

VIII Cultivar resistance against downy mildew (*Peronospora destructor*) in onions

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Introduction

Downy mildew (*Peronospora destructor*) is a serious disease that causes significant yield losses in onion production in Denmark, particularly when the attacks commence early in the season. Onion plants are intensively sprayed against downy mildew, which is not sustainable. Given the recent demands to reduce pesticide usage in agriculture, there is a pressing need to develop tools that can assist farmers in the correct usage of fungicides. Host resistance is an effective and environmentally friendly tool for managing plant diseases. For onion downy mildew, host resistance is considered one of the key elements for successful disease management that relies less on fungicides. However, systematic classification of the resistance and its subsequent integration into IPM strategies has not been carried out in Denmark. This study focused on assessing the resistance level of onion cultivars to downy mildew.

Materials and methods

Field experiments were carried out at AU Flakkebjerg and at Eggeslevmagle to assess the resistance of different onion cultivars (Table 1) to downy mildew. The experiment at AU Flakkebjerg was artificially inoculated by placing infected onion bulbs between the rows in the middle of July.

The disease level was assessed as the percentage of the leaf area affected by downy mildew per plot. The disease assessment data were used to calculate the relative area under the disease progress curve (rAUDPC) as described by Abuley and Hansen (2022). The rAUDPC data were subjected to analysis of variance (ANOVA). Posthoc analysis was done using the Tukey HSD test in R (R Core Team, 2023).

Table 1. Tested onion cultivars at AU Flakkebjerg and at Eggeslevmagle.

Cultivar	Location
Hystore	AU Flakkebjerg and Eggeslevmagle
Hylander	AU Flakkebjerg and Eggeslevmagle
Hygate	AU Flakkebjerg
Highroad	AU Flakkebjerg and Eggeslevmagle
Redlander	AU Flakkebjerg
Restora	AU Flakkebjerg and Eggeslevmagle
EXP 388	AU Flakkebjerg and Eggeslevmagle
BGS 377	AU Flakkebjerg and Eggeslevmagle
Fasto	AU Flakkebjerg
37-117	AU Flakkebjerg and Eggeslevmagle
Redrover	AU Flakkebjerg and Eggeslevmagle

Results and discussion

A significant disease development was observed at the two experimental sites, which made it possible to distinguish between the cultivars. rAUDPC, which indicates the disease level among the different onion cultivars, is depicted in Figure 1. The statistical analysis showed a significant effect of the cultivar on the rAUDPC ($p < 0.001$). The results suggest that the onion cultivars Redlander, Restora, EXP 388 and Hylander exhibit greater resistance to downy mildew. These resistant cultivars are promising for future management of downy mildew.

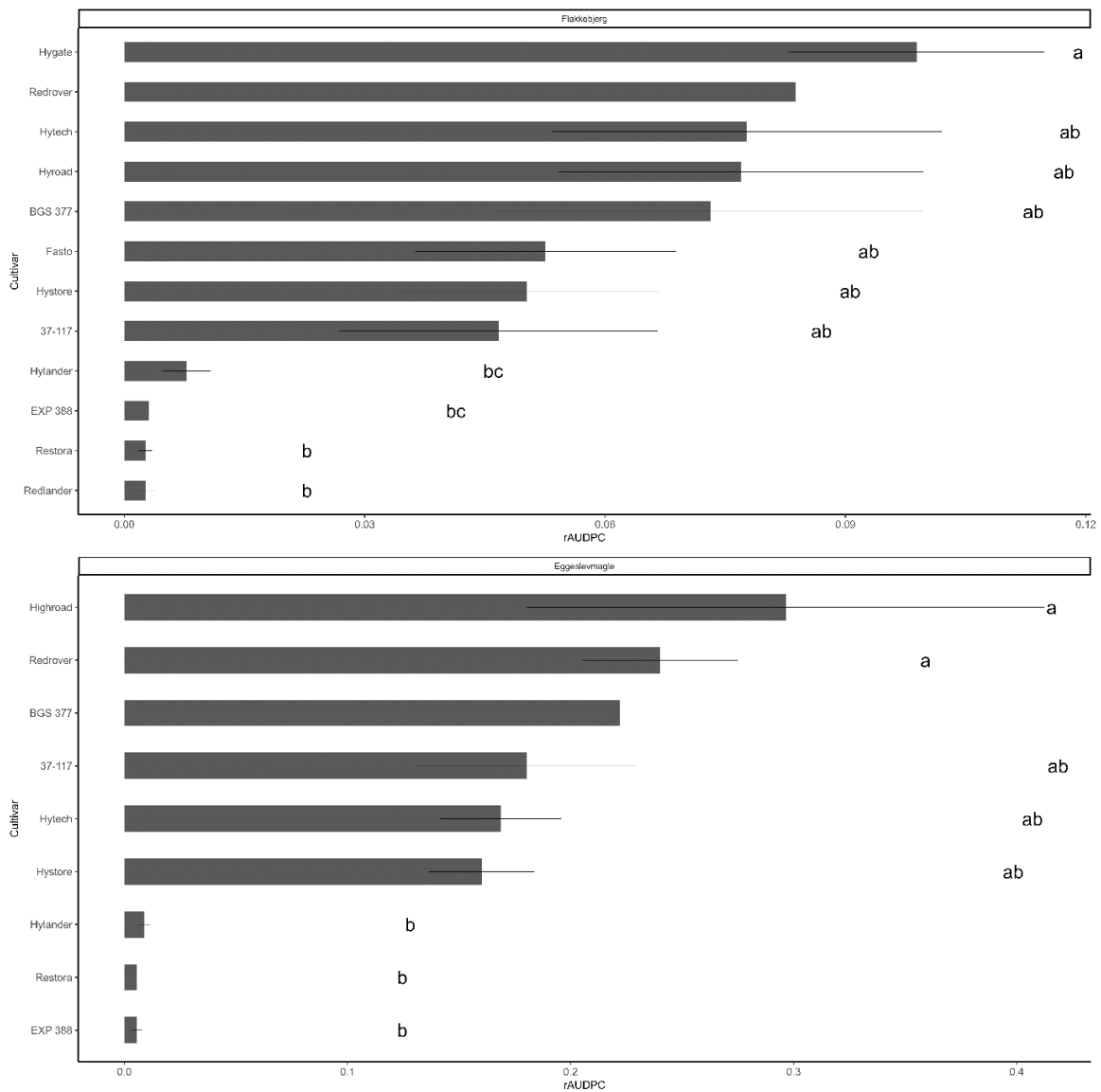


Figure 1. A bar chart showing the mean relative area under the disease course curve (rAUDPC) for downy mildew in different onion cultivars. The horizontal line on each bar is the standard error. The letter(s) on each bar are the letter(s) of significance. Bars that have the same letters are not significantly different and vice versa.

Acknowledgements

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References

- Abuley, I. K. and J. G. Hansen (2022). Characterization of the Level and Type of Resistance of Potato Varieties to Late Blight (*Phytophthora infestans*). *Phytopathology* 112(9): 1917-1927. <https://doi.org/10.1094/PHYTO-07-21-0309-R>
- R Core Team (2023). R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria.