WEED RESISTANCE COMPETENCE CENTER

# A long-term study on spatial and temporal development of ACCase and ALS inhibitor resistance in blackgrass (Alopecurus myosuroides Huds.)

## Review of a three-year sampling period in neighboring fields in Germany

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## Background

- Herbicide resistant blackgrass is an increasing problem in farming systems of Western Europe
- ACCase and ALS-inhibitors together with pre-emergence compounds are used for blackgrass control in Germany
- Resistance to either of these modes of action creates an agronomic problem for farmers
- Early measures need to be taken to sustainably manage a resistance before a major outbreak

**Aim of the study: Investigate the dynamics of herbicides resistance to ACCase- and ALS-inhibitors in space and time in individual fields within small landscapes**

## Material & Methods

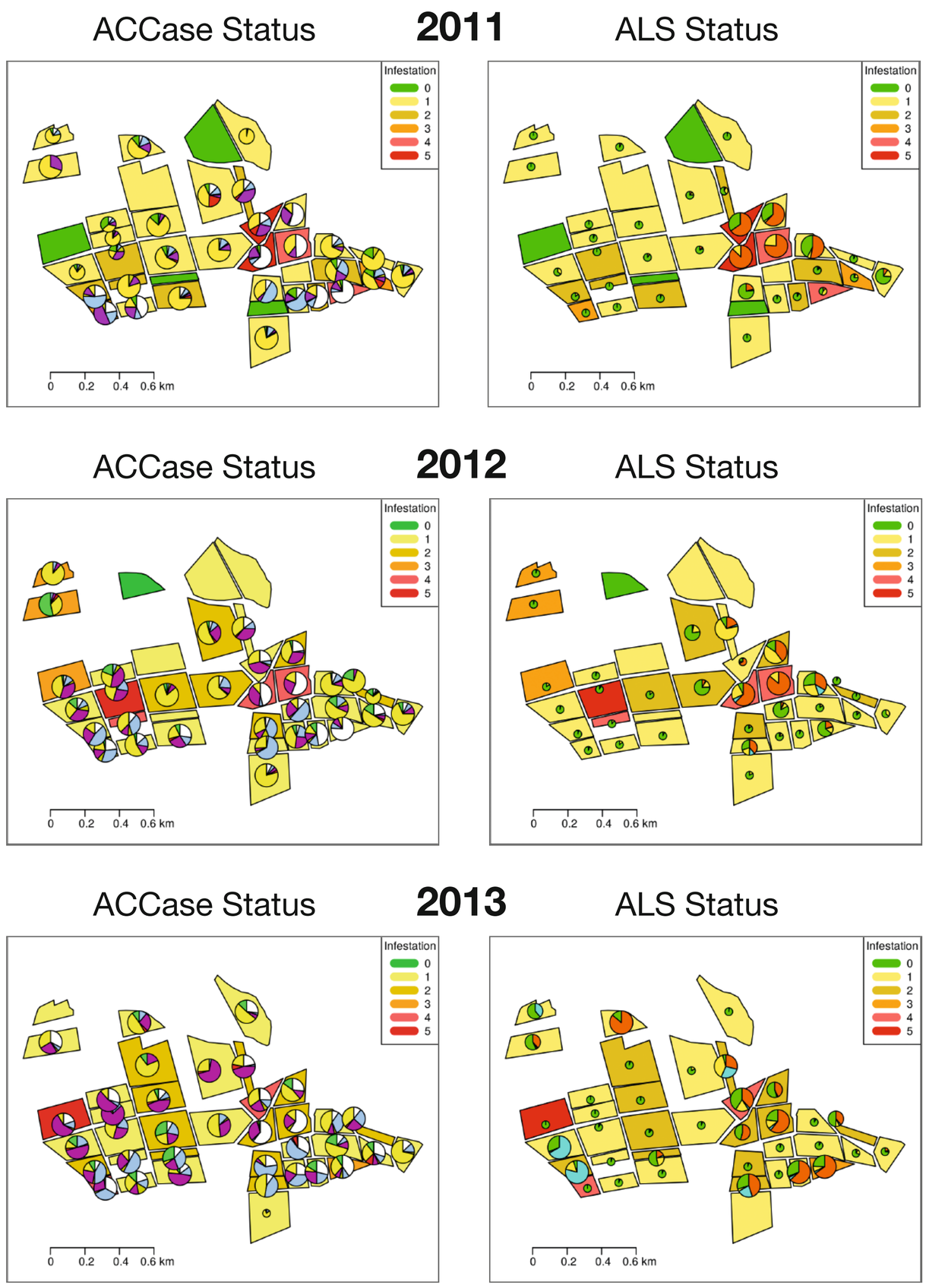
1. Sampling of more than 100 neighboring fields of more than 50 farmers in three nearby locations in Southern Germany
2. Recording of infestation levels in the field (0=no blackgrass to 5=heavy infestation)
3. Greenhouse bioassays with commercial formulations of fenoxaprop-ethyl (Ralon Super®) at 166 g $ha^{-1}$ and three doses of mesosulfuron-methyl+ iodosulfuron (Atlantis WG®) at 15+3 to 60+11 g $ha^{-1}$
4. Laboratory analysis of greenhouse survivors for known ACCase (I1781, W2027, I2041, D2078, G2096) and ALS (P197, W574) target site mutations

## Results

- Resistance to fenoxaprop-ethyl established in >90% of sampled fields
- Resistance to mesosulfuron-methyl in development (<20% fields)
- All known ACCase and ALS mutations conferring resistance were found
- High temporal variability between observations of two different years (Adjusted Rand Index (0.05-0.19)
- Low spatial correlation between observations

## Conclusions

- Blackgrass was found in all fields but not in every year, with infestation levels being mostly below agronomical relevant thresholds
- Resistance status in fields with low/moderate infestation status is variable over years
- Resistance develops independently from neighboring fields
- Single-year observations do not give the full picture of the resistance status of a field




Resistance status maps for ACCase (left) and ALS (right) between 2011-2013. Field color shows infestation level (0-5) at harvest. Pie size shows resistance status as confirmed by greenhouse bioassays and pie color presents the corresponding resistance mechanism

**Work in progress: Analysis of field history information (<10yrs) combined with field observations aim to identify the driving factors of evolution of herbicide resistance in blackgrass**