



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 ?

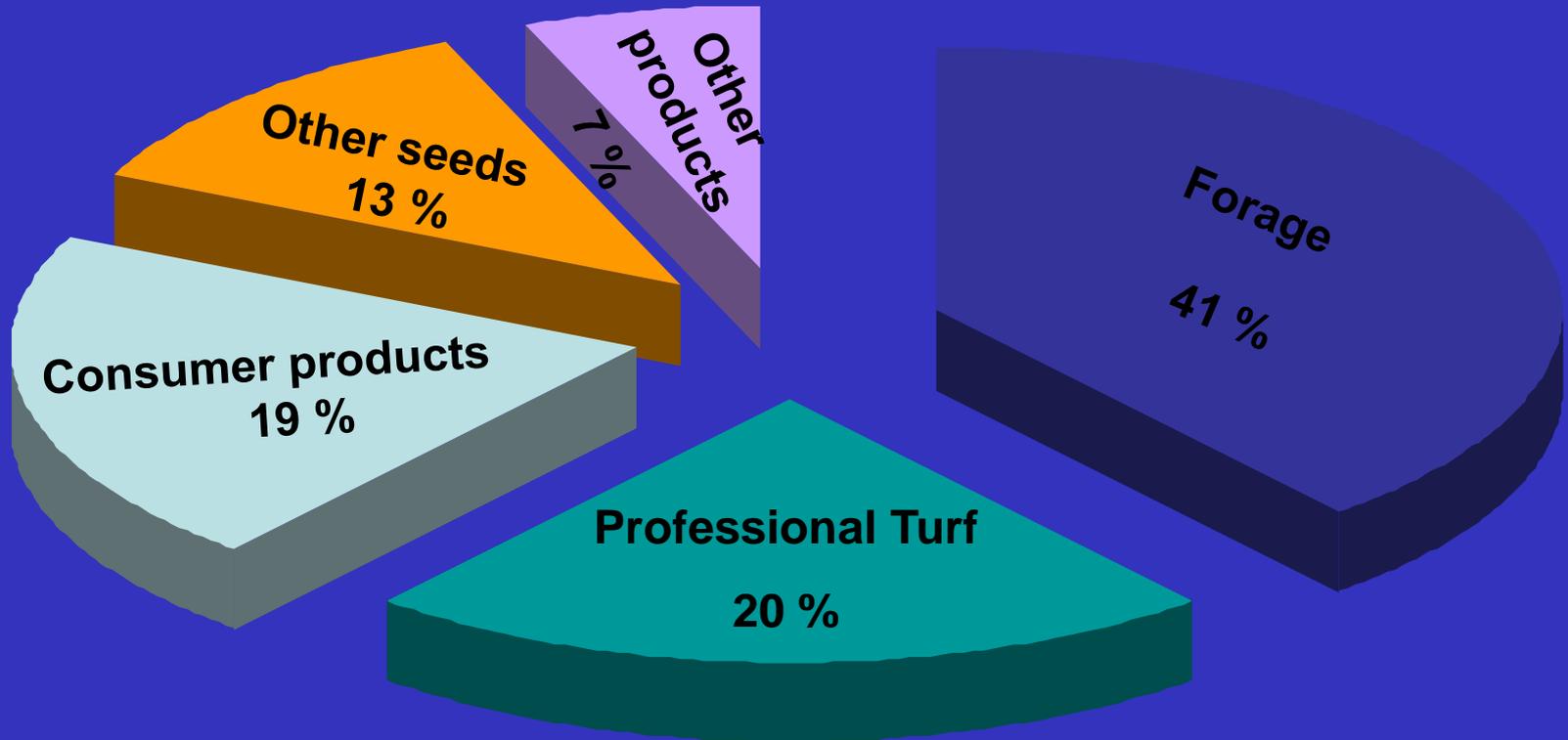


- Family owned company
- Turnover of € 150 million
- Turnover of 75,000 tons of grass seed
- Employs 500 people
- Specialist in grasses (core business)
- Turnover: 55 % amenity grasses and 45 % forage grasses
- Present on 5 continents
- 10 research stations in various climatic zones

Barenbrug Holding



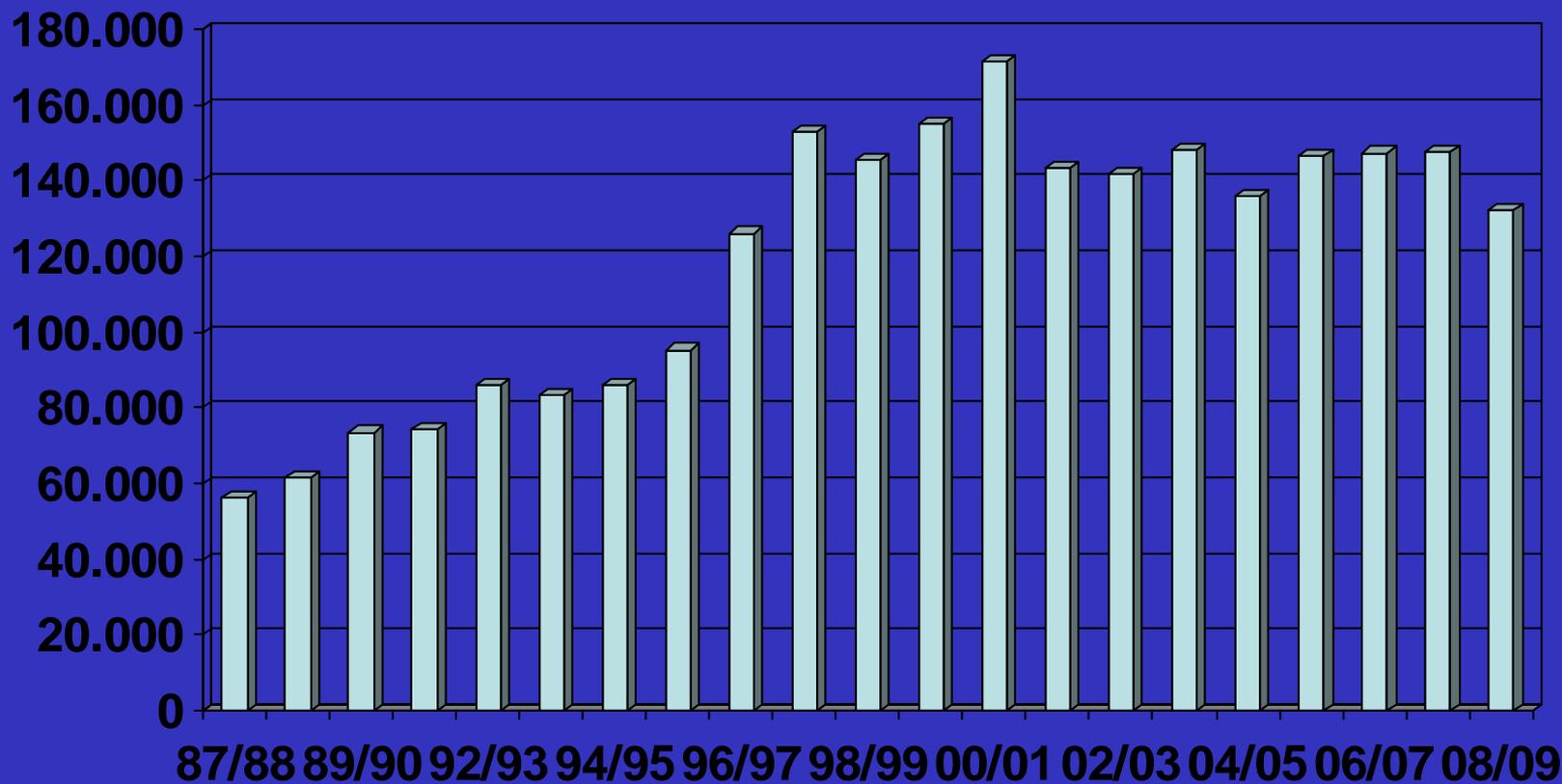
Barenbrug Group Sales Value 08/09



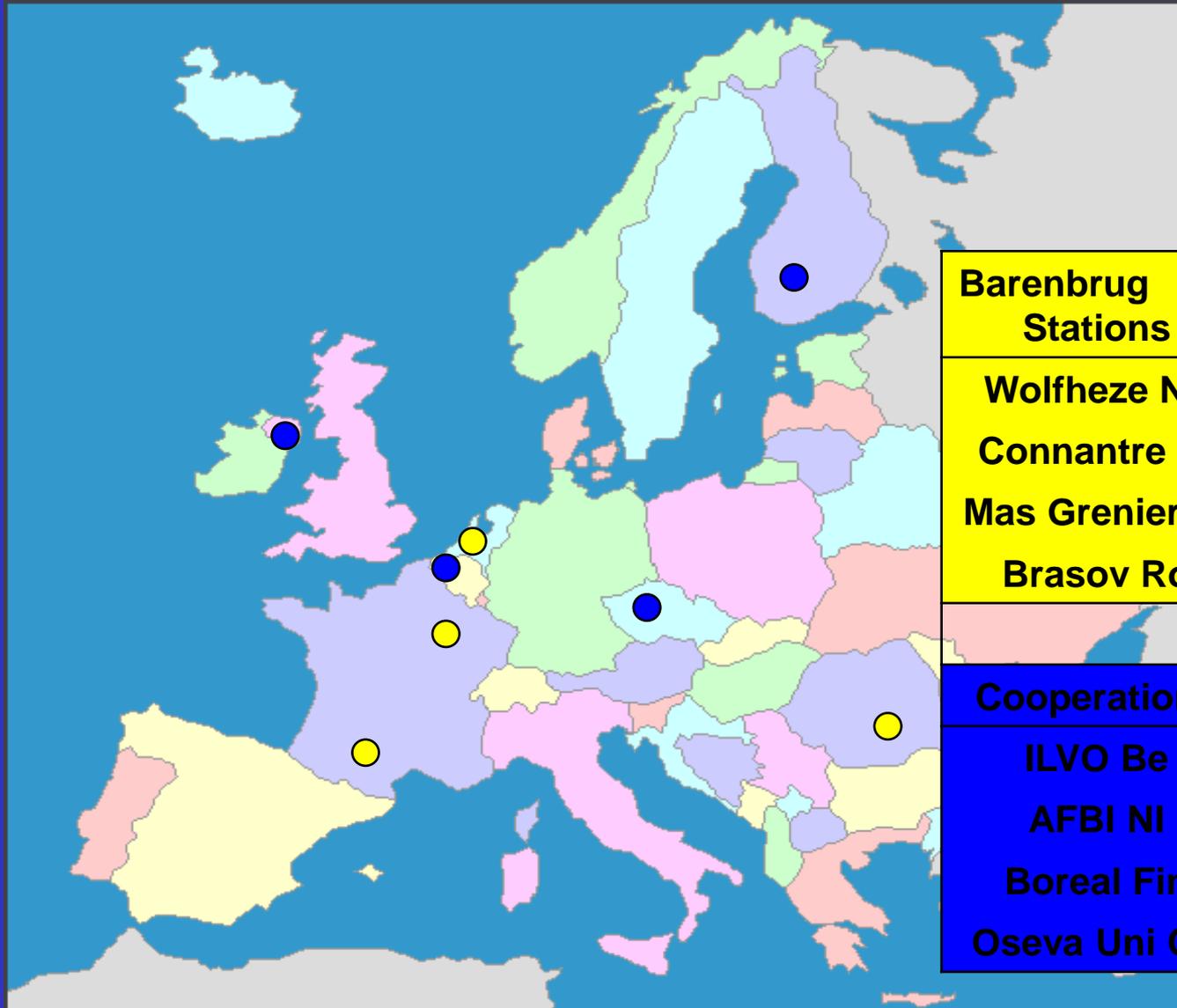


Turnover Royal Barenbrug Group

EUR x 1,000



Breeding Stations Europe



Barenbrug Stations
Wolfheze NL
Connantre Fr
Mas Grenier Fr
Brasov Ro

Cooperations
ILVO Be
AFBI NI
Boreal Fin
Oseva Uni CR

Research station Wolfheze



...A BIT OF HISTORY

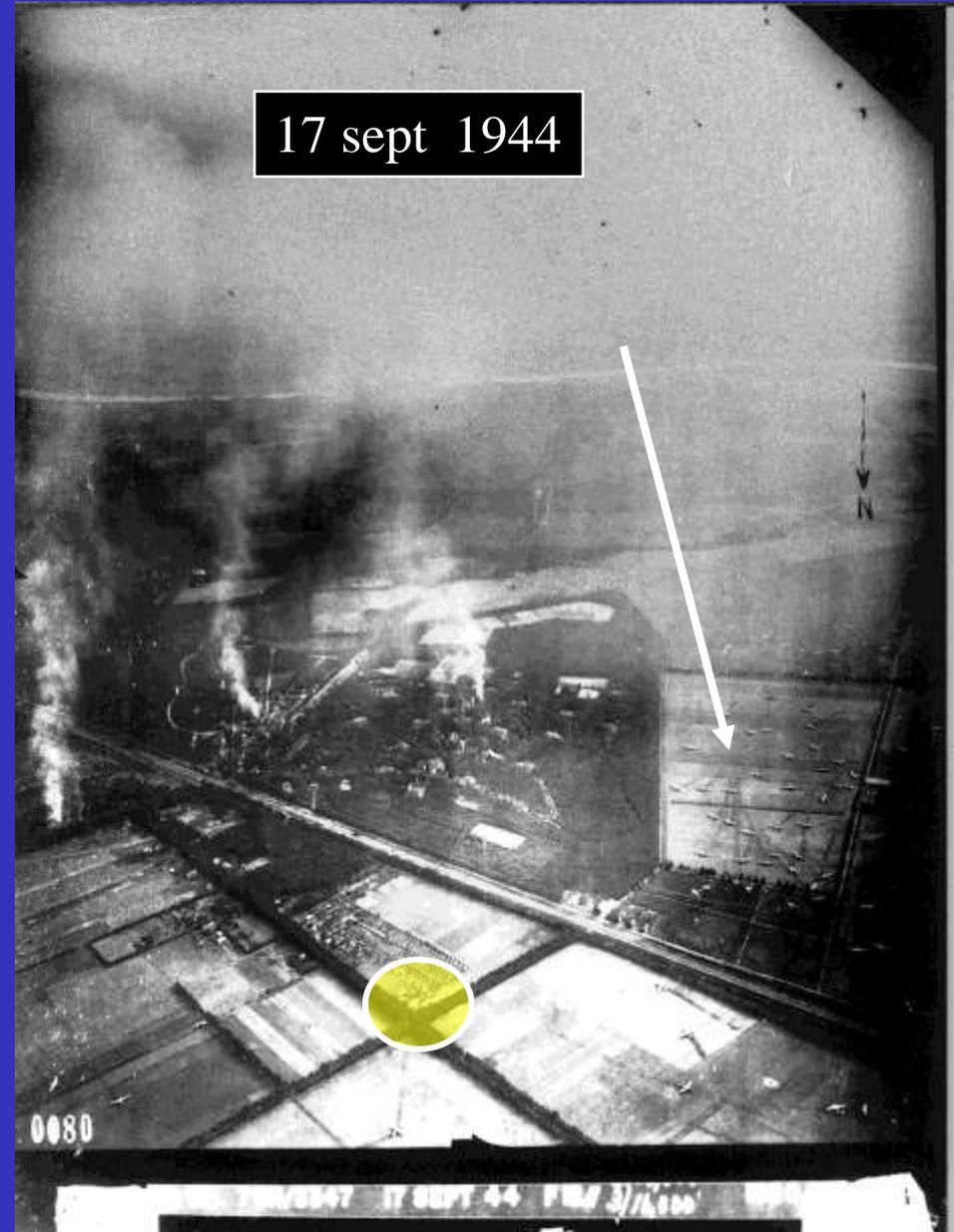


2009



17 SEPT 1944

... A BIT OF HISTORY-2





GRASS BREEDING

AT

BARENBRUG



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



Forage grasses

- Perennial Ryegrass
- Italian 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

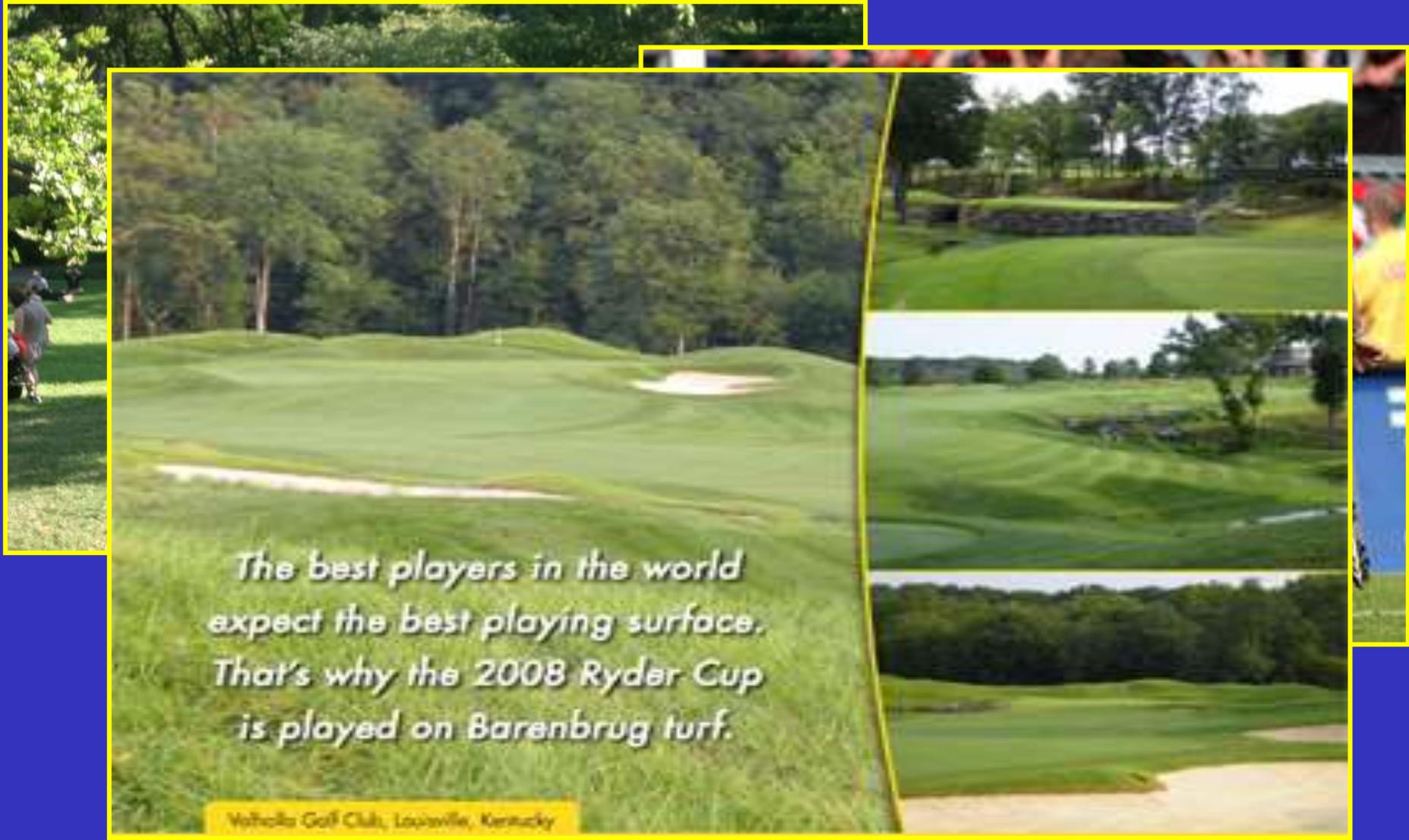
France (Mas Grenier)

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

USA (Oregon)

- Kentucky Bluegrass
- Perennial Ryegrass
- SOS

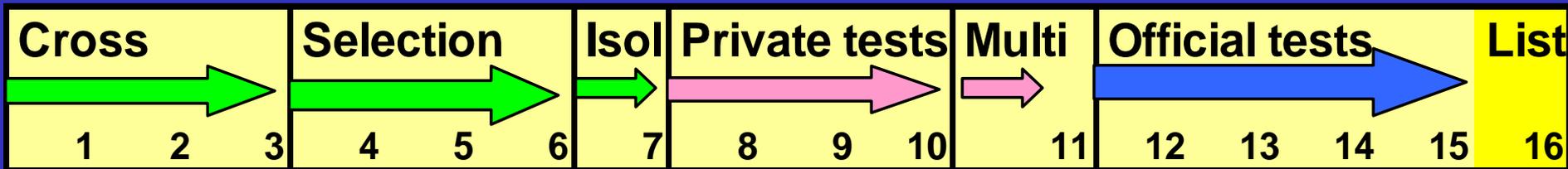
Breeding of turfgrass



*The best players in the world
expect the best playing surface.
That's why the 2008 Ryder Cup
is played on Barenbrug turf.*

Valhalla Golf Club, Louisville, Kentucky

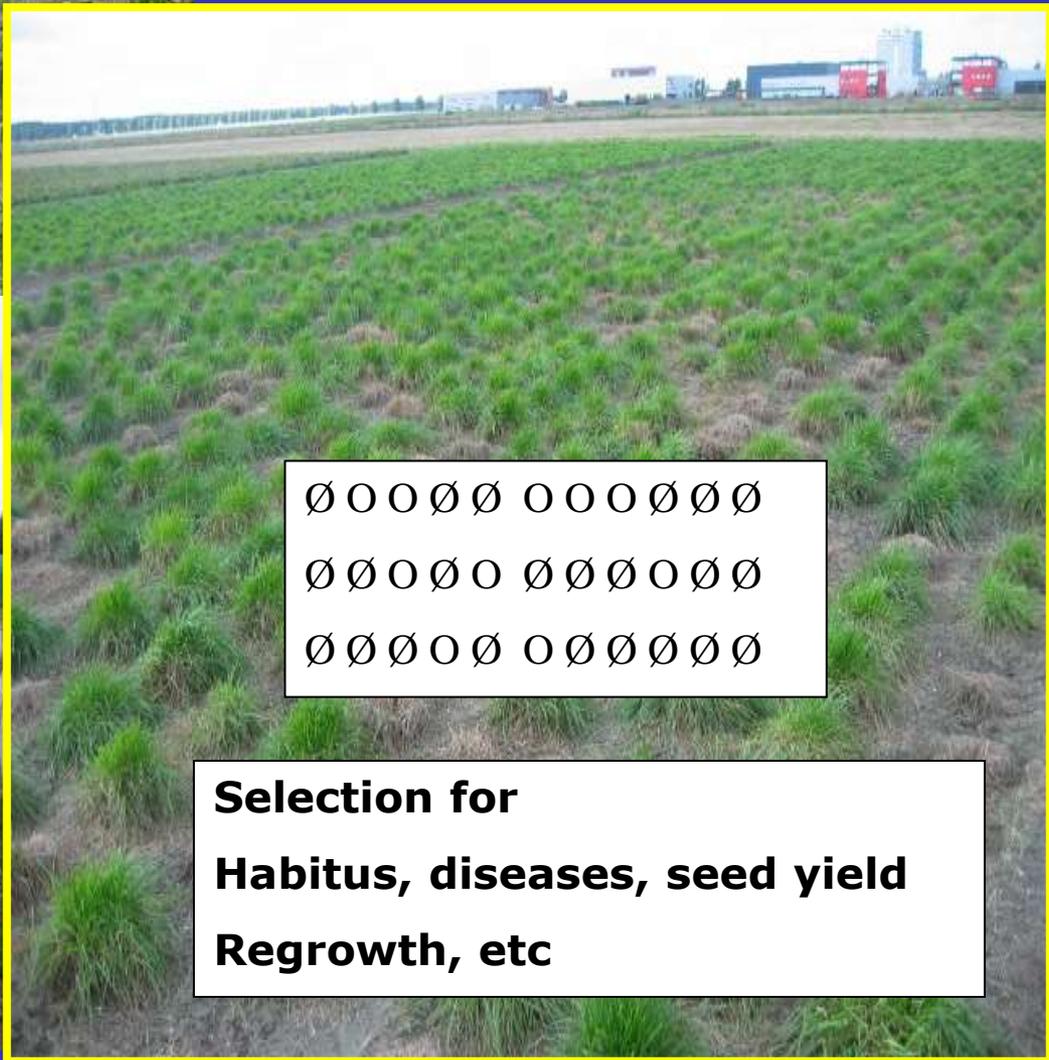
Grass breeding is time consuming



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

○ ○ ○ ○ ○
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○ ○ ○ ○ ○

F2 Seed
Production in
Rye isolation

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

○ ○ ○ ○ ○
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F2 Seed

**Production in
Rye isolation**

4/5

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**Selection for
Competition, Regrowth,**

6/7



Small plots

**1st selection quality, density
diseases**



Selection program Perennial Ryegrass (2)

50 x 50, 1 rep

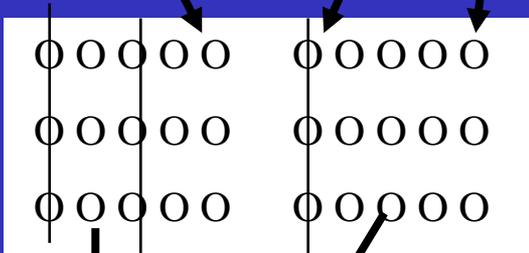
6/7



Small plots

1st selection on wear diseases

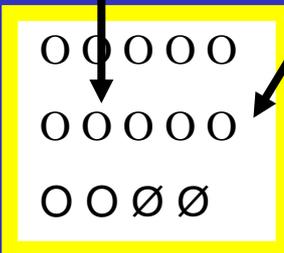
7/8



Clonal rows

Make synthetics based on Uniformity !!!

8/9



Synthetic Seed Production in Rye isolation

10/12

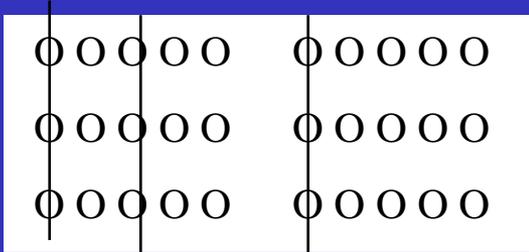


100 x 100, 3 reps

Clonal rows and make synthetics ,



7/8



Clonal rows

Make synthetics based on

Uniformity !!!

Seed production in rye isolation





100 x 100, 3 reps

10/12



Selection program Perennial Ryegrass (3)

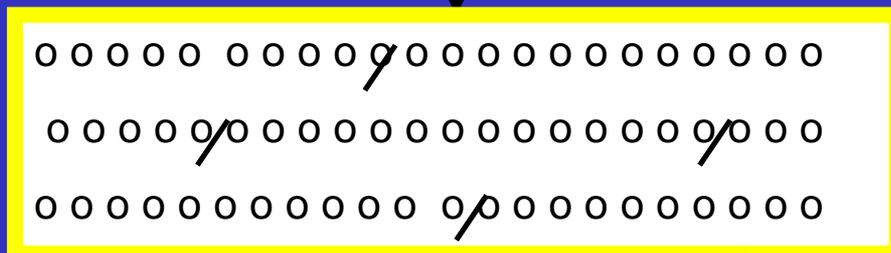


100 x 100, 3 reps

10/12



13/14



**Multiplication
of
Breeders seed**

15/17

**Official trials
Several countries**

18

VARIETY LIST





**Multiplication
of
Breeders seed**

13/14



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



To create variation:

•Make crosses

Find genotypes with high % hybrids

•Use radiation

•Colchicine treatment

•Collect ecotypes



Pp Crossing program



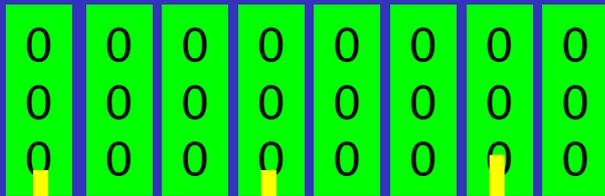
Collection of ecotypes





Ecotype

3 plant rows, Disease, seed yield



Multiplication



Hybrid from Crosses



6 plant rows,
Uniformity
Disease,
seed yield





**Multiplication
of
Breeders seed**

13/14



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

POLES A		POLES B		POLES C		POLES D	
Germany	Spain	Germany	Spain	WYDEN, AND	Spain	Germany	Spain
France	Spain	France	Spain	Spain	France	France	Spain
Portugal	Spain	Portugal	Spain	Portugal	Spain	Portugal	Spain
Spain							
Ranking 7 (see)	Ranking 8 (see)	Ranking 9 (see)	Ranking 10 (see)	Ranking 11 (see)	Ranking 12 (see)	Ranking 13 (see)	Ranking 14 (see)
Germany - Portugal	Germany - Spain	Germany - Portugal	Germany - Spain	WYDEN, AND - Spain	Spain - Portugal	WYDEN, AND - Portugal	Spain - Portugal
Portugal - Spain	Portugal - Spain	Portugal - Spain	Portugal - Spain	WYDEN, AND - Portugal	Spain - Portugal	WYDEN, AND - Portugal	Spain - Portugal
Ranking 11 (see)	Ranking 12 (see)	Ranking 13 (see)	Ranking 14 (see)	Ranking 15 (see)	Ranking 16 (see)	Ranking 17 (see)	Ranking 18 (see)
Germany - Portugal	Germany - Spain	Germany - Portugal	Germany - Spain	WYDEN, AND - Portugal	Spain - Portugal	WYDEN, AND - Portugal	Spain - Portugal
Portugal - Spain	Portugal - Spain	Portugal - Spain	Portugal - Spain	WYDEN, AND - Portugal	Spain - Portugal	WYDEN, AND - Portugal	Spain - Portugal
Ranking 12 (see) - semifinals 1	Ranking 13 (see) - semifinals 2	Ranking 14 (see) - semifinals 3	Ranking 15 (see) - semifinals 4	Ranking 16 (see) - semifinals 5	Ranking 17 (see) - semifinals 6	Ranking 18 (see) - semifinals 7	Ranking 19 (see) - semifinals 8
Spain							
Ranking 20 (see) - semifinals 9	Ranking 21 (see) - semifinals 10	Ranking 22 (see) - semifinals 11	Ranking 23 (see) - semifinals 12	Ranking 24 (see) - semifinals 13	Ranking 25 (see) - semifinals 14	Ranking 26 (see) - semifinals 15	Ranking 27 (see) - semifinals 16
Spain							
Ranking 28 (see) - semifinals 17	Ranking 29 (see) - semifinals 18	Ranking 30 (see) - semifinals 19	Ranking 31 (see) - semifinals 20	Ranking 32 (see) - semifinals 21	Ranking 33 (see) - semifinals 22	Ranking 34 (see) - semifinals 23	Ranking 35 (see) - semifinals 24
Spain							

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

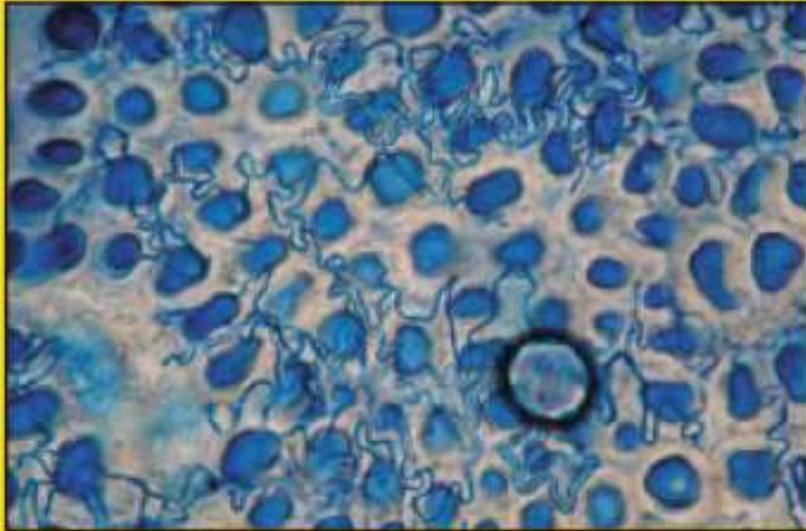
- Insectresistance
- Disease resistance
- Drought tolerance
- Enhances seed production

NEGATIVE

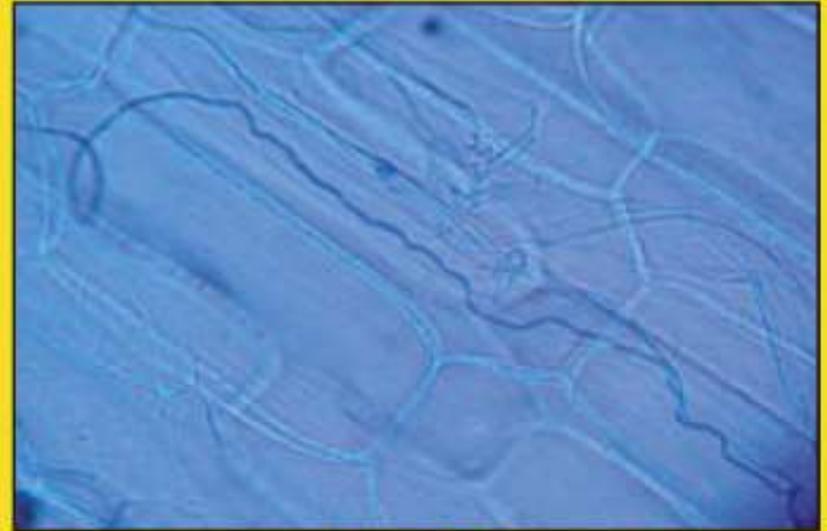
- Alkoloids can be poisonous for cattle and horses



4 Screening of seeds and plants.



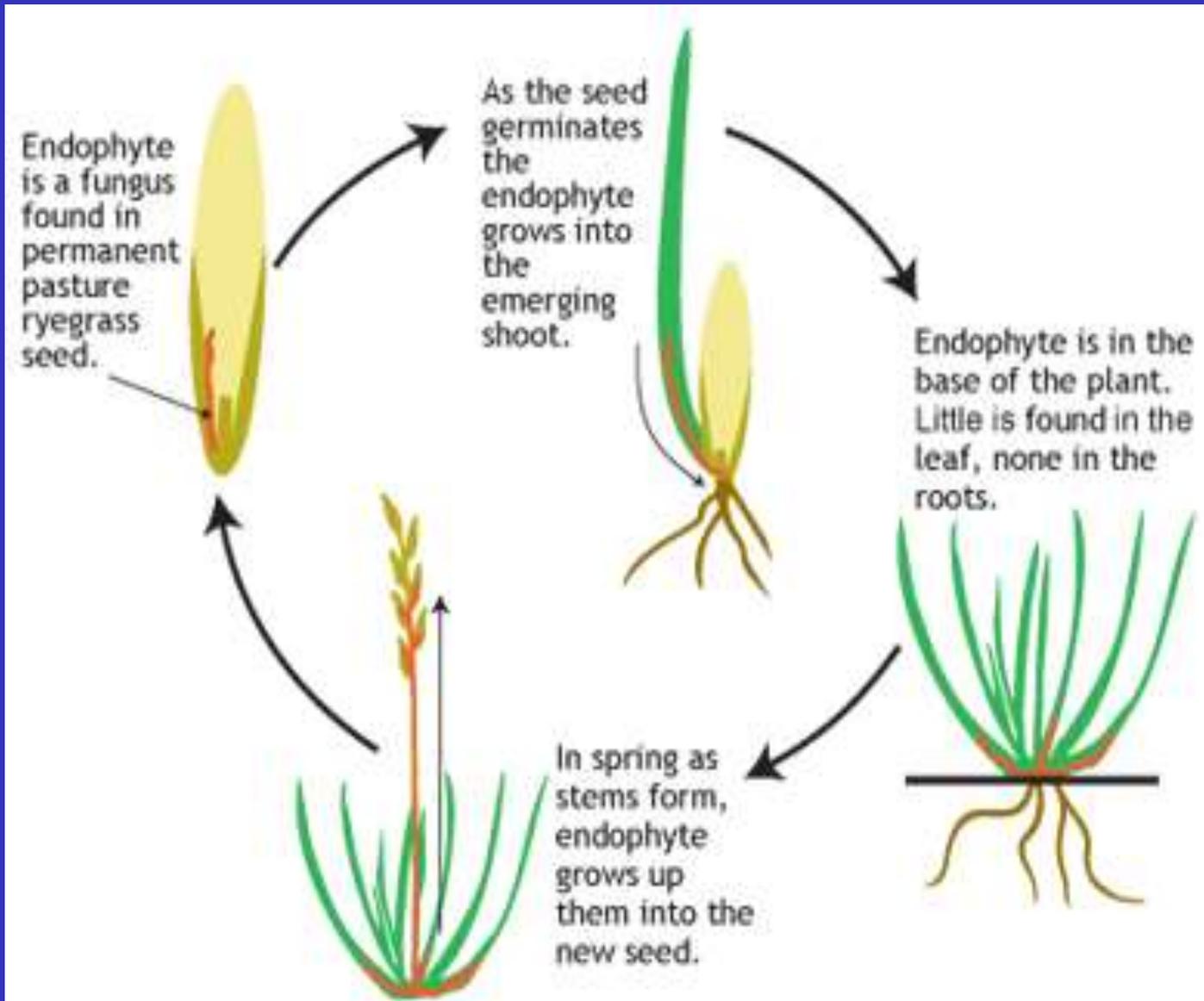
seed 400x



plant 400x

ENDOPHYTES

Life cycle



ENDOPHYTES

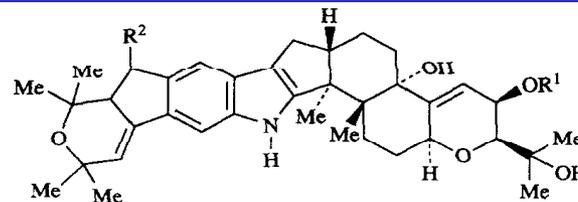


Endophytes produce several bioactive secondary metabolites

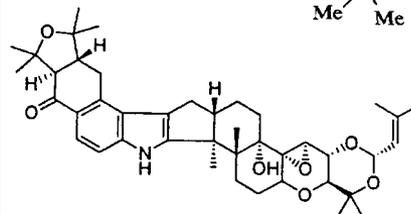
Alkaloid	Function in host	Toxicity
Peramine	Insect resistance	None known
Ergovaline	Abiotic stress tolerance	Mammalian herbivores
Lolitrems B	Abiotic stress tolerance	Mammalian herbivores



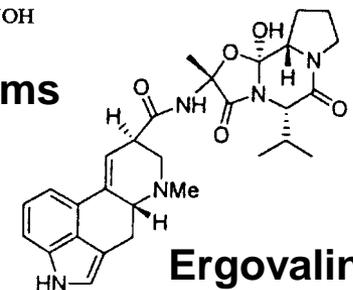
Peramine



Janthitrem



Lolitrems B



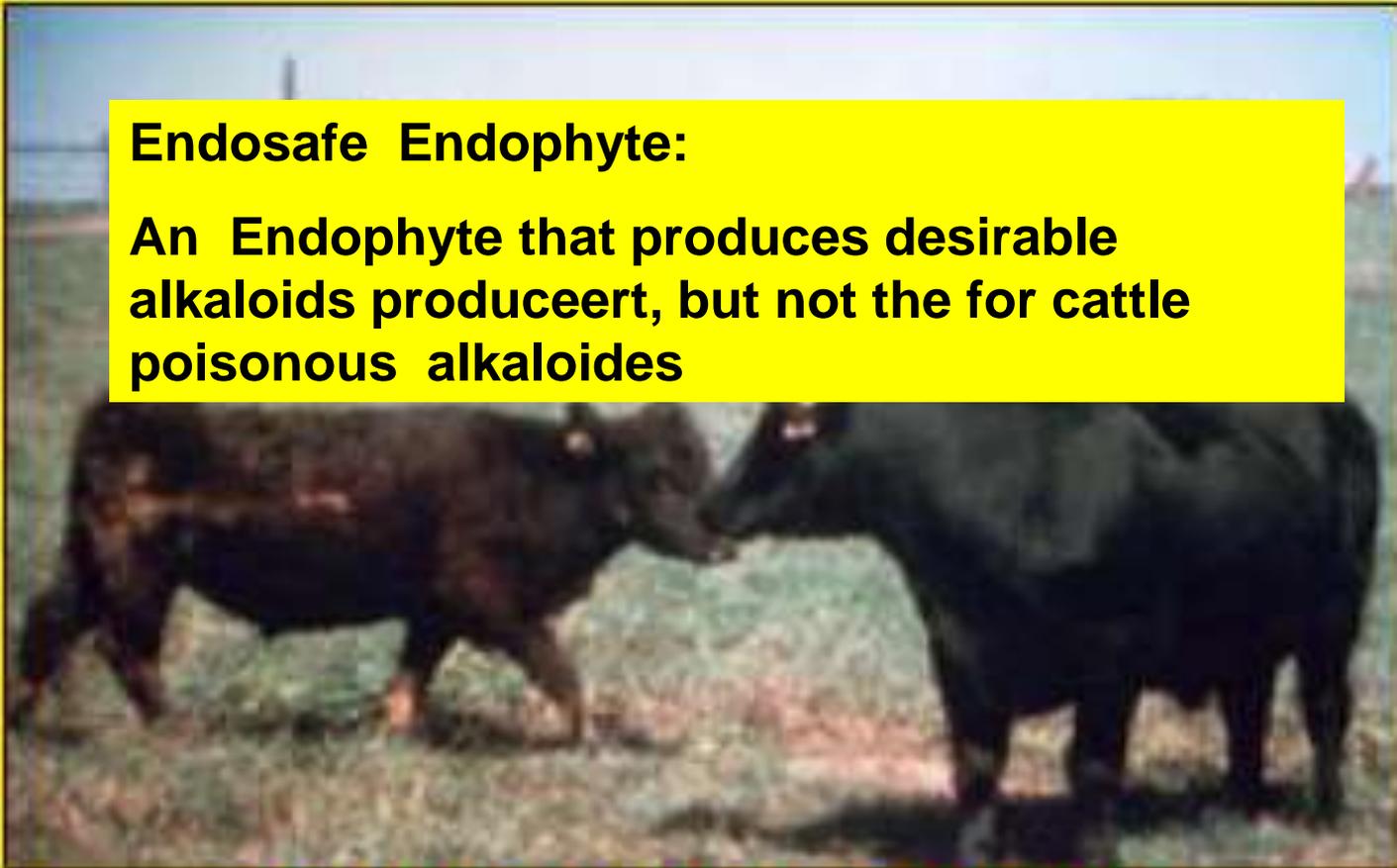
Ergovaline

“STAGGERS”



Endosafe Endophyte:

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



**grazing experiment
with a twin**



GREAT IN GRASS