

Does nitrogen deposition cause decline of butterflies by fatal changes in host plant quality?

Rich plant, poor caterpillar?

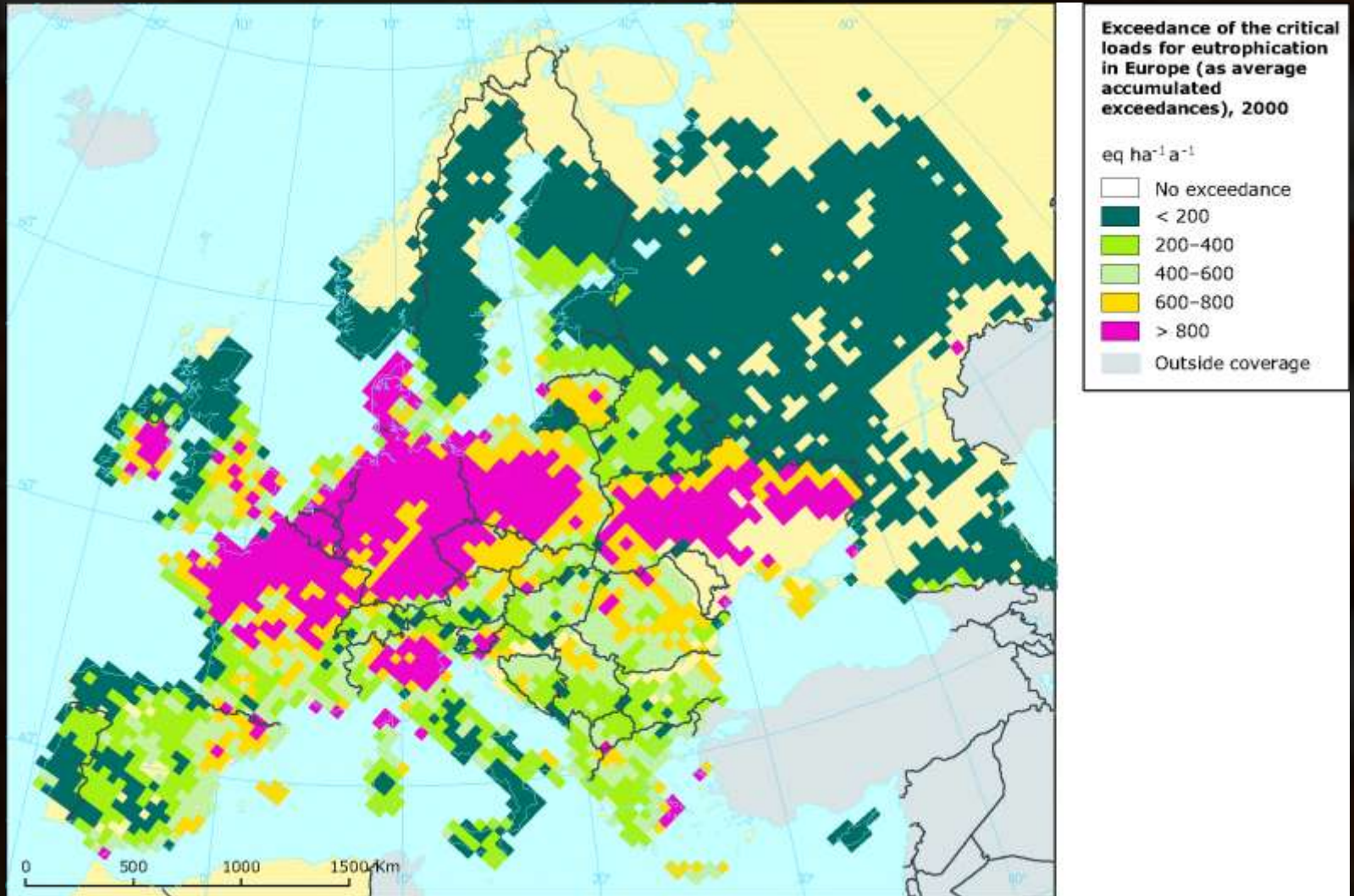
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Decline of butterflies in nutrient poor habitats

* Decline also where host plants still present





Hypothesis

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- Problems found in birds of prey in poor forests due to deficiencies → imbalances in prey and plants ?
 - Acidification/drainage → *minerals* ↓
 - Nitrogen deposition → *nutrients* ↑
 - *Imbalances* between nitrogen and essential minerals, amino acids → *feeding triggered by N* → *imbalances fatal to caterpillars*



Do field data support the hypothesis?



1. Bio-assay: feeding caterpillars with host plants of different sites



2. Analysis of host plant quality from Dutch sites and reference sites: elements, amino acids, ratio with N content





Vaccinium oxycoccos
host plant of *Boloria aquilonaris*
cranberry & cranberry fritillary



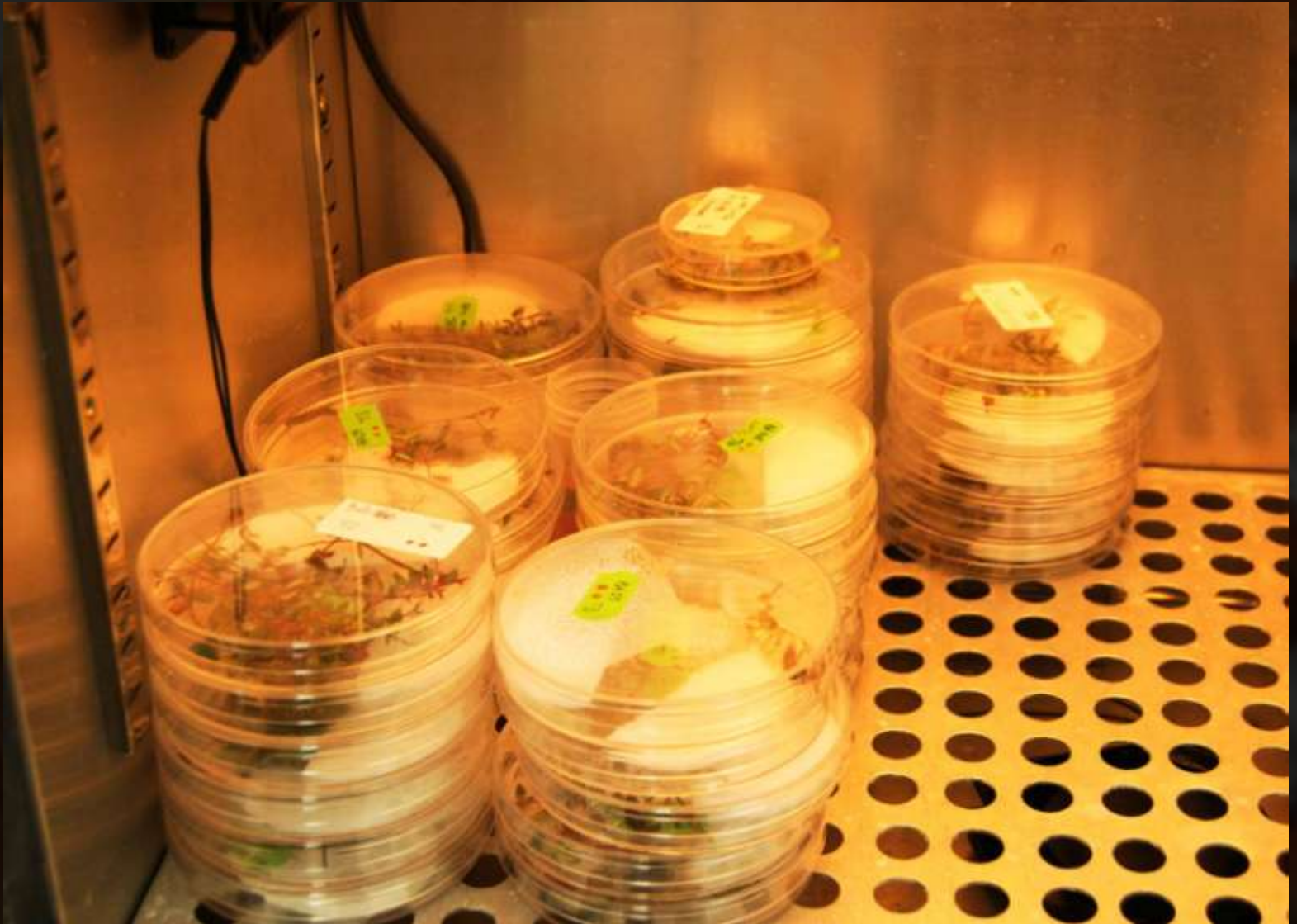


Be: influence of buffered ground water



NL: acid, no influence of buffered ground water

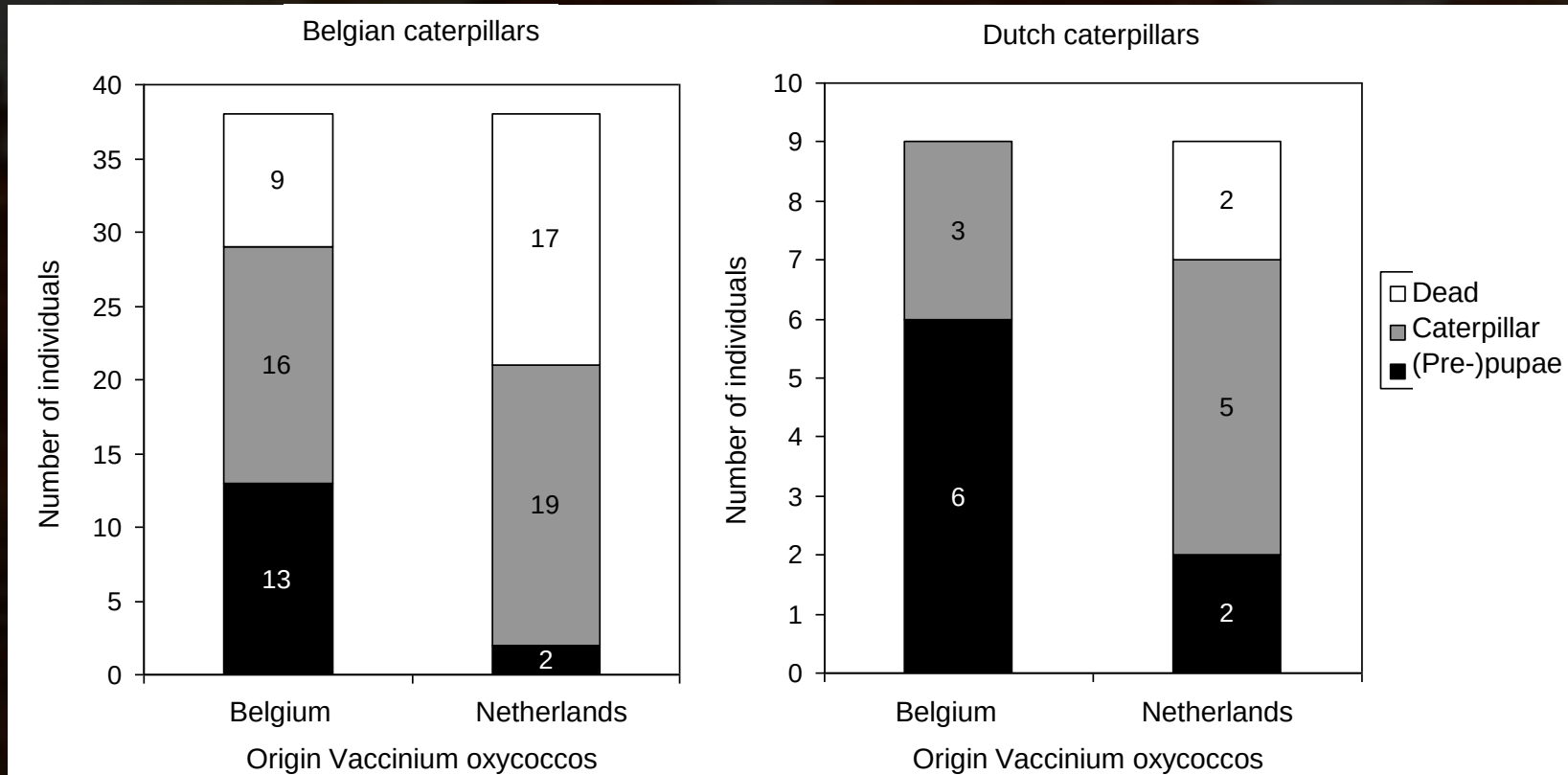
Bio-assay: *V.oxycoccos* plants and *B.aquilonaris* caterpillars from B & NL



Bio-assay: *V.oxycoccos* plants and *B.aquilonaris* caterpillars from B & NL



Bio-assay: *V.oxycoccus* plants and *B.aquilonaris* caterpillars from B & NL



- Caterpillars do better on Belgian plants

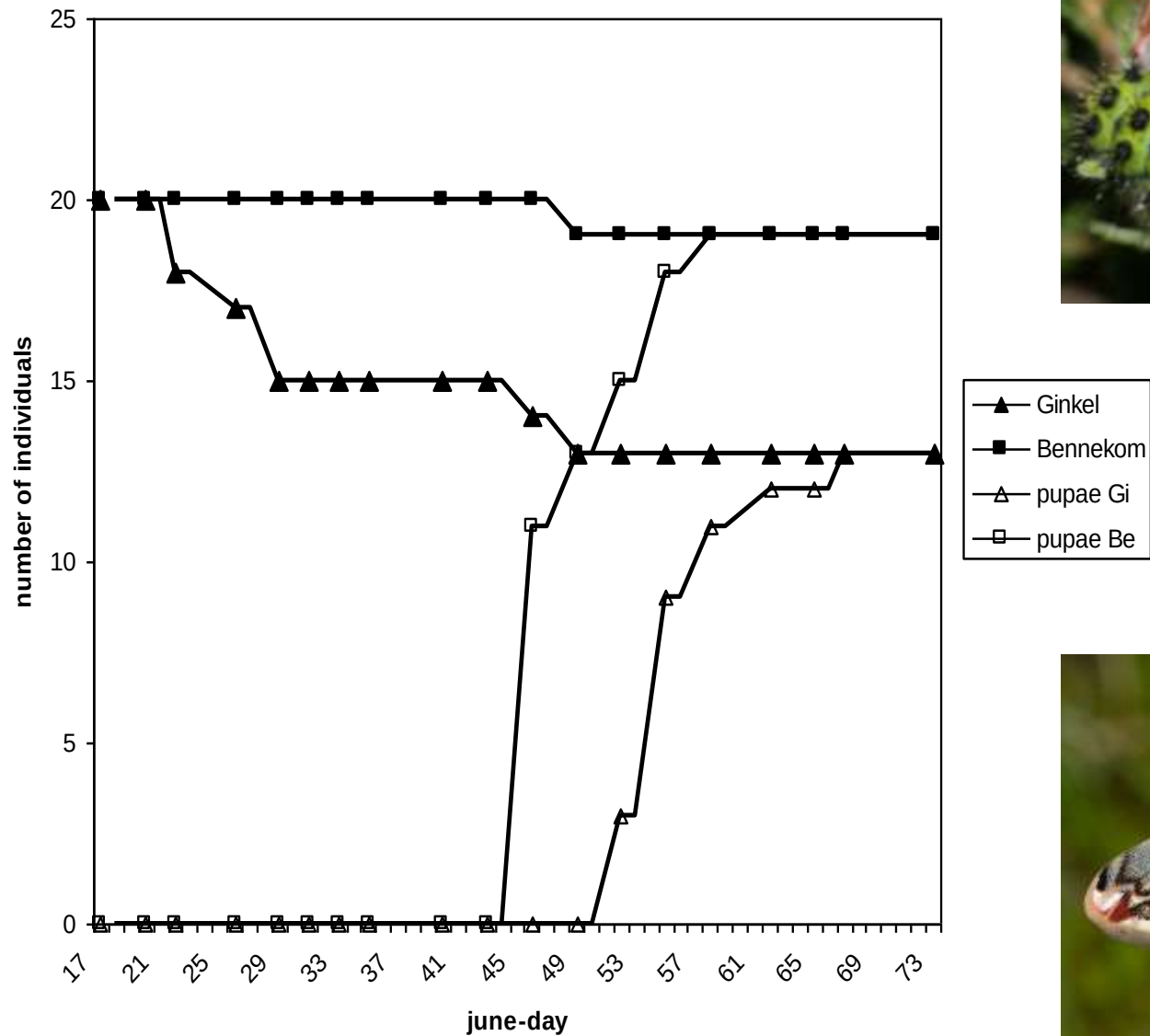
What's the problem
with this leave?



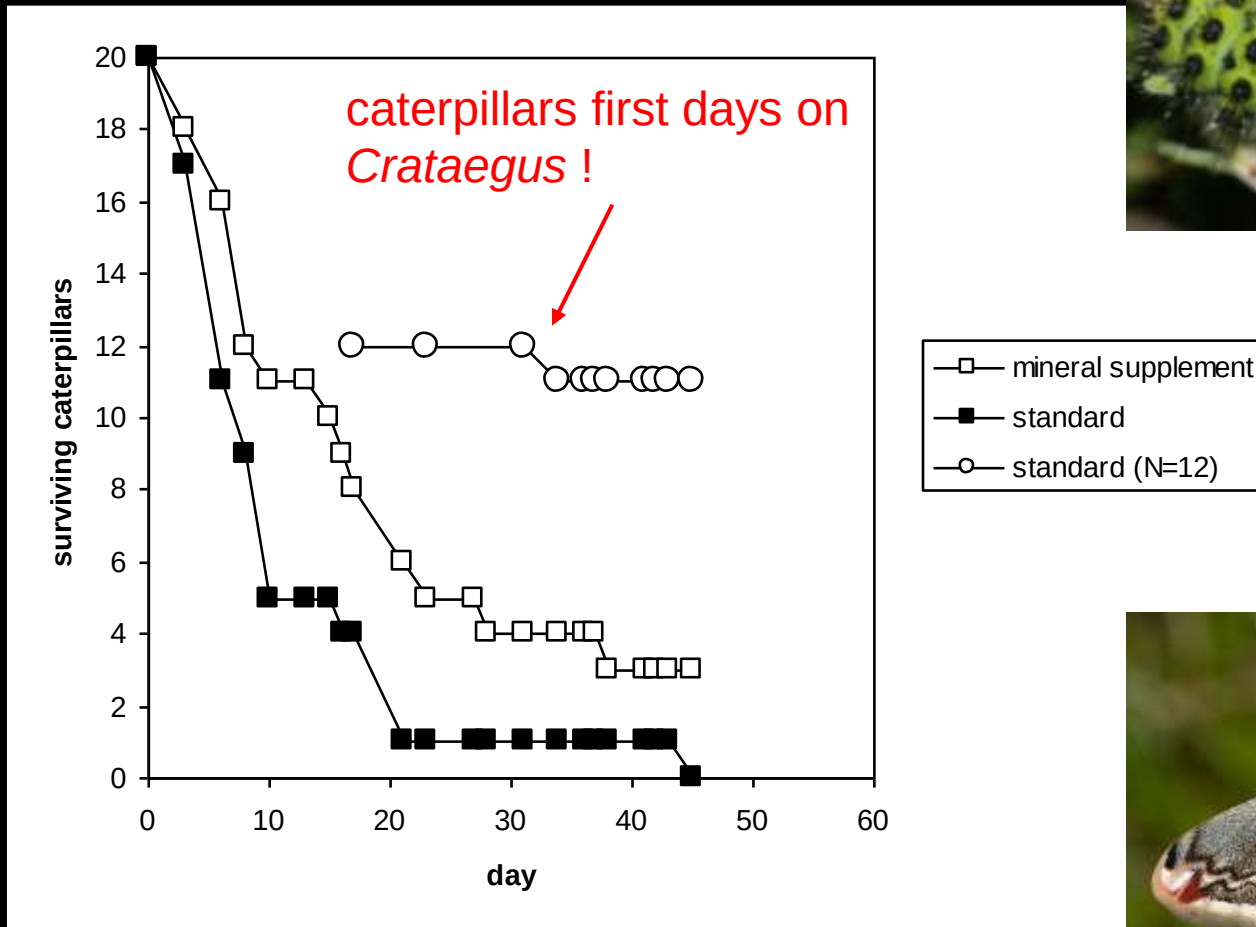
Saturnia pavonia on *Calluna vulgaris*



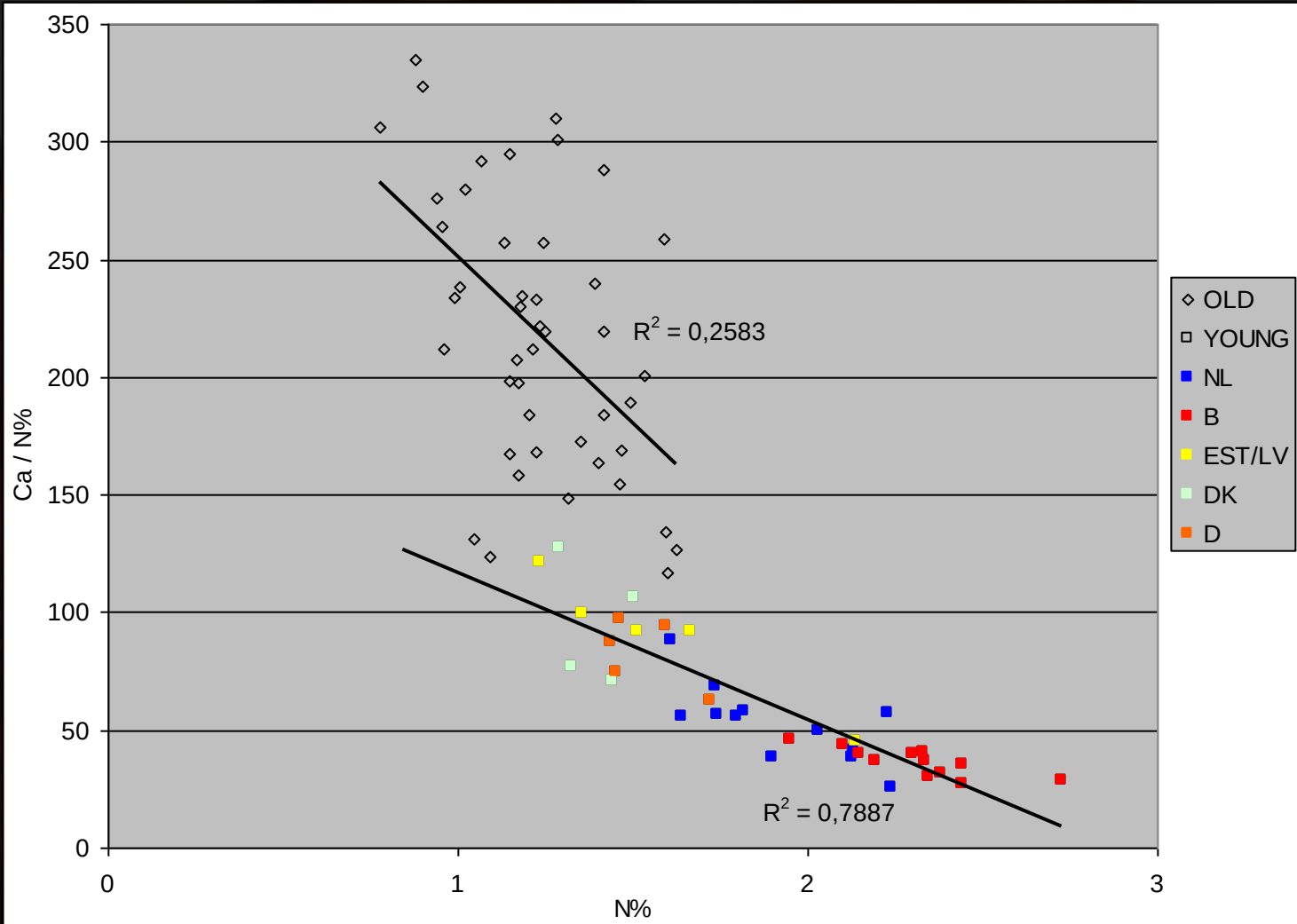
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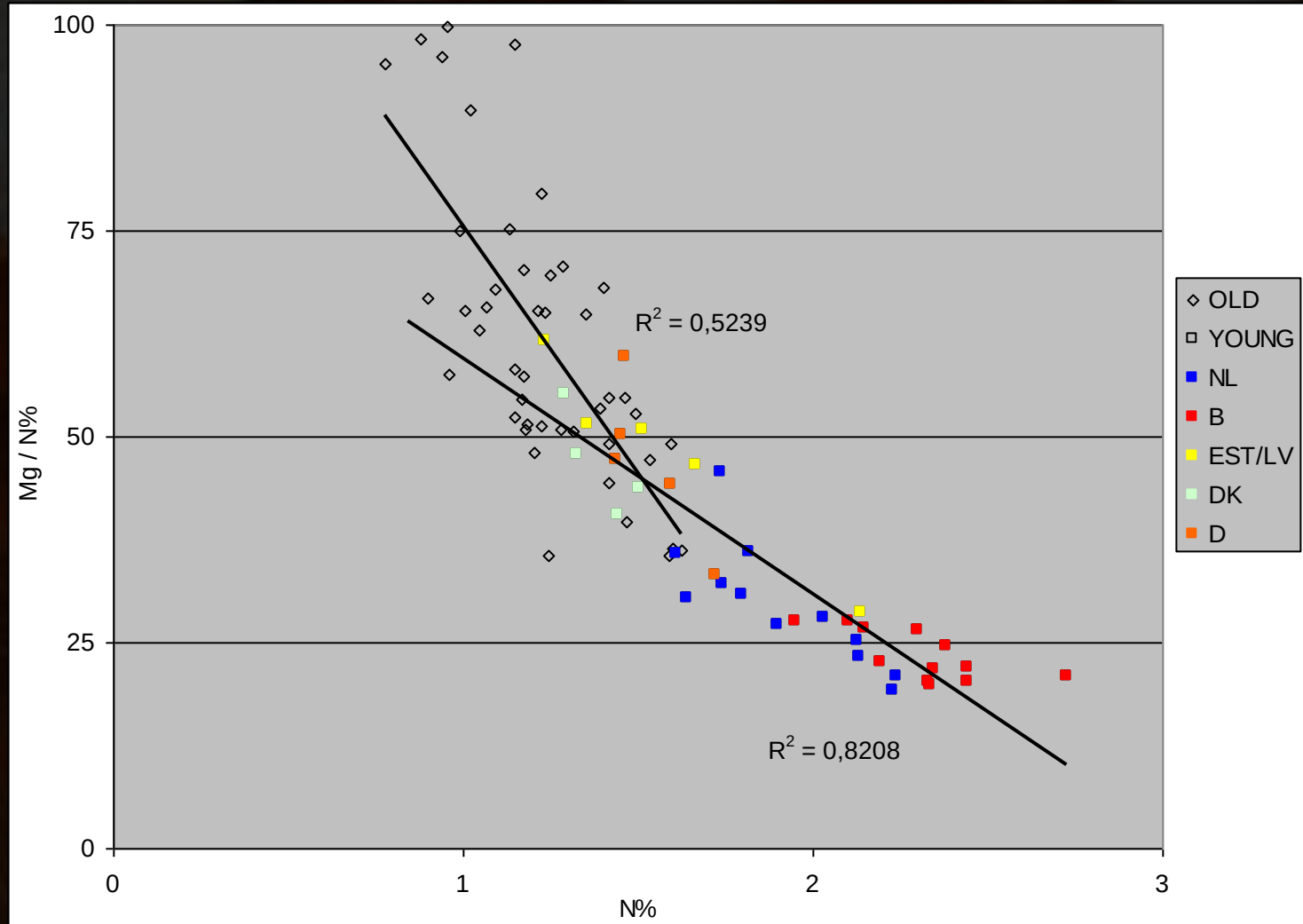


Ratio Calcium/N% in *V.oxycoccos*



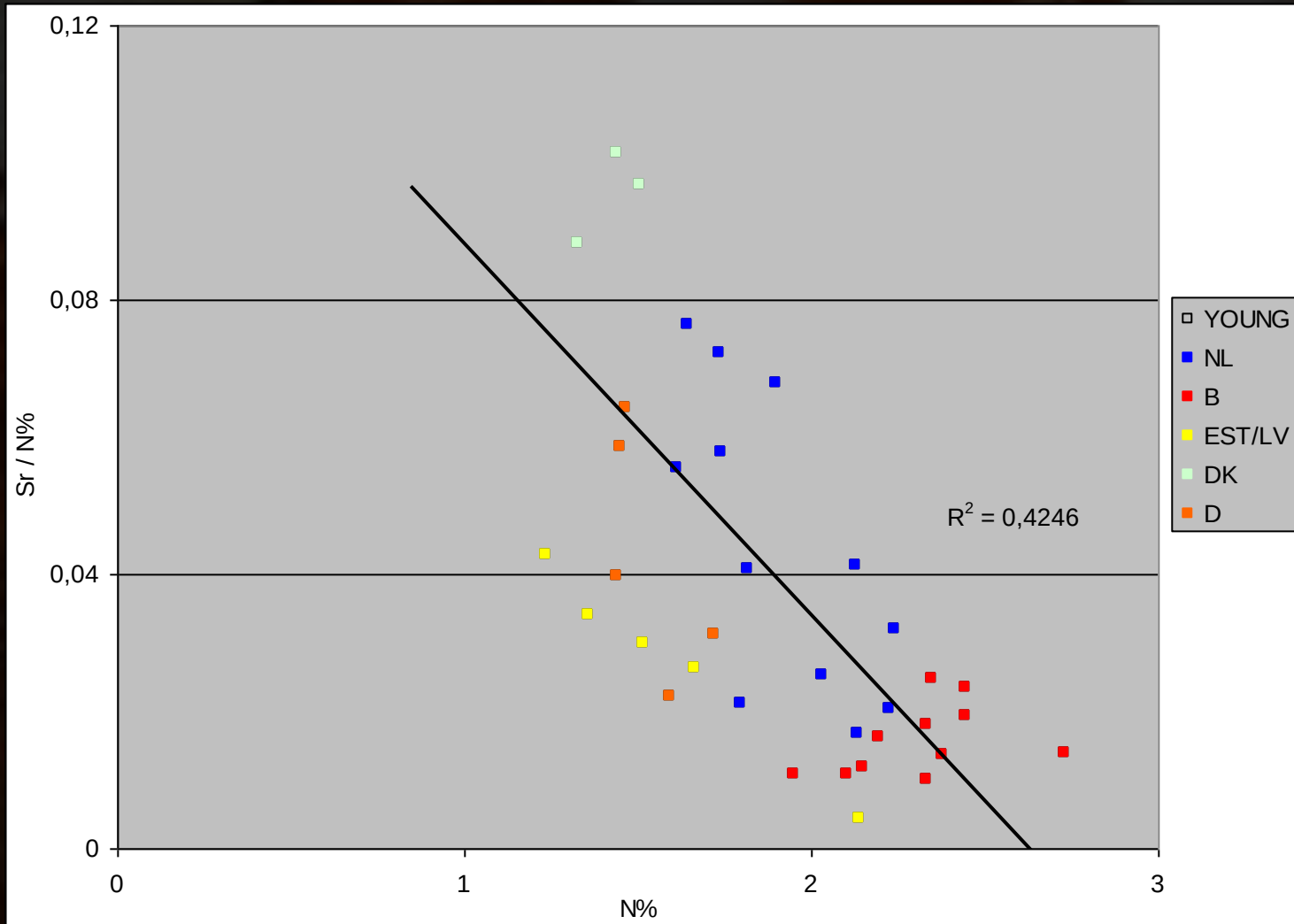
- Development in content: maturation ?
- Is imbalance the problem ?

Ratio Magnesium/N% in *V.oxycoccos*



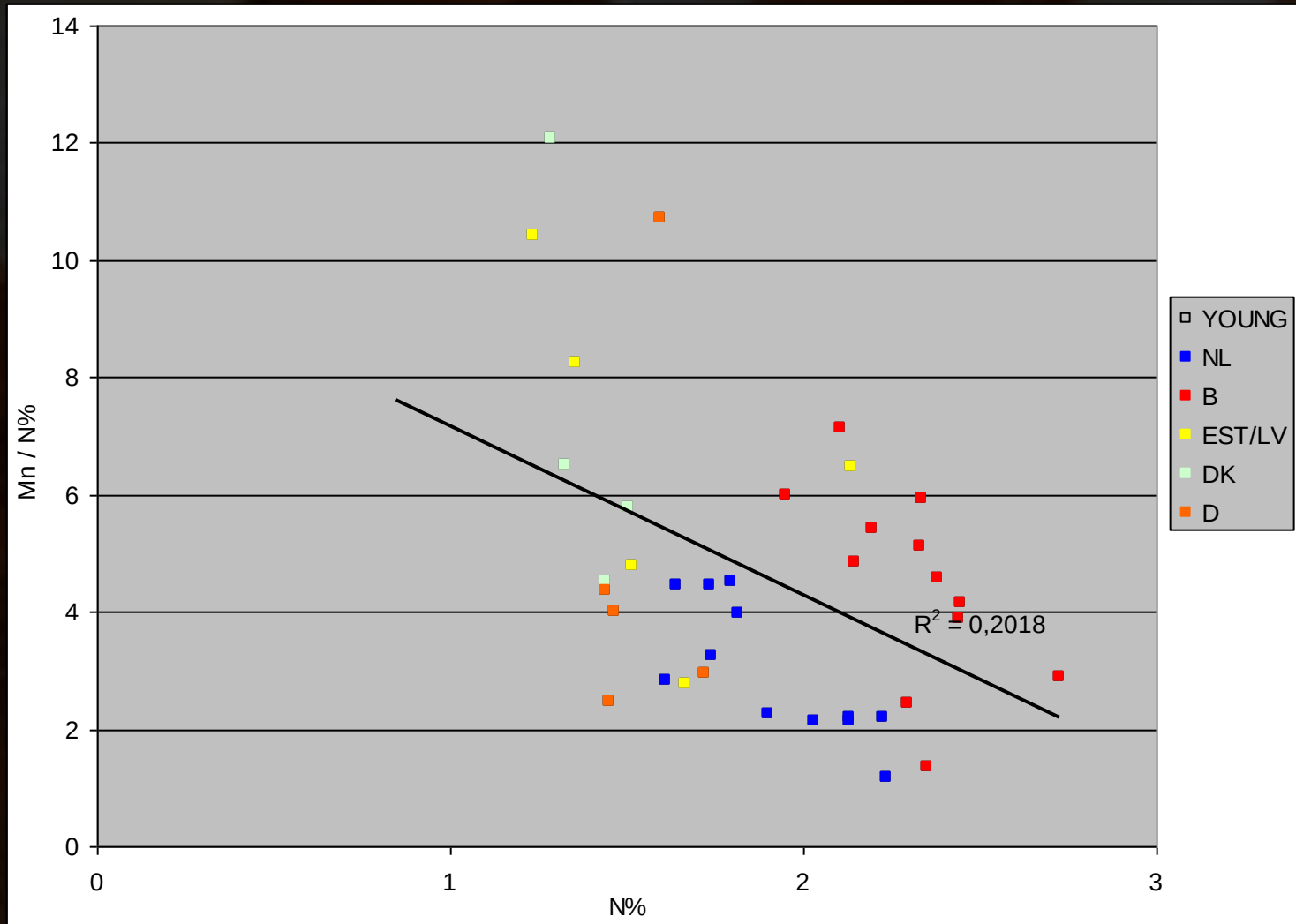
- Development in content: maturation ?
- Is imbalance the problem ?

Ratio Strontium/N% in *V.oxycoccos*

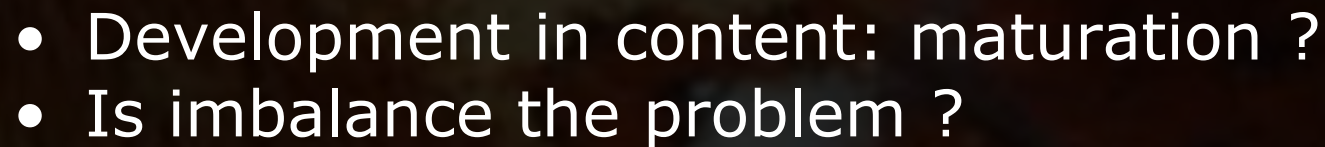


- Development in content: maturation ?
- Is imbalance the problem ?

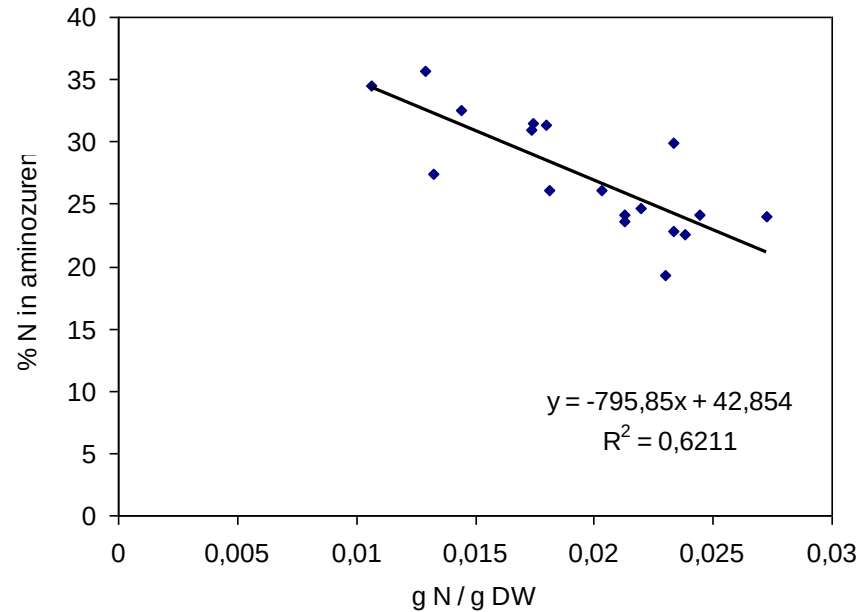
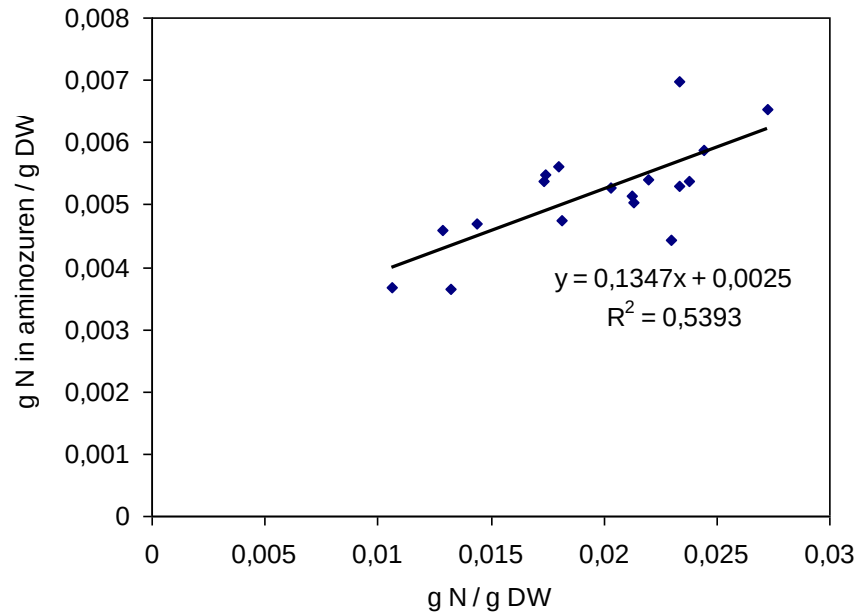
Ratio Manganese/N% in *V.oxycoccos*



- NL low Mn content

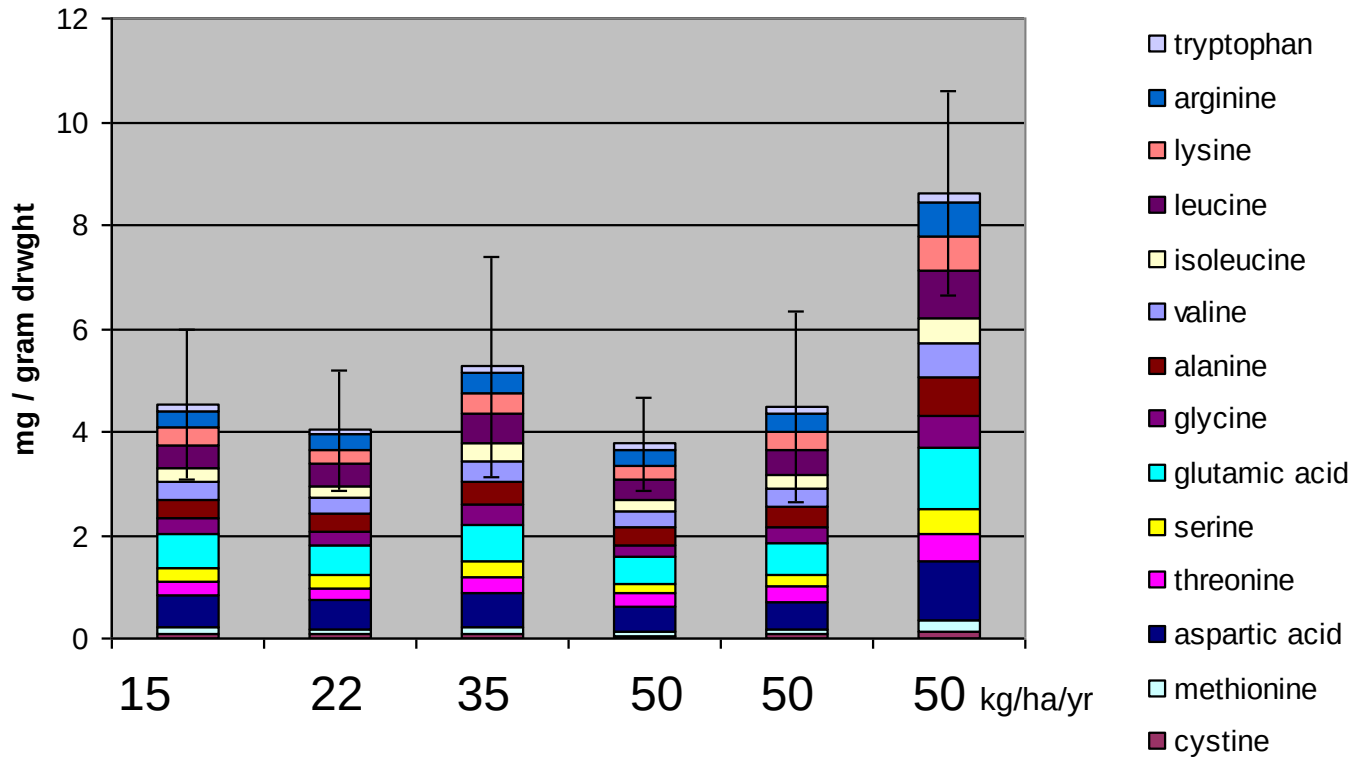


Extra N not only in amino acids



Is extra N present in amino acids?

Grey Hair-grass (*Corynephorus canescens*)



High N-deposition →
Sand burial →

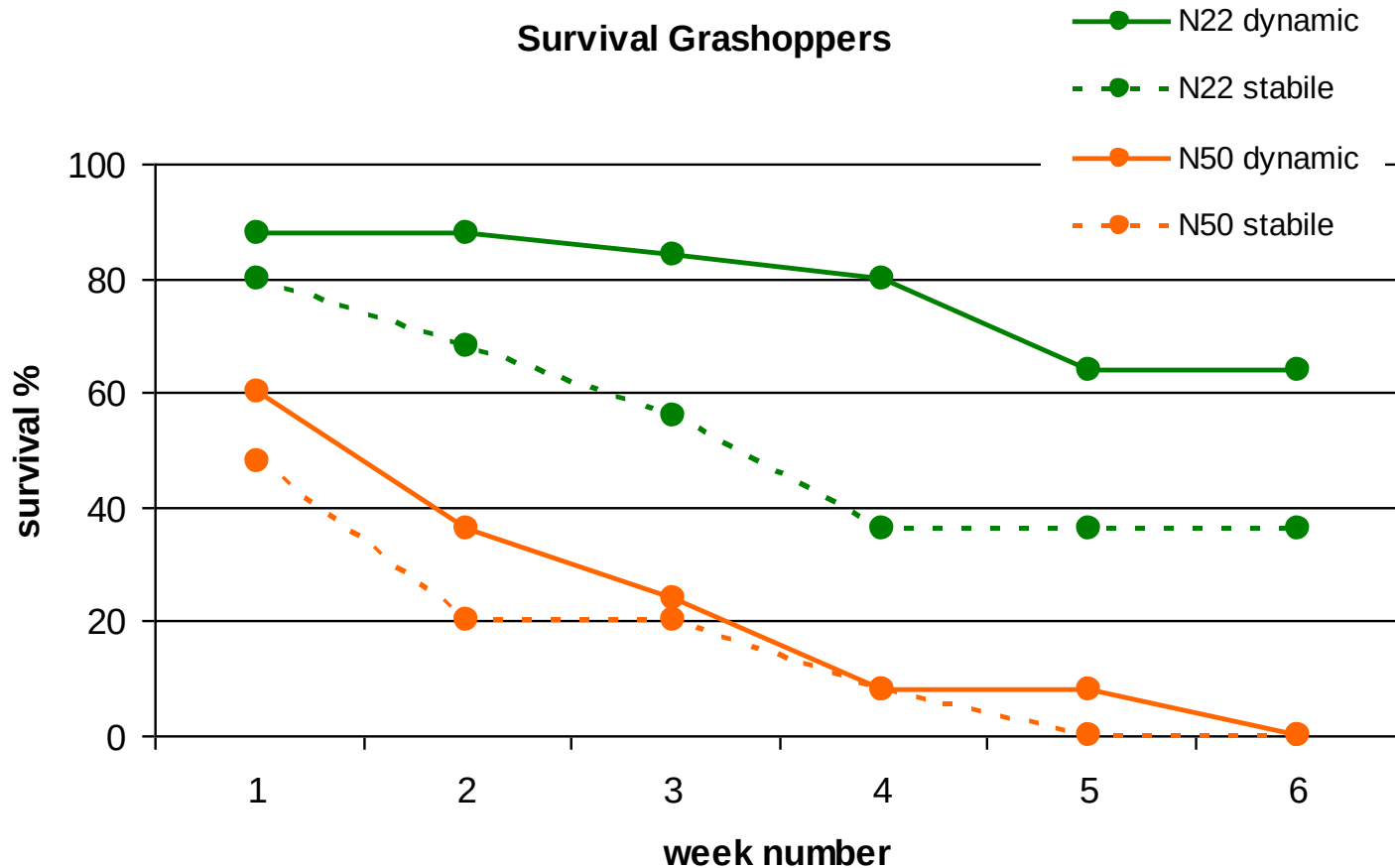
No !
Yes, an increase !





Lab experiment
Myrmeleotettix maculata on
Grey Hair-grass *Corynephorus canescens*

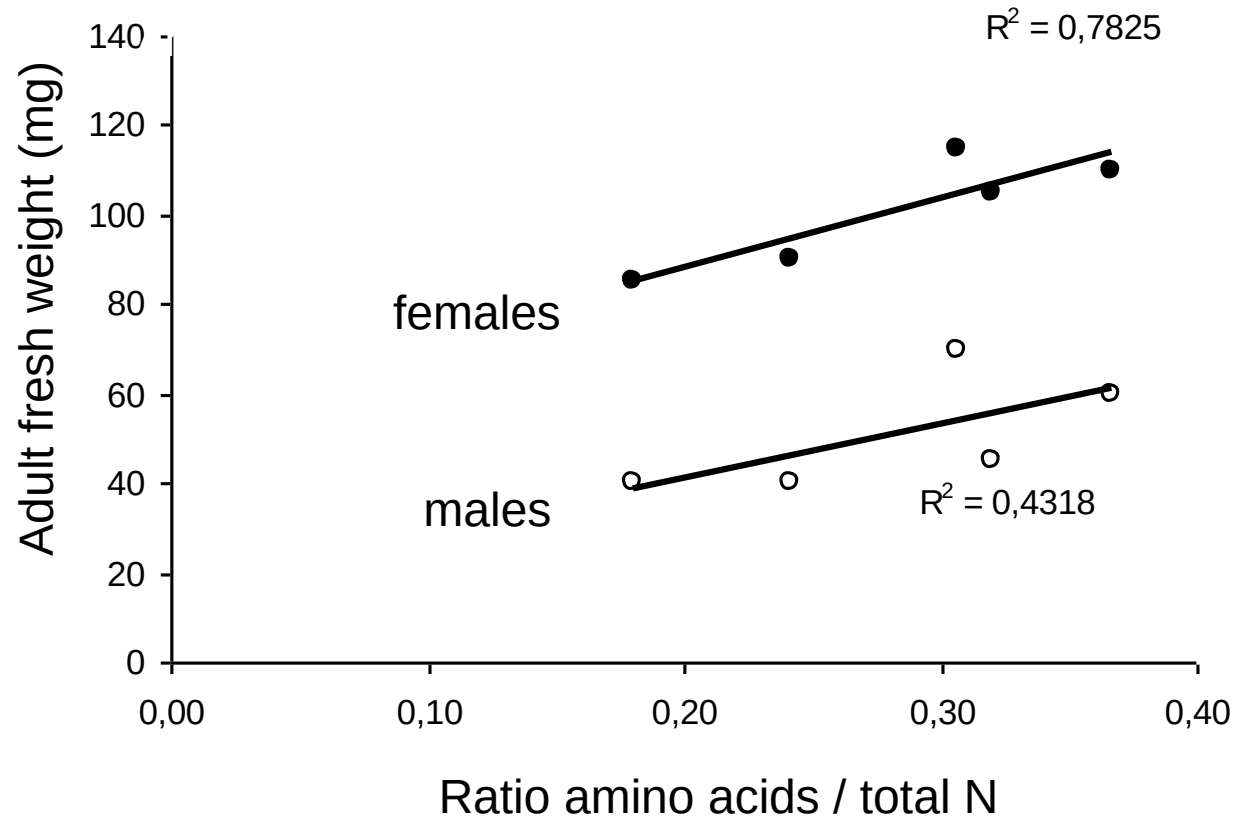
Do differences in food-quality have effect on growth and survival of herbivores?



Yes; low N-deposition and high dynamics increase survival rate



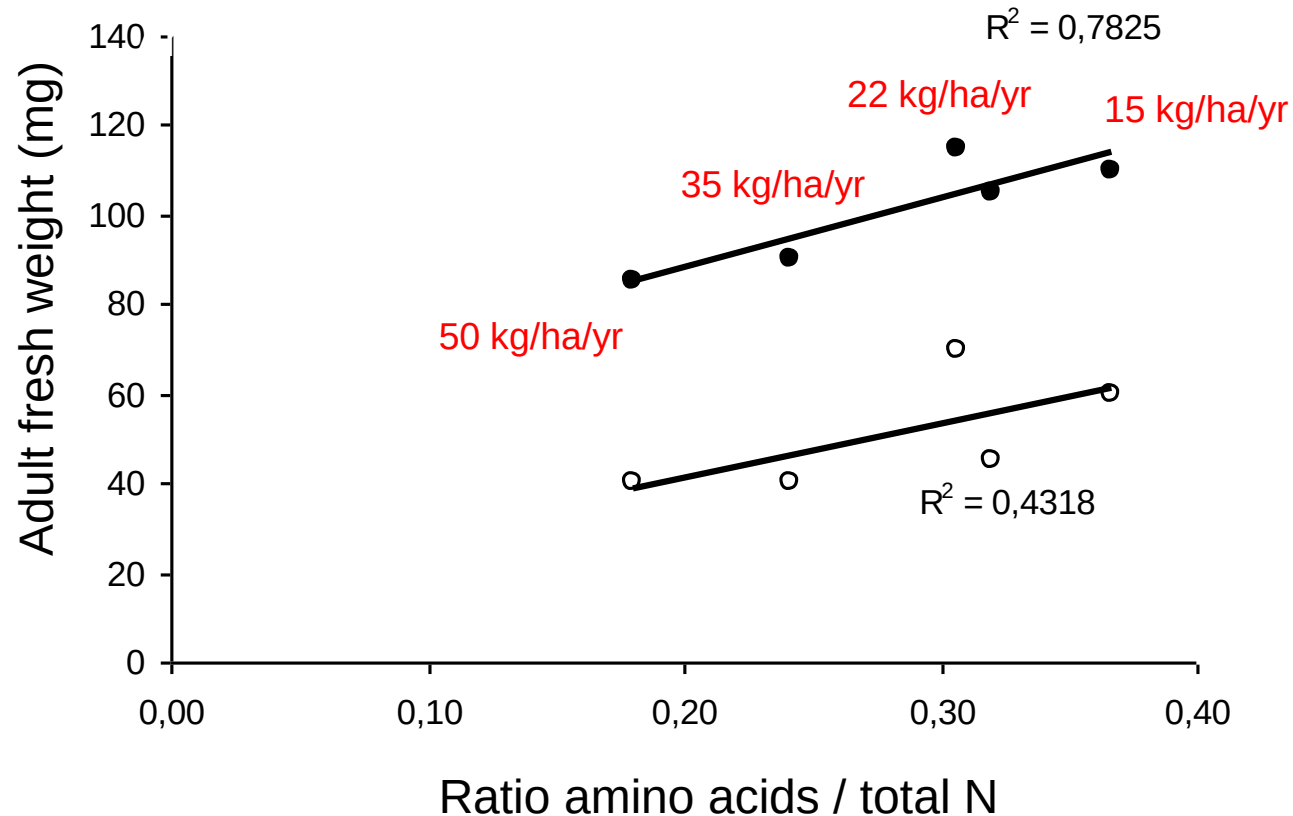
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Yes; high ratio of amino acids correlates with high adult body weight



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Conclusions

- Increased content of N-compounds in host plants can be fatal to caterpillars
- Imbalances between N% and amino acids and various elements correlated to increased N%, but depending on growth conditions
- A problem to caterpillars ? Depending on compounds in which extra N is stored in the plant, other compounds, age of leaves...



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