



Nutrient addition affects leaf N-P scaling relationship in *Arabidopsis thaliana*

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Yan *et al.*, 2018. *Functional Ecology*.



Outline

- ✿ **Introduction**
- ✿ **Materials and Methods**
- ✿ **Results and Discussion**
- ✿ **Conclusion**

Outline



Introduction



Materials and Methods



Results and Discussion

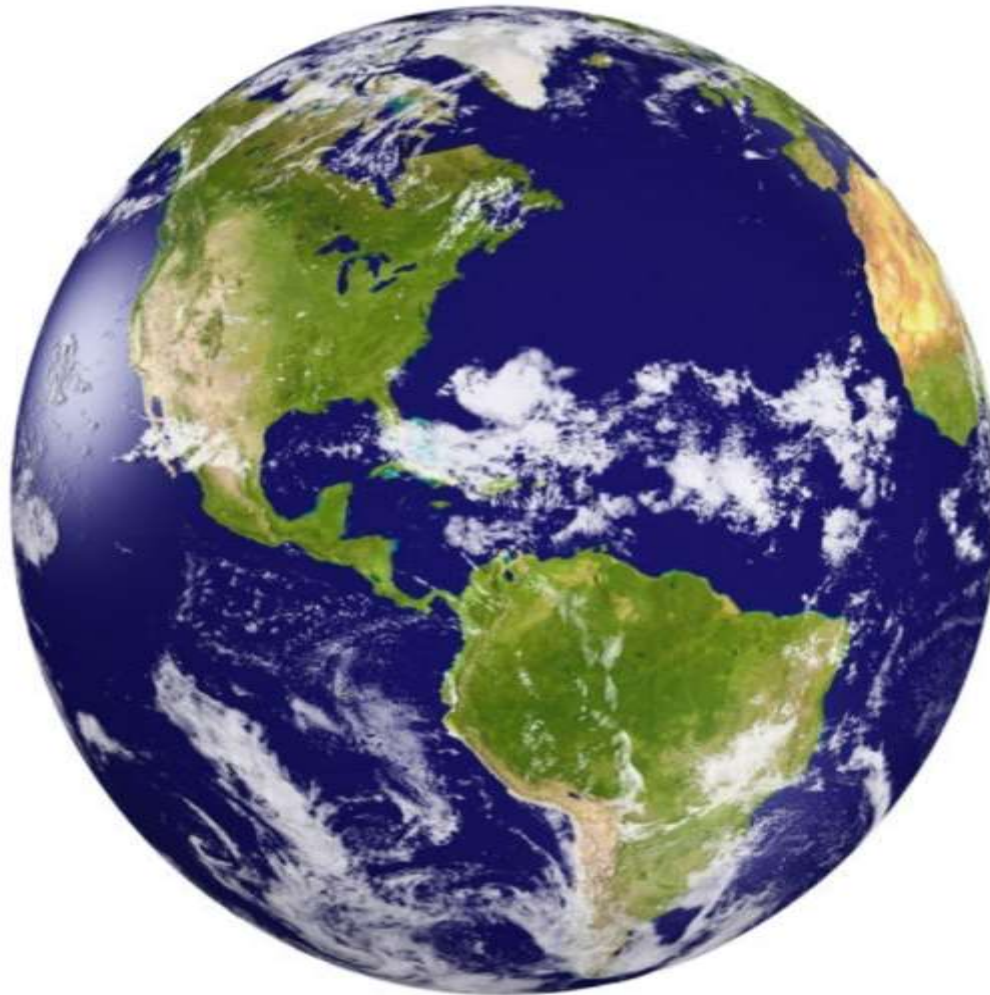


Conclusion

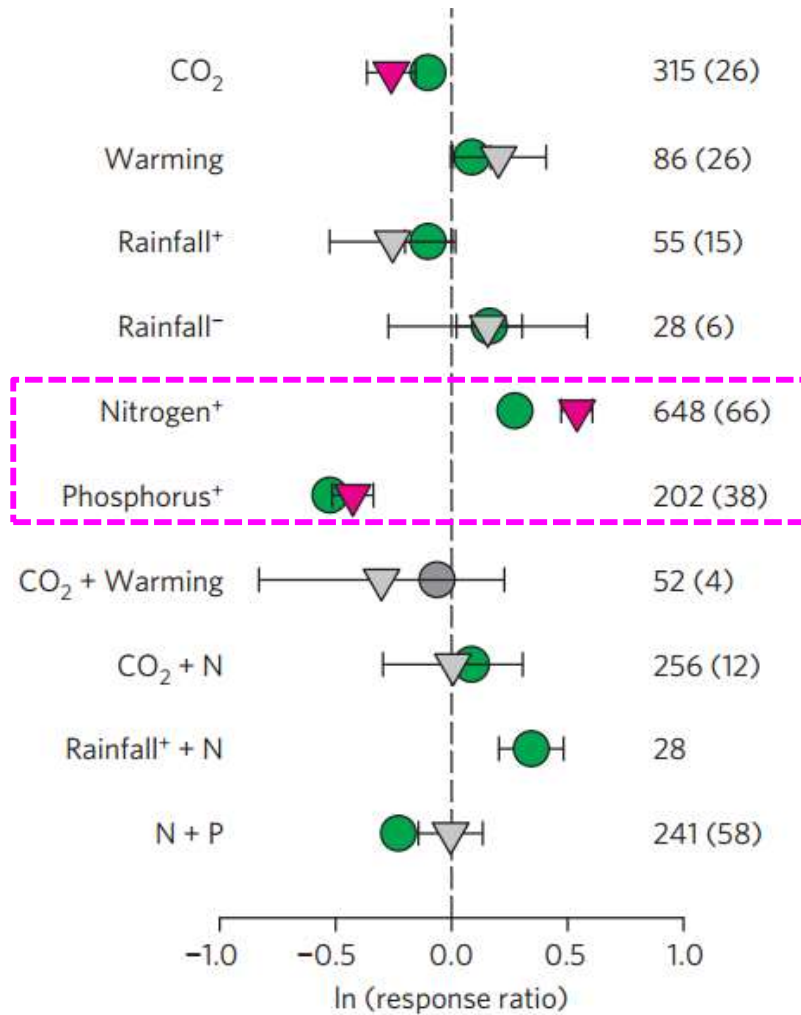
1. Introduction

Global nutrient changes

We fertilize the biosphere



Decoupling of plant N and P under global changes

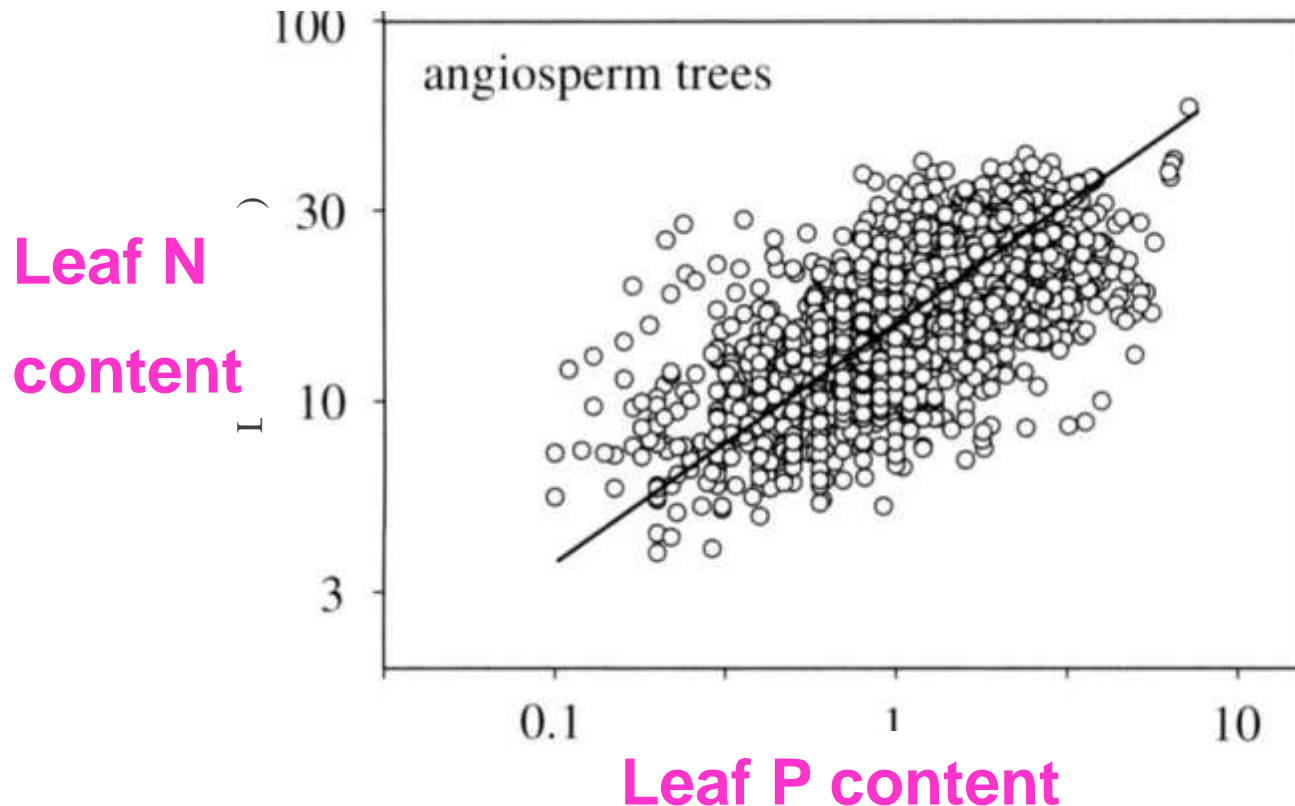


N:P response

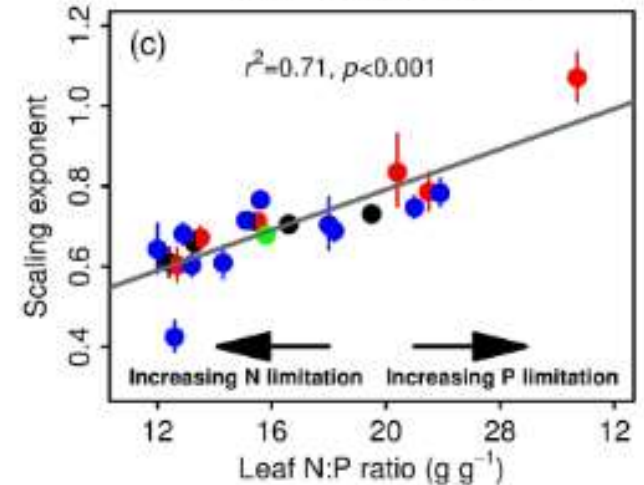
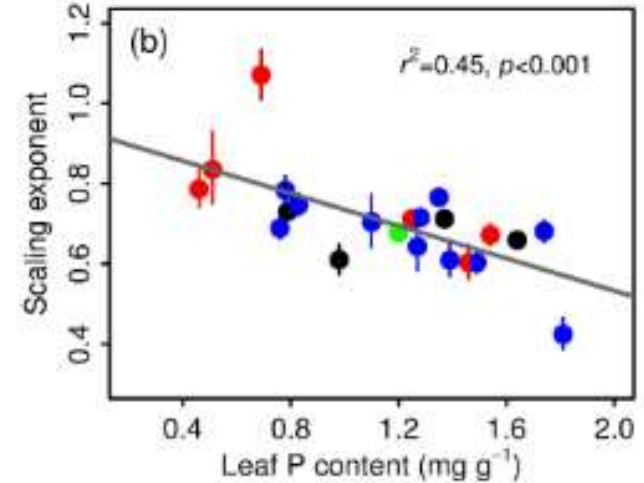
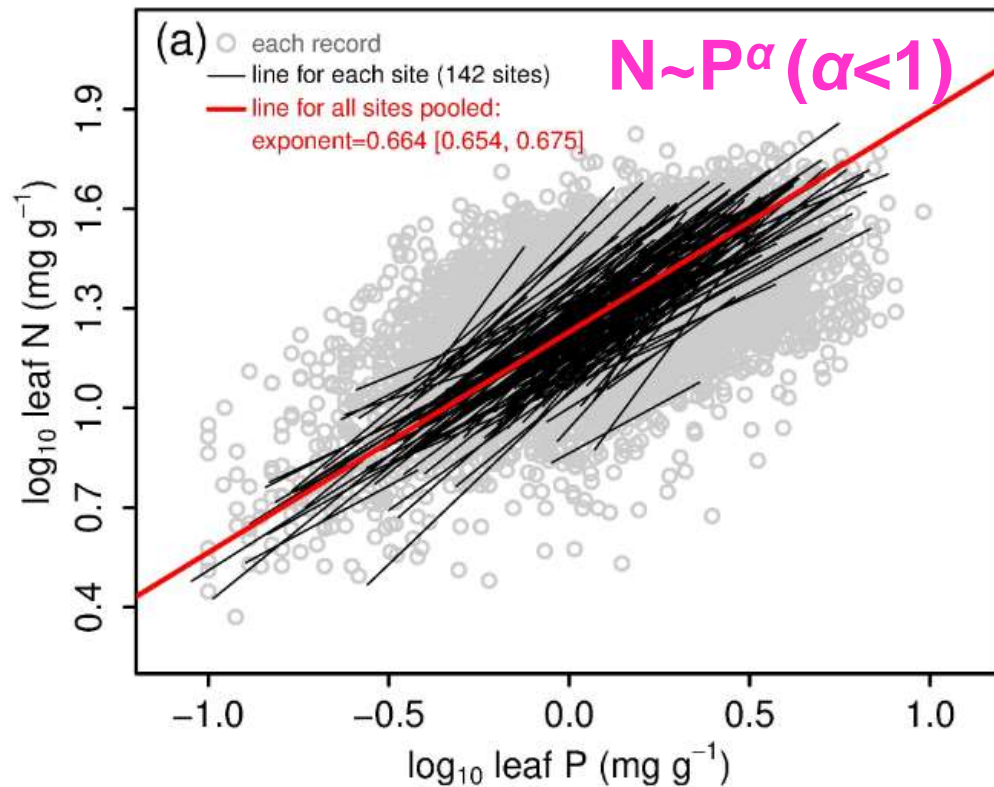


Evidence of a **general 2/3-power law** of scaling leaf nitrogen to phosphorus among major plant groups and biomes

Peter B. Reich, Jacek Oleksyn, Ian J. Wright, Karl J. Niklas, Lars Hedin and James J. Elser



Revisiting the N~P scaling at the global scale



- Vary across functional groups, sites, latitudinal zones and ecoregions
- Tight association with leaf P content

My scientific question

How do the nutrient changes influence the leaf N-P scaling relationship???



Outline



Introduction



Materials and Methods

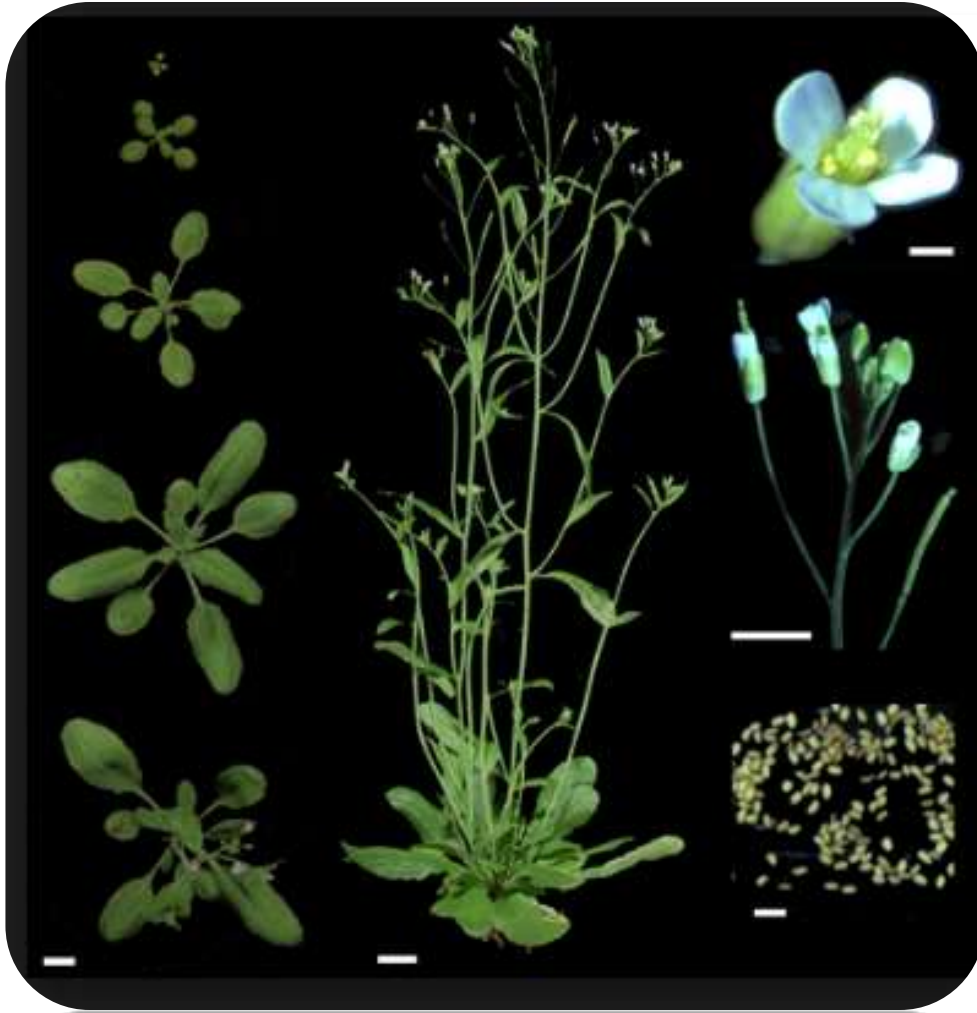


Results and Discussion



Conclusion

2. Materials and Method



A species in the family
Brassicaceae

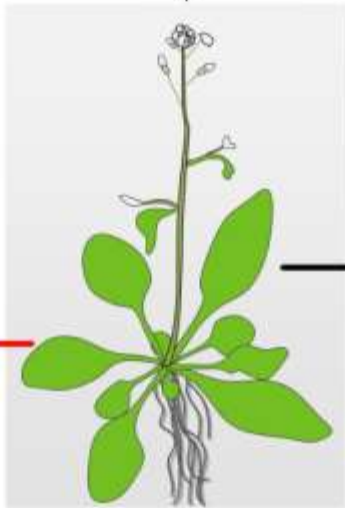
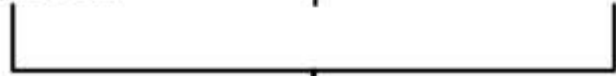
An annual life-history
strategy

A model organism for
plant biological studies

Five levels of N
addition

+

Five levels of P
addition



Conducting:
nine repeat
experiments

Measuring:
N and P
contents

Leaf



Exploring the effects of
nutrient addition type on the
leaf N-P scaling relationship

Exploring the effects of
nutrient addition level on the
leaf N-P scaling relationship



Growth conditions : 18-20 °C,
16 h light/8 h dark photoperiod

Growing substrate : sterilised
vermiculite+Hogland nutrient
solutions



Outline



Introduction



Materials and Methods



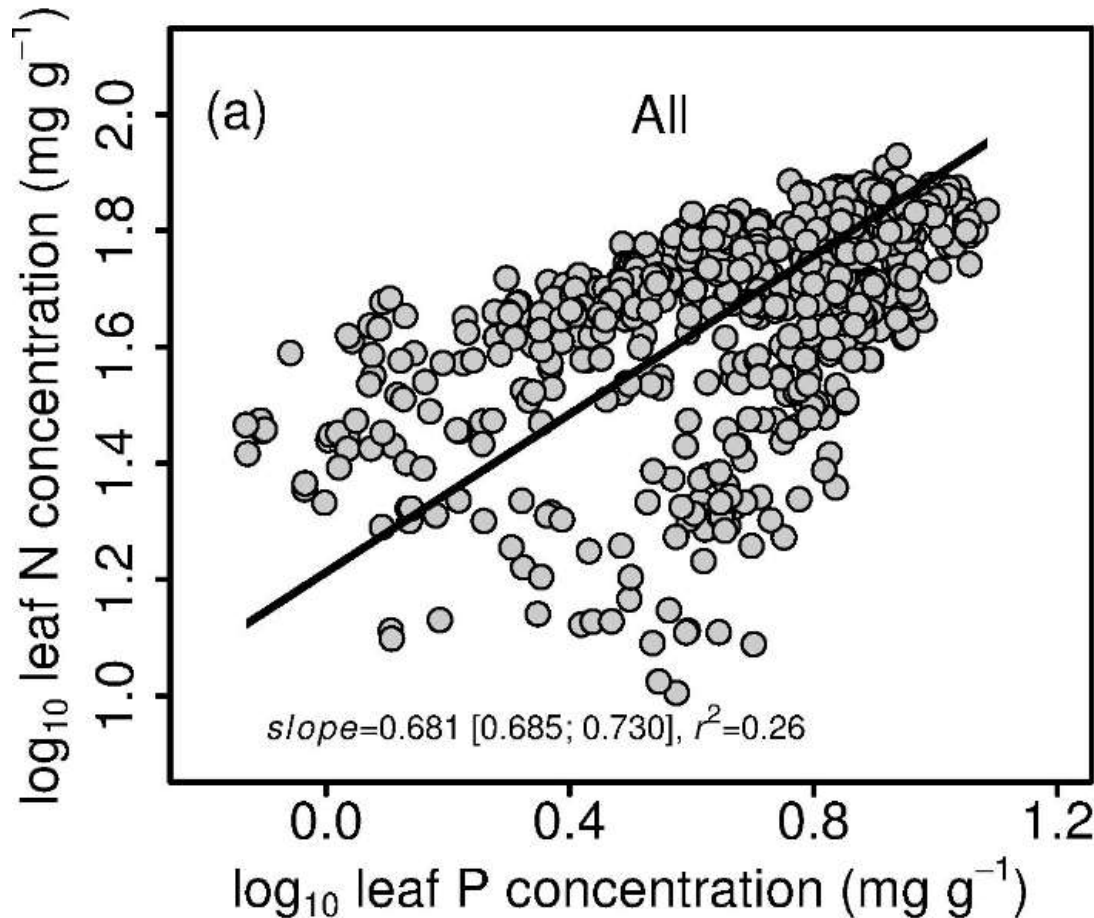
Results and Discussion



Conclusion

3. Results and Discussion

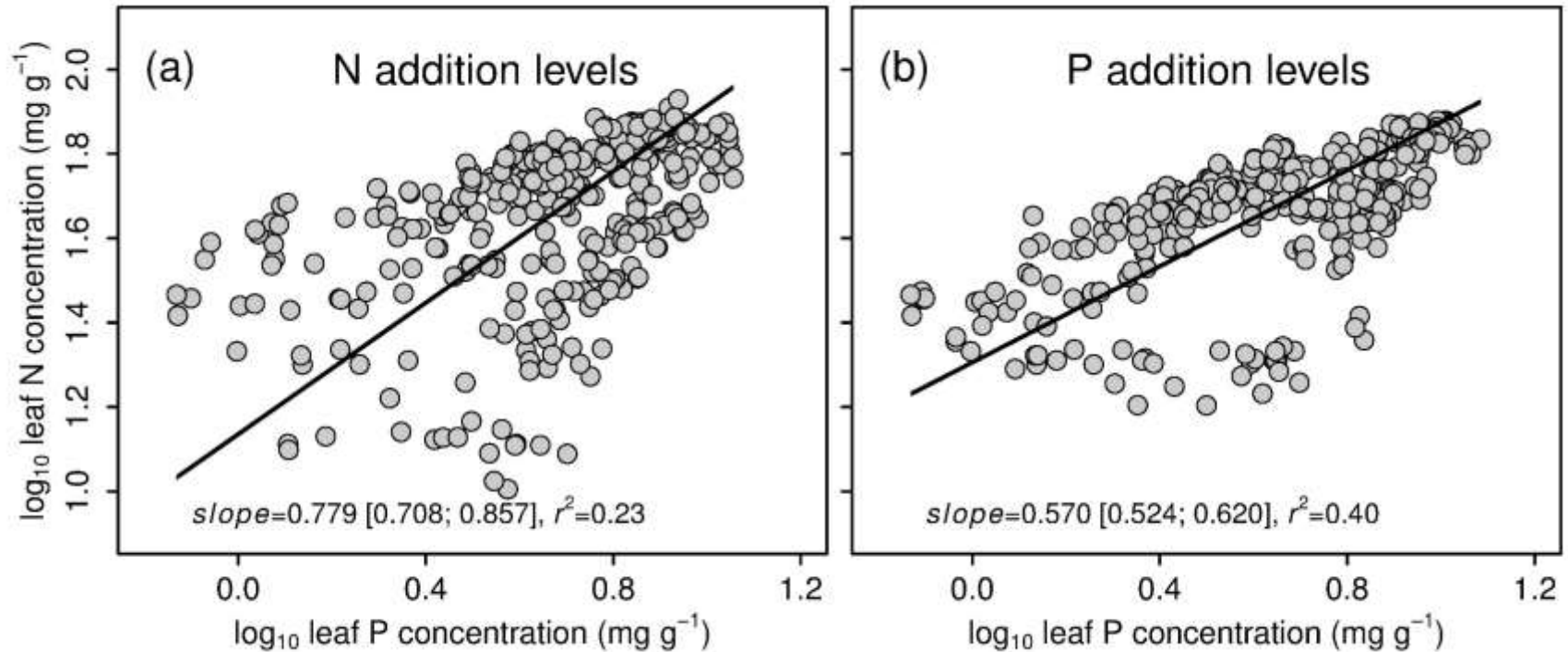
➤ All data pooled together



Scaling exponent
0.681 [0.685, 0.730]

Approx. 2/3

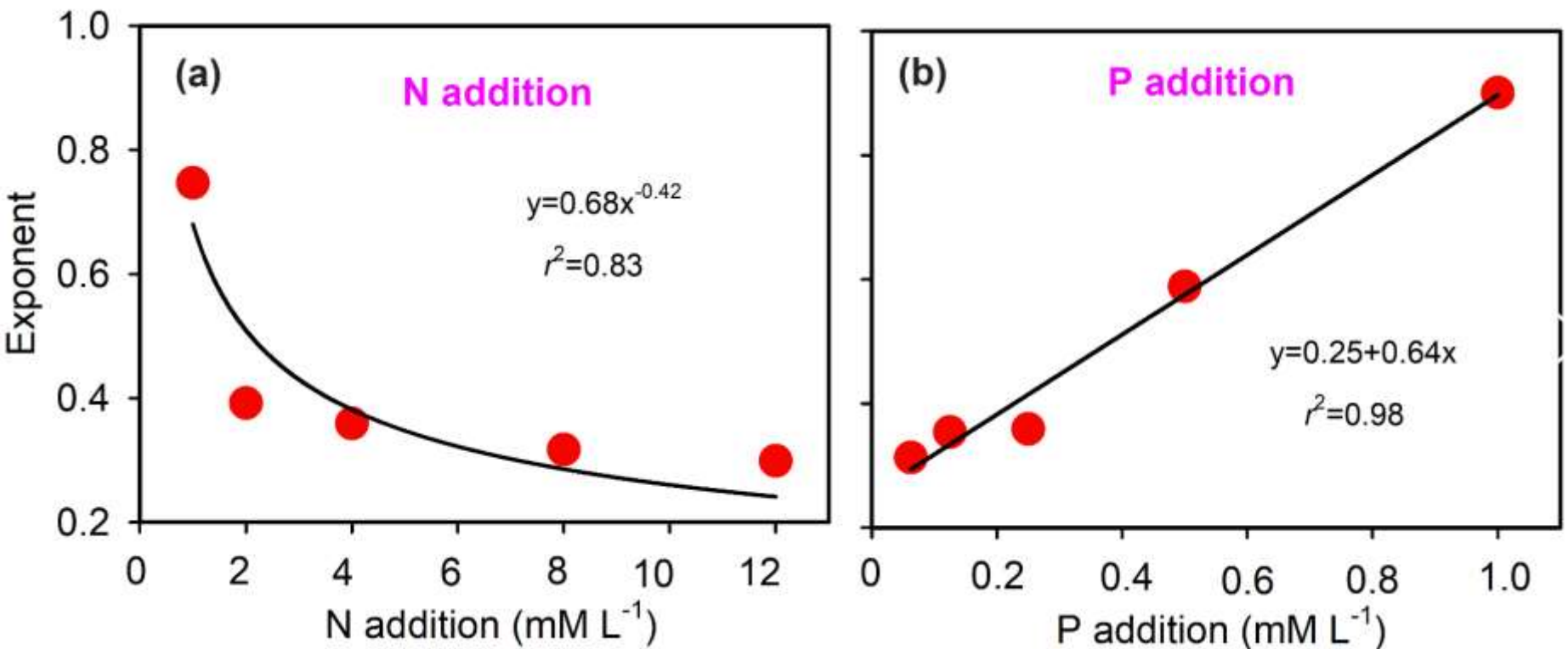
➤ Considering the effects of nutrient addition type



N addition (0.779) > P addition (0.570)

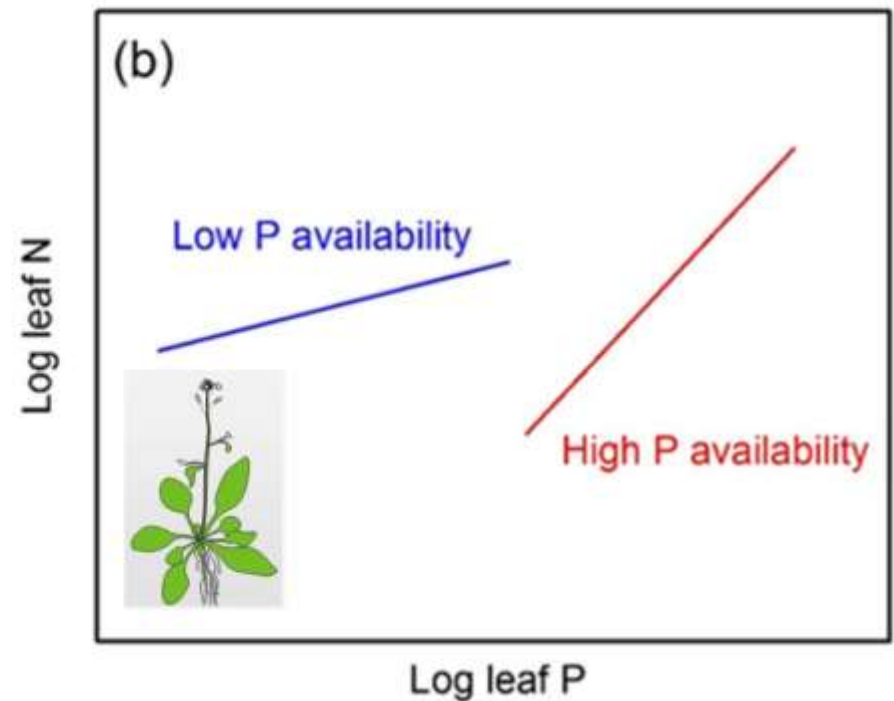
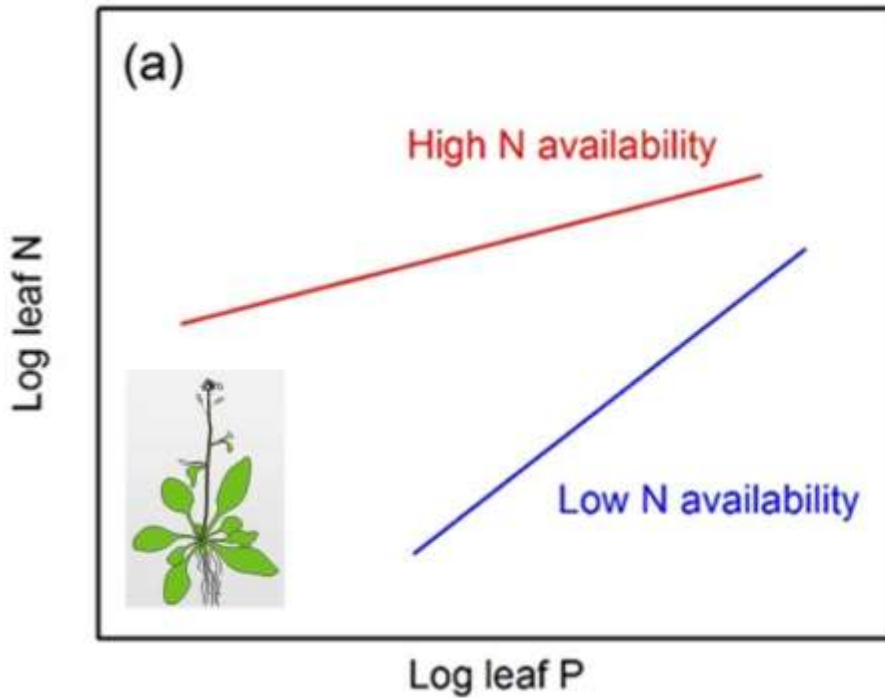
Compared with P addition, N addition increases the relative variability of leaf N content, and *vice versa*

➤ Considering the effects of nutrient addition levels



N addition decreases the scaling exponent;

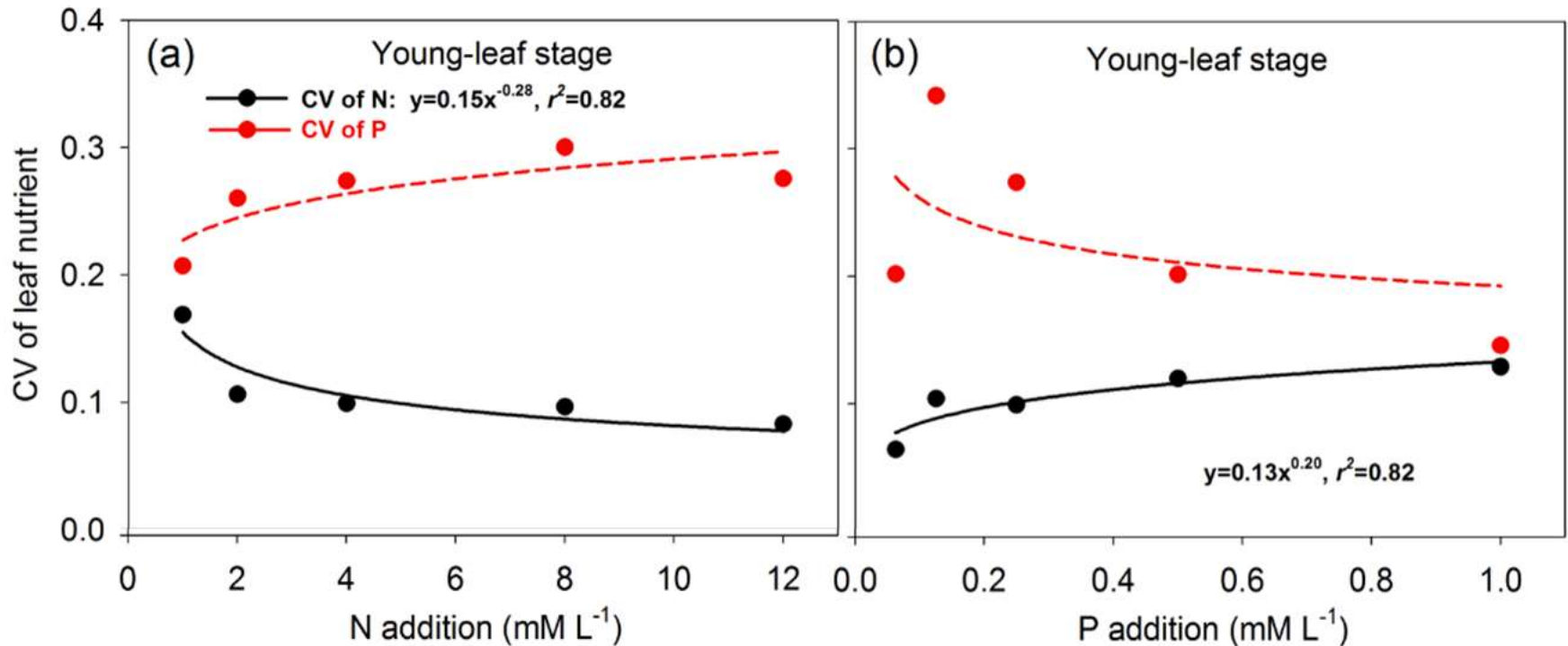
P addition increases the scaling exponent



That is, the increasing level of N (or P) addition induced the diminished (or accelerated) variability of the leaf N relative to P concentration among plant individuals.

Further support

CV: coefficient of variation

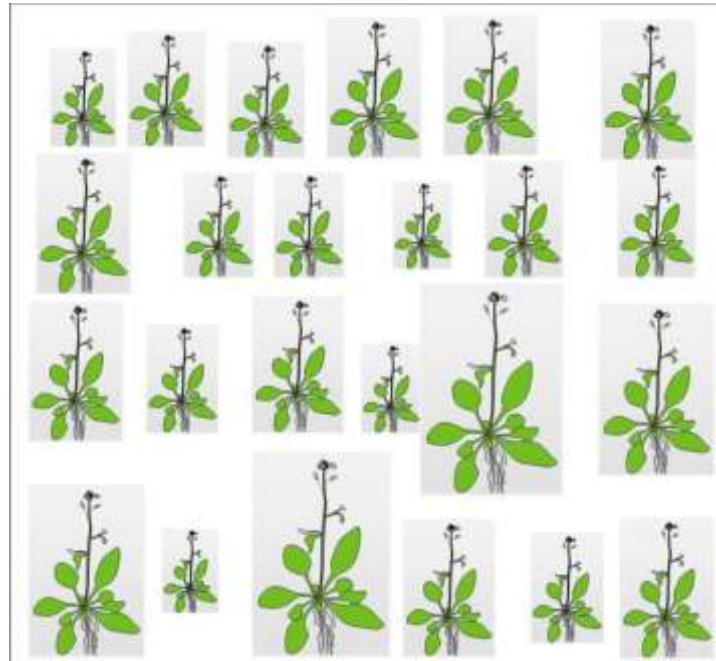


N addition decreases the CV of leaf N but increases the CV of leaf P;

P addition increases the CV of leaf N but decreases the CV of leaf P

Nutrient Availability-Individual variability Hypothesis

High nutrient availability decreases the variability of its own concentration, but promotes the fluctuation in another tightly associated nutrient concentration in leaves among plant individuals



One population

Outline



Introduction



Materials and Methods



Results and Discussion



Conclusion

Conclusions

- **Proposing one novel hypothesis**

Nutrient availability-Individual Variability Hypothesis

- **Nutrient type and level alter leaf N-P scaling relationship**

- **General law may mask important information at fine scale**

Future research interests

- **Plant stoichiometry and its linkage with ecological functioning**
- **Nitrogen and phosphorus cycles in terrestrial and aquatic ecosystems under global change**
- **Biogeography and variability of plant functional traits at large scales**

These Work from them....



Prof. Jingyun Fang



Prof. Wenxuan Han



Prof. Yalong Guo



Dr. Di Tian



Dr. Zhengbing Yan

Thanks for your attentions!!!

If you have any other questions or suggestions, please email me yanzhengbing@pku.edu.cn

