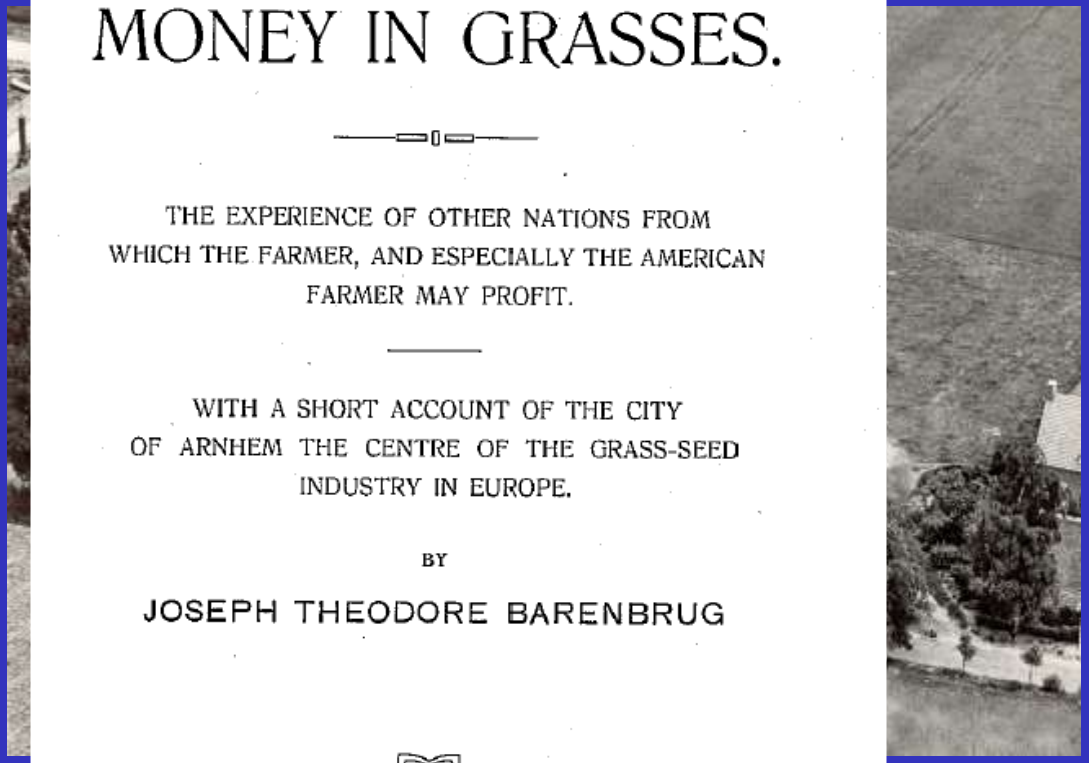
BARENBRUG

WOLFHEZE

Breeding of Turf grasses

1904 Start in Arnhem



MONEY IN GRASSES.

THE EXPERIENCE OF OTHER NATIONS FROM WHICH THE FARMER, AND ESPECIALLY THE AMERICAN FARMER MAY PROFIT.

WITH A SHORT ACCOUNT OF THE CITY OF ARNHEM THE CENTRE OF THE GRASS-SEED INDUSTRY IN EUROPE.

BY

JOSEPH THEODORE BARENBRUG

PUBLISHED BY:
BARENBRUG, BURGERS & Co,
Grass-seed specialists,
ARNHEM (HOLLAND).

1904

gseweg

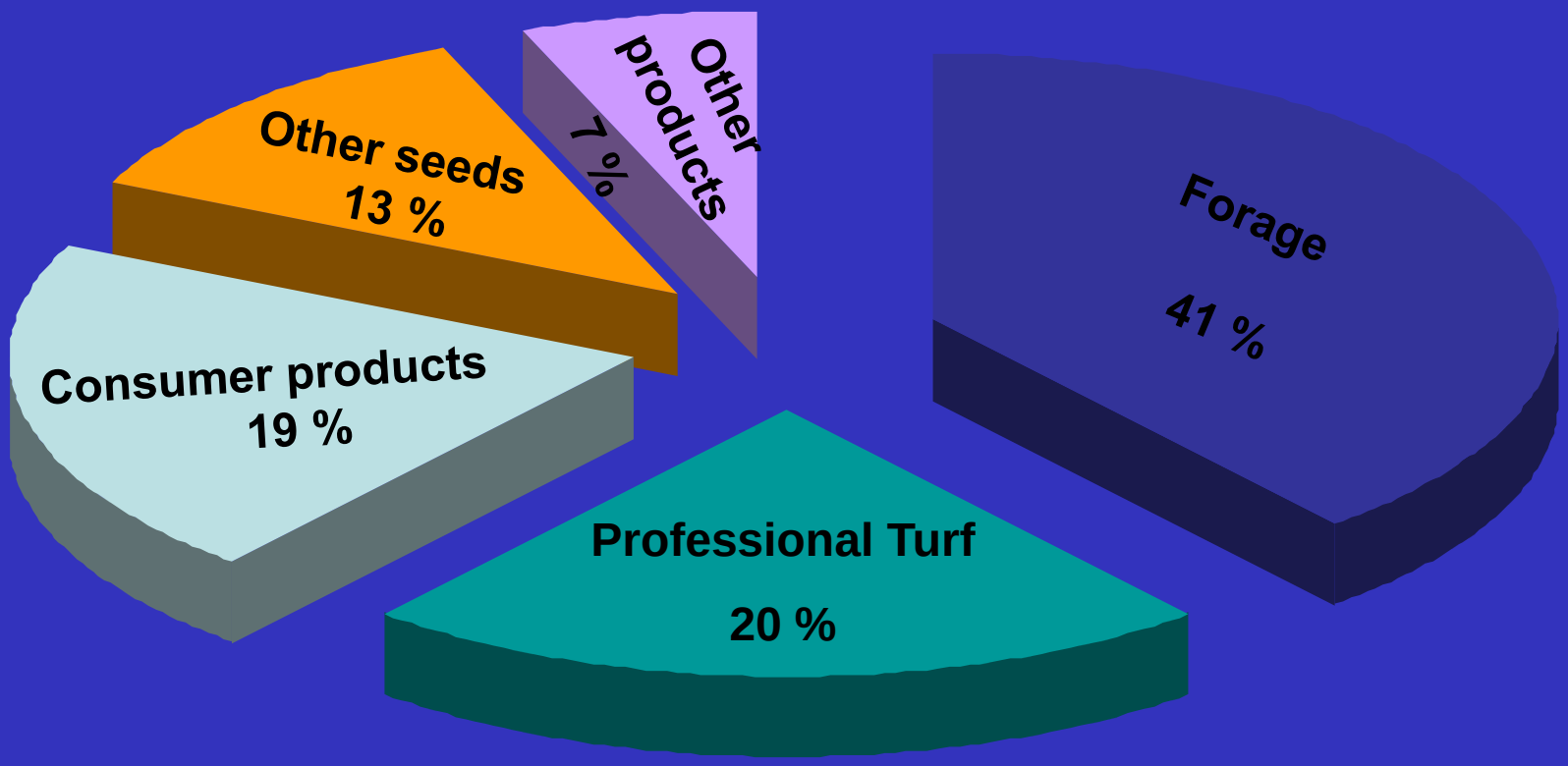
Joseph Barenbrug

Who or what is Barenbrug ?

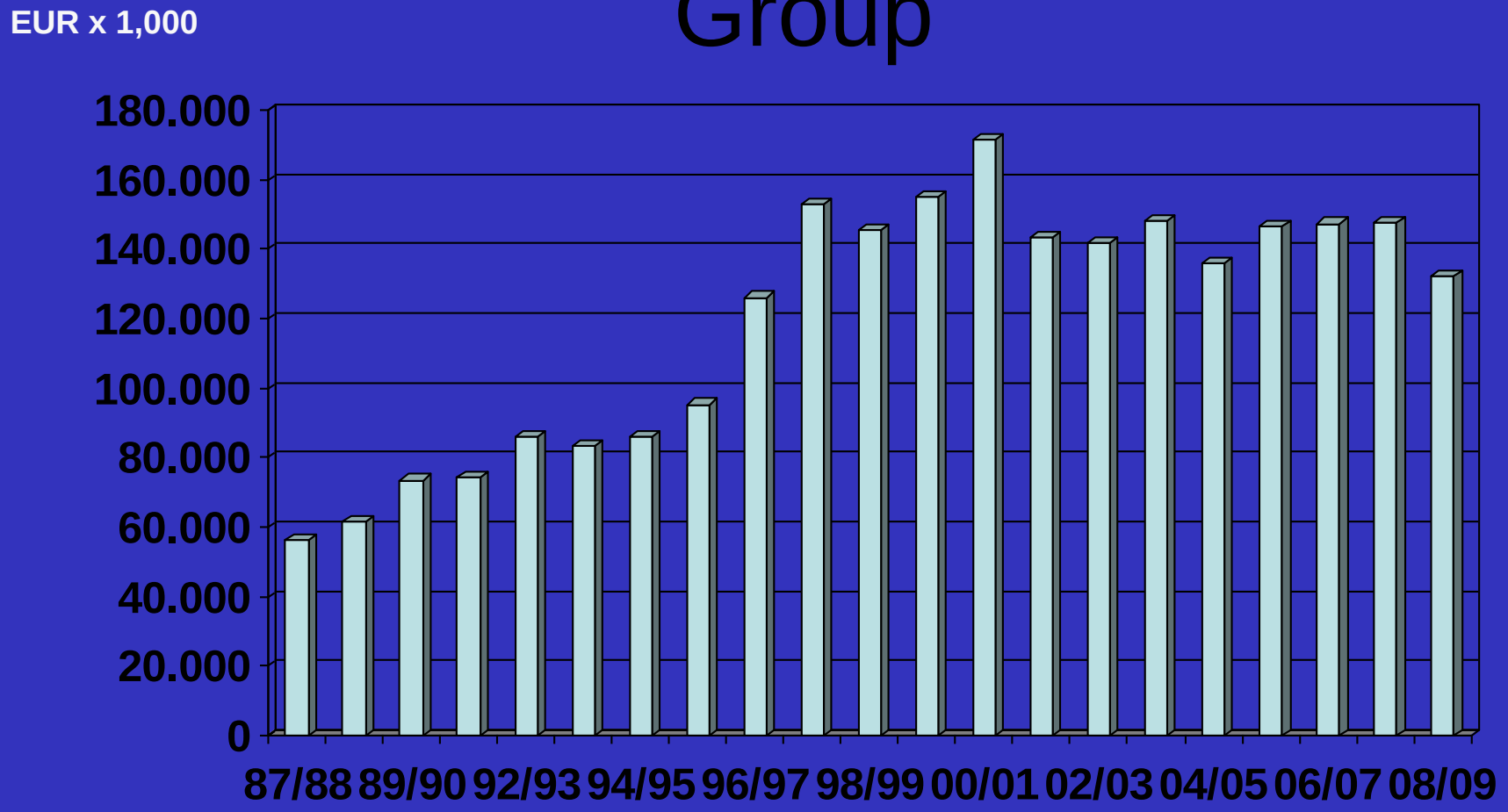
- Family owned company
- Turnover of € 150 million
- Turnover of 75,000 tons of grass seed
- Employs 500 people
- Specialist in grasses (core business)
- Turnover: 55 % amenity grasses and 45 % forage grasses
- Present on 5 continents
- 10 research stations in various climatic zones

Barenbrug Holding

Barenbrug Group Sales Value 08/09



Turnover Royal Barenbrug Group



Barenbrug Holding

The Netherlands – head office

Belgium

Poland

France

Luxembourg

United Kingdom

Romania

USA (east coast)

USA (west coast)

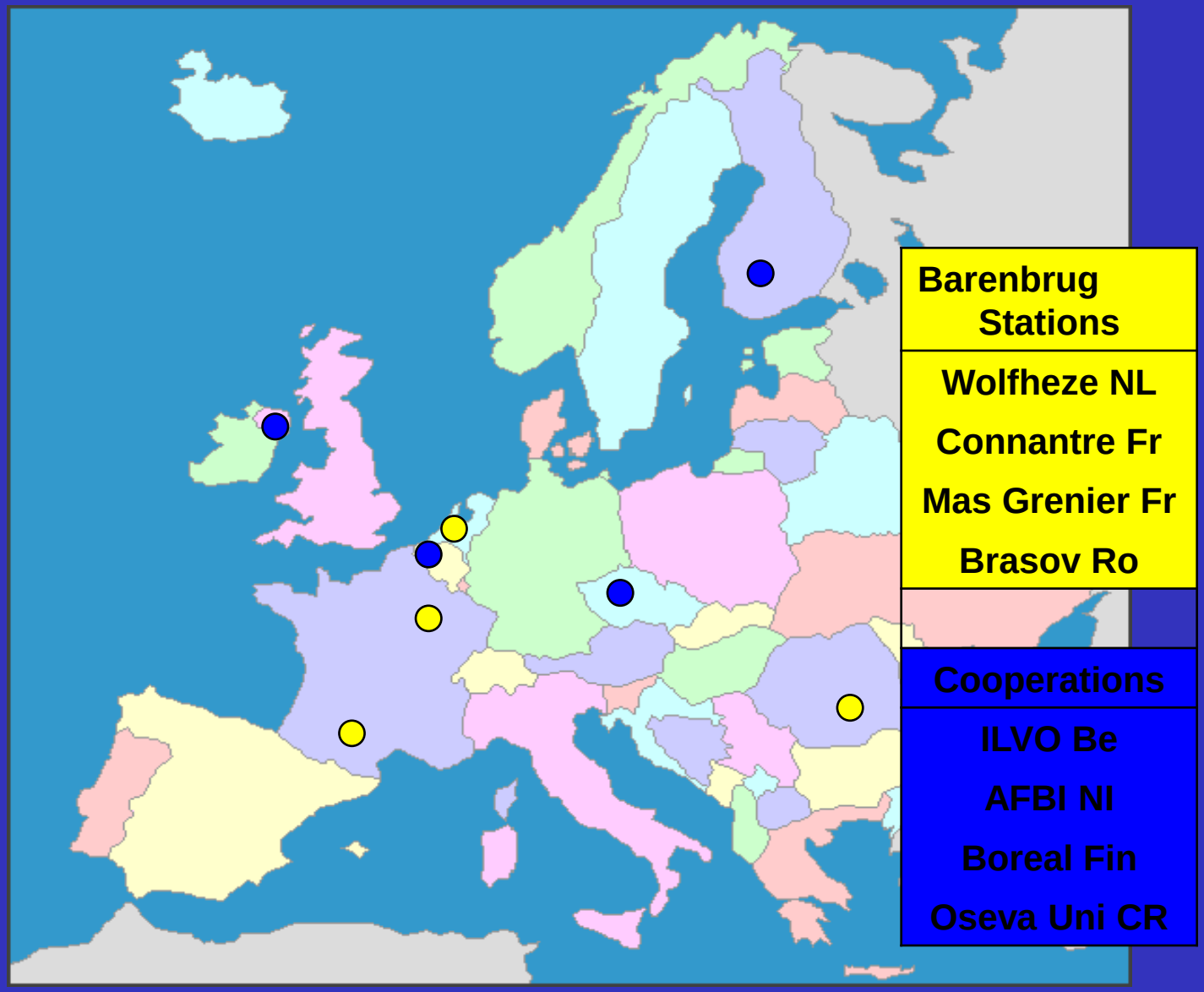
China

New Zealand

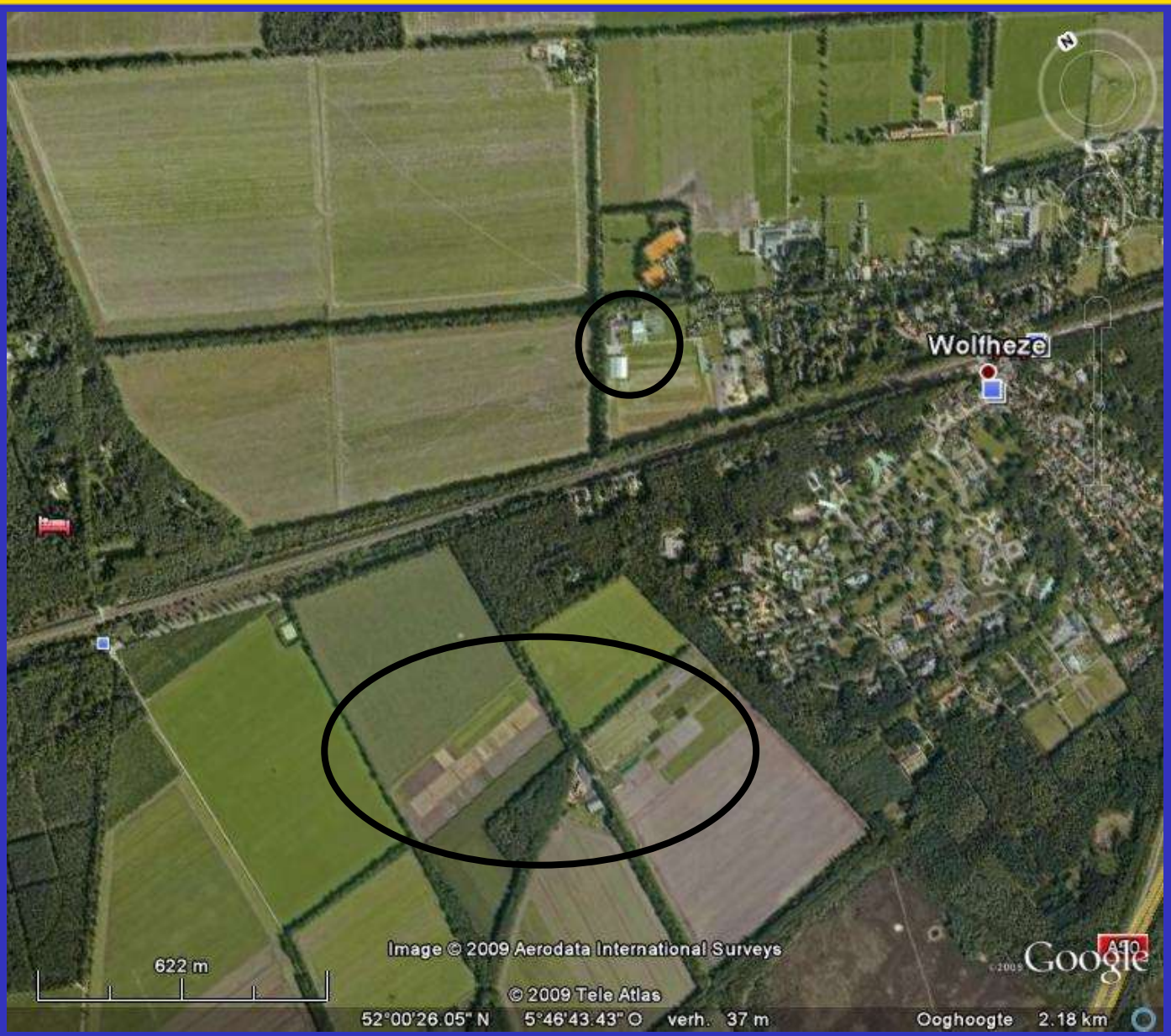
Australia

Argentina

Breeding Stations Europe



Research station Wolfheze

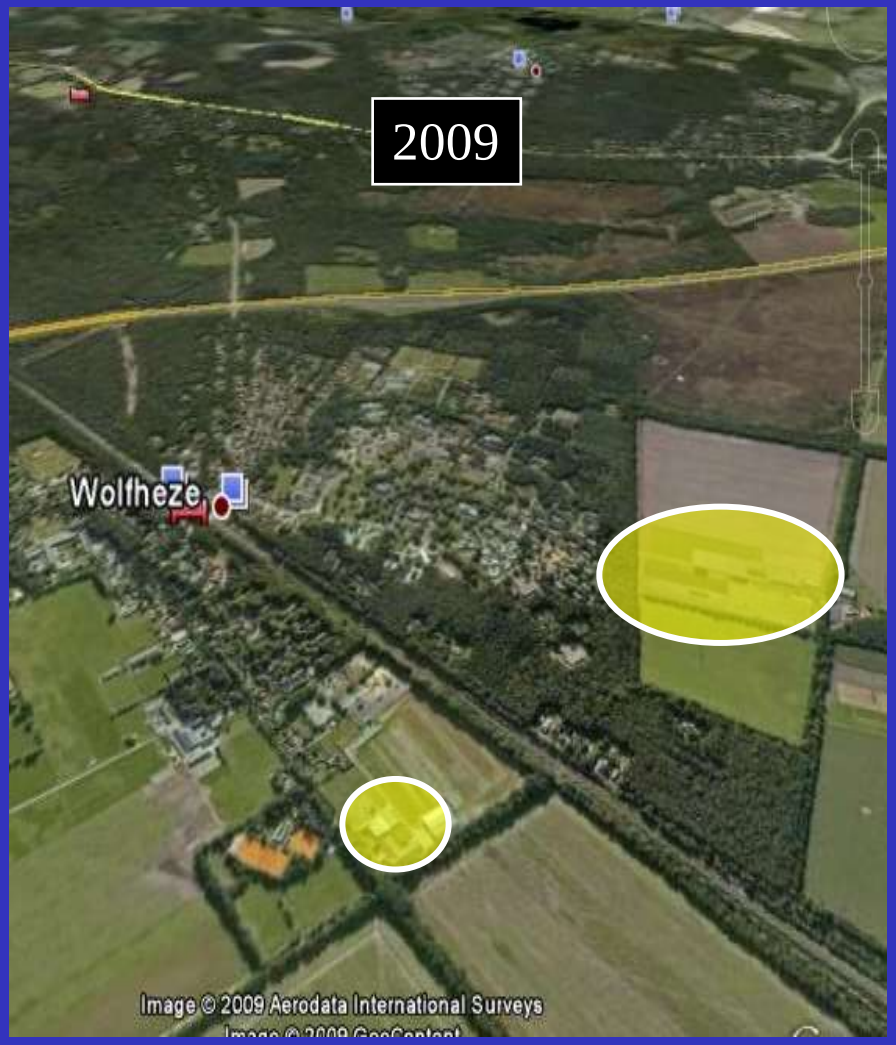


...A BIT OF HISTORY

2009

17 SEPT 1944

... A BIT OF HISTORY-2



GRASS BREEDING

AT

BARENBRUG

Organisational aspects Wolfheze

STAFF

15 , of which 2 breeders

Locations

- Wolfheze :
  - Office, greenhouse, Turf trials, plant selection
  - Lab (Disease preparation, NIR, Endophytes)
- Forage trials: Lelystad, Heteren, Bremen

Budget

- appr. € 900.000

Breeding programs Wolfheze

Forage grasses

- **Perennial Ryegrass**
- **Italians Ryegrass**

Turf grasses

- Perennial Ryegrass
- Red Fescues (c and t)
- Kentucky bluegrass

- Agrostis
- Descampsia
- Koeleria

Barenbrug Turf Breeding programs

Holland (Wolfheze)

Turf grasses

- Perennial Ryegrass
- Red Fescues (c and t)
- Kentucky bluegrass

- Agrostis
- Descampsia
- Koeleria

France (Mas Grenier)

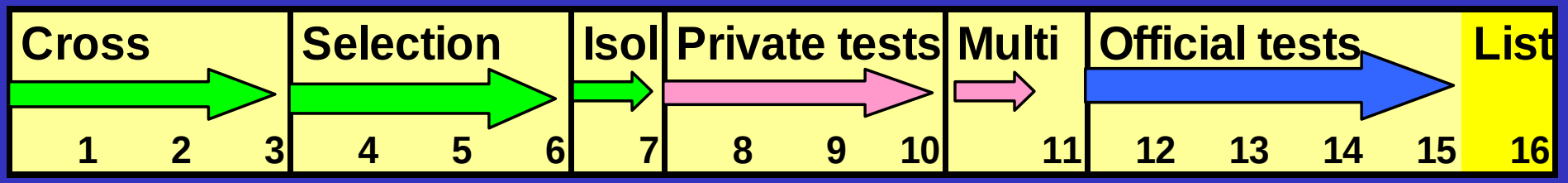
- Perennial Ryegrass
- Red Fescue (r)
- Tall Fescue

USA (Oregon)

- Kentucky Bluegrass
- Perennial Ryegrass
- SOS

Breeding of turfgrass

Grass breeding is time consuming



Selection program Perennial Ryegrass (1)

1/2

Make F1 seeds

(Crosses)

2/3

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F2 Seed

Production in Rye isolation

4/5

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Selection for

Habitus, diseases, seed yield

Regrowth, etc

6/7

Small plots

1st selection on wear ,

diseases

Make crosses (F1) and polycross block

Make F1 seeds

(Crosses)

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Selection for

Habitus, diseases, seed yield

Regrowth, etc

Small plots and Wear

6/7



Small plots

1st selection on wear

diseases

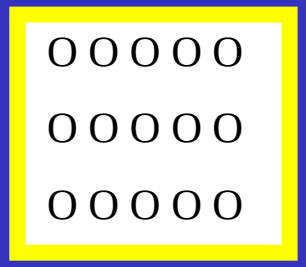
Selection program Red fescue (1)

1/2

Make F1 seeds

(Crosses)

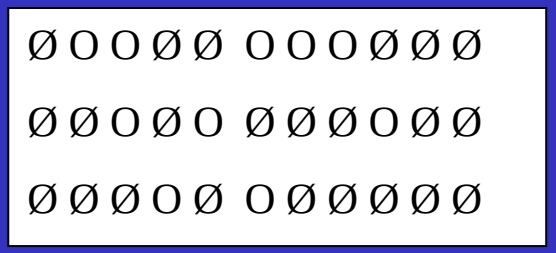
2/3



F2 Seed

Production in Rye isolation

4/5



Selection for

Competition, Regrowth,

Selection program Red fescue (1)

4/5

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Selection for

Competition, Regrowth,

Selection program Red fescue (1)

4/5

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Selection for

Competition, Regrowth,

Selection program Red fescue (1)

4/5

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Selection for

Competition, Regrowth,

Selection program Red fescue (1)

4/5

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Selection for

Competition, Regrowth,

Selection program Red fescue (1)

1/2

Make F1 seeds

(Crosses)

2/3

O O O O O

O O O O O

O O O O O

F2 Seed

Production in Rye isolation

4/5

Ø O O Ø Ø O O O Ø Ø Ø

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Selection for

Competition, Regrowth,

6/7

Small plots

1st selection quality,density

diseases

Selection program Perennial Ryegrass (2)

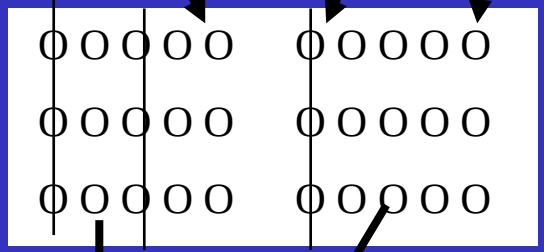
6/7

Small plots

1st selection on wear

diseases

7/8

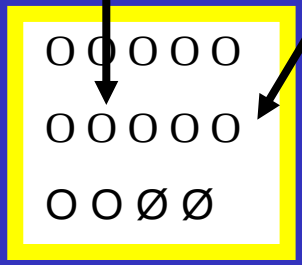


Clonal rows

Make synthetics based on

Uniformity !!!

8/9



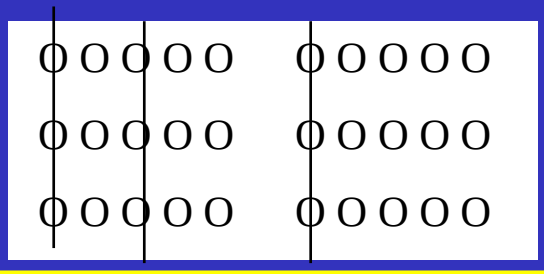
Synthetic Seed Production

in Rye isolation

10/12

Clonal rows and make synthetics ,

7/8



Clonal rows

Make synthetics based on

Uniformity !!!

100 x 100, 3 reps



10/12

Selection program Perennial Ryegrass (3)

100 x 100, 3 reps

10/12



13/14

o o o o o o o o o o o o o o o o o o o o o o

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Multiplication

of

Breeders seed

15/17

Official trials

Several countries

18

VARIETY LIST

Multiplication of Breeders seed

Kentucky Bluegrass (Poa pratensis) Turf

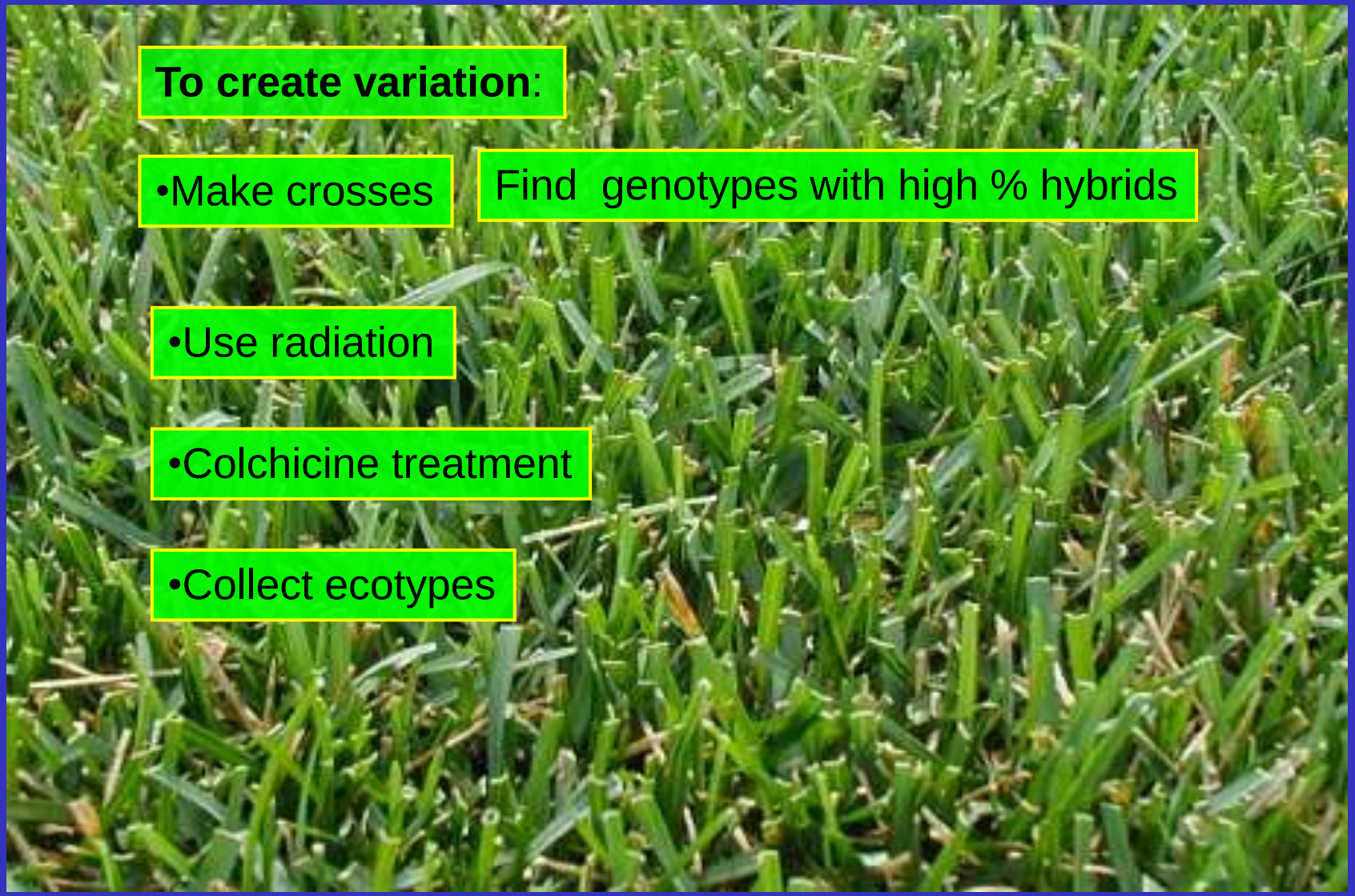
Important turf species, global

Sports and lawn

Also used as forage

- **Rhizomes (vegetative)**
- **Variable chromosome numbers basic genome = 7, n: 28-147**
- **apomict**

Consequences Apomixis for breeding



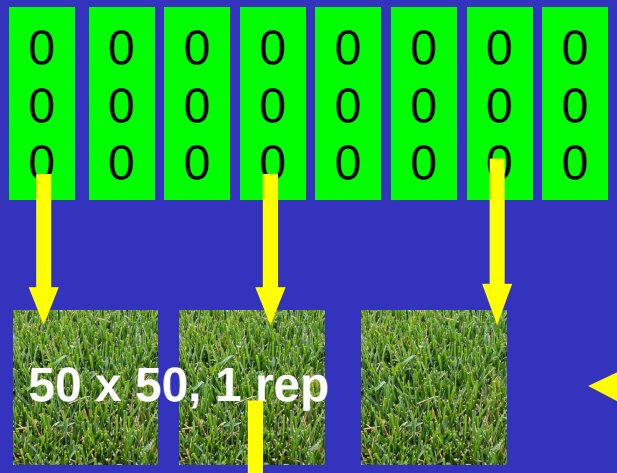
Pp Crossing program

Collection of ecotypes

Program

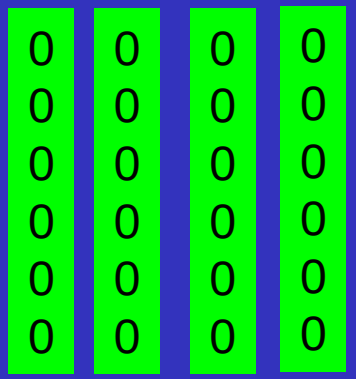
Ecotype

3 plant rows, Disease, seed yield



Multiplication

Hybrid from Crosses



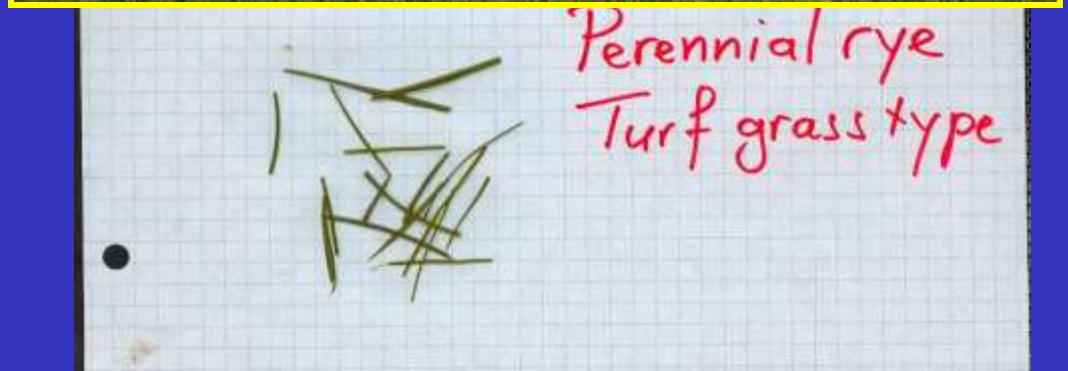
6 plant rows,

Uniformity
Disease,
seed yield

Multiplication of Breeders seed

Breeding goals – Turf grasses

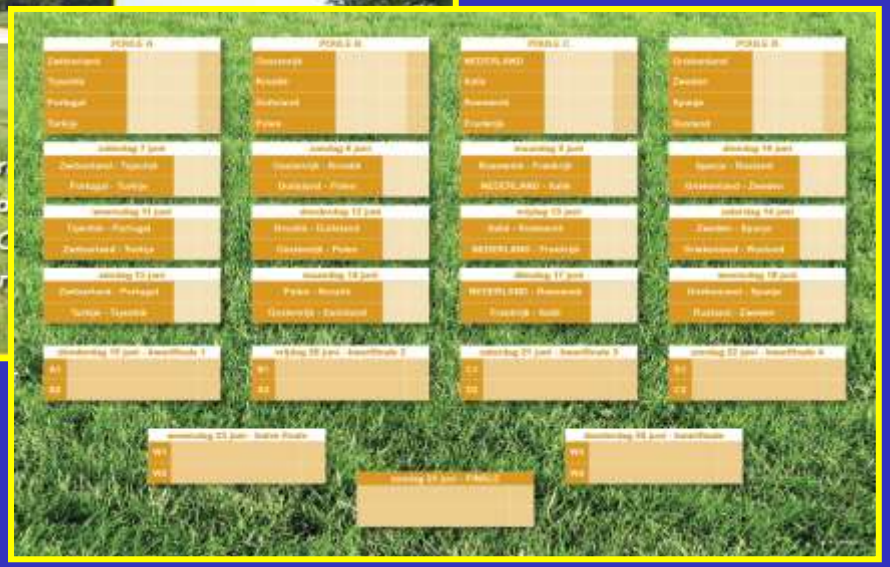
- Wear tolerance
- Sod density
- Seed yield
- Disease resistance
- Fineness of leaf
- Shade tolerance
- Low maintenance



Results Barenbrug Turf Breeding

Bird's Nest Olympics
2008

Ryder Cup 2008



EC
2008

ENDOPHYTES

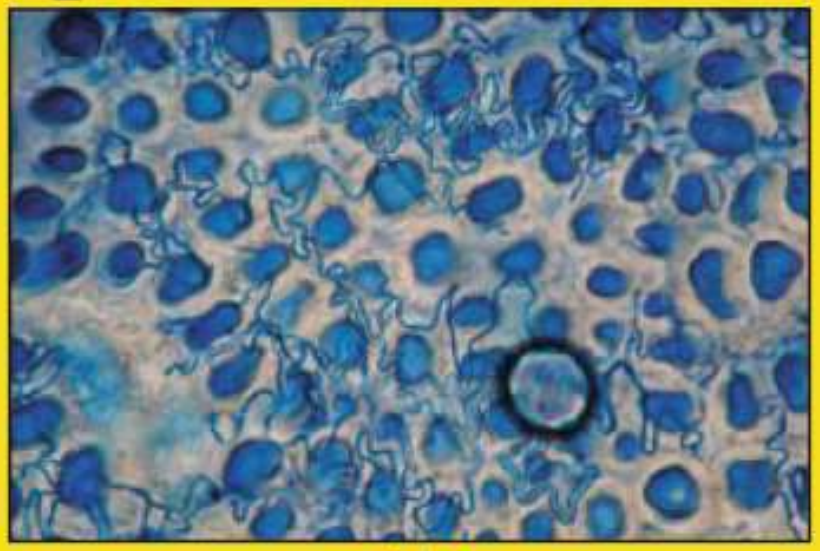
- A fungus that grows within plants, without visible external features or infections
- Natural occurrence in many grass species

Endophytes produce alkaloid with both positive and negative effects

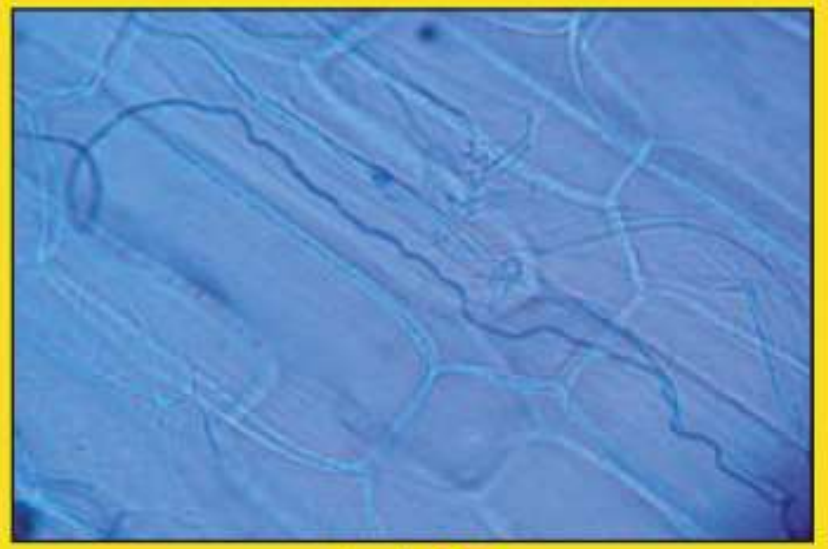
POSITIVE
- Insectresistance
- Disease resistance
- Drought tolerance
- Enhances seed production

NEGATIVE
- Alkoloids can be poisonous for cattle and horses

4 Screening of seeds and plants.

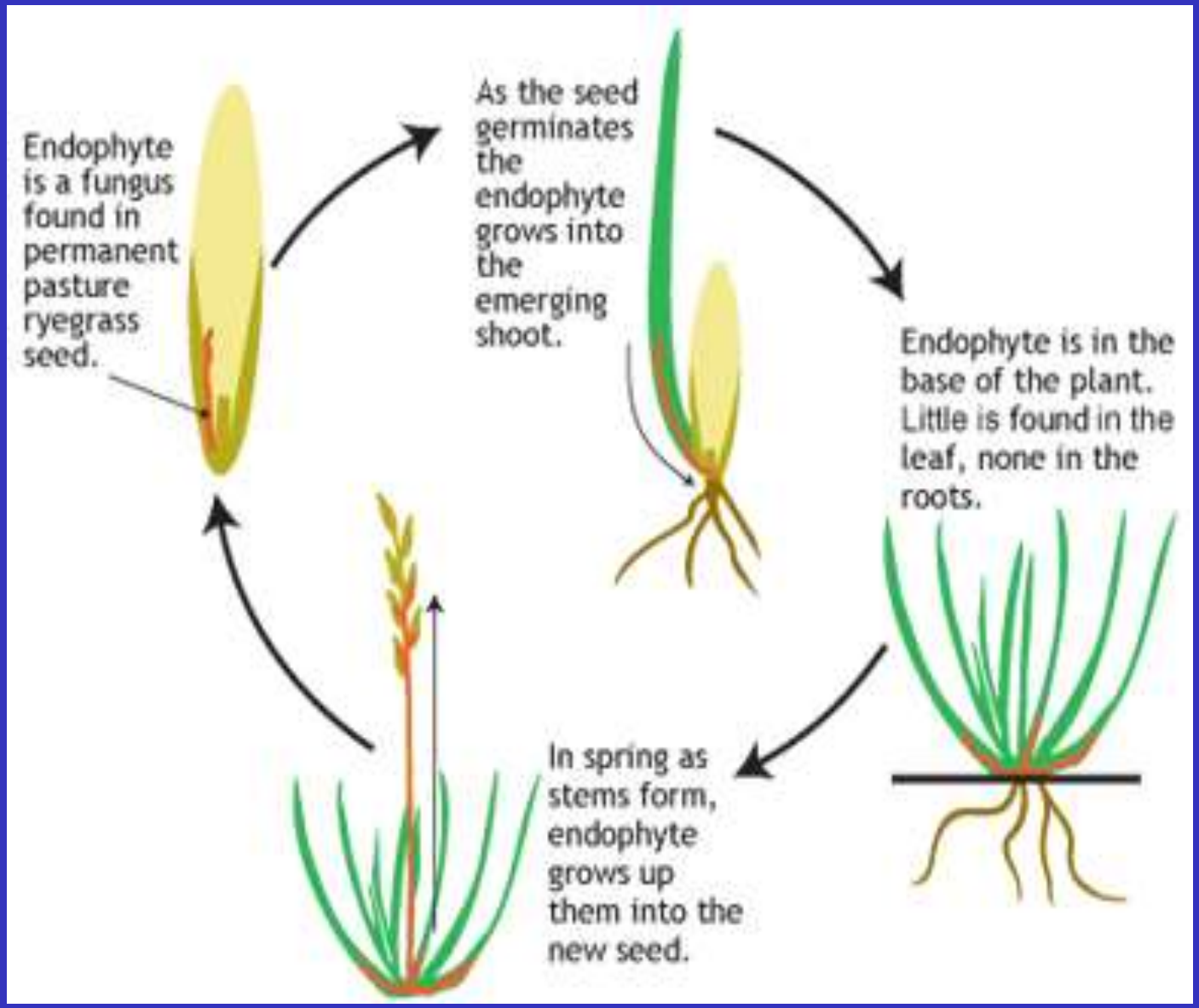


seed 400x



plant 400x

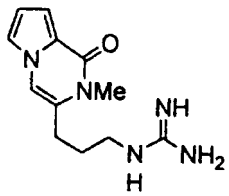
ENDOPHYTES Life cycle



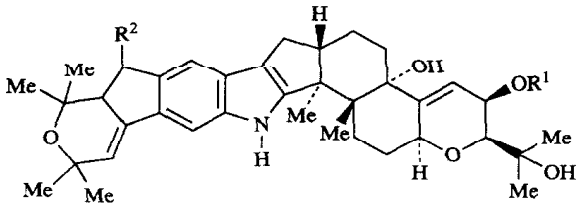
ENDOPHYTES

Endophytes produce several bioactive secondary metabolites

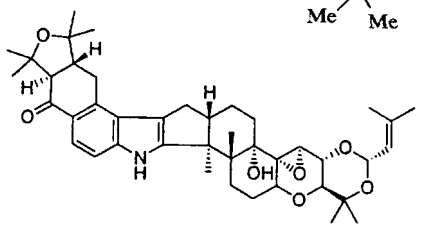
Alkaloid	Function in host	Toxicity
Peramine	Insect resistance	None known
Ergovaline	Abiotic stress tolerance	Mammalian herbivores
Lolitrem B	Abiotic stress tolerance	Mammalian herbivores



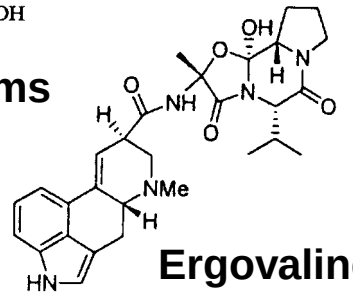
Peramine



Janthitrems

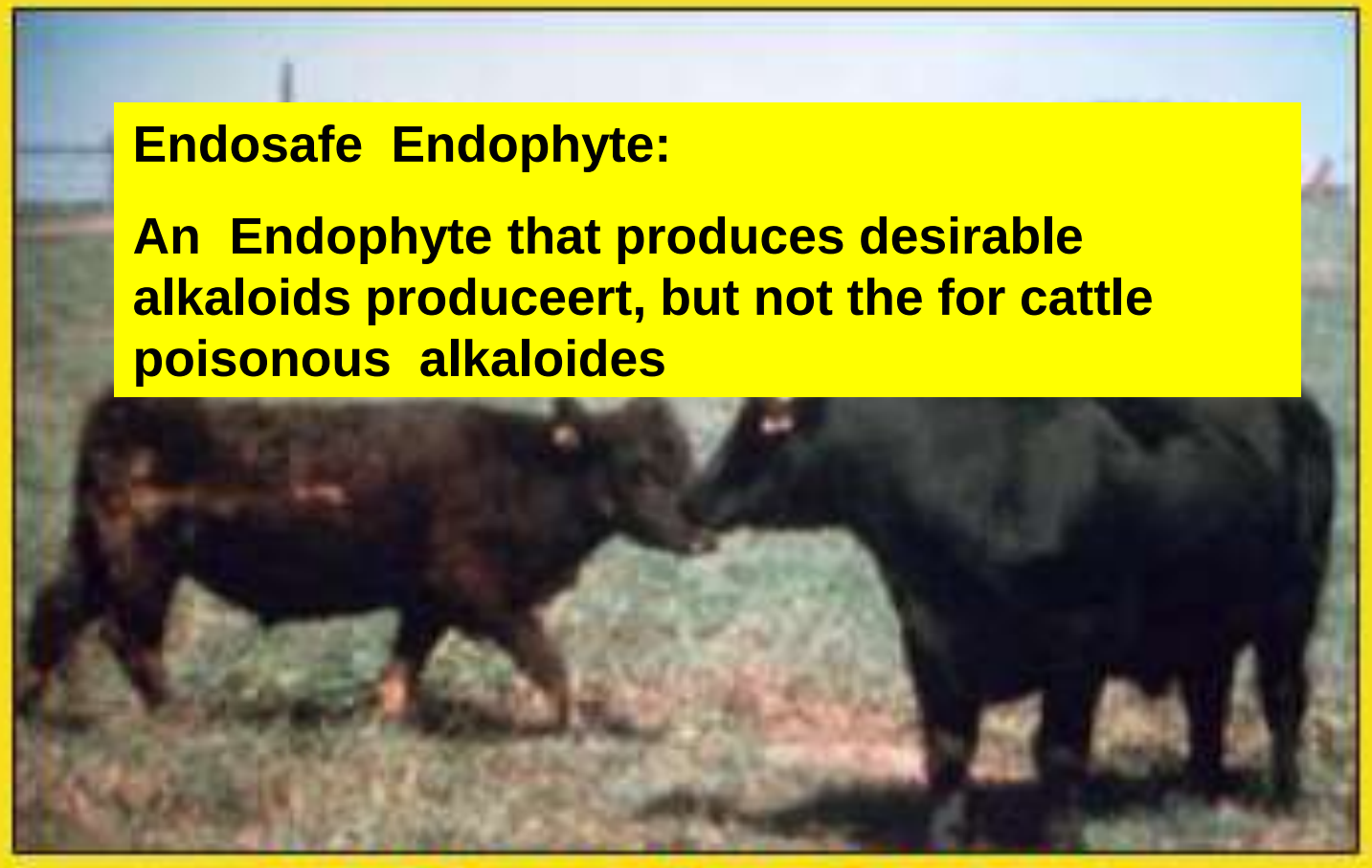


Lolitrem B



Ergovaline

“STAGGERS”



Endosafe Endophyte:

An Endophyte that produces desirable alkaloids produceert, but not the for cattle poisonous alkaloides

grazing experiment
with a twin

BARENBRUG

GREAT IN GRASS