



## Strengthen Maize against Seed and Soil-borne Fungal Pathogens

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MicroFunction Workshop - 21th June 2024, Rostock, Germany

[www.julius-kuehn.de](http://www.julius-kuehn.de)

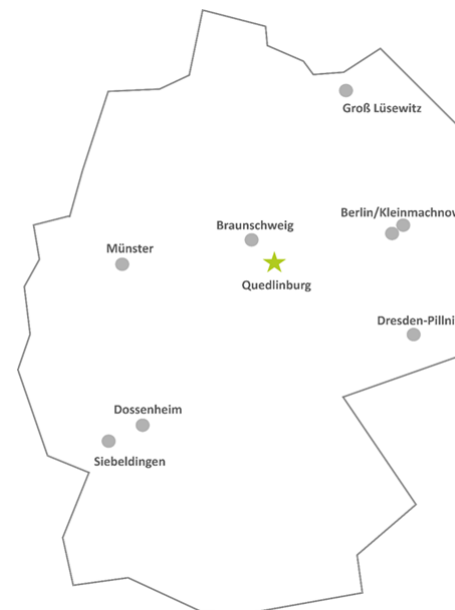
# The Julius Kühn-Institut, JKI in short ...



... is the Federal Research Centre for Cultivated Plants in Germany.

... is both a research institute and a higher federal authority.

... was constituted on January 1st, 2008, as the German Ministry of Food and Agriculture merged its research from previously 7 to 4 centres.



# Seed and soil-borne fungal pathogens

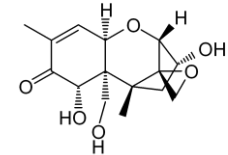
Fusarium spp.  
Phytium spp.  
Rhizoctonia spp.



optimal emergence  
plant development  
yield stability



accumulation of mycotoxins in the  
harvested material



toxic effects in humans and  
animals even at low  
concentrations

increase in infestation rates can even  
be expected in the future

Created with [BioRender.com](https://www.bio-render.com)

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# Seed coatings - current situation

## Authorised available products



Product name	Authorisation number	End of authorisation	Active substances	Target organisms
Belanty	00A480-00	20.03.30	Mefentrifluconazole	Fusarium spp.
Redigo M	007996-00	15.08.26	Metalaxyl + Prothioconazole	Fusarium spp. Phytophthora spp.
Surrender	00A774-00	31.10.24	Fludioxonil	Fusarium spp.
Vibrance 500 FS	008230-00	31.01.25	Sedaxane	Rhizoctonia spp.

Source: <https://psm-zulassung.bvl.bund.de/psm>

# Seed coatings – current situation



- Only a few fungicides are authorized for the chemical seed treatment

National Action Plan



- 30 % reduction in the risks that the use of plant protection products entails for the environment by 2023 (based on the average of the years 1996 to 2005)
- Limiting the use of plant protection products to the necessary minimum
- Plant protection methods that involve limited use of plant protection products in integrated pest management and organic farming

# Integrated pest management



- growth of a healthy crop with the least possible disruption to agro-ecosystems
- encourage of natural pest control mechanisms

Legend: **PREVENTION** **OBSERVATION** **INTERVENTION**

Adapted from "Integrated Pest Management", by BioRender.com (2024). Retrieved from <https://app.biorender.com/biorender-templates>

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# Testing alternative seed coatings

- increasing interest and demand for alternative products and treatment methods

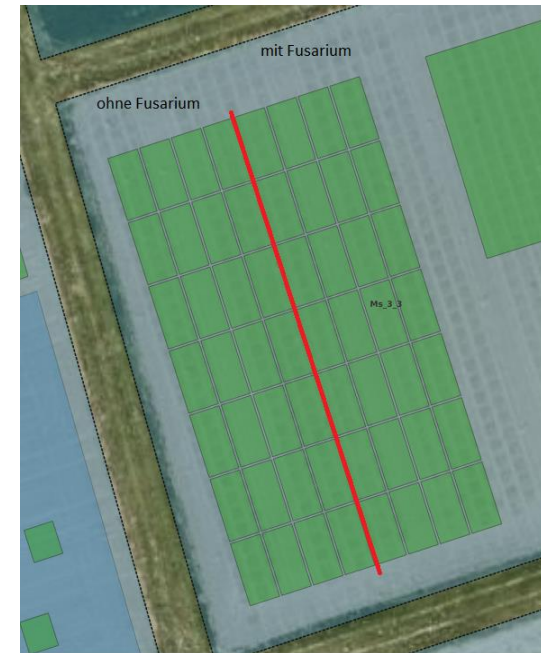
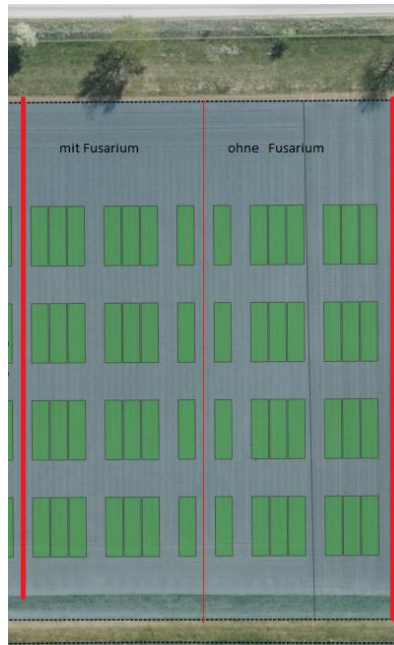


- Sweet corn, one variety Tramunt
- 3 coatings: control, Redigo M (metalaxyl and prothioconazole), Maisguard (mixture of minerals, root stimulants, plant extracts and soil bacteria)
- 2 field sites
- 2 treatments: with/ without *Fusarium* spp.
- 4 plots per treatment and coating



# Field sites

- Braunschweig, Germany
- Soil: silty loam



Fusarium spp. infected wheat kernels

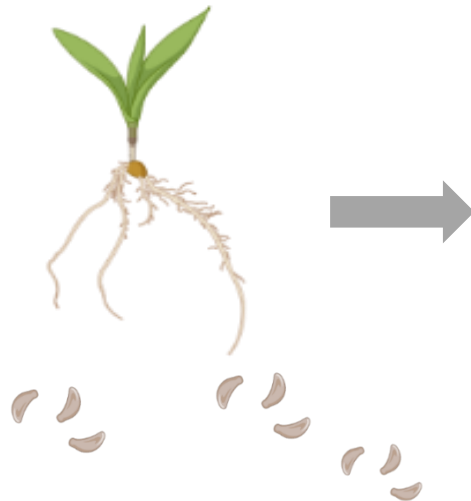
A) Bundesallee

B) Messeweg



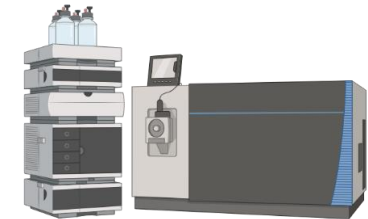
# Seed coatings

Plant emerge  
BBCH14



Weight

Mycotoxins



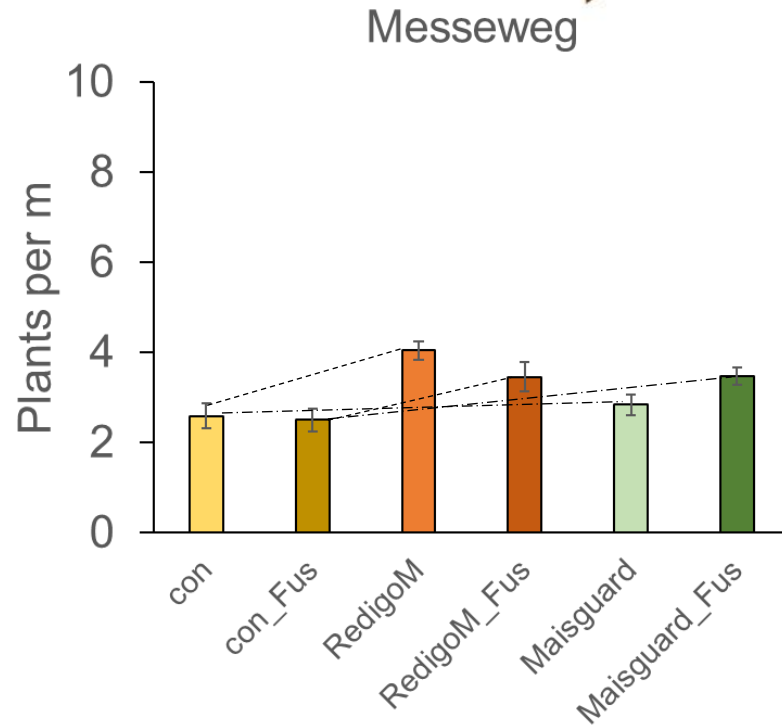
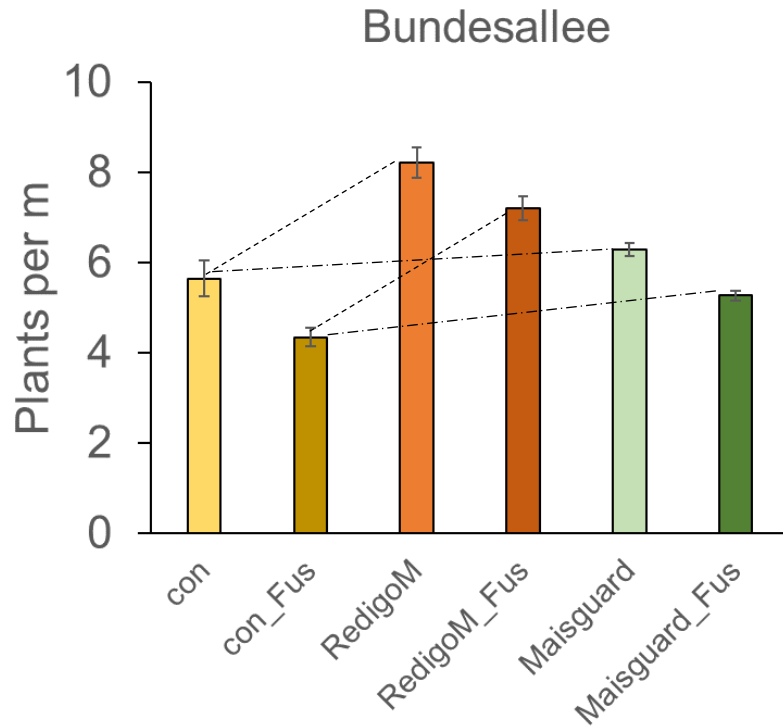
LC-MS/MS analysis

Natural soil microflora vs.  
infected soils



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# Plant emergence at BBCH14

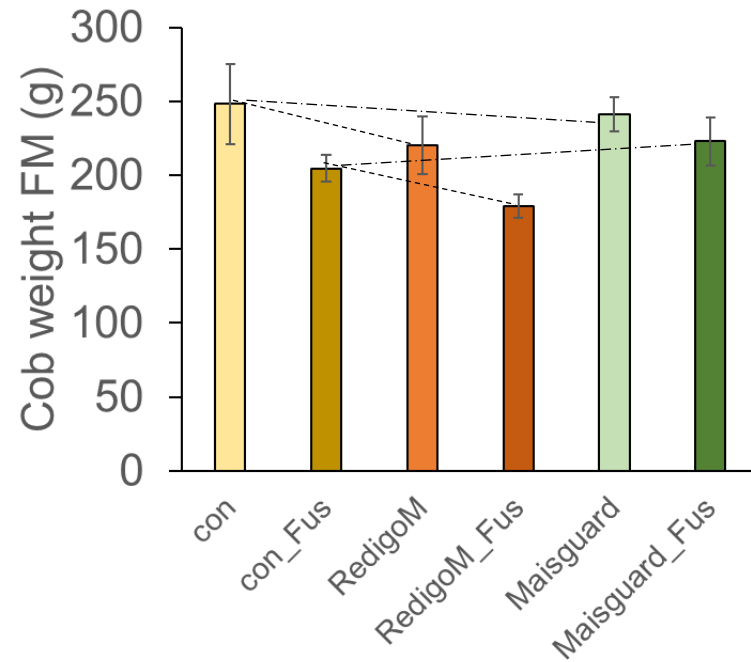
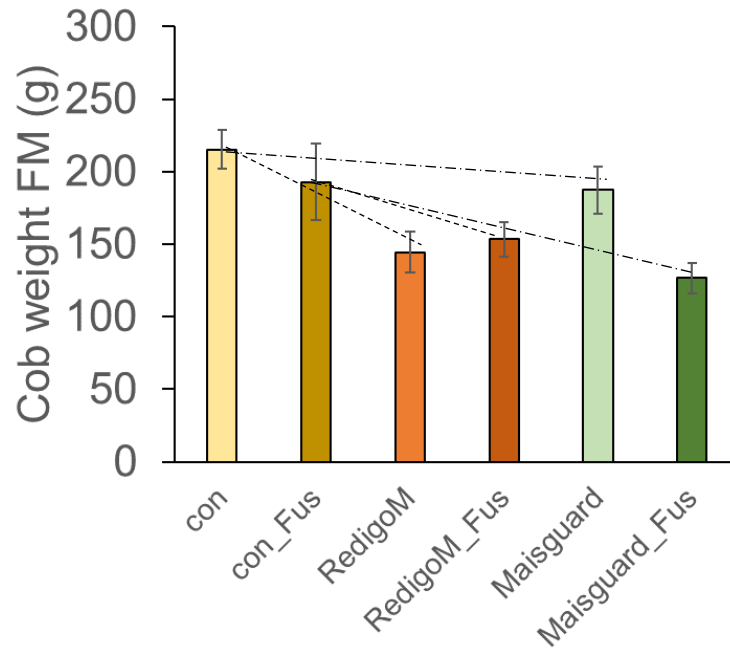


# Cob mass

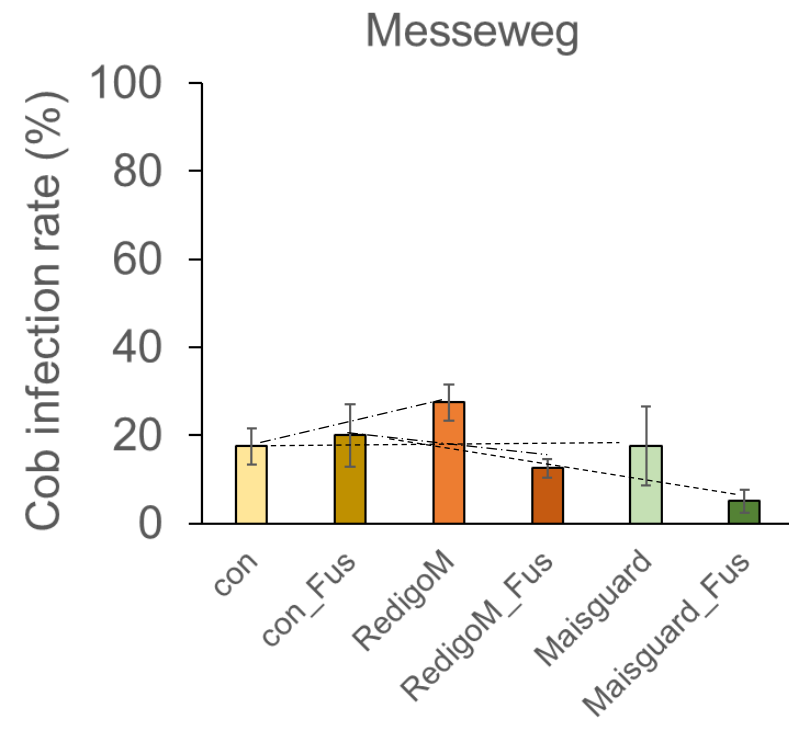
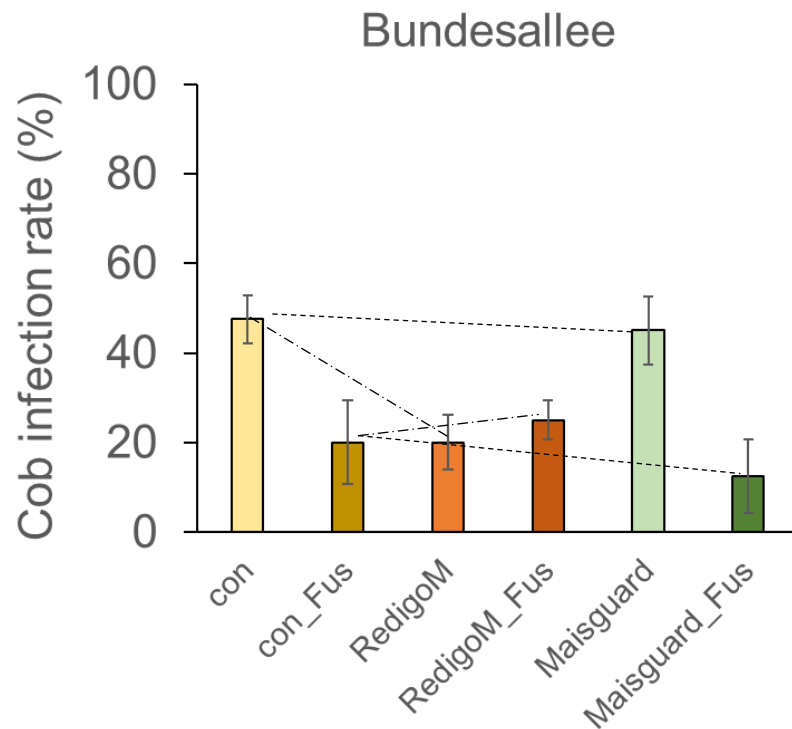


Bundesallee

Messeweg



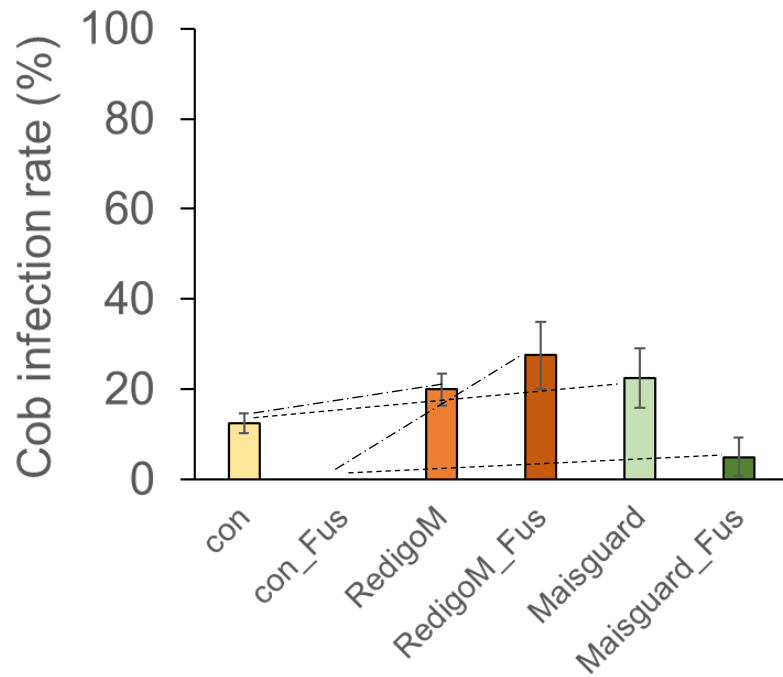
# Cob infection rates



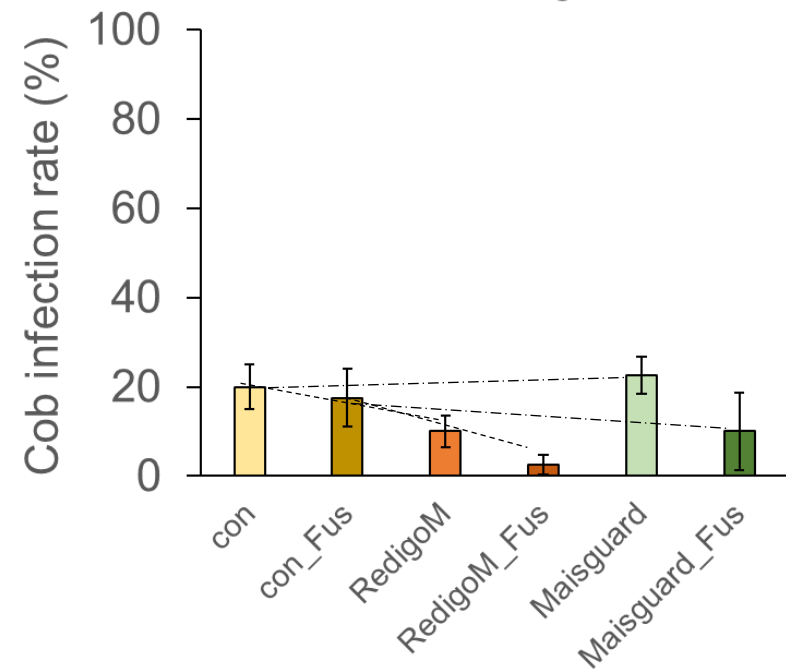
# Corn borer - *Ostrinia nubilalis*



Bundesallee



Messeweg



# Mycotoxin occurrence in kernels – Deoxynivalenol (DON)



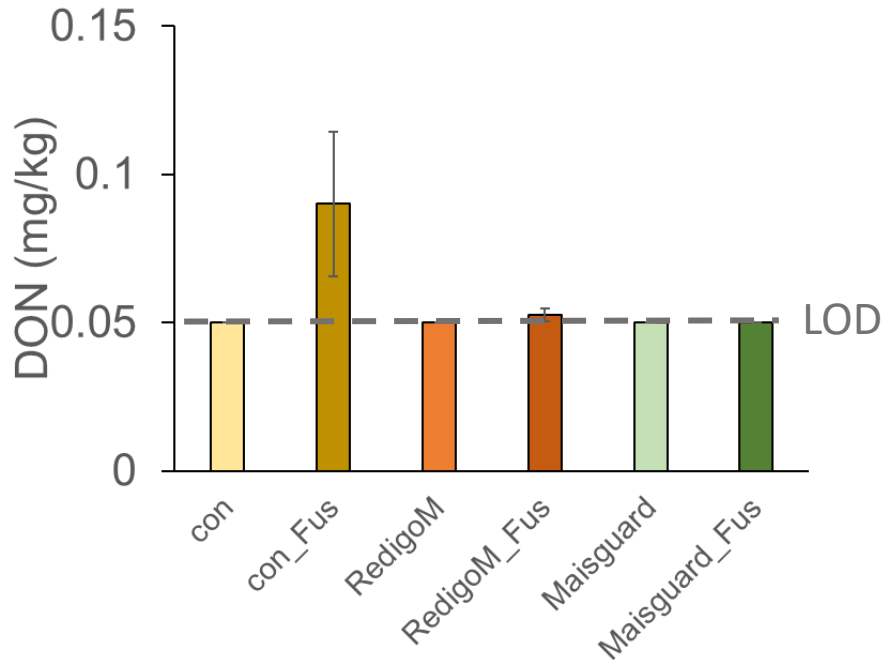
Mycotoxins



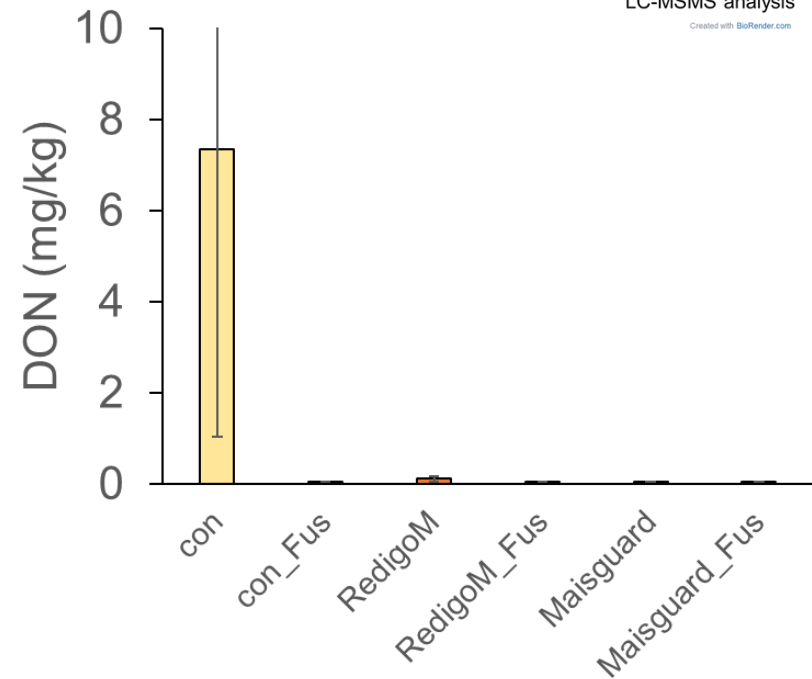
LC-MS/MS analysis  
Created with BioRender.com



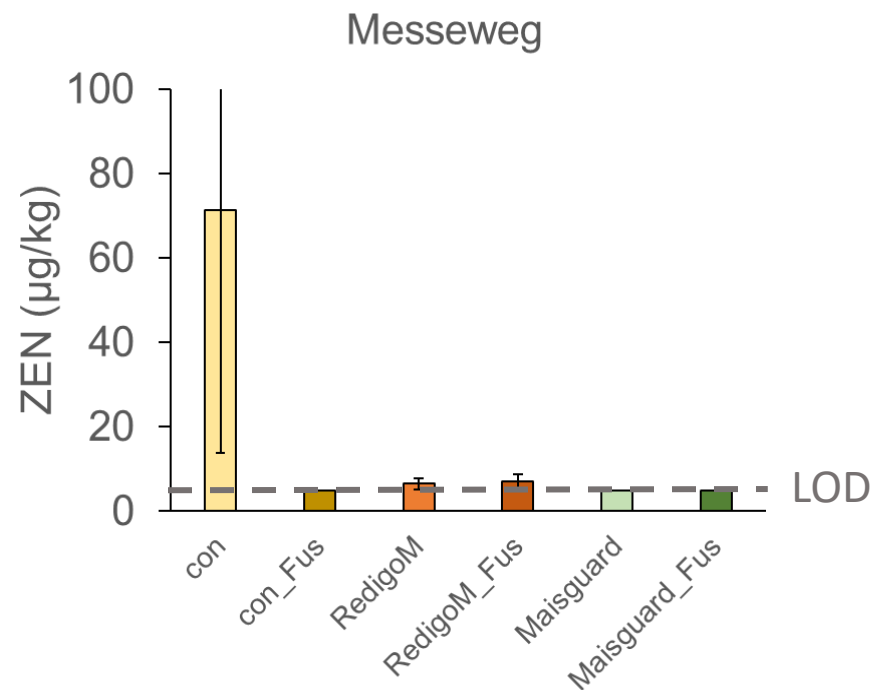
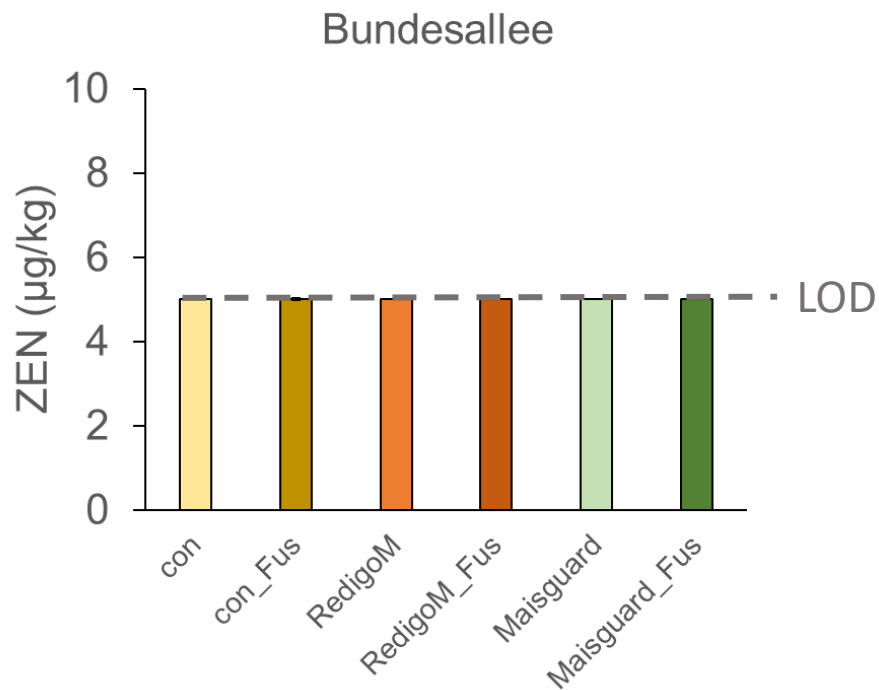
### Bundesallee



### Messeweg



# Mycotoxin occurrence in kernels – Zearalenone (ZEN)



# Summary



- The chemical seed coating product and the alternative ecological product led to improved plant emergence compared to the control.
- With regard to the mycotoxin contents detected in maize grain, a likewise lacking or low impact from both coating methods was observed.



# Acknowledgements



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Many thanks to Vanessa Schmidt, Tanja Schütte, Bernd Kahlstorf  
and Florian Lalla for technical assistance in field work

SeedForward for providing the coated sweet corn



# Who was Julius Kühn?

- Julius Kühn lived from 1825 till 1910.
- He established and developed the agrarian sciences as part of university education in Germany in the 19th century.
- He is one of the most prominent founders of modern phytomedicine.
- In 1863 he was given the permission to establish the first independent research institute in agricultural sciences in Germany at the University of Halle.
- Under his leadership during the next 40 years, this institution evolved into the most eminent educational and research institution of agrarian sciences in Germany at that time.
- He published about 300 articles mainly about plant protection.

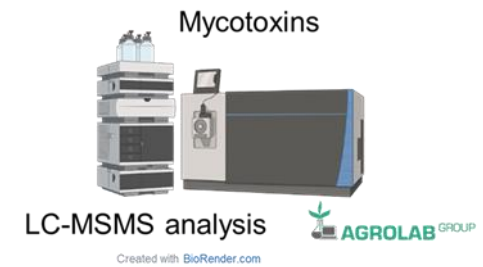


# Mycotoxin occurrence in kernels – Fumonisin B1 and B2



## Bundesallee

	B1		B2	
	µg/kg	SE	µg/kg	SE
con	67.5	41.1362067	31.25	9.742785793
con_Fus	39.925	10.7535677	20	0
RedigoM	267.5	214.341287	75.5	48.06440991
RedigoM_Fus	36.6	10.1247222	20.7	0.606217783
Maisguard	20.05	0.04330127	20	0
Maisguard_Fus	41	18.1865335	25.2	4.5033321



## Messeweg

	B1		B2	
	µg/kg	SE	µg/kg	SE
con	261.4	124.804026	78.9	35.84037528
con_Fus	2339.95	1590.73943	742.5	534.5426199
RedigoM	792.25	191.359078	248.95	80.03109942
RedigoM_Fus	662.25	374.812015	204.65	120.8997183
Maisguard	927.5	299.315573	240.125	72.23969974
Maisguard_Fus	126.3	76.767498	30.55	9.13656801