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2014 - 2020

# Organic breeding for resilient cropping systems with a focus on common bunt

EIP-project “Seed health Hessen”, Dr. C. Vollenweider, 9.11.23

# Content

I. Common bunt of wheat
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III. Comprehensive plant health strategies

# I. Common bunt of wheat

https://bauernzeitung.at/so-halten-sie-den-steinbrand-in-schach/ (Accessed on: 30.01.23)

https://www.pflanzenkrankheiten.ch/krankheiten-an-kulturpflanzen-2/getreide-mais/weizen/tilletia-caries-weizen (Accessed on: 30.01.23)

# Common bunt (*Tilletia caries*)

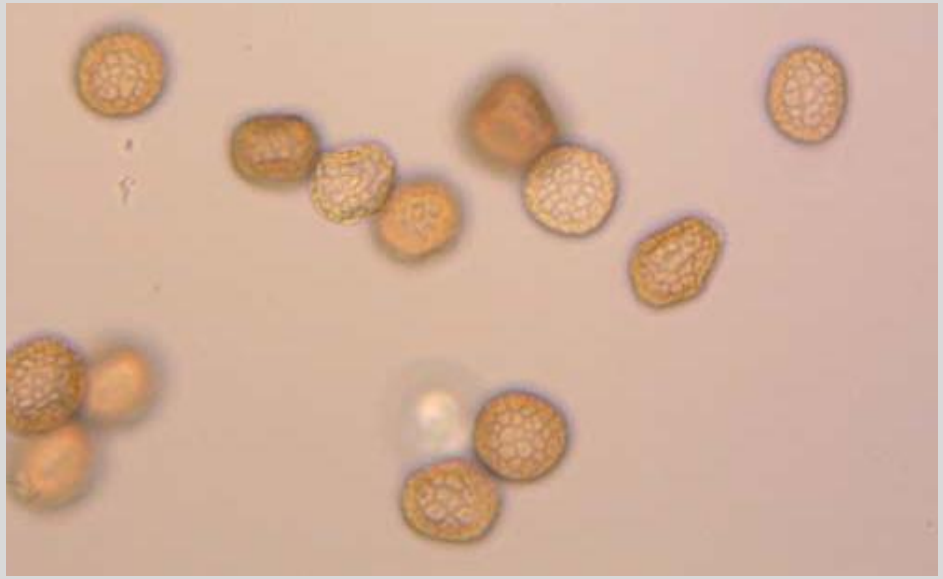
- Fungal spores instead of grains
- Seed-borne disease

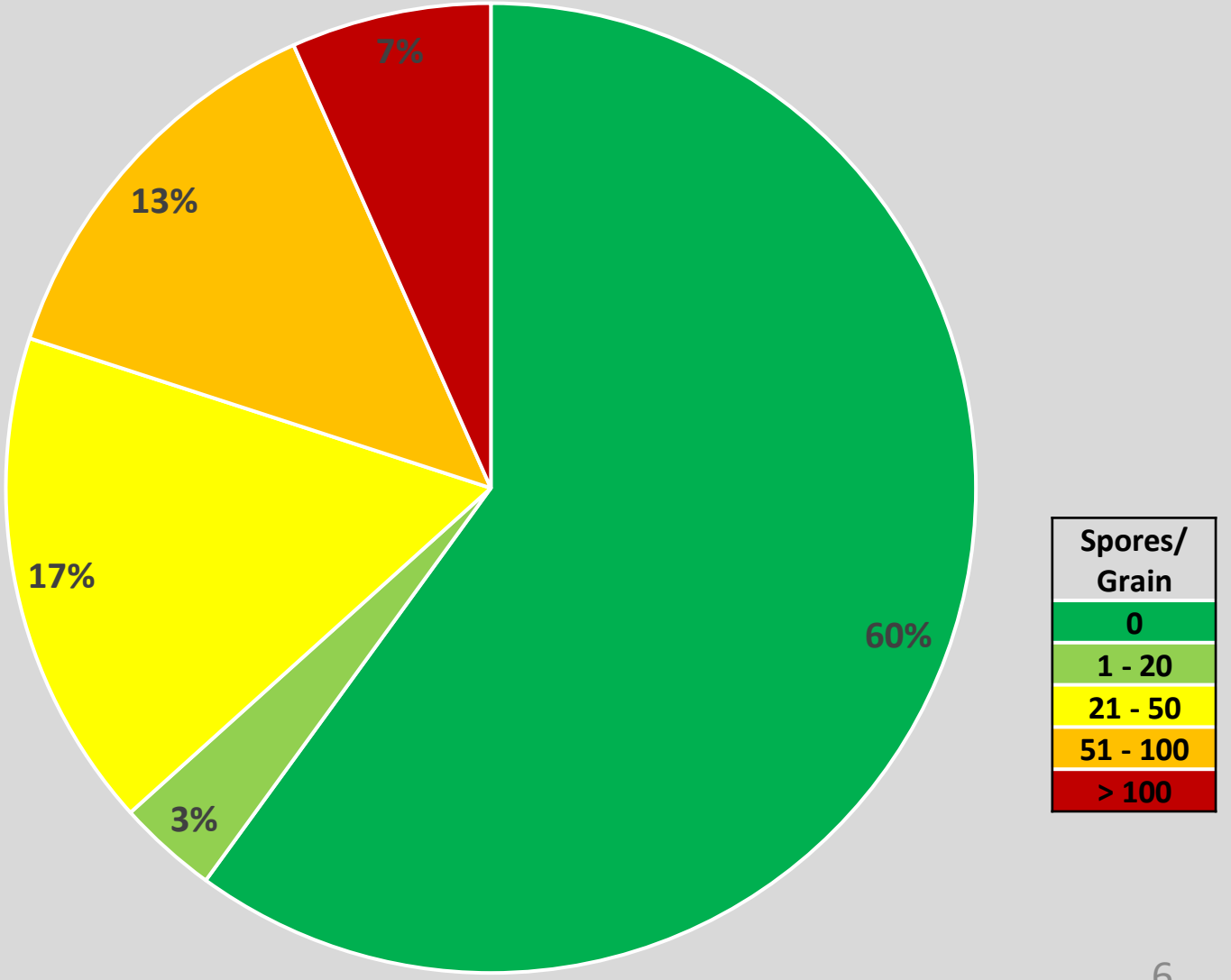
# A dangerous disease in organic farming

1. **Synthetic seed treatments** are **not available**
2. Almost all **varieties are susceptible**
3. **Entire seed lots at risk**, long-term contamination hazards

# **Common bunt monitoring 2021**: Spore counts

- 30 pre-cleaned seed samples from OBEG Hohenlohe
- Analyzed in the EIP-project "Seed health Hessen"








Data from the EIP-project „Seed health Hessen"

# II. Organic breeding

Varieties are developed

1. under organic growing conditions
2. respecting organic principles (breeding methods)

# Organic bunt resistance breeding

~15 resistant wheat cultivars registered in Germany (from Cultivari Darzau, FZD)

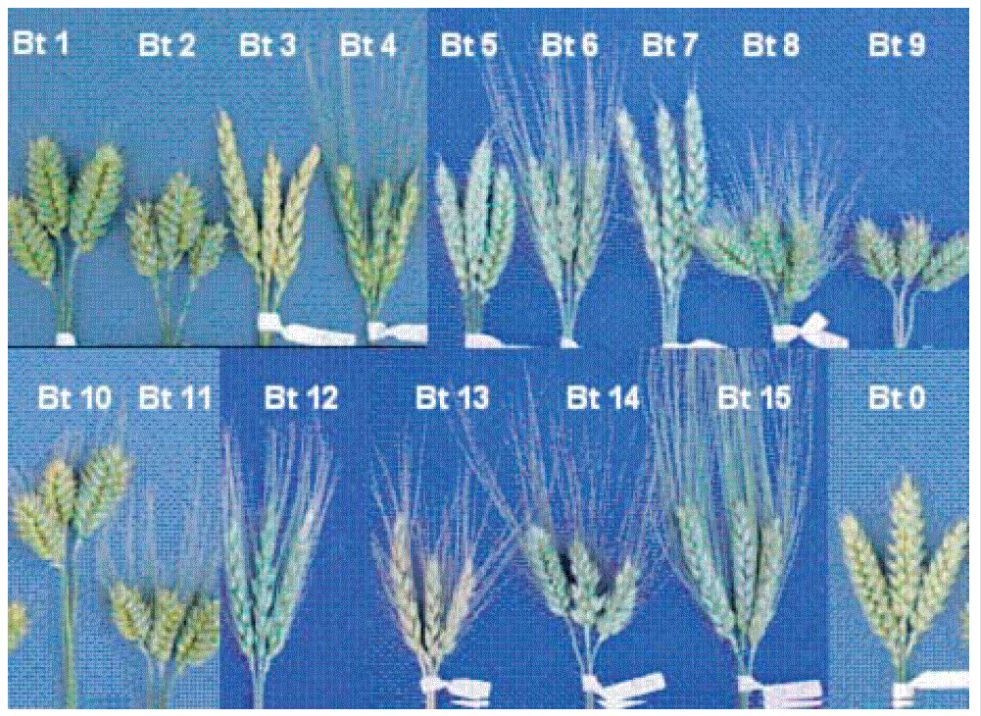
# Sustainability

Monogenic resistances can be broken.
What can be done?

# Gain a better understanding

of types of resistance and bunt races

develop strategies to protect resistance genes (diversification, pyramidization,… )




Source: Wächter et al. 2007

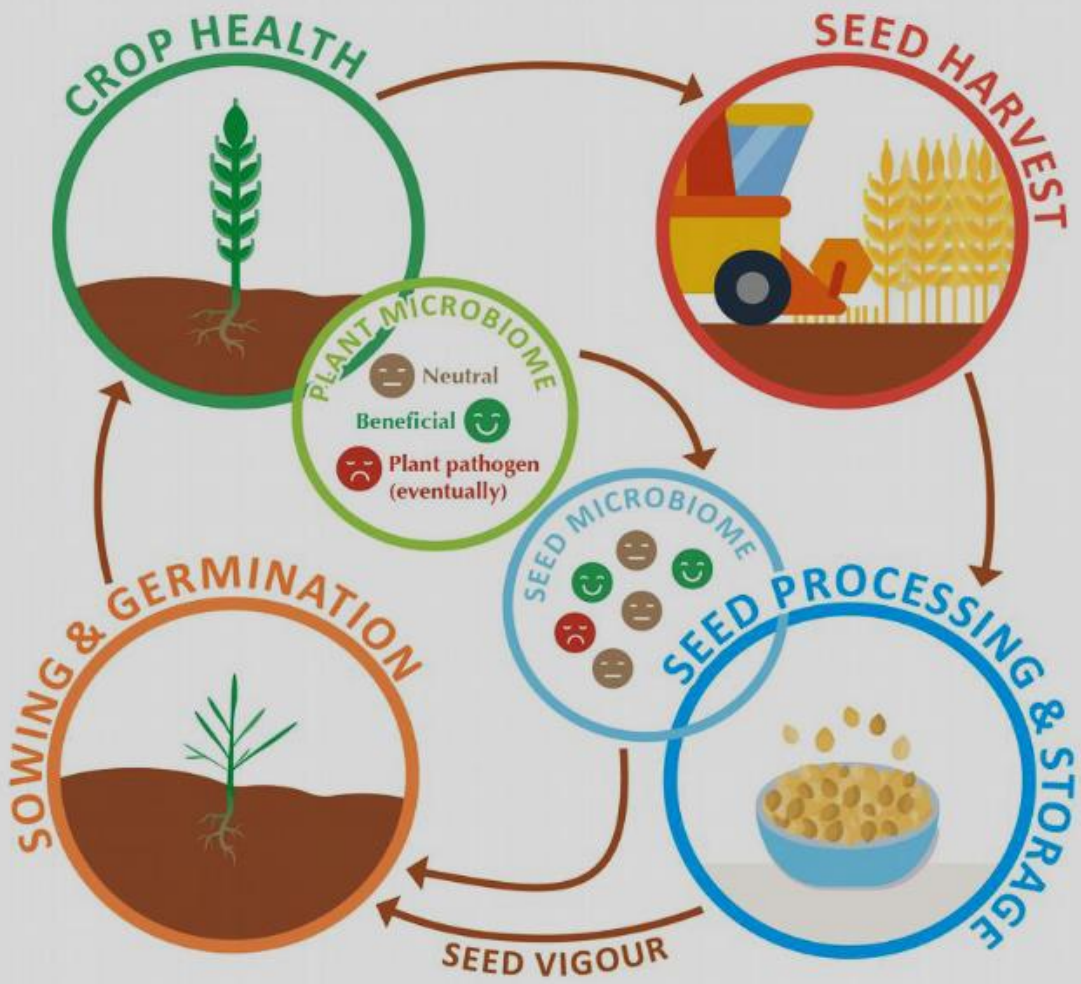
# Predicting resistance genes

Work done by Dr. A. Borgen and in the EIP-project “Seed health Hessen”

| Variety | Year | Bunt isolates (colored numbers indicate infection levels in %) | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | vr0 | vr3 | vrDot | vr10 | vr13 | vr2 | vr341 | vr8 | vrG | vrP(wes) | vrR | vr1 | vr3540 | vr4 |
| Butaro | 2018 | | | | 4 | 2 | 70 | | | 0 | | 0 | 39 | | 0 |
| Butaro | 2019 | 0 | 0 | 0 | 21 | 4 | 90 | 0 | 0 | 17 | 24 | | | | |
| Aron | 2018 | | | | 0 | 0 | 4 | | 0 | 5 | | 18 | 27 | | 33 |
| Aron | 2019 | 62 | 38 | 17 | 47 | 0 | 26 | 31 | 32 | 86 | 36 | | | | |
| Bill | 2018 | | | | 0 | 0 | 0 | | 4 | 18 | | 0 | 0 | | 0 |
| Bill | 2019 | 5 | 0 | 0 | 10 | 0 | 0 | 0 | 0 | 55 | 0 | | | | |
| Blizzard | 2019 | 0 | 0 | 5 | 0 | 0 | 0 | 0 | | 0 | | | | | |
| Bonneville | 2019 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | 0 | | | | | |
| Bussard | 2018 | | | | 0 | 0 | 66 | 0 | 2 | 6 | 100 | 56 | 31 | 0 | 0 |
| Bussard | 2019 | 7 | 94 | 70 | 7 | 0 | 94 | 3 | 0 | 21 | 11 | | | | |
| Tilexus | 2019 | 0 | 0 | 0 | 88 | 0 | 0 | | | 0 | | | | | |
| Tillstop | 2019 | 0 | 0 | 0 | 33 | 0 | 0 | | | 0 | | | | | |

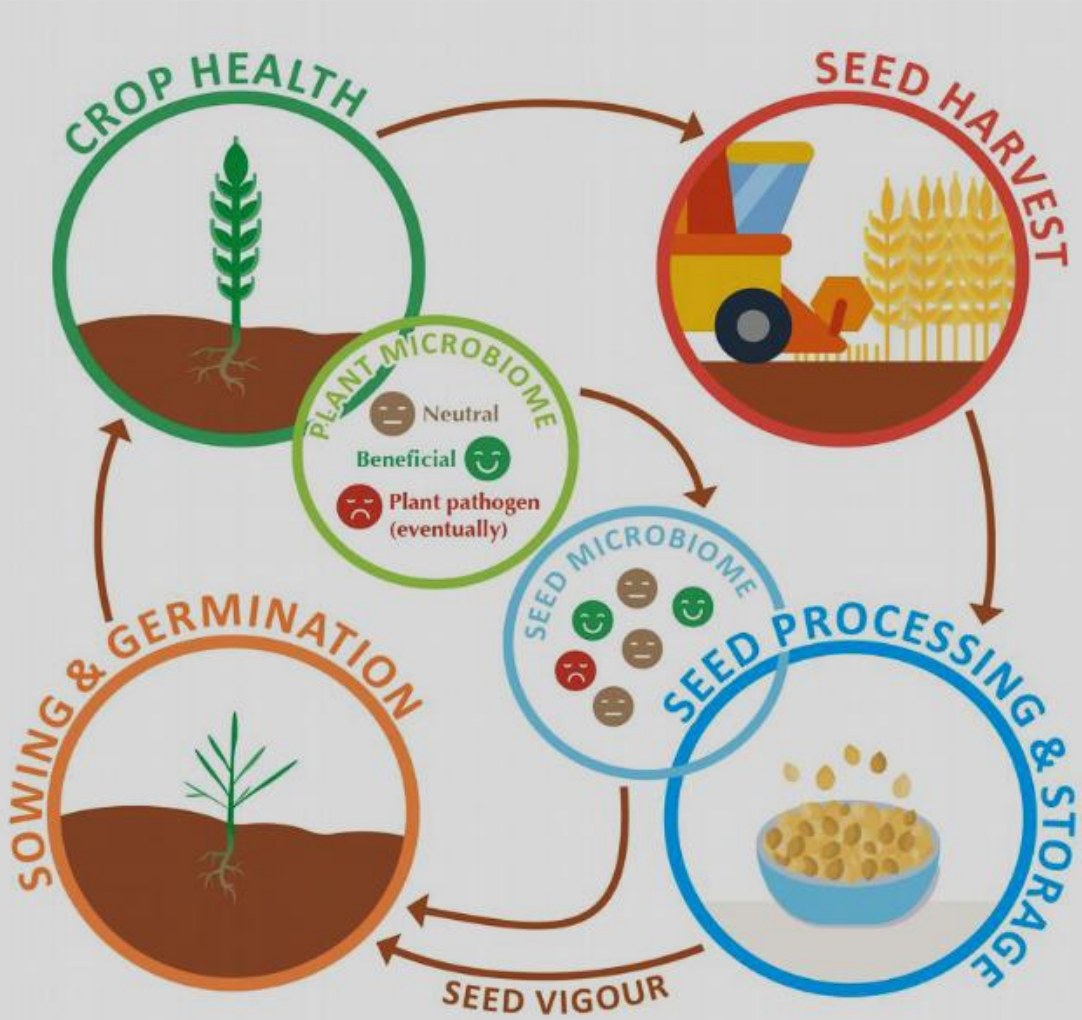
*Common bunt trials conducted at Agrologica, Mariager, DK in 2018-19 within the EU-Horizon 2020-project Liveseed. The varieties in the table were infected with the indicated bunt isolates.

# III. Comprehensive plant health strategies




Source: Klaedtke S. (2021):Common bunt management on organic wheat: multi-factorial, knowledge-based. Contribution to the International Workshop on Bunt and Smut Diseases – May 6th, 2021

# Integrate measures




1. **Seed quality & controls**
2. **Curative** (in case of an infection) **& preventive** agronomic **measures**
3. **Organic seed treatment**
4. **Resistance breeding**

Source: Klaedtke S. (2021):Common bunt management on organic wheat: multi-factorial, knowledge-based. Contribution to the International Workshop on Bunt and Smut Diseases – May 6th, 2021

# Heterogeneous populations

| Category | Bunt resistant populations | | Varieties (for comparison) |
|---|---|---|---|
| Subcategory (# entries) | CCP (2) | Dynamic (2) | Susceptible varieties (4) |
| Common bunt infection* [%] | 0.3-6.9 | 0 | 13.0-81.3 |

*Results from common bunt trials conducted at Dottenfelderhof, 2022-23
CCP: Composite Cross Population; dynamic population: generated from multiple breeding lines

# Outlook

- implement effective **holistic plant health strategies** and
- tackle similar challenges such as loose smut