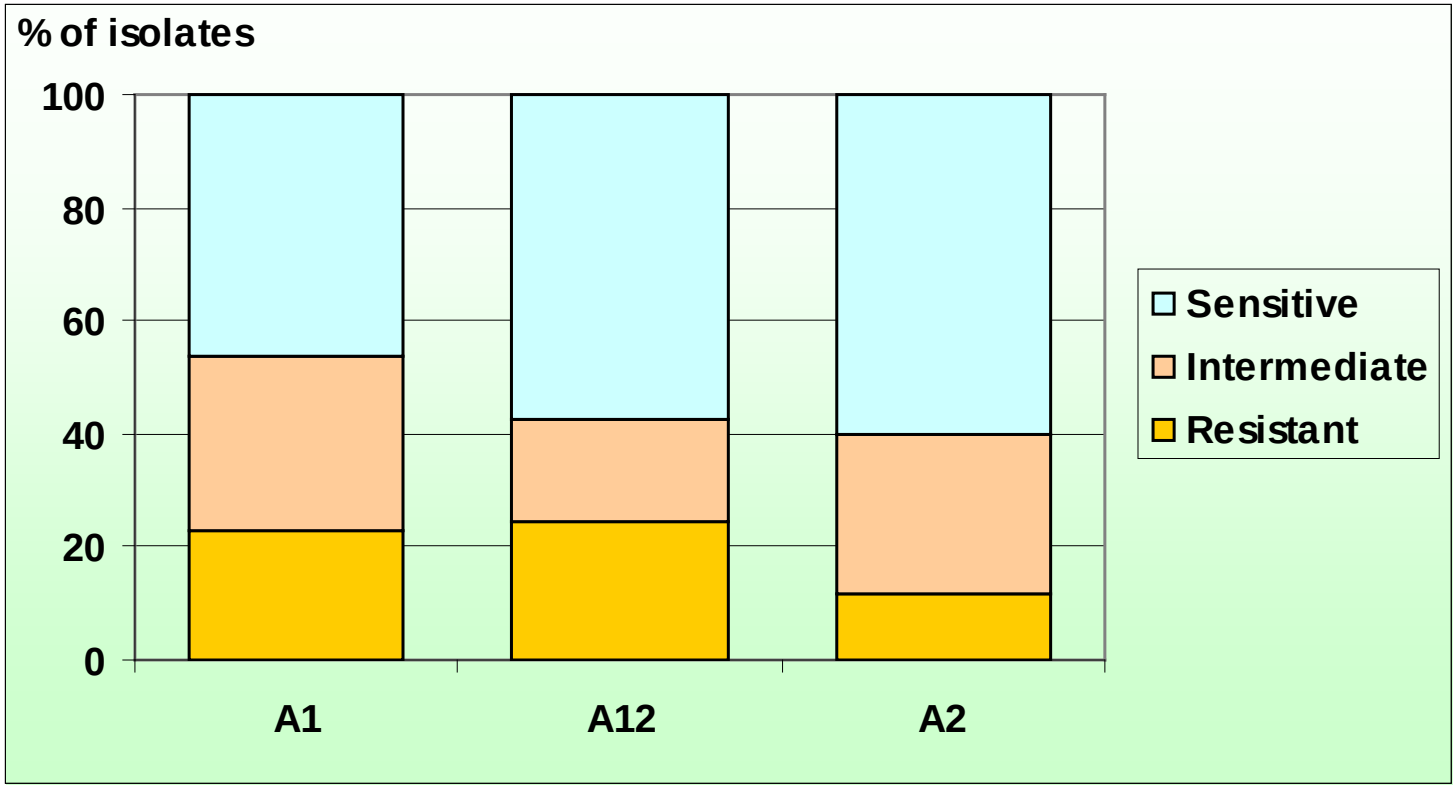
Results and discussion

- Response to metalaxyl-M
  - In Finland metalaxyl products were re-introduced to markets in 2006
  - All isolates from fields where metalaxyl had been sprayed were intermediate or resistant
  - In Russian fields metalaxyl has never been used



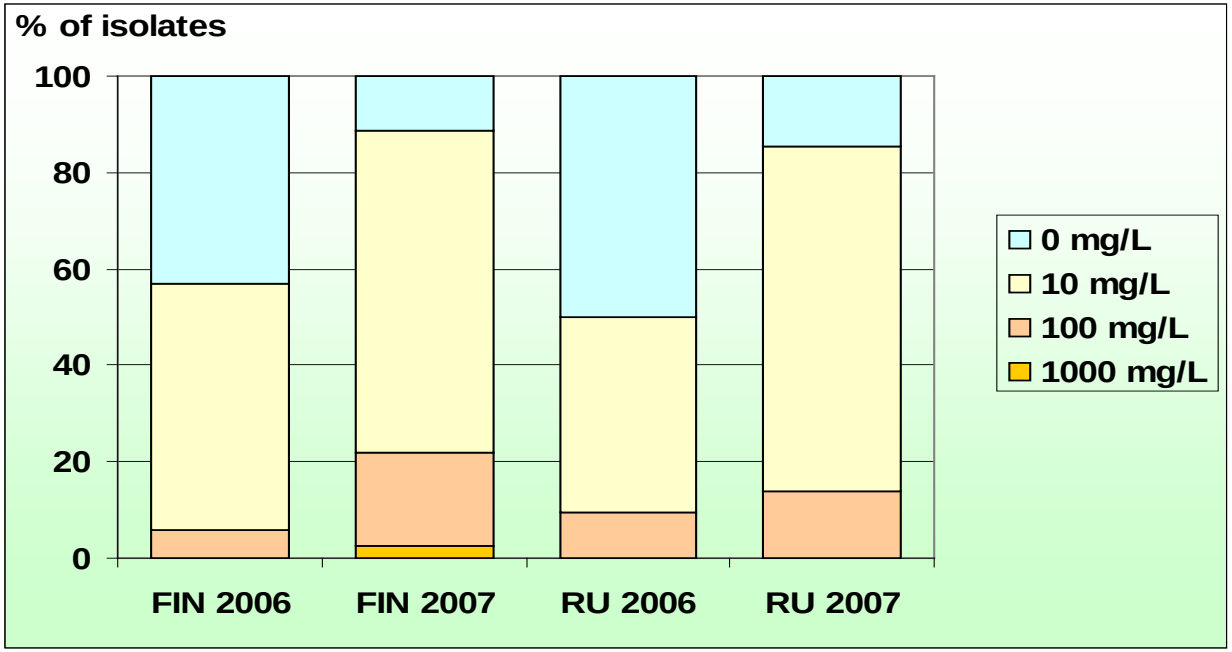
Results and discussion

- Response to metalaxyl-M
  - Insensitivity to metalaxyl was more common among A1 than A2 isolates
  - In 1990s in Norway and Finland the difference between A1 and A2 isolates was much bigger



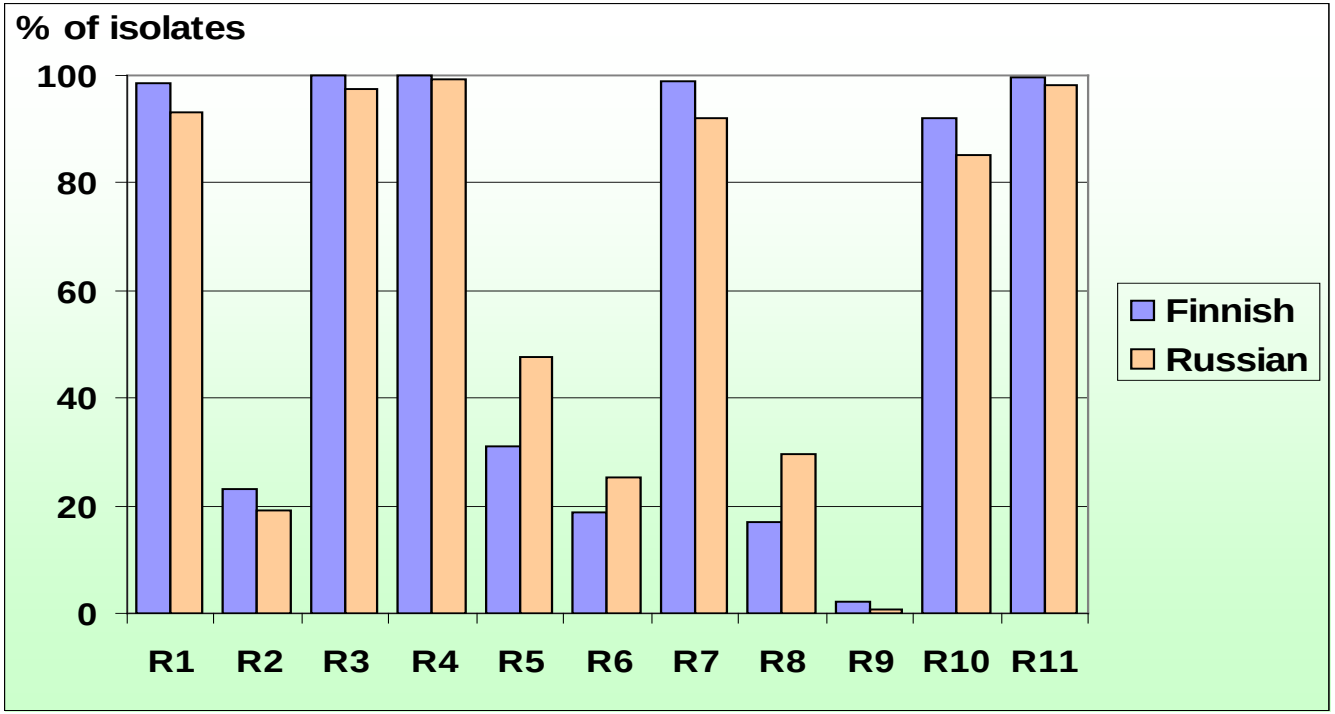
Results and discussion

- Response to propamocarb-hydrochloride
  - Tolerance to low dosages of propamocarb is common in both Finnish and Russian populations
  - In Finland the level of tolerance has been stable from 1990s to 2000s and there are no indications of decreased efficacy of propamocarb fungicides in potato production



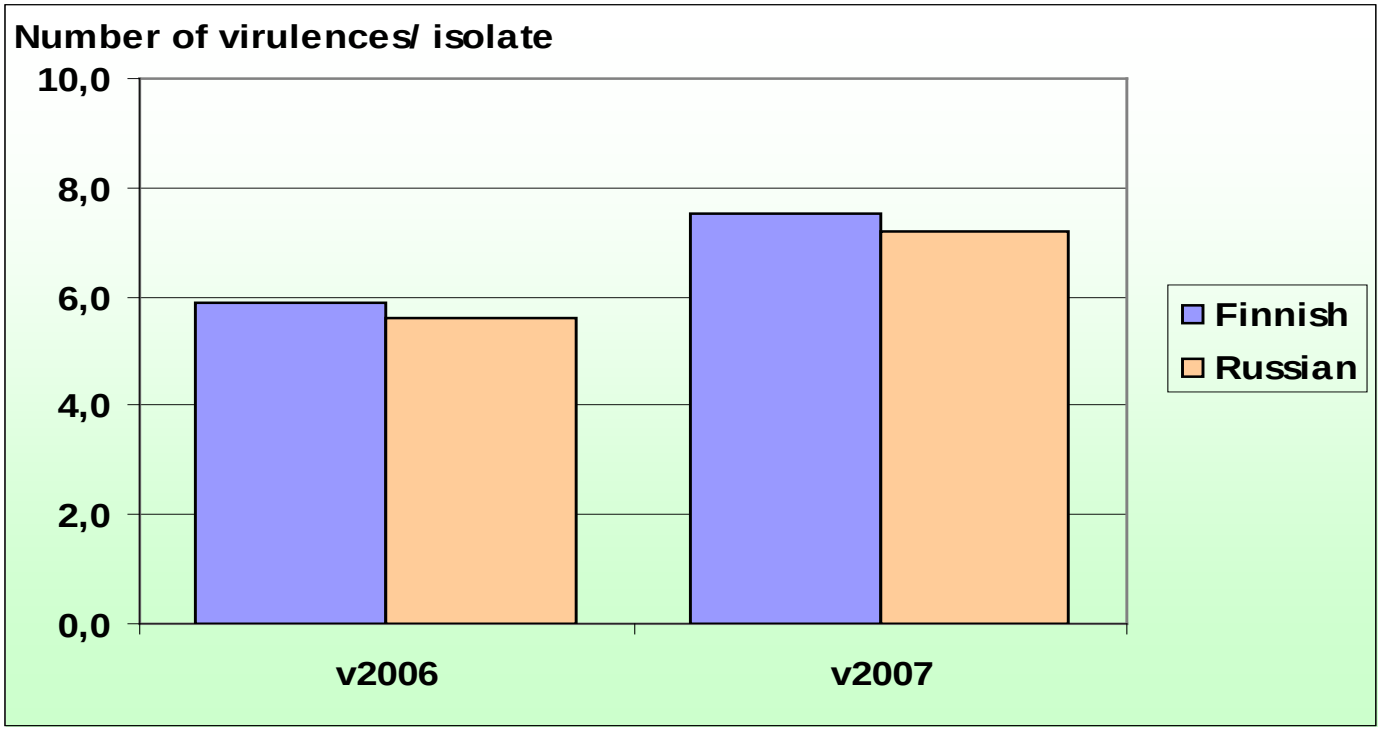
Results and discussion

- Pathotypes based on Black's R-gene differentials
  - Most isolates were able to break resistances R1,3,4,7,10 and 11
  - Few isolates are able to break resistances R2,5,6,8 and 9
  - Isolates breaking R9 have never been found before in the Nordic countries



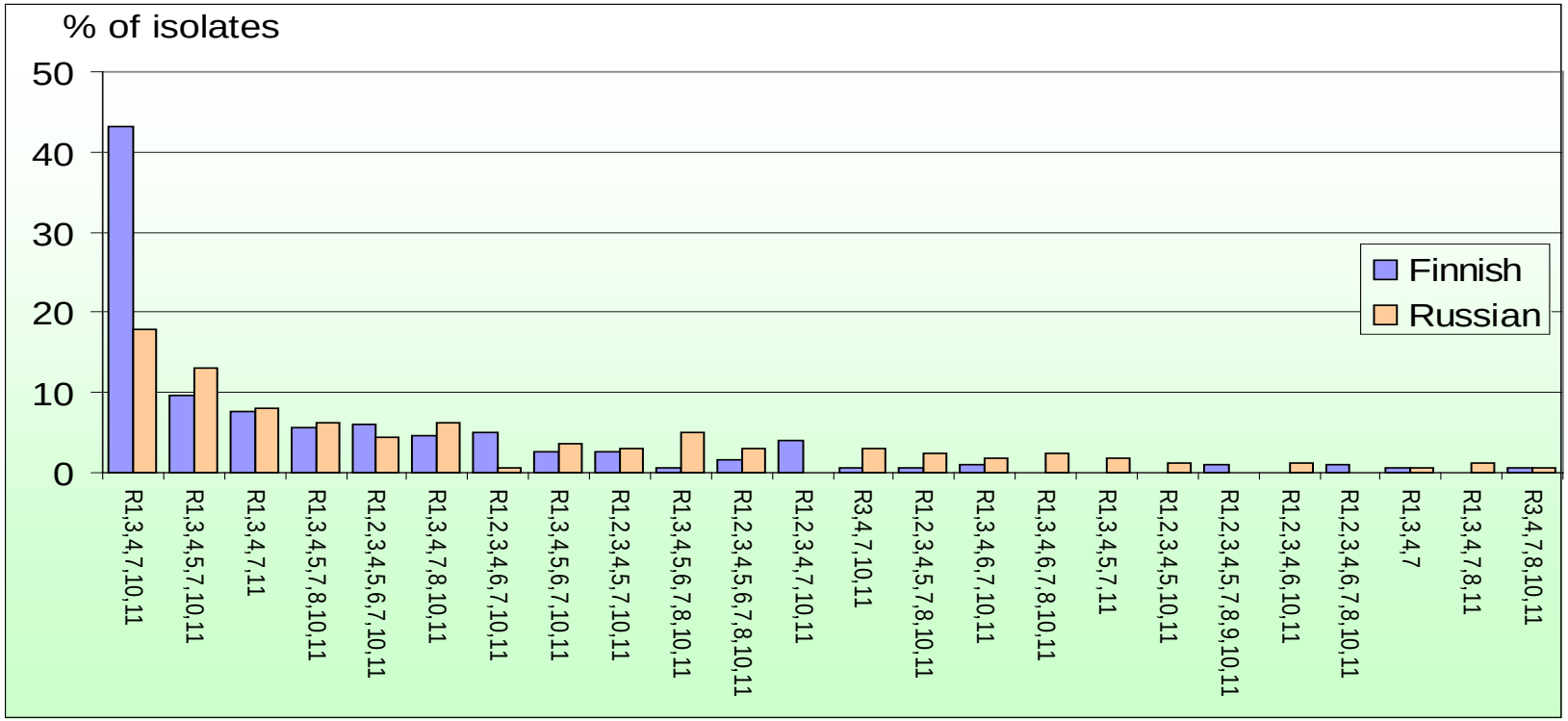
Results and discussion

- Pathotypes based on Black's R-gene differentials
  - In 2007 in the average more than 7 virulences were present per isolate
  - In earlier studies 5 – 6 virulences per isolate have been found in the Nordic countries
  - Isolates containing all 11 virulences were found



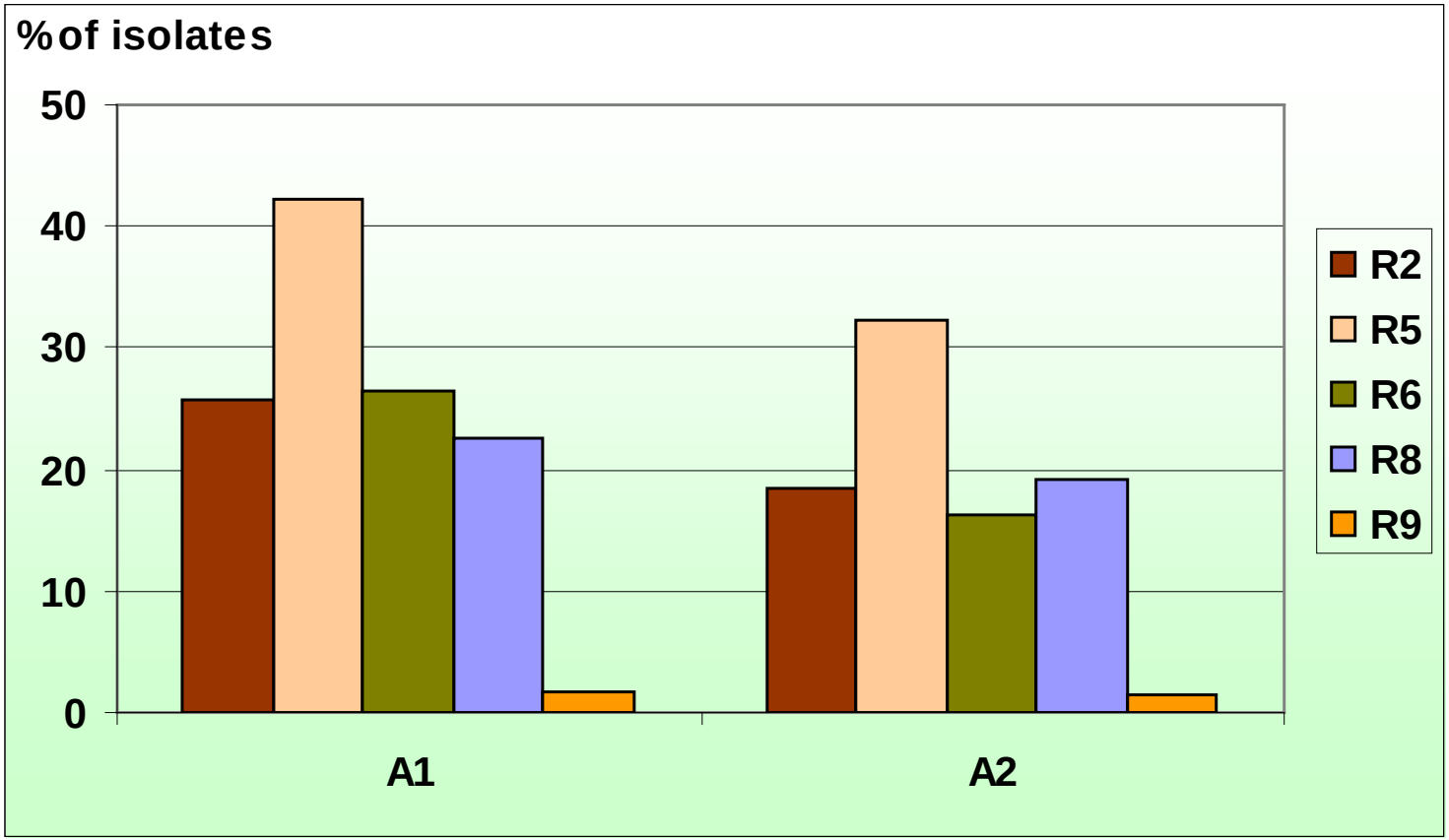
Results and discussion

- Pathotypes based on Black's R-gene differentials
  - Altogether 49 different pathotypes were found 363 among isolates tested
  - 10 most common pathotypes represented 90% of the population in Finland but only 70% in Russia



Results and discussion

- Pathotypes based on Black's R-gene differentials
  - Rare virulences were more common in A1 isolates than A2 isolates



Conclusions

- The *P. infestans* population in Kola and Karelia is very similar to that in Finland and other Nordic countries
- It represents potentially sexually reproducing population and contains A1 and A2 mating types in close to 1:1 ratio
- Risk of oospores and soil derived epidemics must be considered in blight management practises
- The occurrence of oospores and early onset of epidemics should be surveyed also in Russian regions

Thank you for your attention