Internal

Lantmännen BioAgri

ThermoSeed - Innovative solutions at farm & production level

11/28/2021

Lantmännen

Lantmännen BioAgri

- CEO Anders Krafft
- Fully owned daughter company of Lantmännen Lantbruk
- 12 employees
- Sales/marketing, production lab and R&D company

BioAgri’s core business

Seed technology
ThermoSeed®

Seed treatment
Cedomon®, Cerall®, Cedress®

Biostimulants
eg Stimplex®, Resid®

Research projects

The advantage of vigour tests

104 oat seedlots from 2013

Infection (% seeds with fusarium)	No of seed lots	Traditional paper test germination Untreated seeds (mean value)	Emerged plants in Vigour test Untreated seeds (mean value)	Emerged plants in Vigour test ThermoSeed treated seeds (mean value)
0 – 9 % infection	31	95 %	86 %	93 %
10 - 20 %	45	94 %	76 %	91 %
21 – 30 %	22	94 %	68 %	90 %
> 30 %	6	89 %	58 %	91 %

- **Lantmännen BioAgri's** biological seed treatments have the benefit of over ten years of intensive research, testing, and product development, initially at the **Swedish University of Agricultural Sciences** and subsequently at **Lantmännen BioAgri** itself.

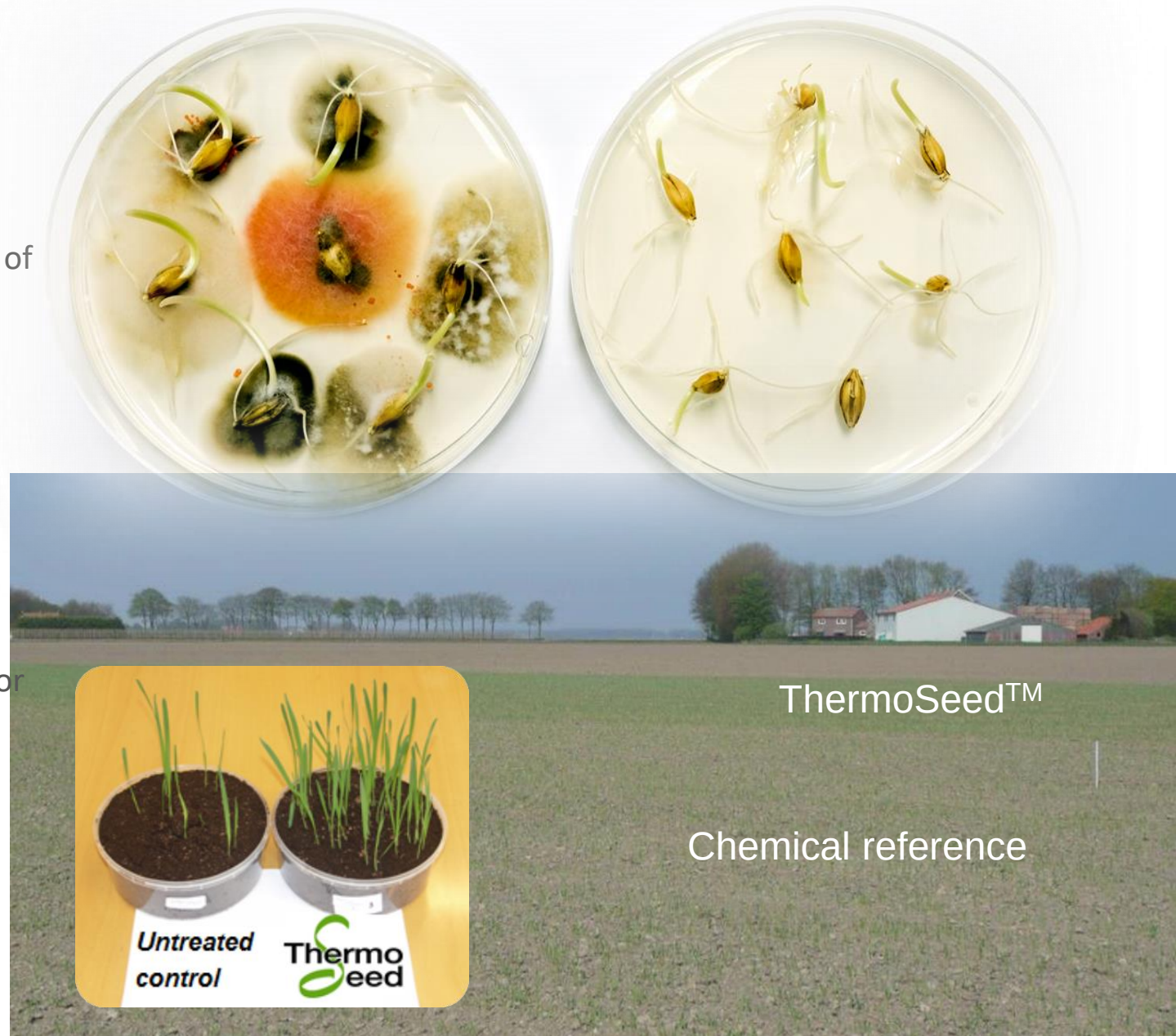
- The dressing agents **Cedomon®**, **Cerall®** and **Cedress®**, with the active substance Pseudomonas chlororaphis MA342, a naturally occurring bacterium in soil, have been available since the late 1990s. Products based on MA 342 can be applied to seed with standard seed treatment machinery.

- **Advantages of Cedomon®, Cerall® and Cedress®**

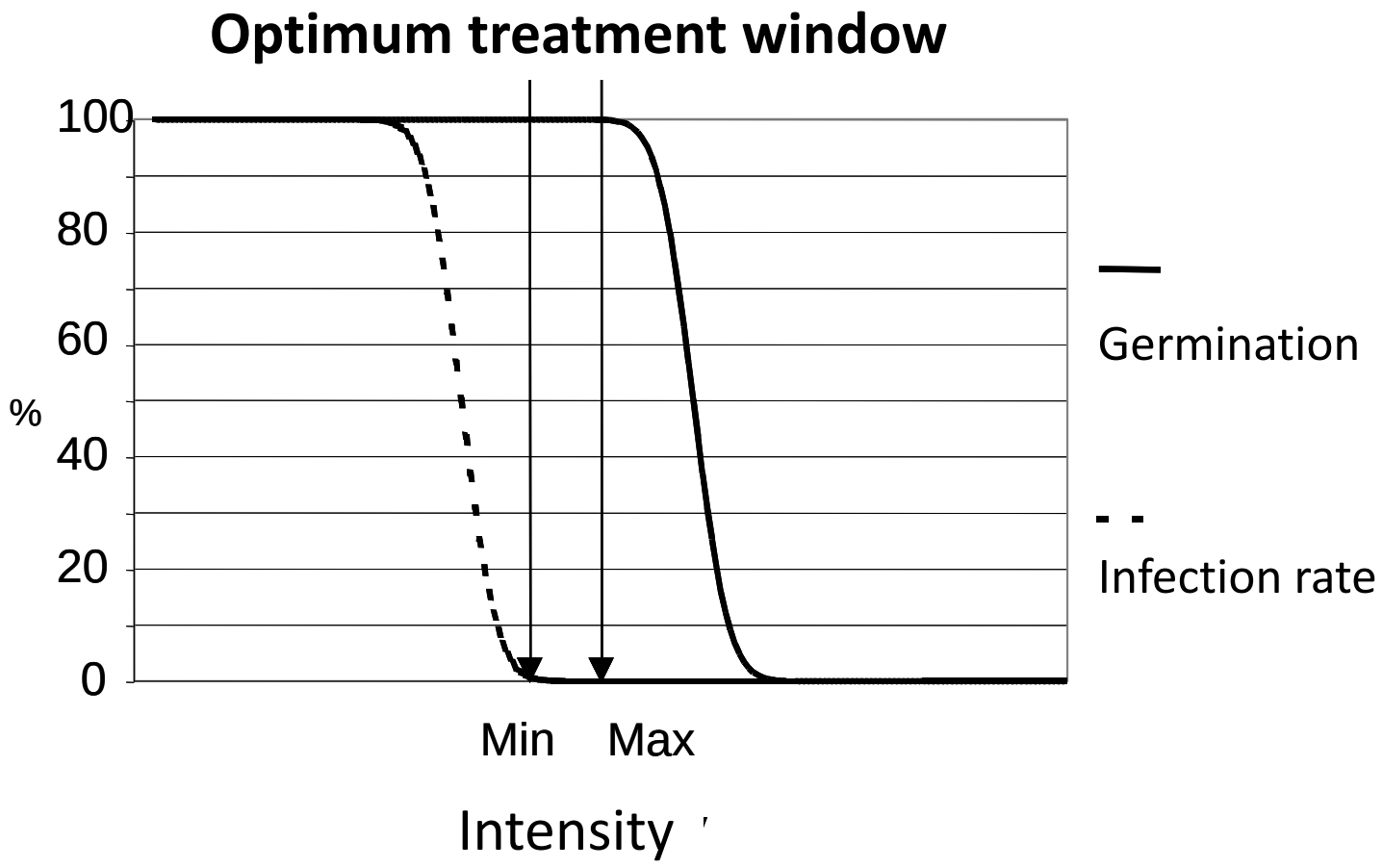
- Naturally occurring soil bacterium as the active substance in these products
- Can be used in organic production
- Biodegradable
- Improve root growth
- Increased harvest
- Treated seed can be stored for 12 months without any loss of effect

The Innovation - Thermoseed®

- A unique innovative seed treatment for effective control of seed-borne pathogens by the use of hot humid air
- For highly productive and sustainable agriculture
- Effective control of seed-borne pathogens without chemicals
- Proven effectiveness on large scale commercial level and confirmed by numerous official trial results
- Control of seed borne pathogenic and non pathogenic microbes strengthens the seed vigour which is the base for high yield with a high quality.



The Thermoseed principle



Thermoseed® expertise in field crops

Proven control of seed pathogens

The outcome of the innovation

- Sustainable, profitable and highly efficient seed treatment
- 15 different crops treated commercially
- App. 65 different crops treated in our test facility to be commercialized
- 12 production Thermoseed plants in the EU and US
- 20 ongoing projects with potential customers

- Each year we treat app. 150 000 ton of seed with Thermoseed
  - That replaces 250 000 l of chemicals each year

Commercial status 2022

- **Cereals**
  - > 150.000 tons/year (Europe)
- **Flax**
  - > 5.000 tons/year (France)
- **Rice**
  - > 1.000 tons/year (USA)
  - Major interest from Japan, Italy and other rice producing countries
- **Vegetables**
  - A few tons/year (Europe)

conclusions

- It is important that EU continue to promote sustainable methods that can substitute chemicals with no or little yield penalty in the light of Ukraine crisis as well as the climate challenges
- If we want sustainable production to increase in use, EU need to adapt their regulation for this type of products. Today it is too expensive and to complicated to register biological products as plant protection.
  - Investigate possibilities for easier testing of products with potential low-risk substances
  - LM BioAgri have promising products in our research but it in not worth the investment today to make them available on market
- Invest in fundamental research that promotes access to new products as well as applied research and advisory services that promotes the use of sustainable products
- **Thermoseed can today substitute chemicals for seed treatment without risking any damages to the seed and by that contributing to both a sustainable world as well as food safety by having the same or even higher yields**

Thank you!

Thermoseed is one of the first examples where we can substitute chemicals with only water and still get 100 % efficiency against seedborne diseases

The advantage of vigour tests

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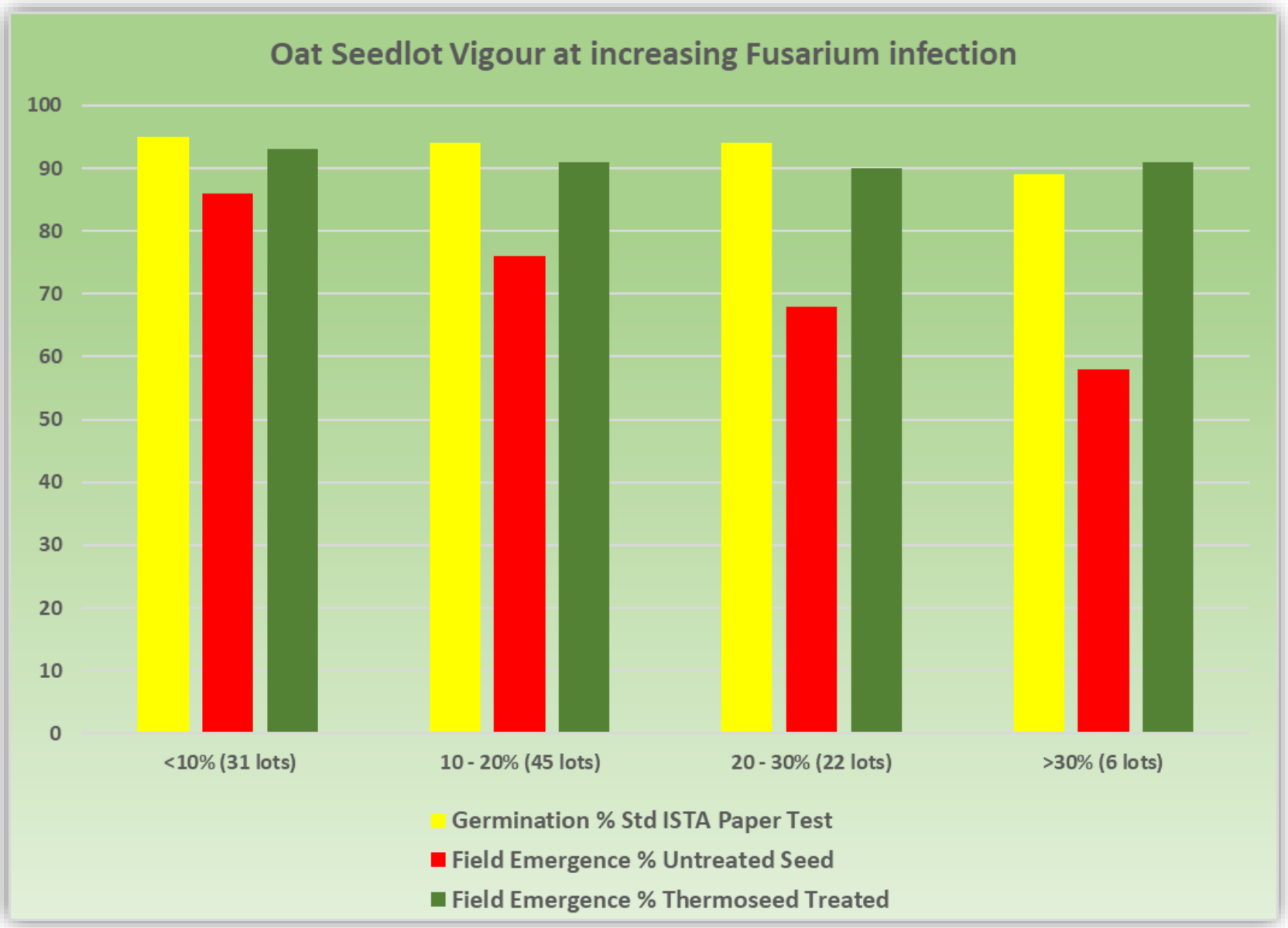
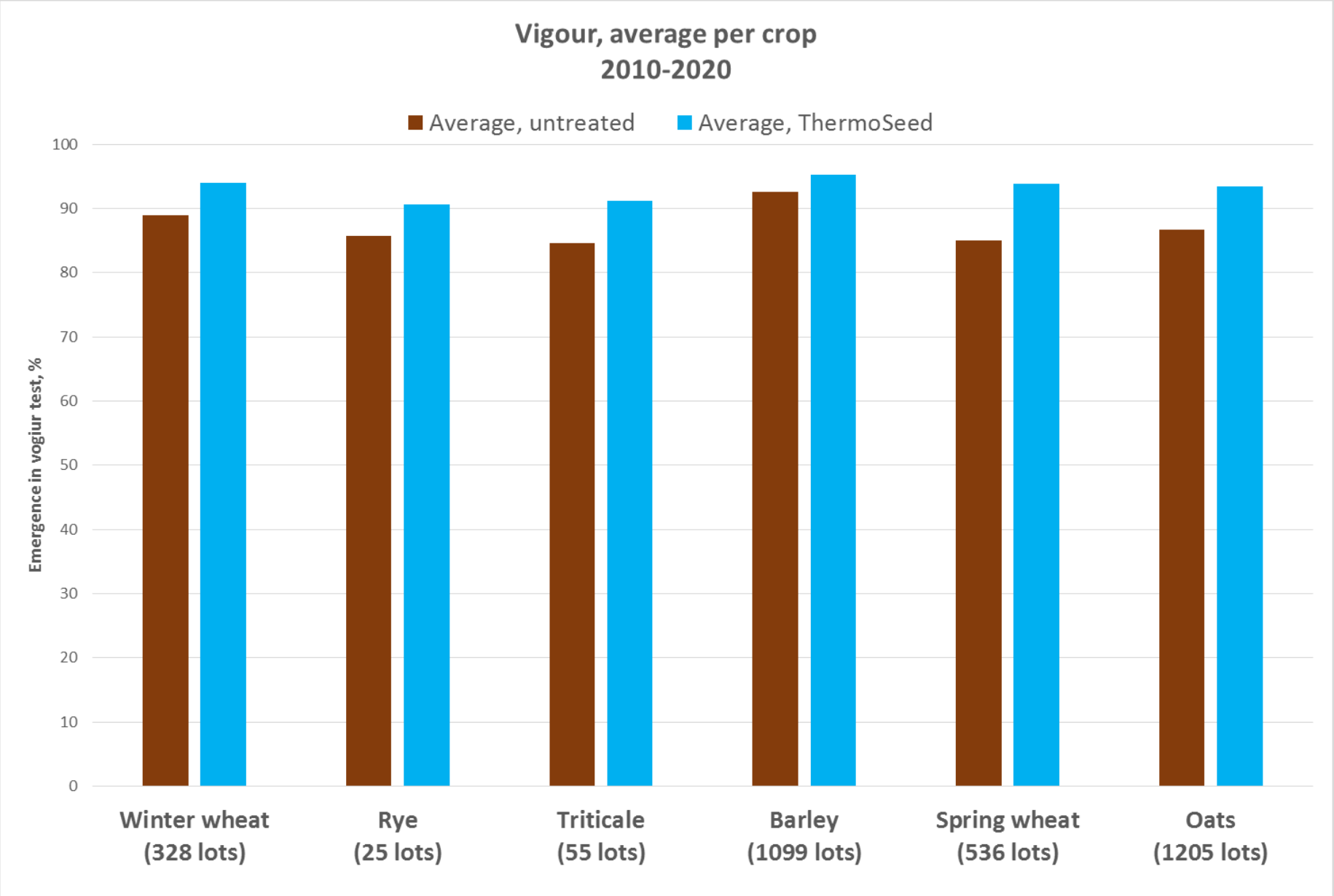
The essence of vigour testing

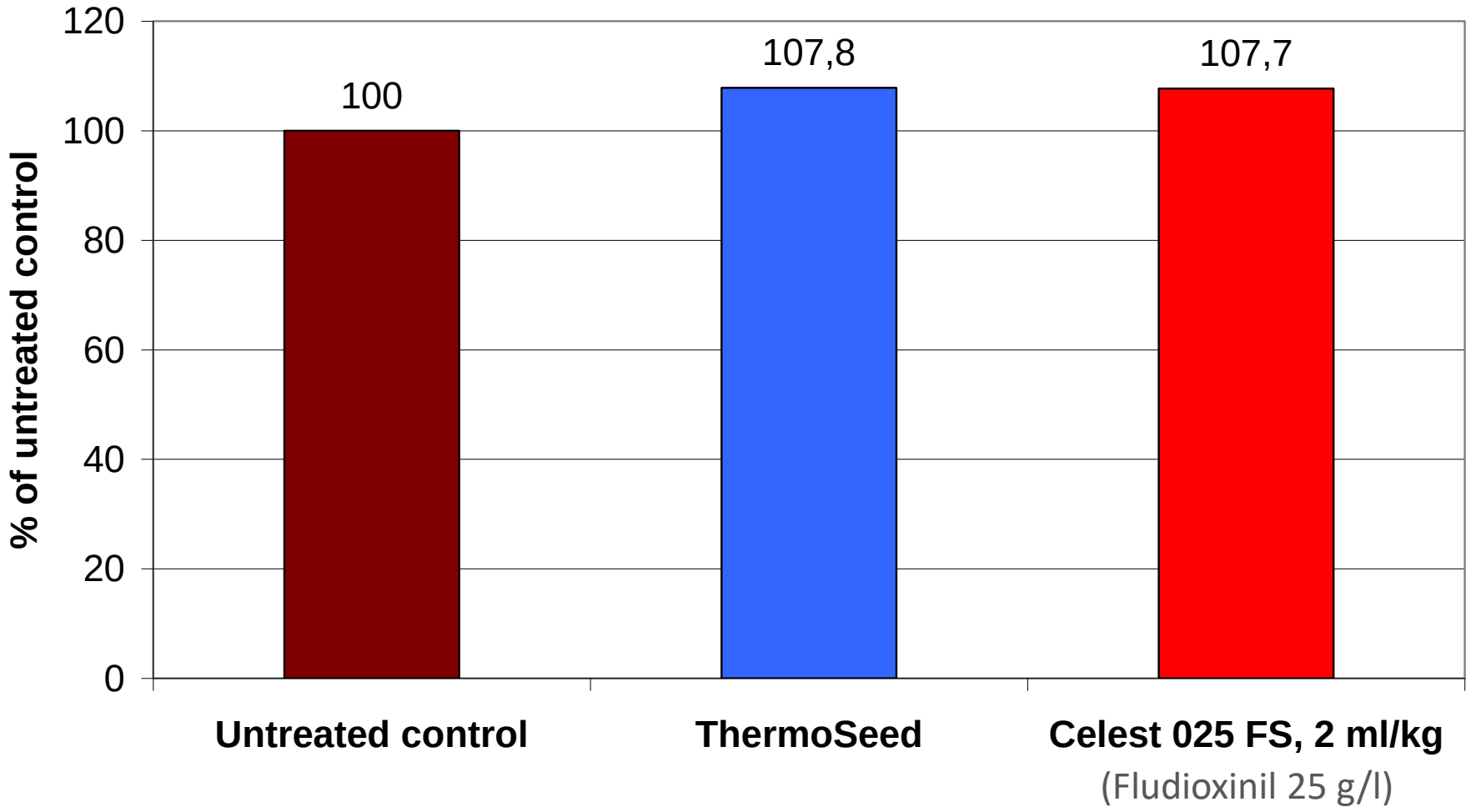


Average vigour increase ThermoSeed

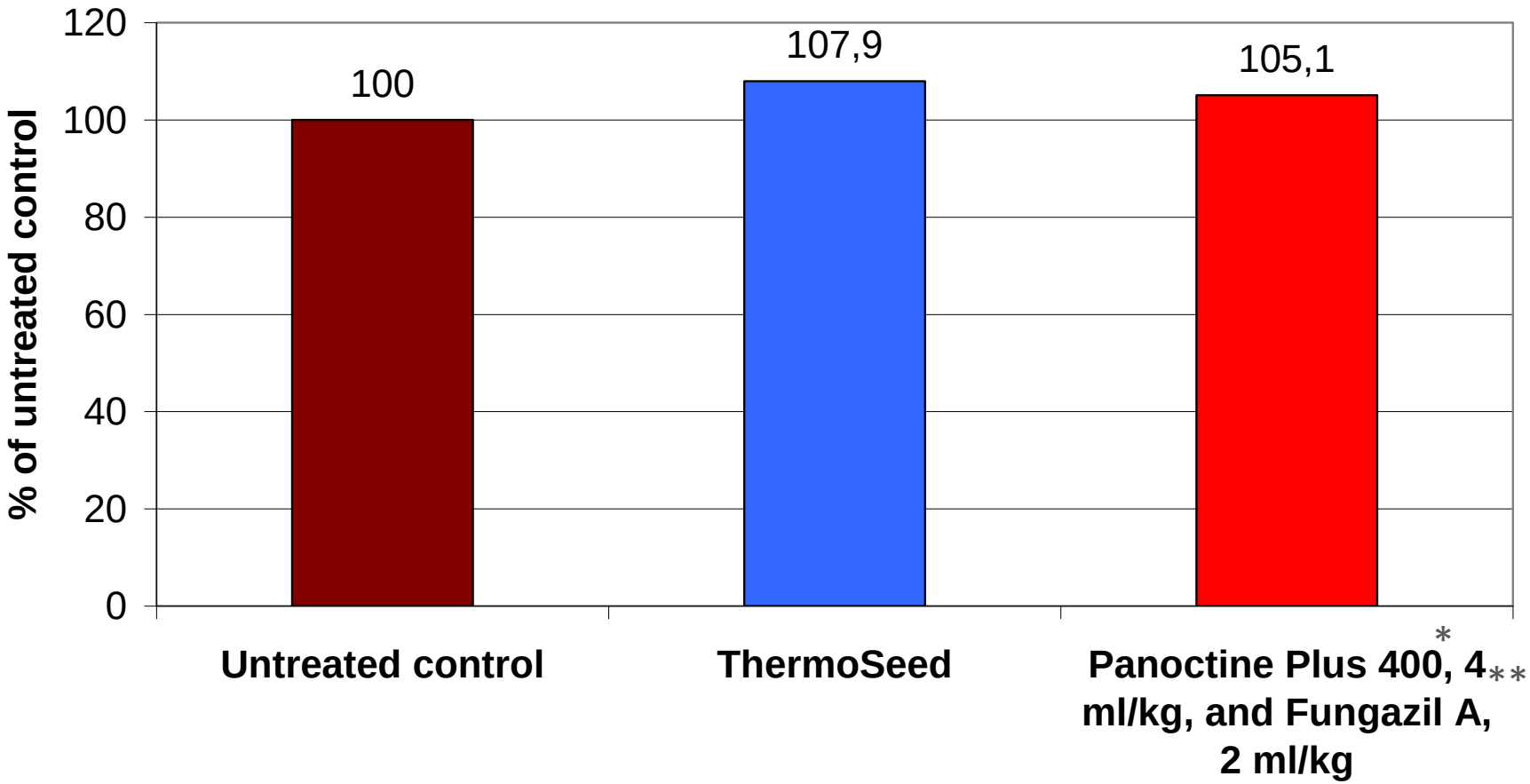
in commercially treated seedlots, 2010-2020



Yield wheat, 41 field tests 2003-04

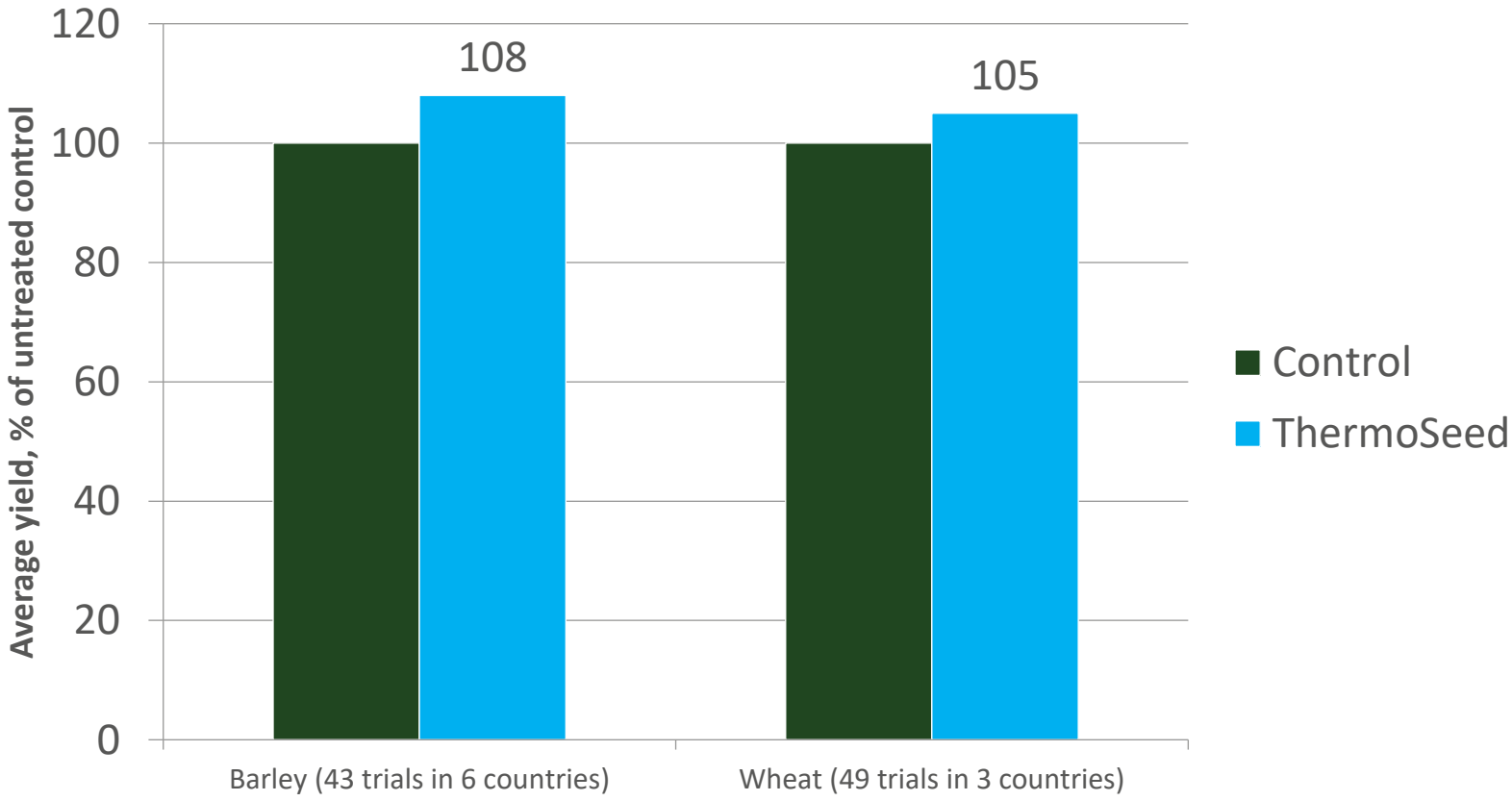


Yield barley, 24 field trials 2003-04

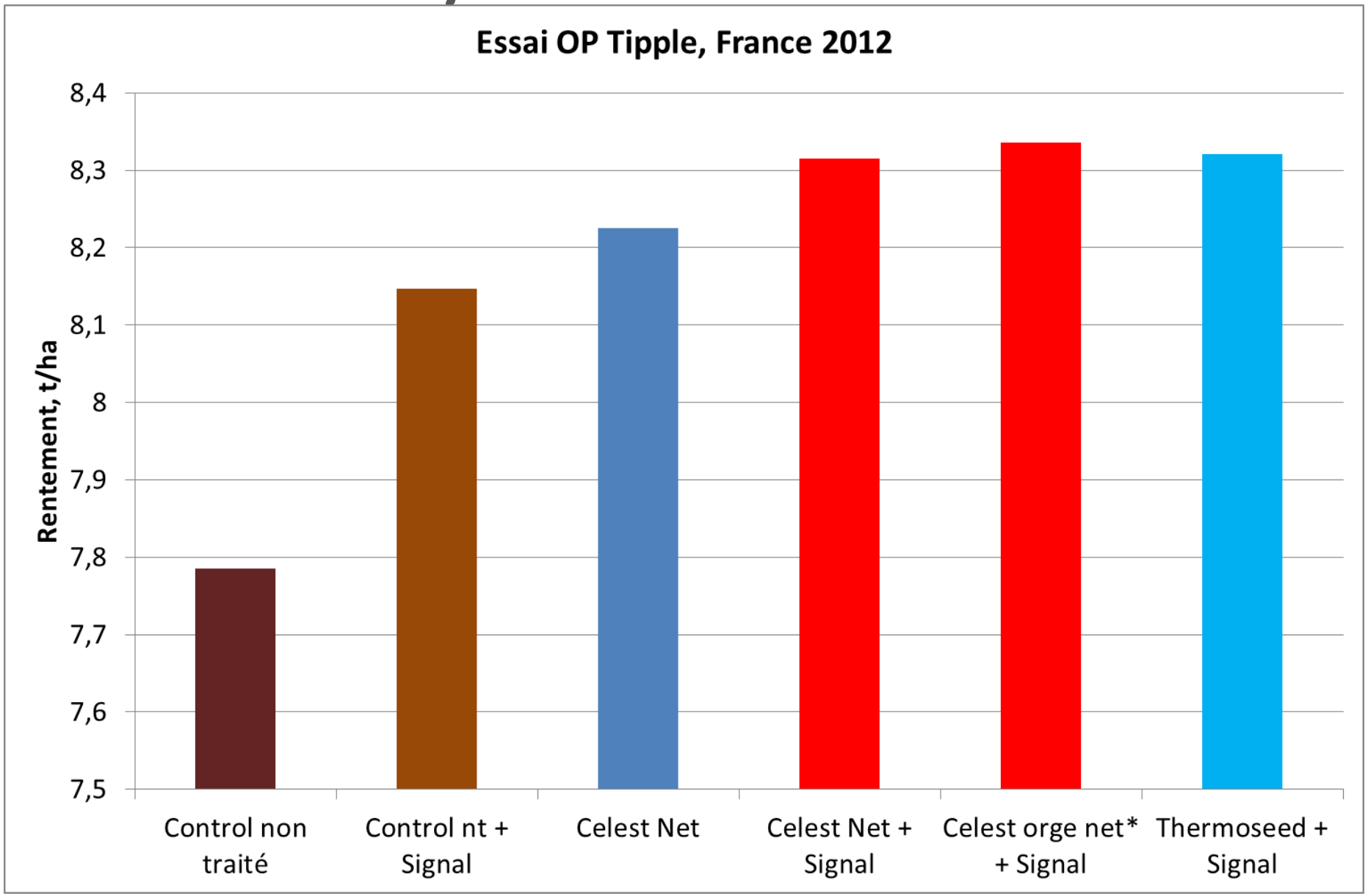


*Imazalil 10 g/l, guazatine 150 g/l
**Imazalil 25 g/l

Effect on yield, field trials 2003-2009



Barley field trial France 2012



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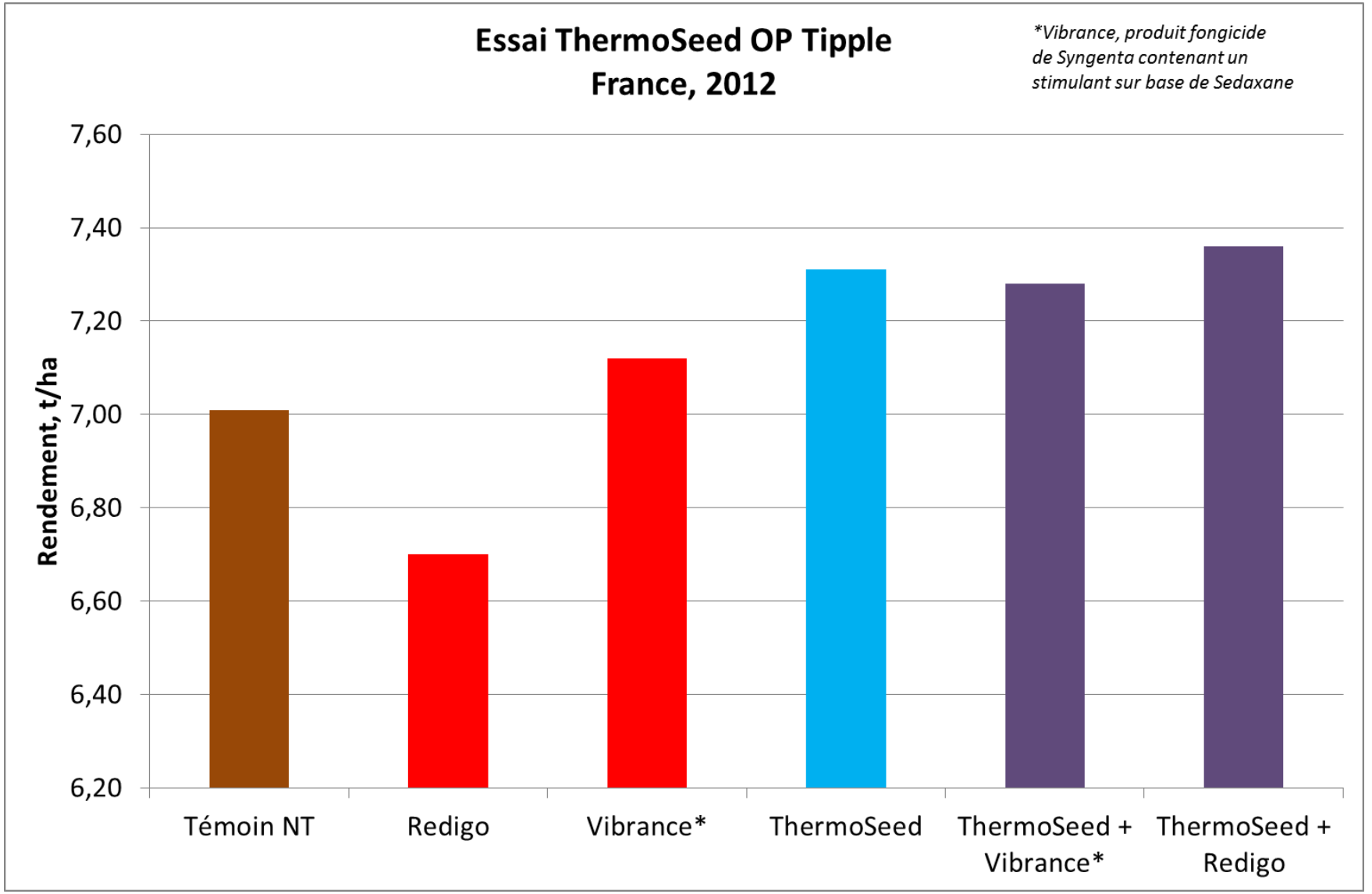
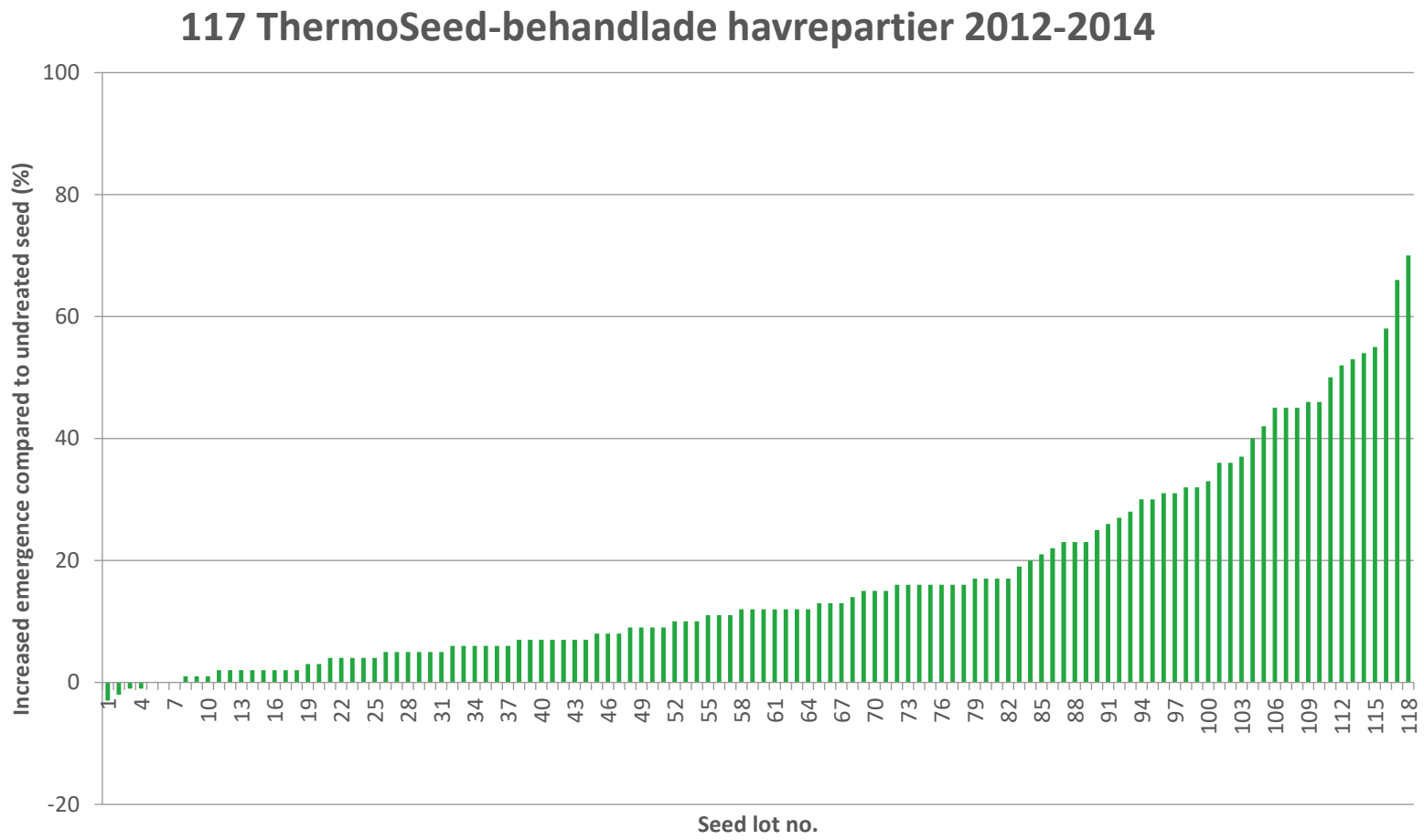
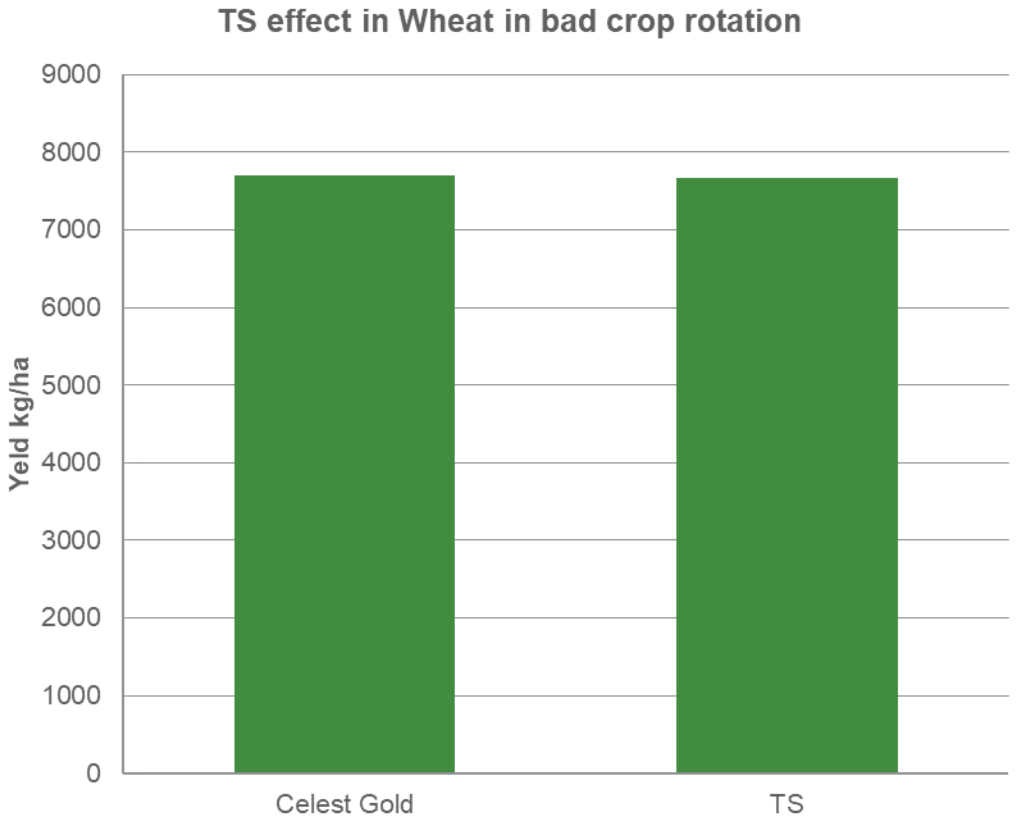


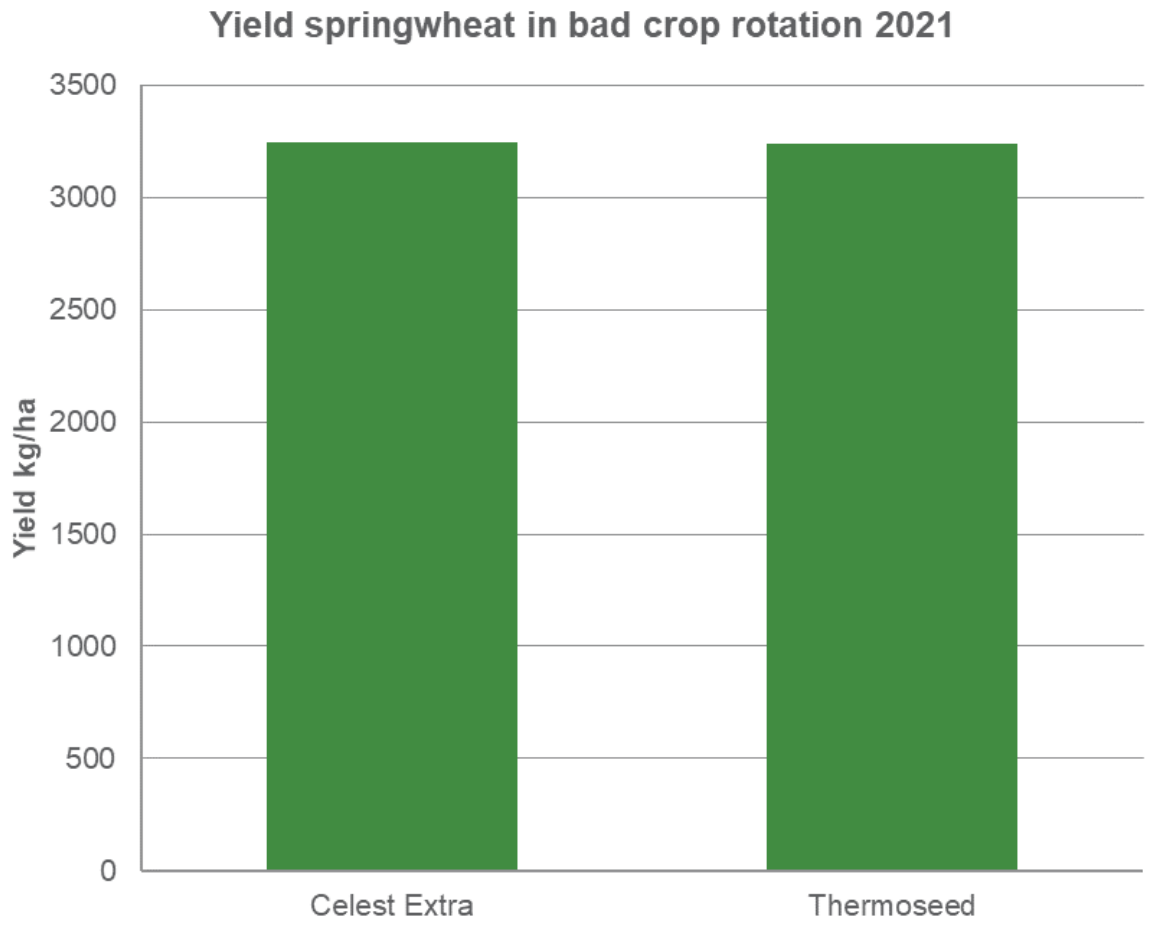
ThermoSeed vigour increase in oats



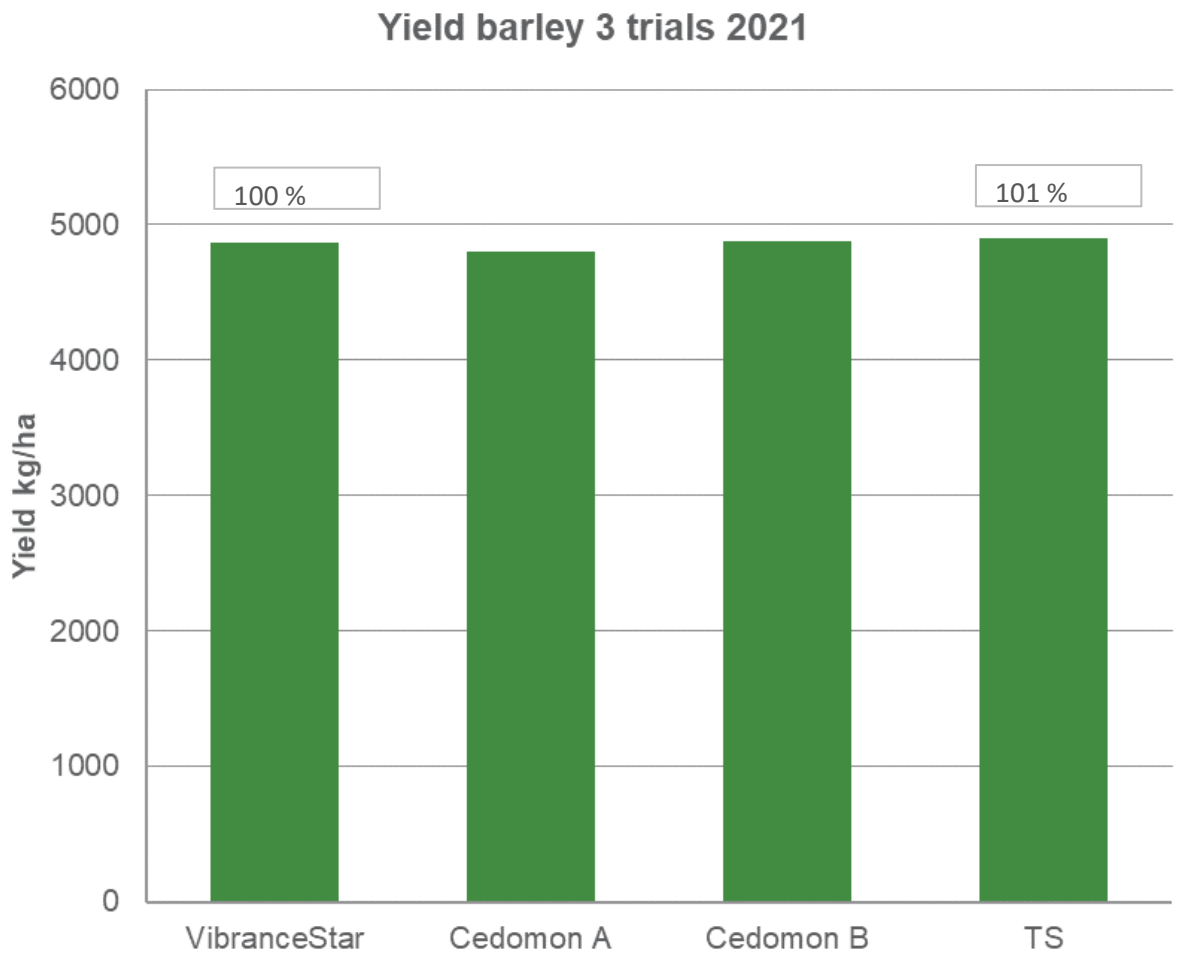
Effect of TS in bad crop rotation 2020



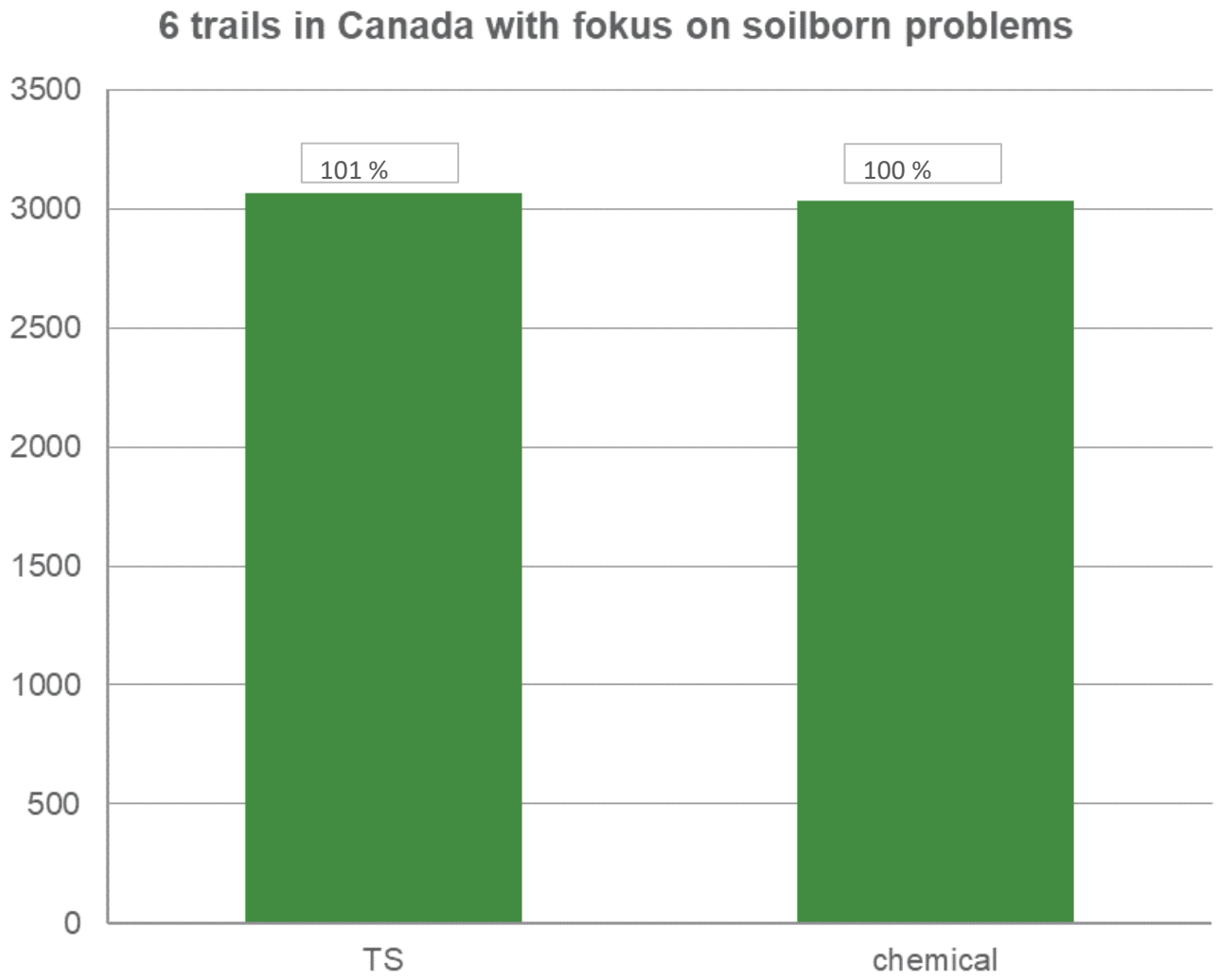
Yield in spring wheat 2021 in bad crop rotation



Average yield 3 trials barley 2021



Yield 6 trials in Canada 2022 with focus on soilborn problems (Pythium och Rhizoctonia)



The increasing Bean Weevil problem

Grodda åkerbönor med hål av bönsmyg
Kanterna på hålen är svampinfekterade och man kan se missfärgning eller svampmycel

Effekt av ThermoSeed-behandling i åkerbönor

Obehandlat

ThermoSeed

Foton: Mariann Wikström

Agro Plantarum