Quantitative relationships in the infection cycle of seed-borne net blotch

Hans O. Pinnschmidt [1], *Bent J. Nielsen* [1] & *Henrik J. Hansen* [2]

[1] Danish Institute for Agricultural Sciences, Plant Protection Division; [2] Danish Plant Directorate, Microbiological Laboratory

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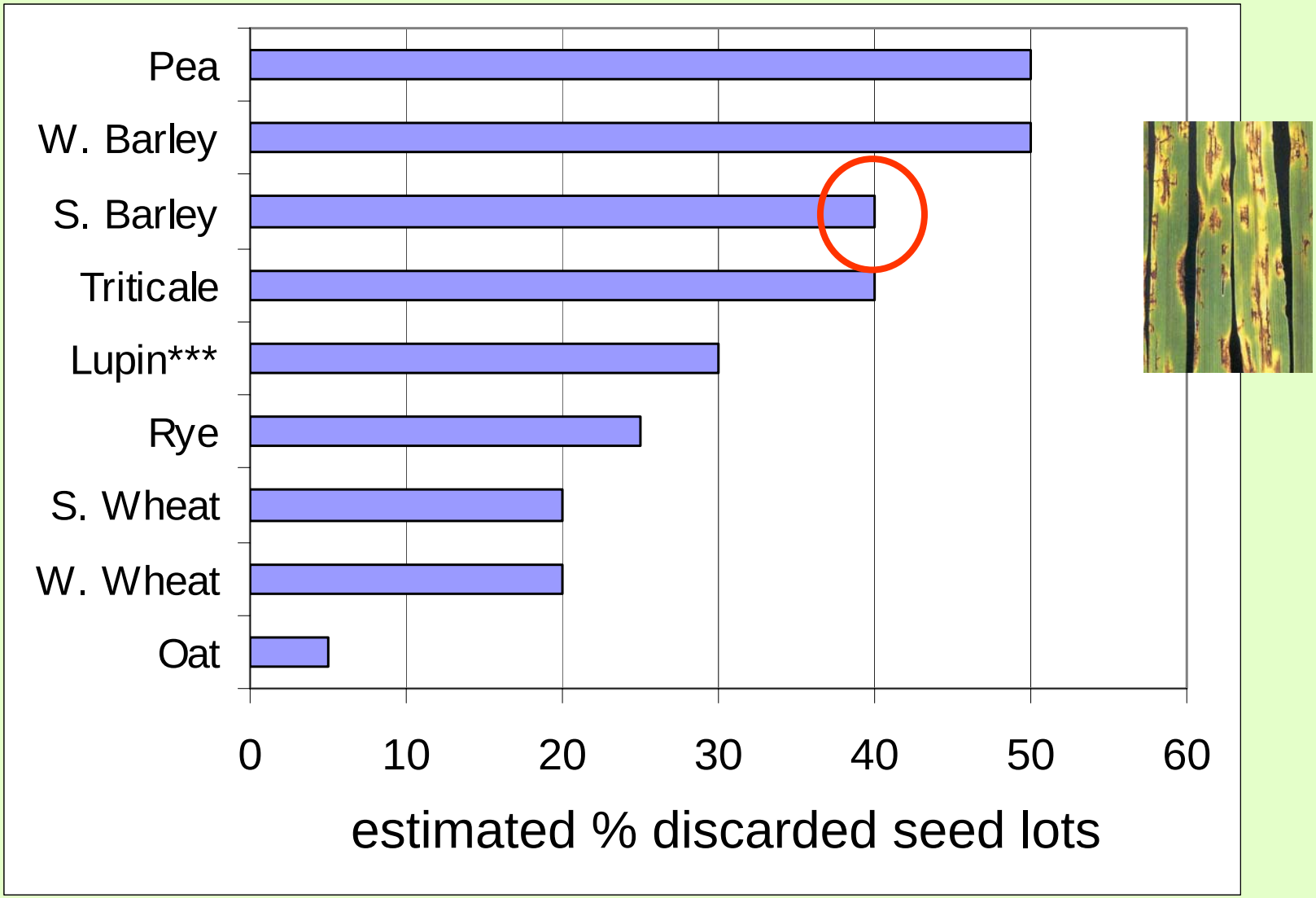
Estimated discarding of organic seed due to seed-borne diseases

Based on seed analysis at organic seed producers 1999/2000

(Bertelsen, 2002)

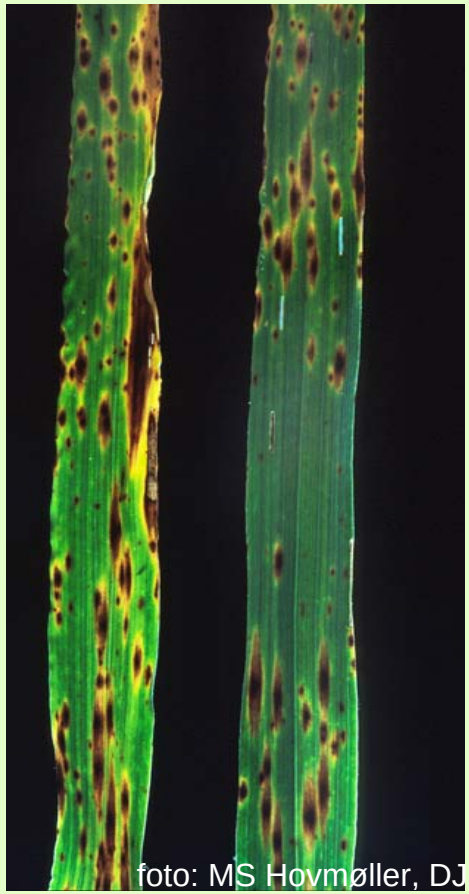


Barley net blotch (*Drechslera [Pyrenophora] teres*)

seed-borne
primary infection

net type
symptoms

spot type
symptoms



Seed infection threshold for barley net blotch (Denmark):

15% infected seeds

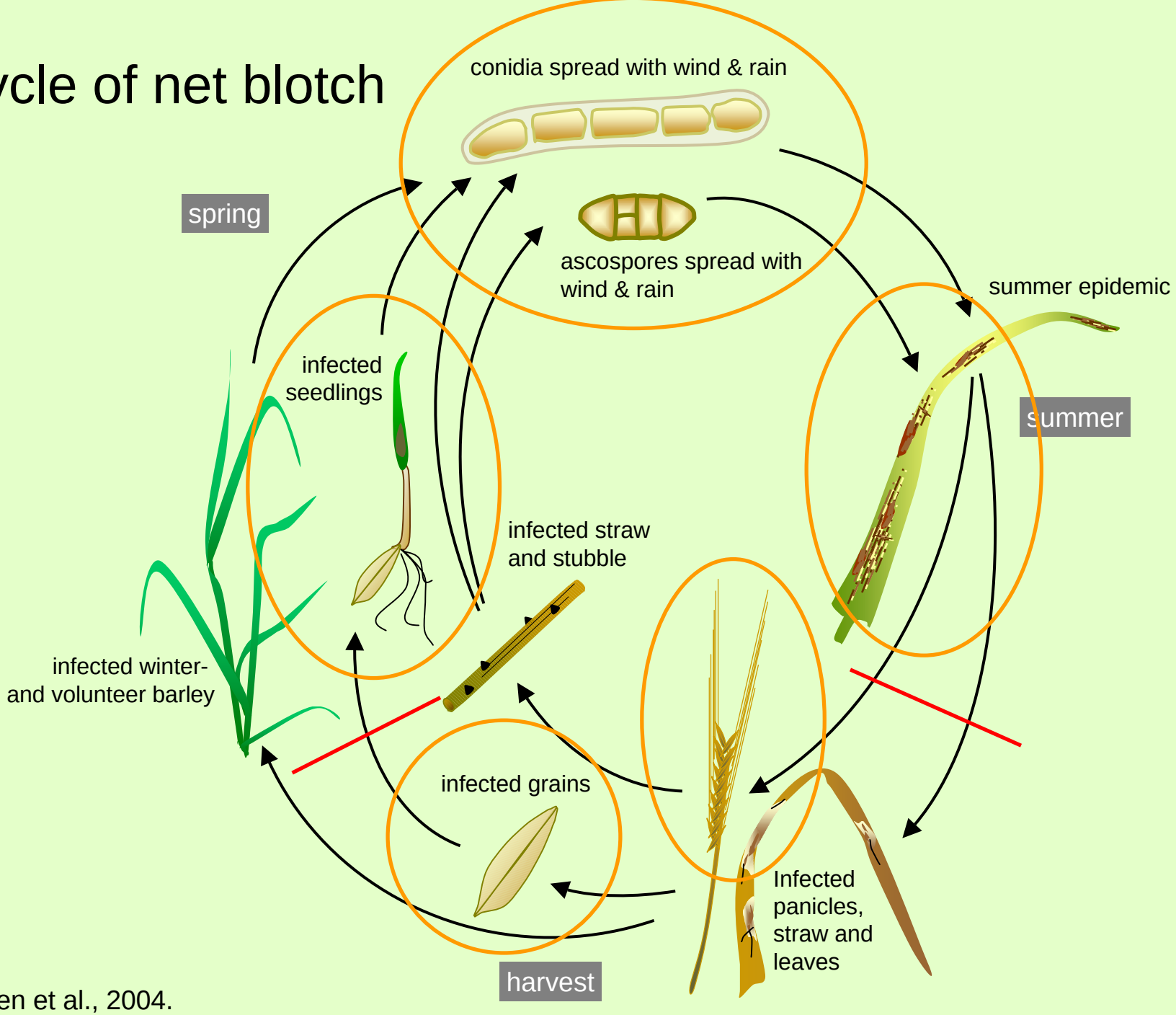
→ organic seed supply threatened in some years!

The ORGSEED project (DARCOF II 2001 – 2005): Healthy seed for organic production of cereals and legumes:

- Revision of seed infection thresholds
- Development of disease propagation models
- … other tasks & objectives …

hans.pinnschmidt@agrsci.dk

Life cycle of net blotch



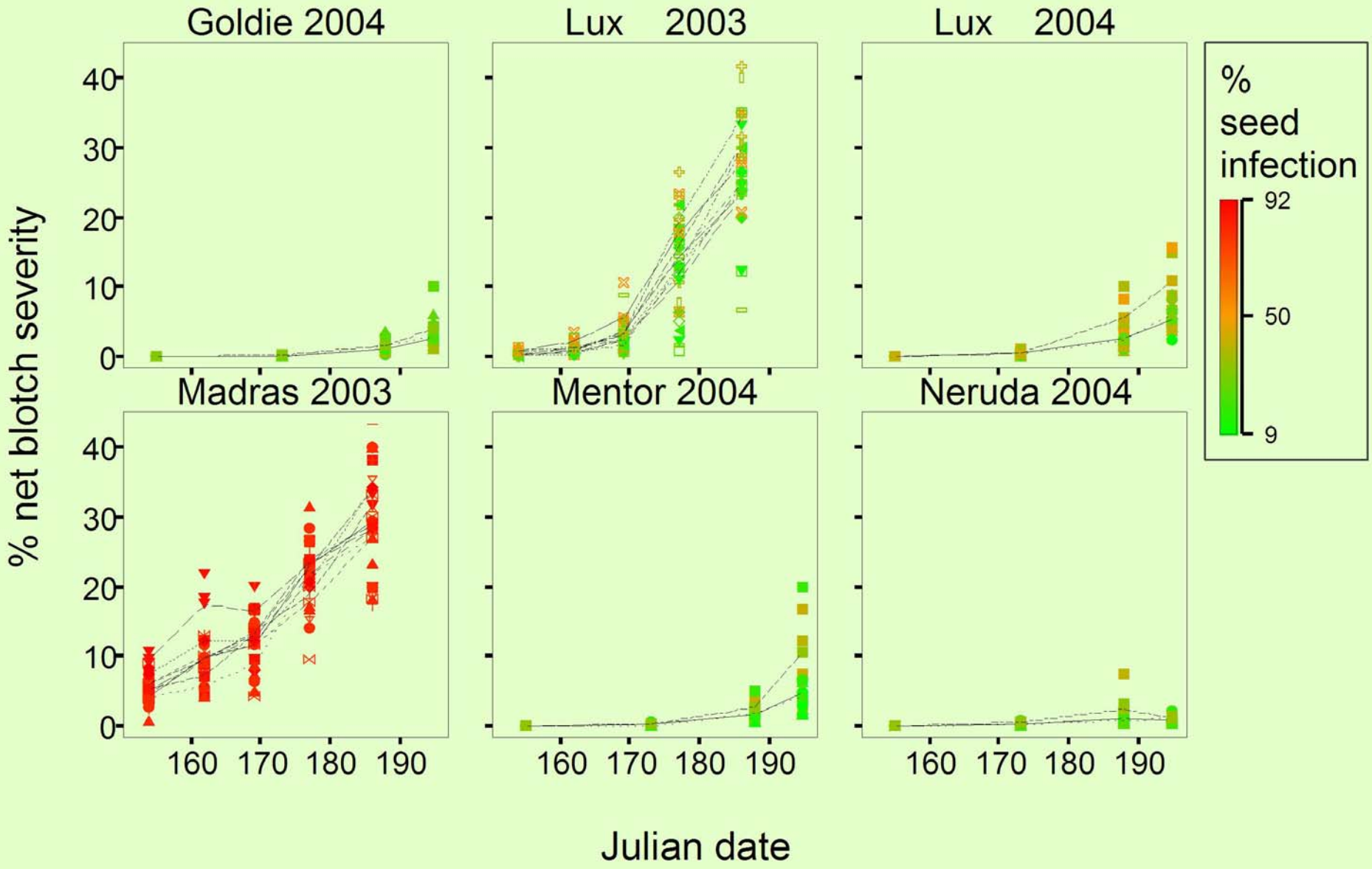
From: Jørgensen et al., 2004.

Objective:

Quantify the links between relevant
life cycle- and damage aspects
of seed-borne net blotch
to provide a data basis for developing
decision tools for net blotch management
in organic barley (seed) production.

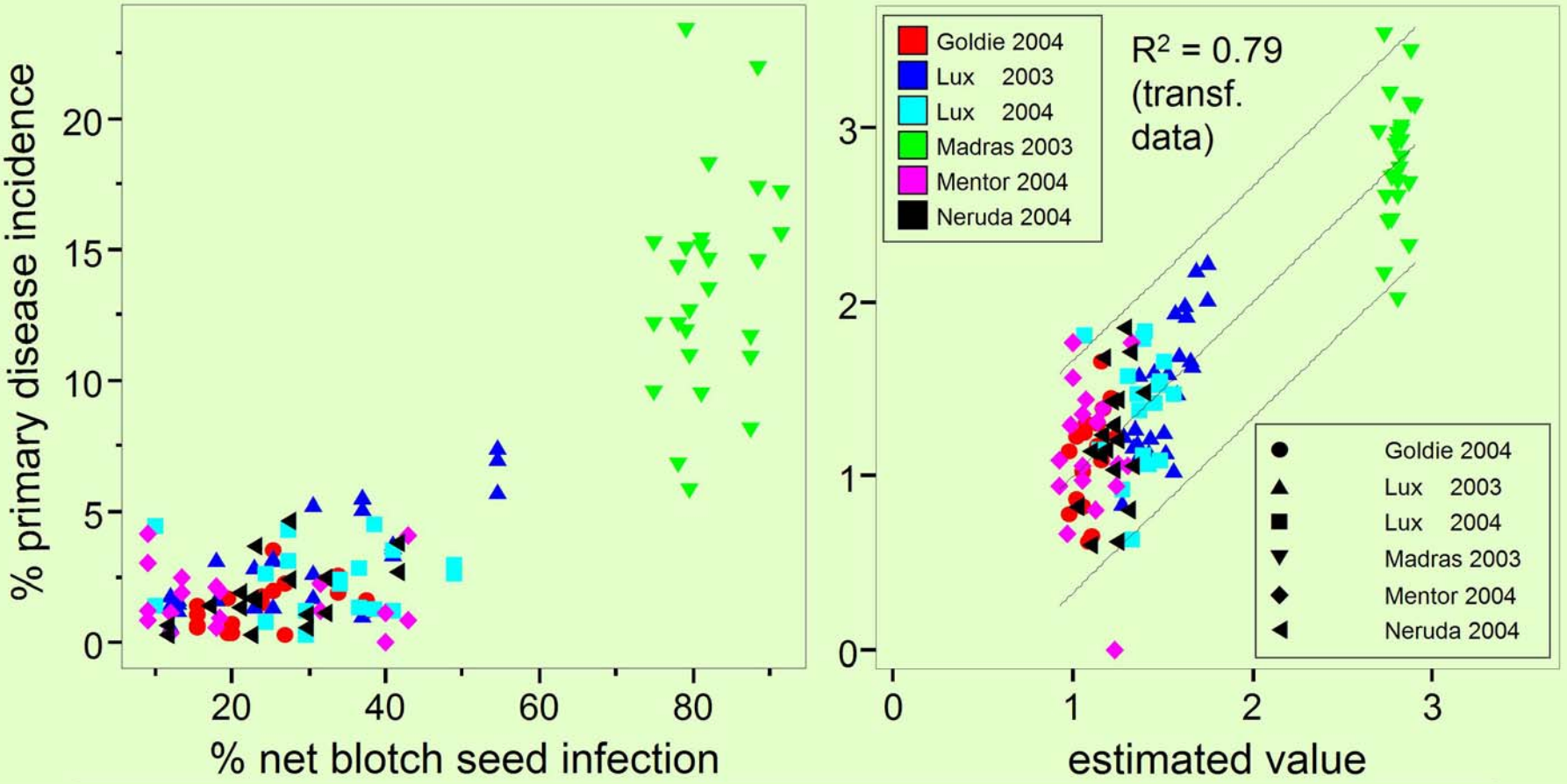
Methods:

- Field trials with various varieties & seed infection levels
- Field emergence, primary infection, disease development, yield parameters determined
- Infection levels of seeds & harvested grains determined by blotter method
- Data analysis using GLM with covariates and year and replication as random effects



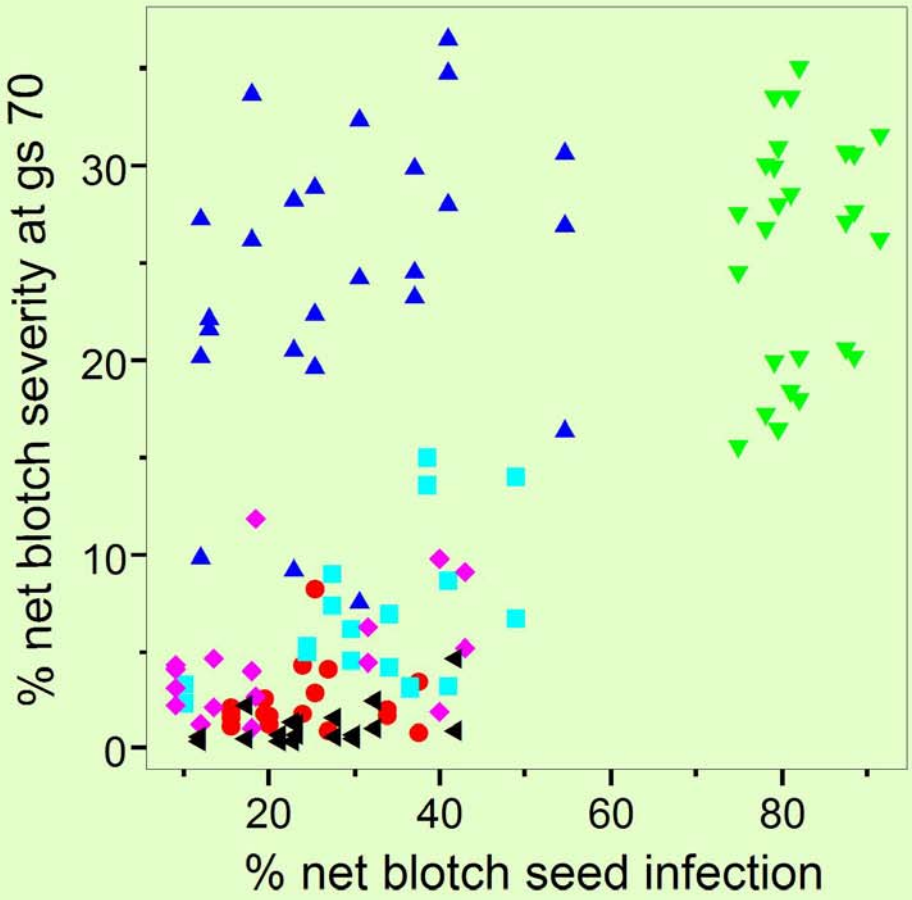
Disease progress of net blotch by seed infection level, variety & year

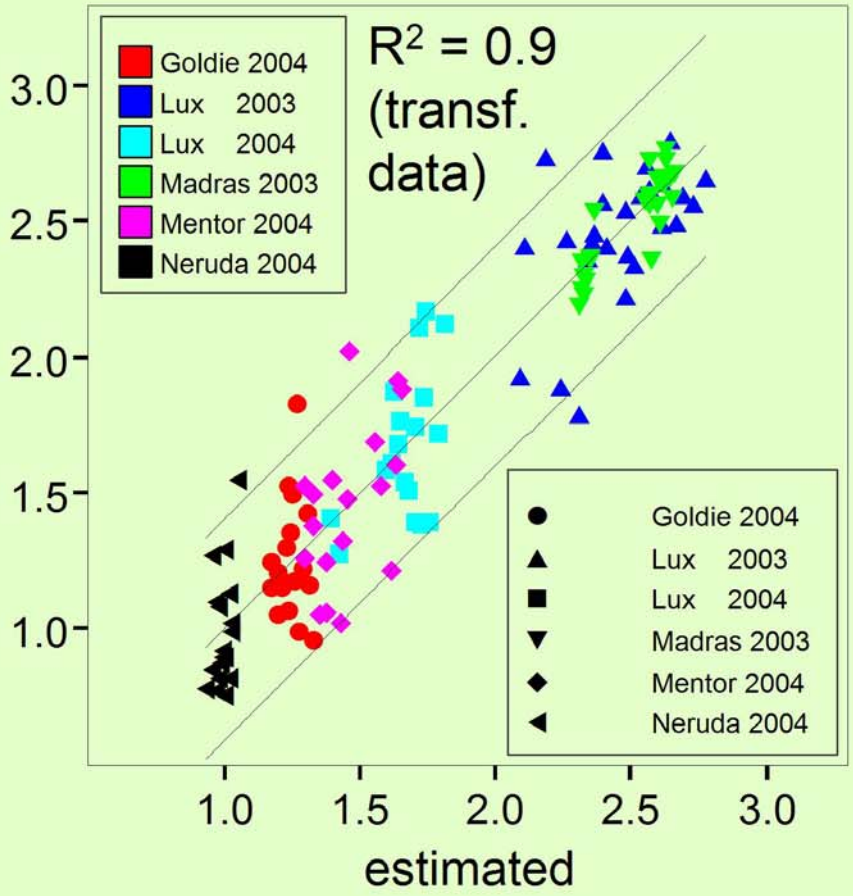
Net blotch seed infection vs primary net blotch incidence by variety & year



Significant effects: variety x seed infection level ***

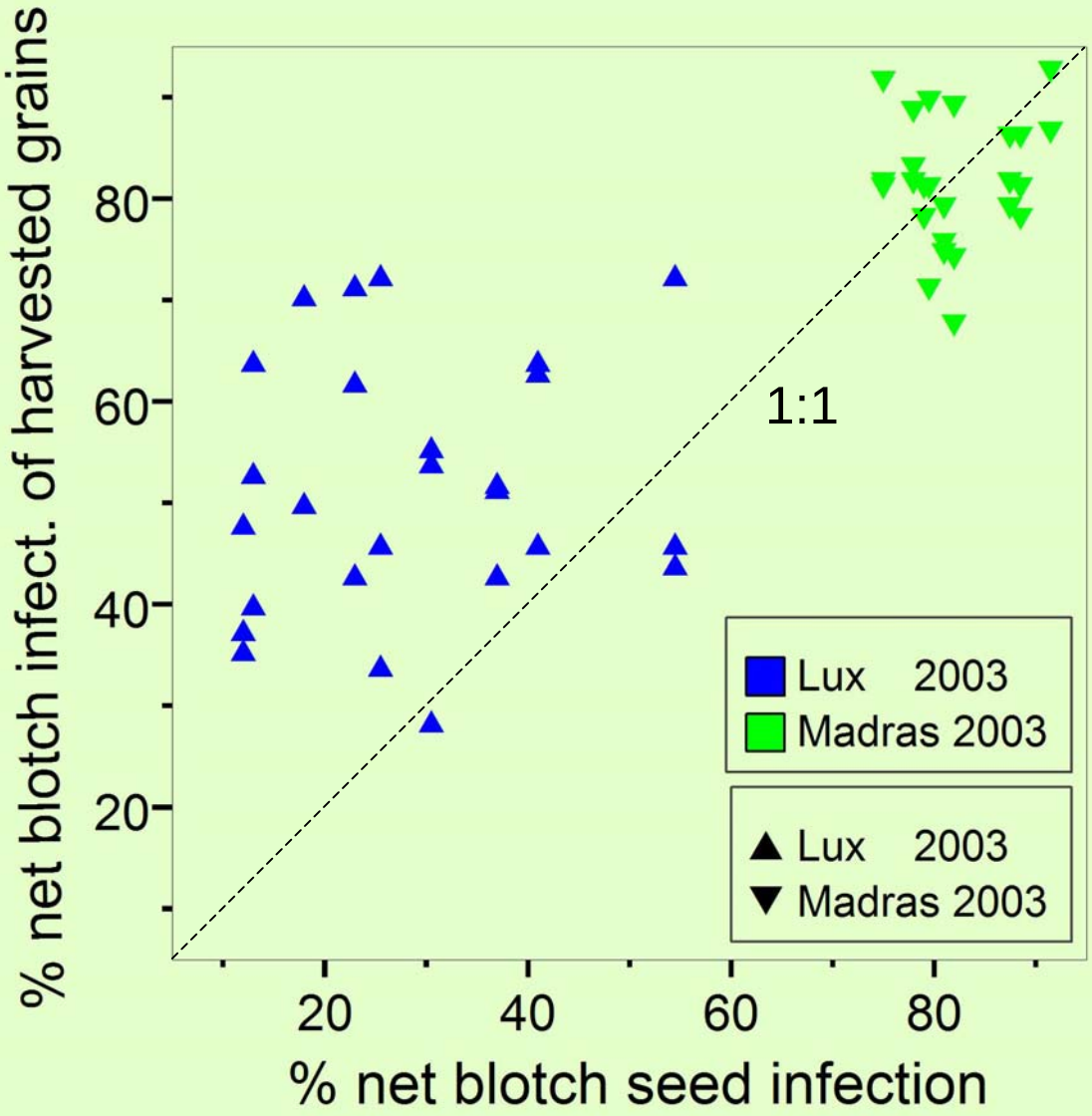
Net blotch seed infection vs net blotch severity at early grain filling (gs 70) by variety & year



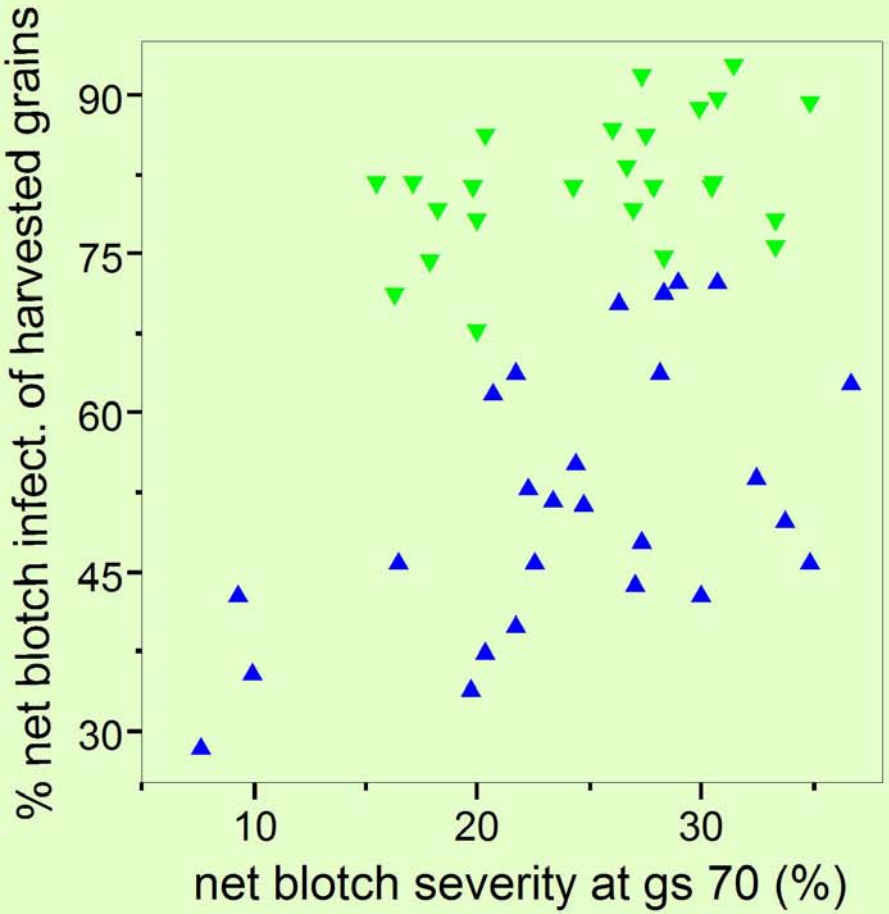


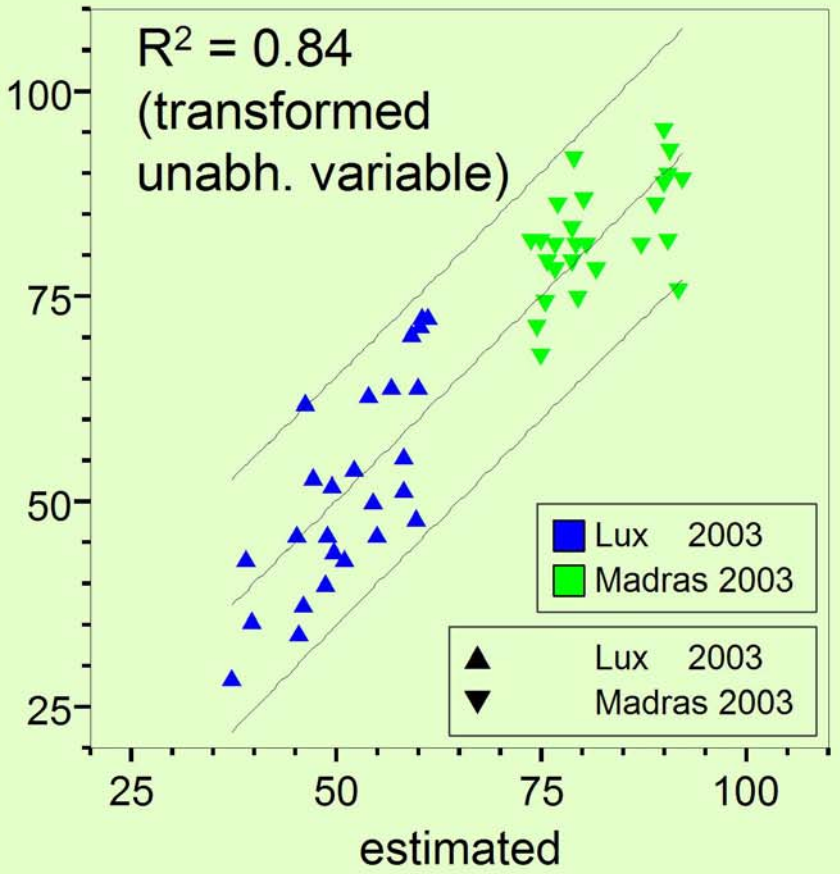
Significant effects: year x rep ***; variety x seed infection level ***

Net blotch seed infection vs net blotch infection of harvested grains for cvs Lux & Madras in 2003.



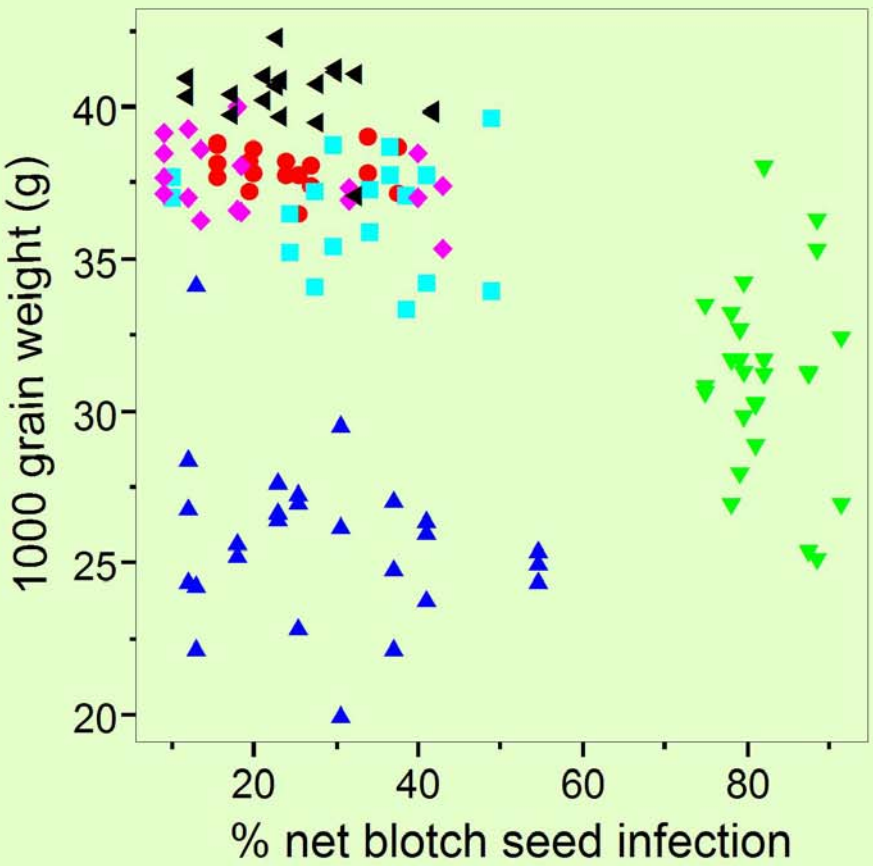
Net blotch severity at early grain filling (gs 70) vs net blotch infection of harvested grains

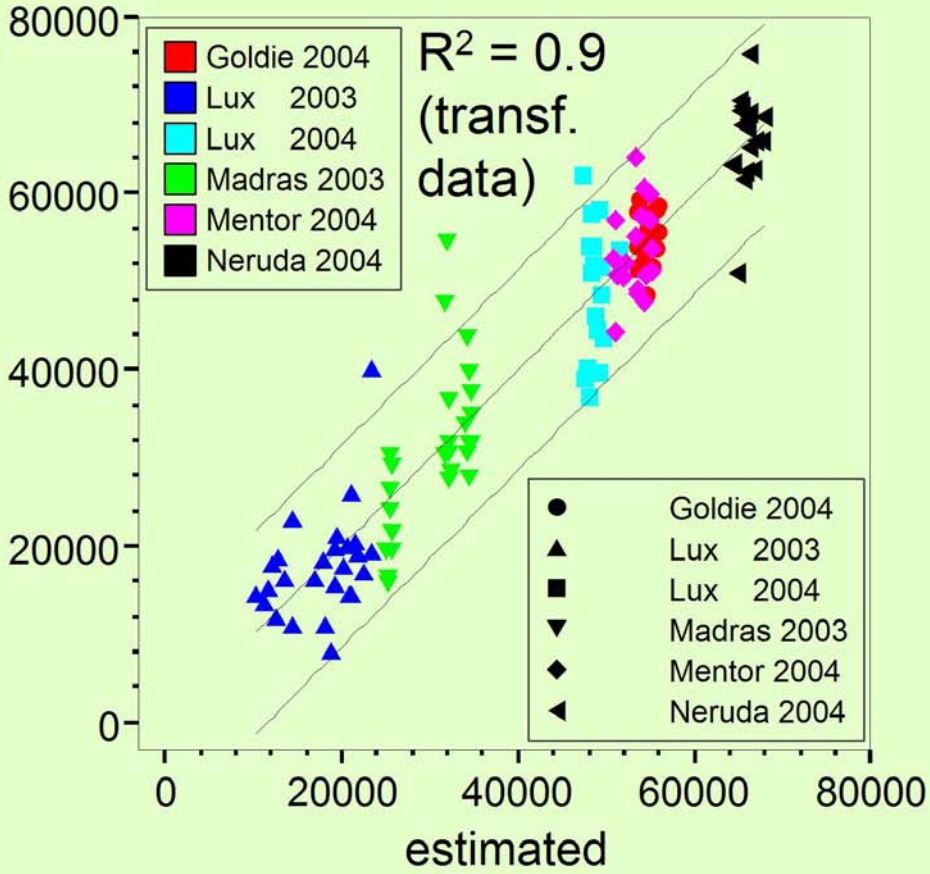




Signif. effects: rep ***; variety ***; net blotch severity at gs 70 **

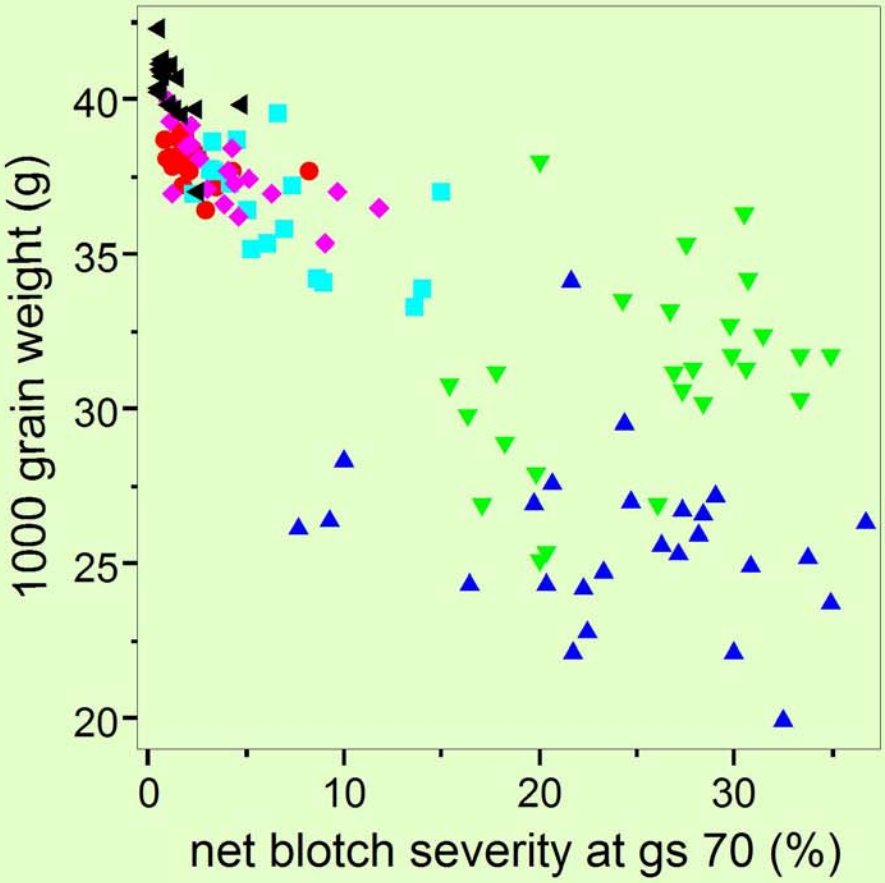
Net blotch seed infection vs thousand-grain weight by variety & year

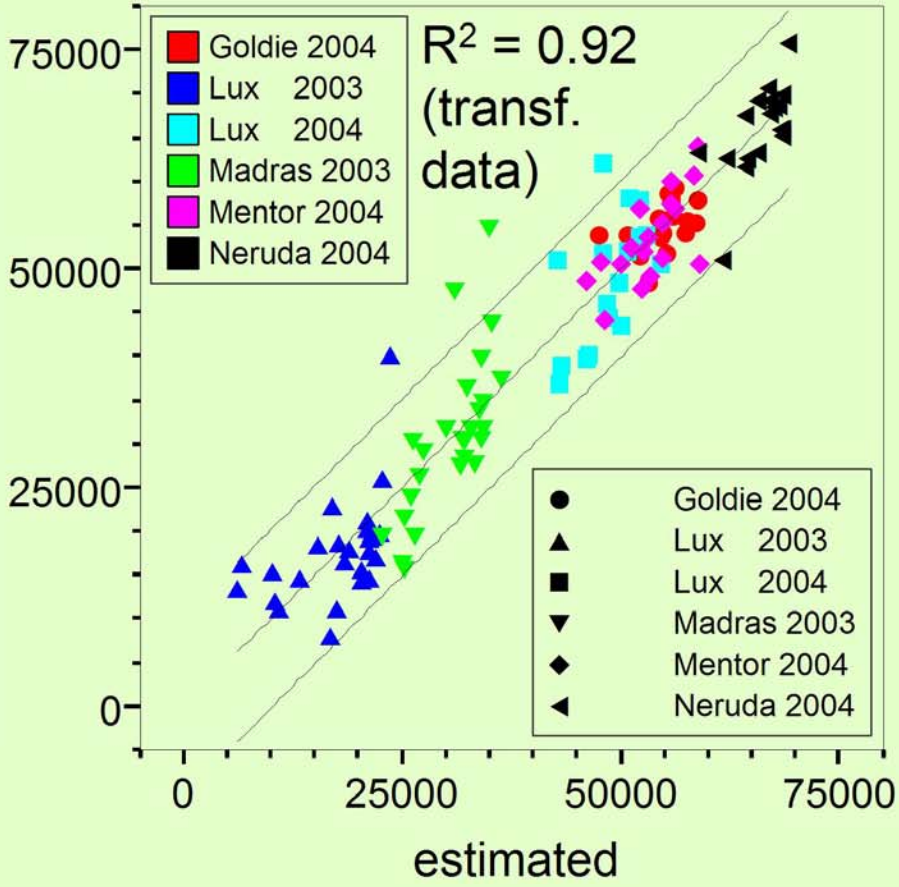




Signif. effects: year ***; rep(year) ***; variety ***; seed infection *

Net blotch severity at early grain filling (gs 70) vs thousand-grain weight by variety & year





Signif. effects: year **; rep(year) ***; variety ***; seed infection ***

Summary & conclusions

Life cycle- & damage relations of seed-borne net blotch can be quantified!

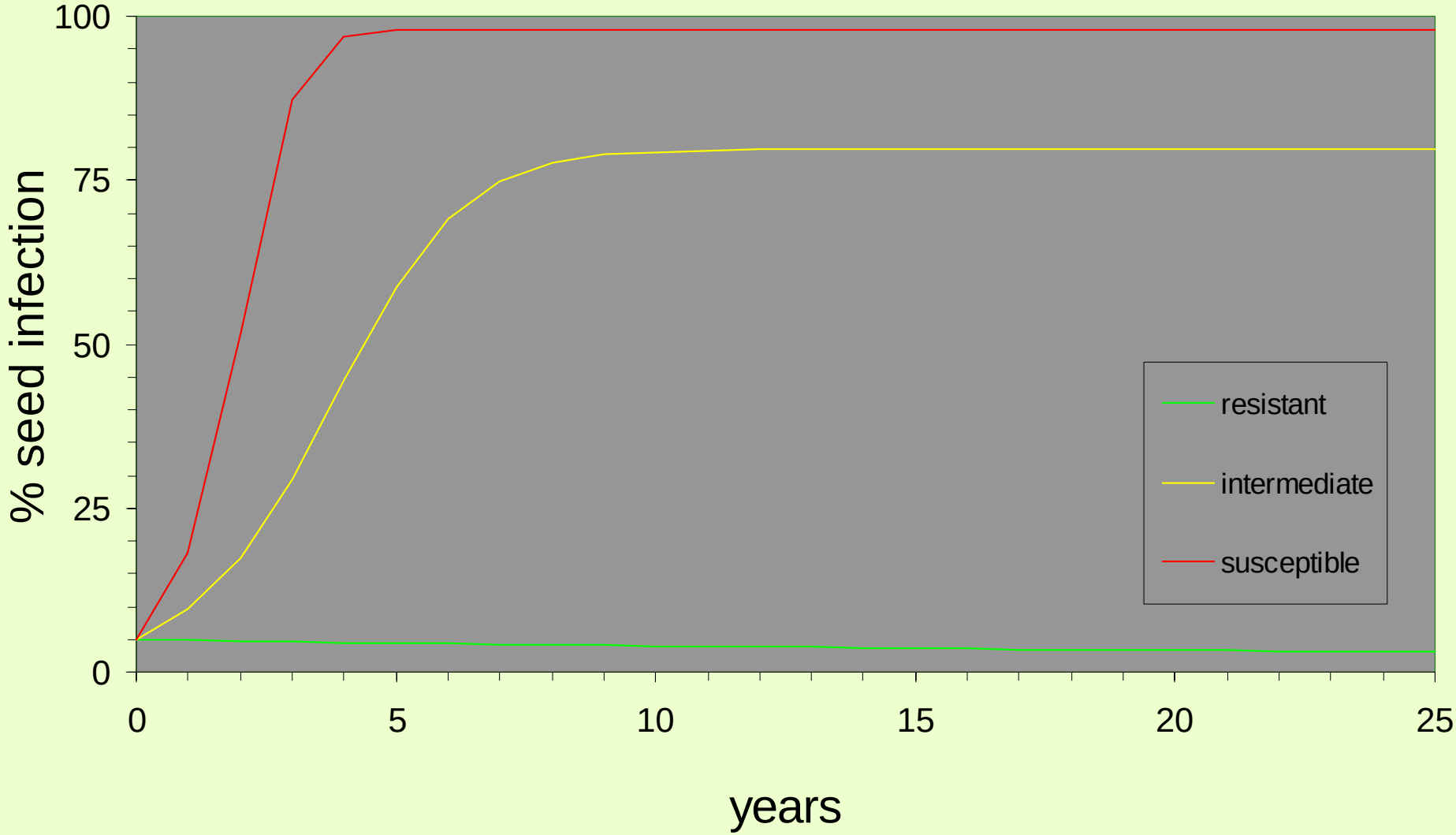
- Seed infection level (Y_s) is highly correlated with important life cycle- and yield variables.
- Epidemic severity level at gs 70 (Y_{gs70}) is particularly well correlated with infection level of harvested grains (Y_g) & yield parameters (Y_y).
- Y_g;$Y_y = f(Y_{gs70})$; $Y_{gs70} = f(Y_s)$; $Y_s = f(Y_{gs70})_{t-1}$...
- Variability/specificity related to variety, environment & other effects needs to be considered.

Future work: parameterisation of life cycle- & damage relation models that consider varietal & stochastic effects

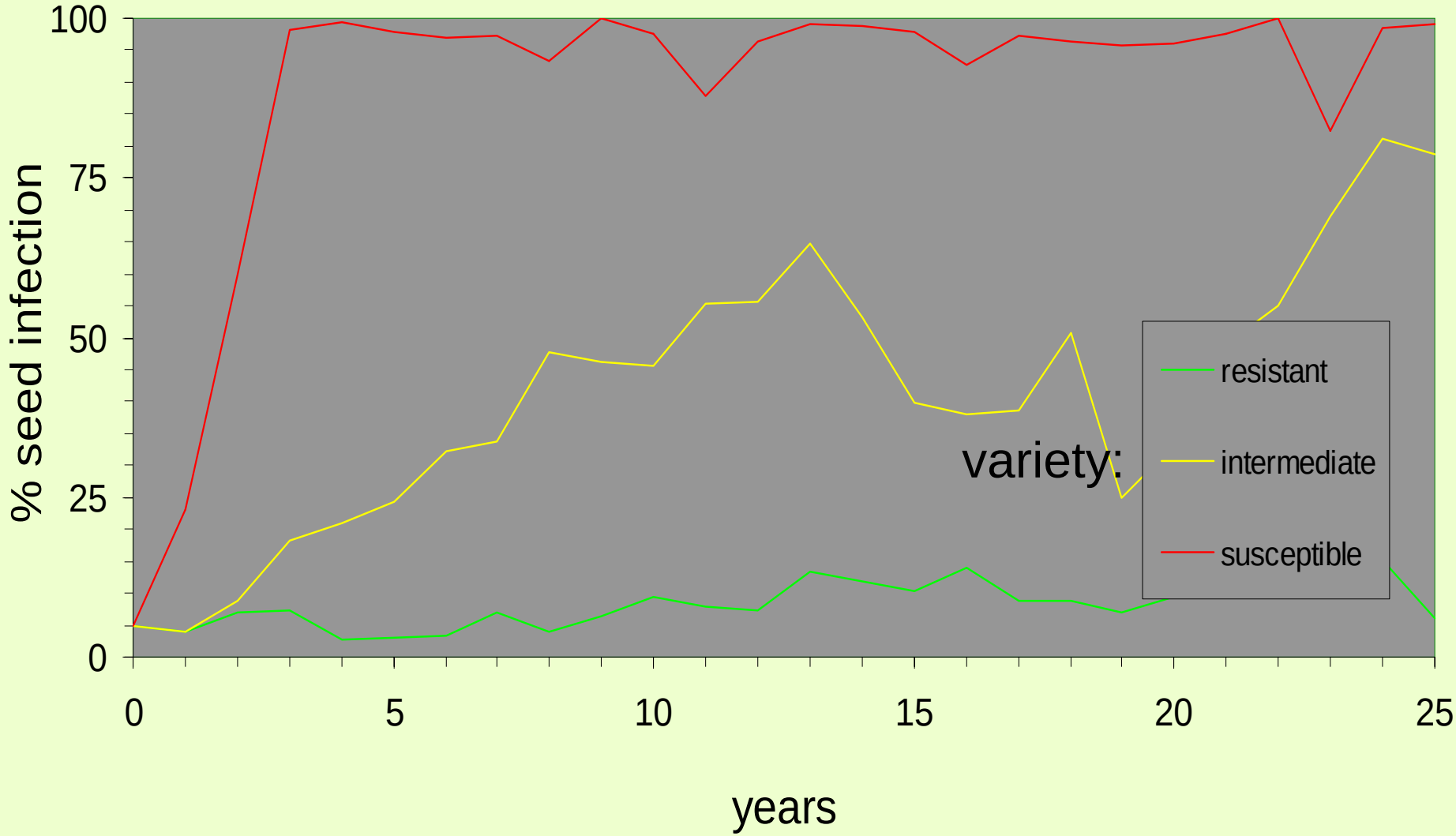
→ projections of disease propagation & disease-induced damage to judge risks associated with seed-borne net blotch

→ recommendations for:

- flexible seed infection thresholds (tactical level)
- research & management priority setting (strategic level)

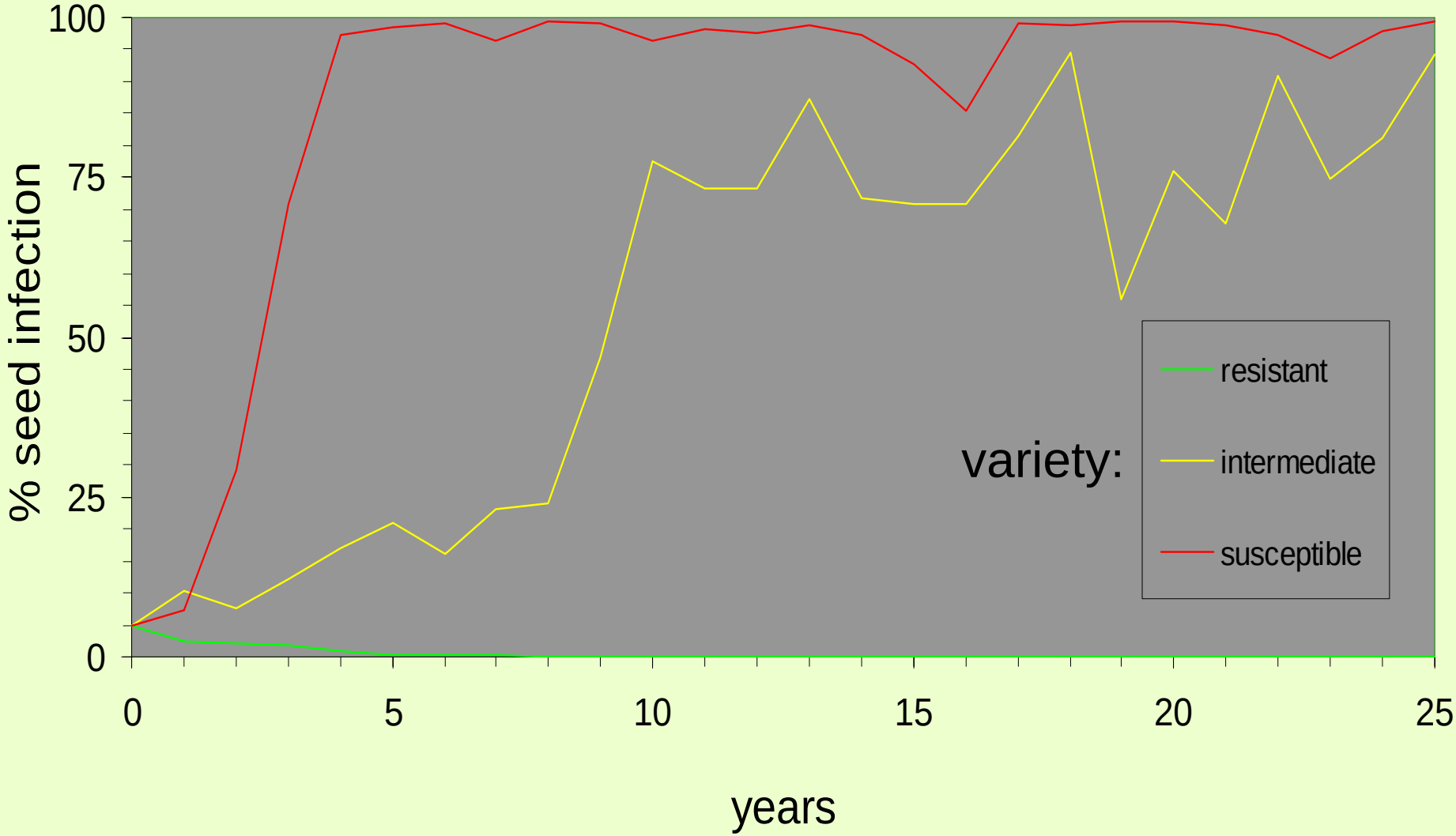


Seed infection levels over production cycles projected by a deterministic model considering variety-specific resistance.

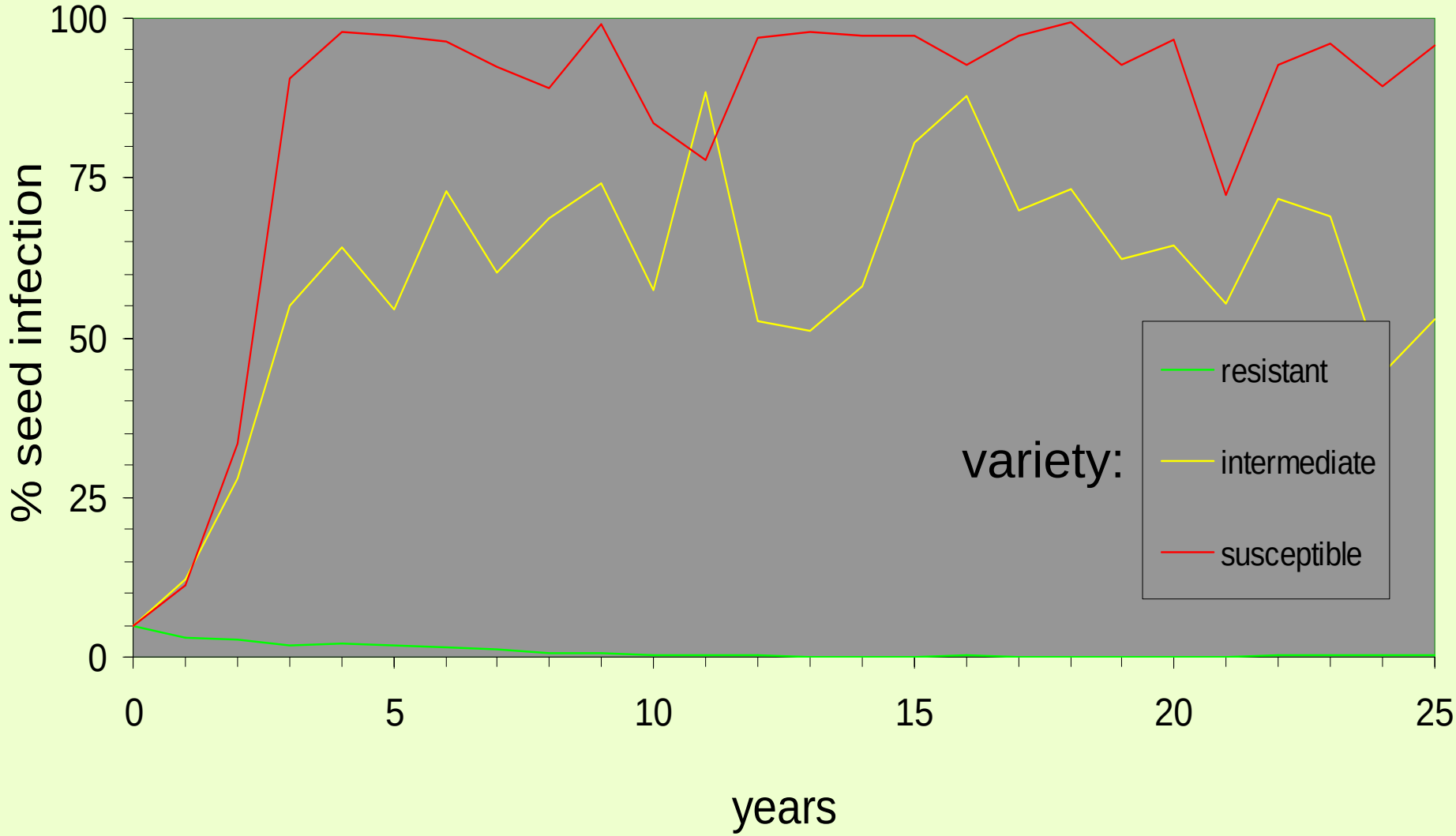


Seed infection levels over production cycles projected by a stochastic model considering variety-specific resistance.

Seed infection levels over production cycles projected by a stochastic model considering variety-specific resistance.



Seed infection levels over production cycles projected by a stochastic model considering variety-specific resistance.



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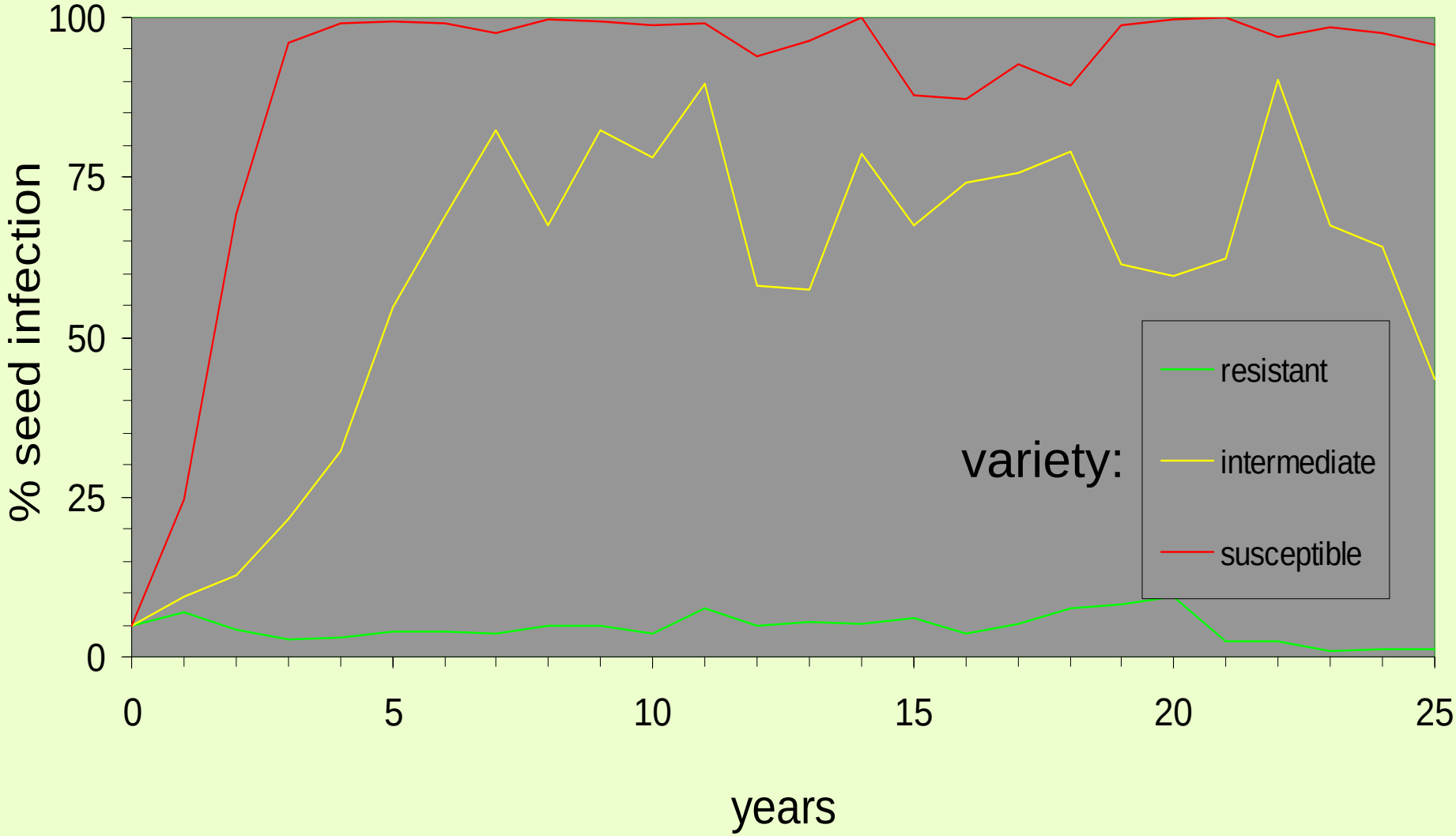

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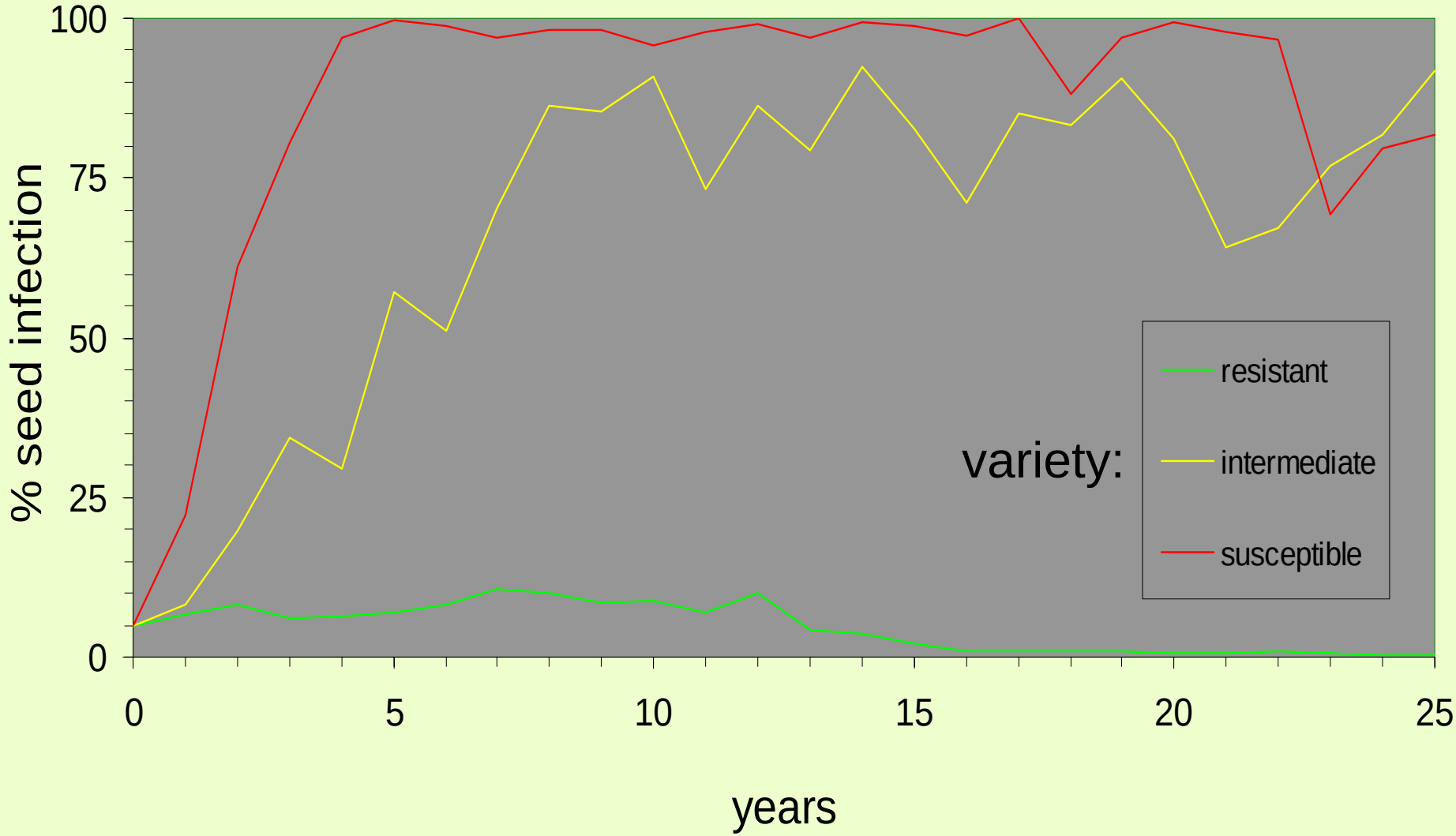

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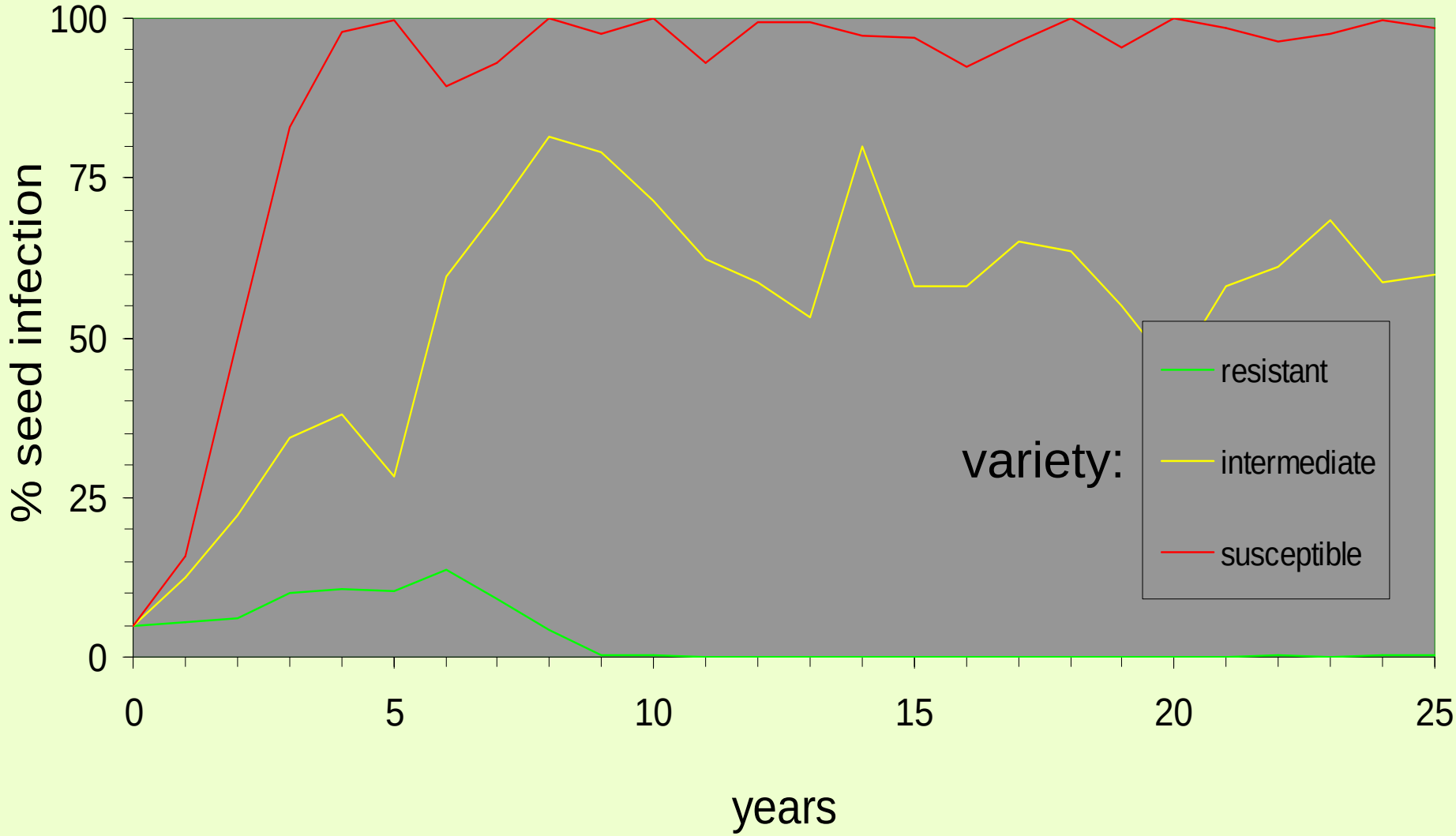

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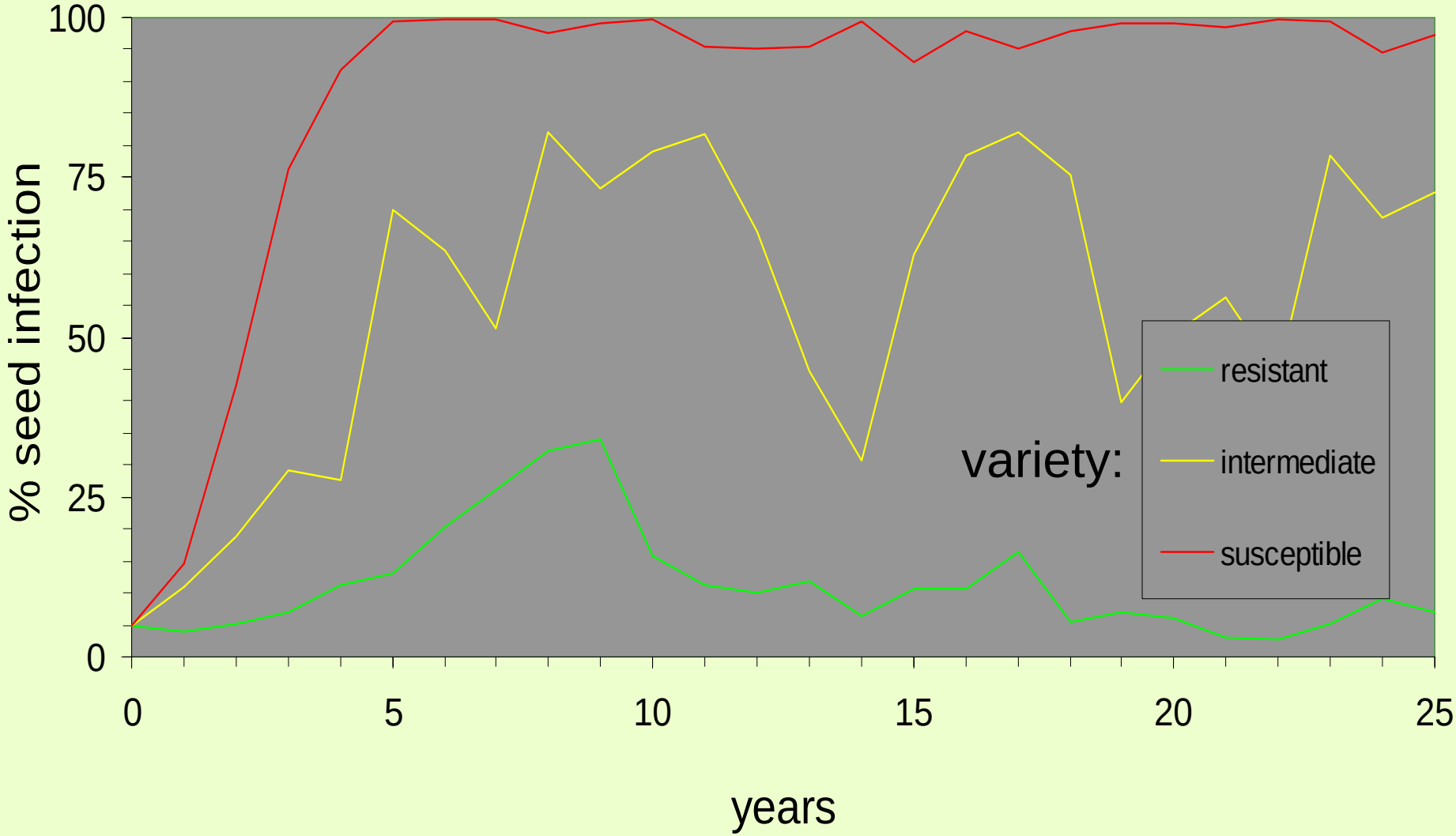

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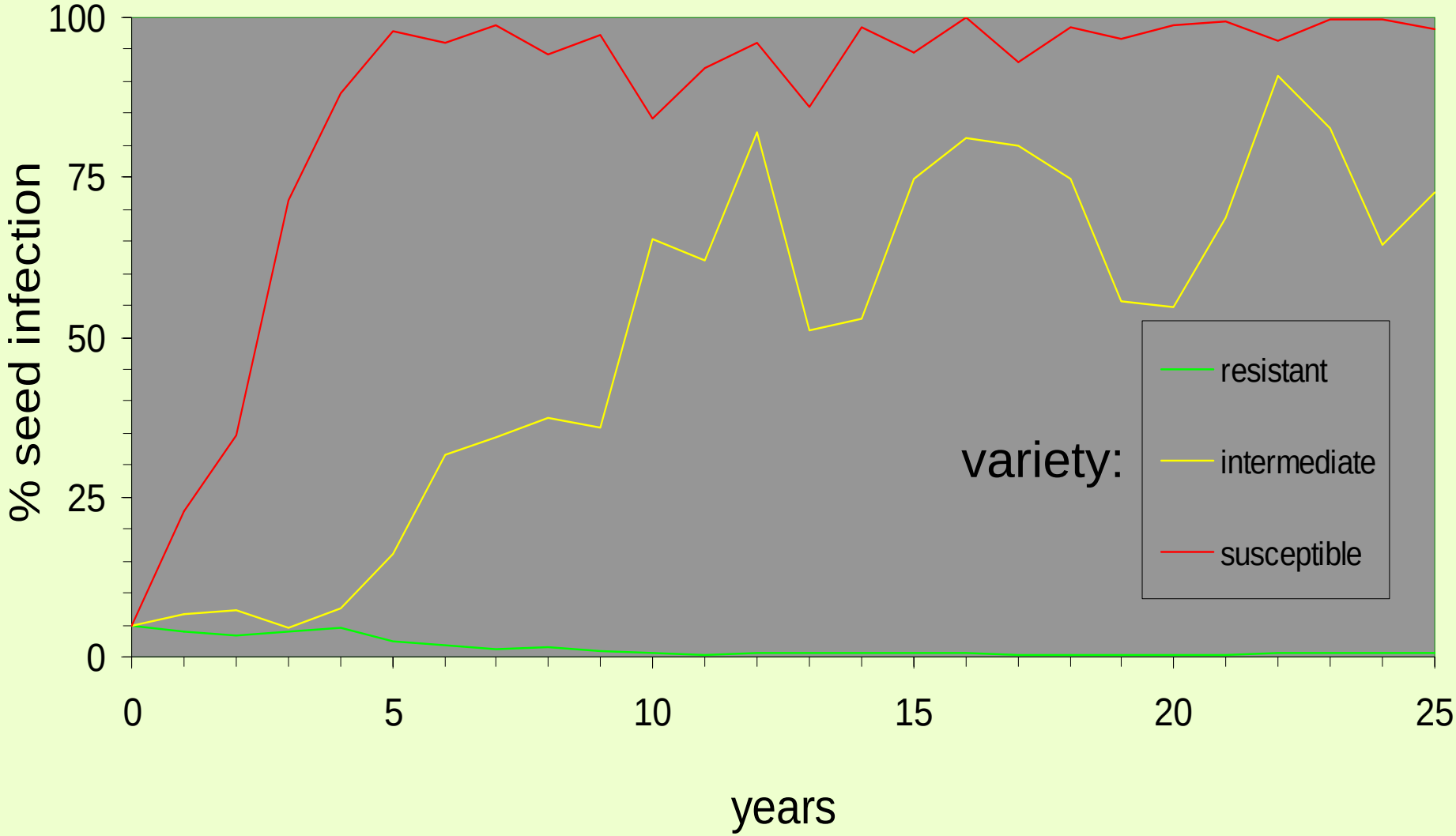

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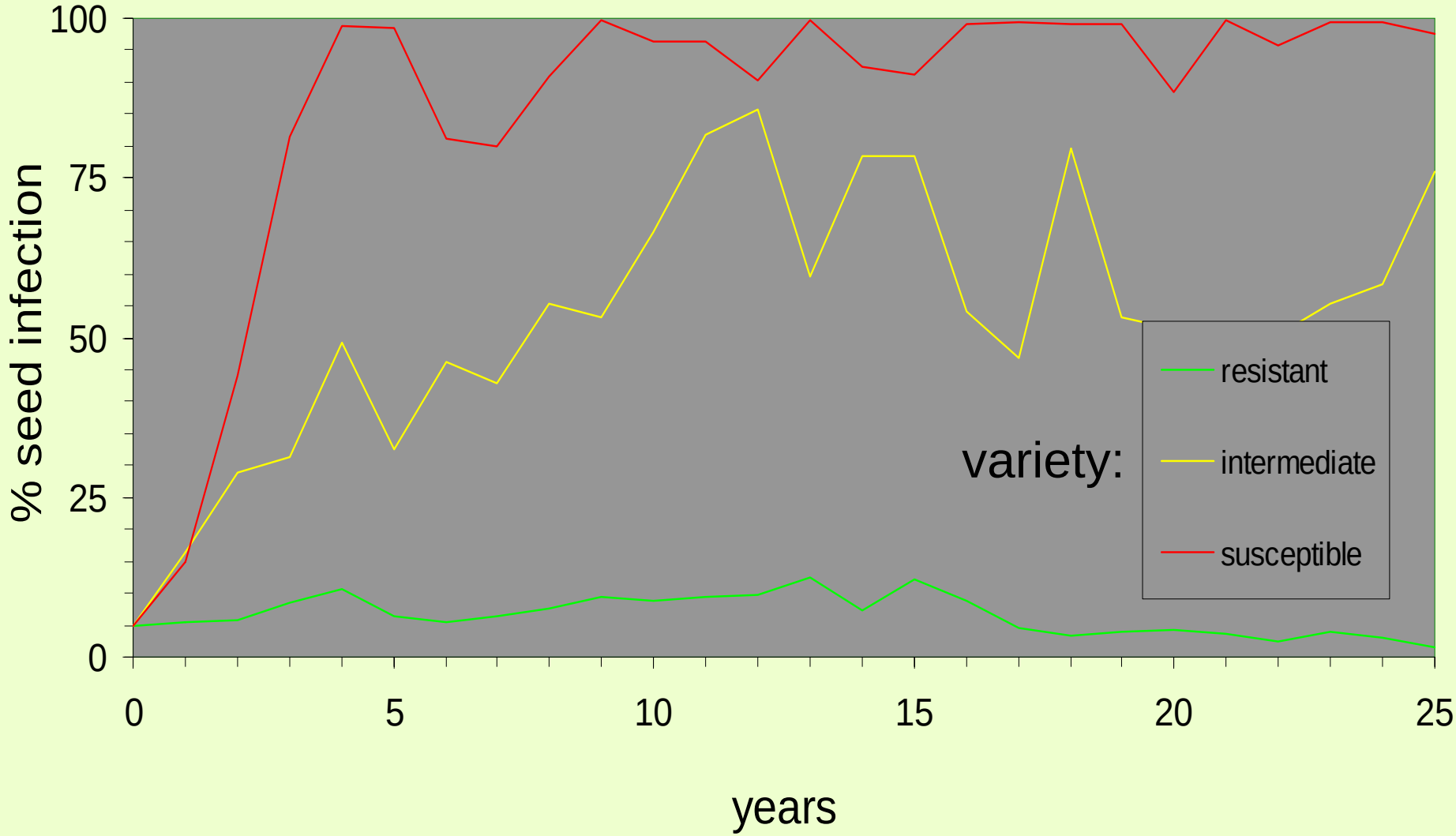

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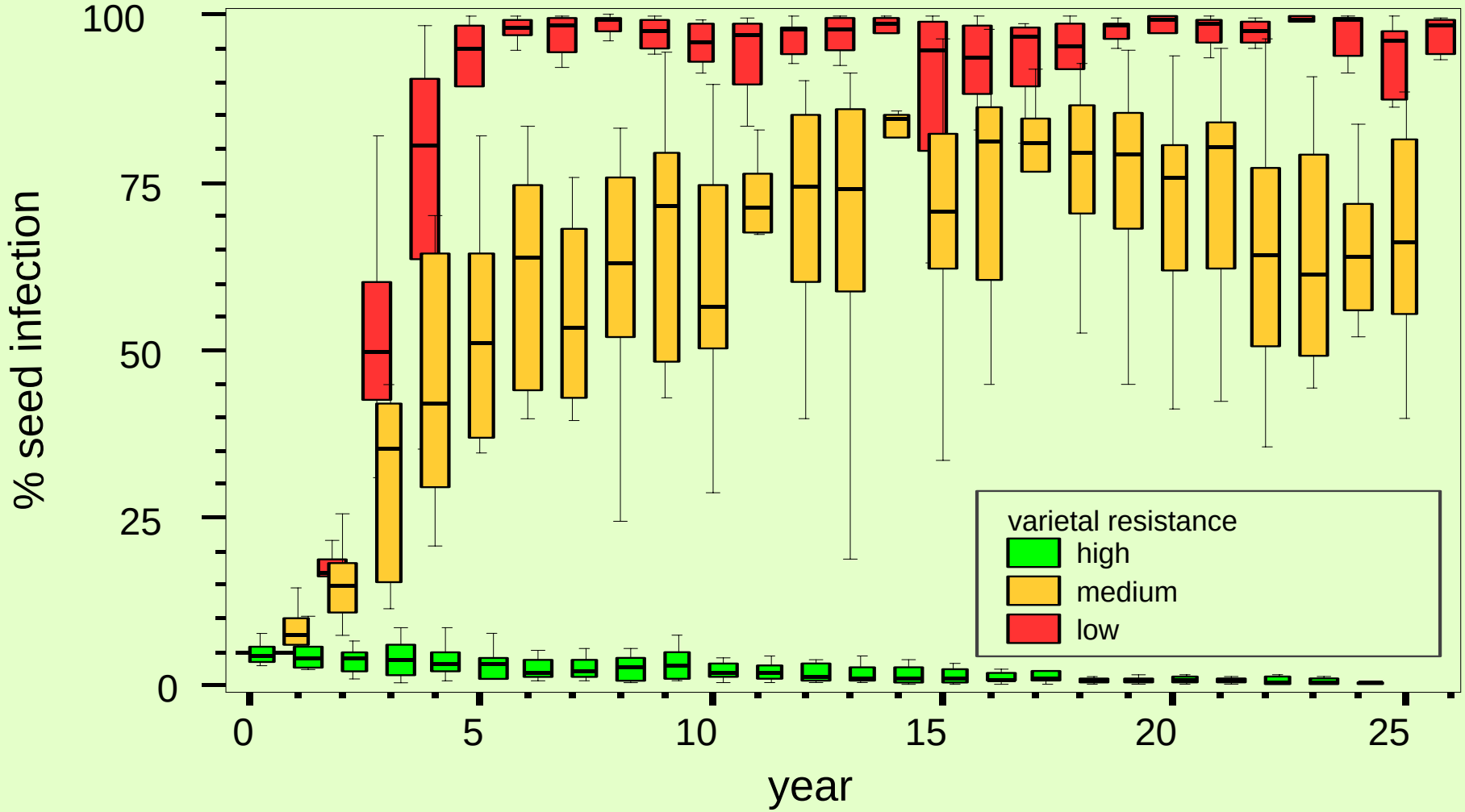
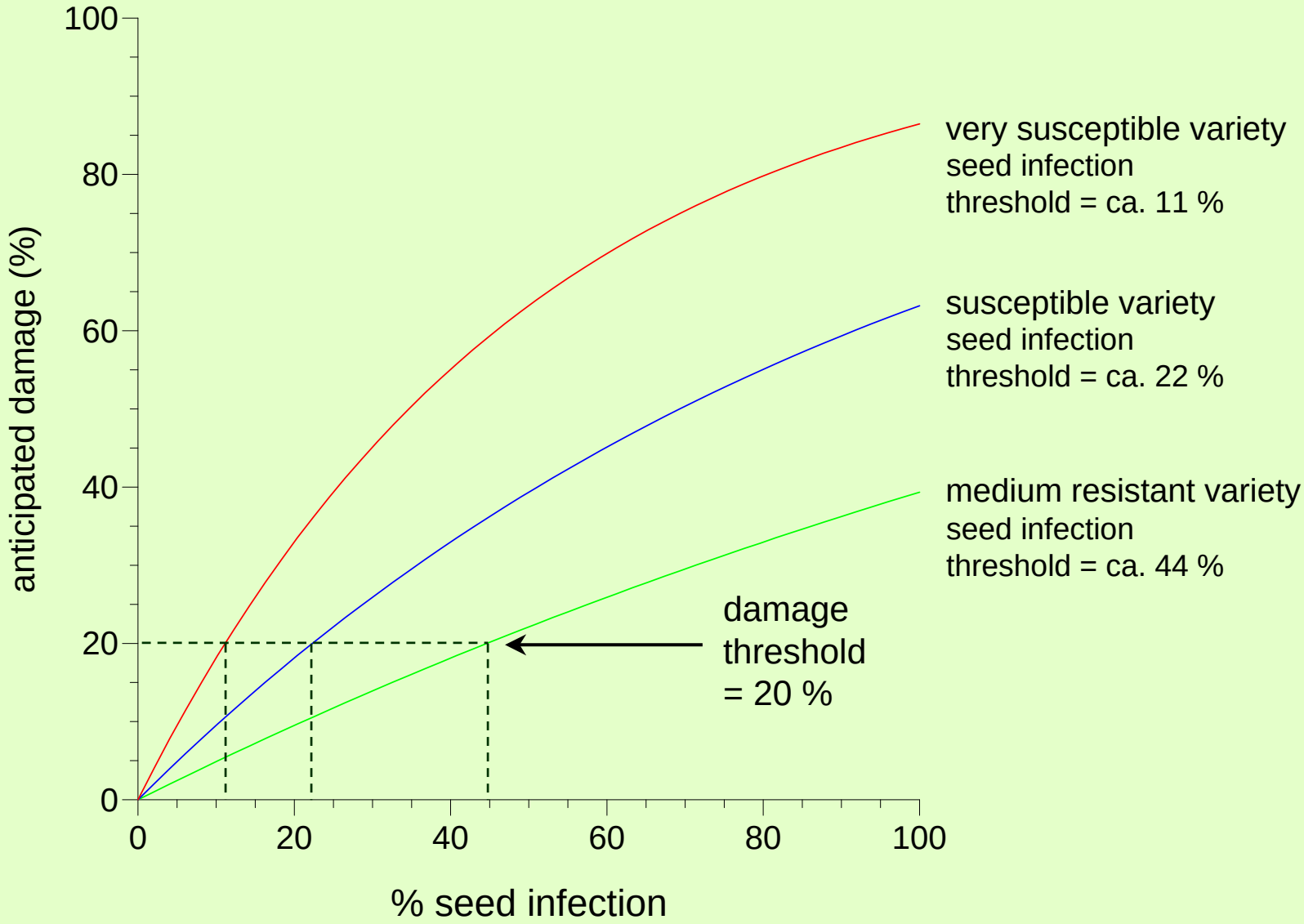


Seed infection levels over production cycles projected by a stochastic model considering variety-specific resistance (boxplots summarising 10 model runs).



Example of variety-specific seed infection thresholds assuming a damage threshold of 20%.