

Correlated biogeographic variation in magnesium across trophic levels

Xiao Sun^{1,2}



Yue Gao²



Chunjiang Liu¹



¹School of Agriculture and Biology and Research Centre for Low-Carbon Agriculture, Shanghai Jiao Tong University, Dongchuan Rd. 800, Shanghai 200240, China (chjliu@sjtu.edu.cn)

²College of Agro-grassland Science, Nanjing Agricultural University, 1 Weigang Road, Nanjing, Nanjing, 210095, China (sunxiao1014@126.com for Xiao Sun)

Introduction

- Some studies suggest that change of climate, such as the increase of temperature and change of precipitation may influence organism Mg and K:Mg (Reinbott and Blevins, 1994; Han et al, 2011; Sun et al, 2012);
- However, we have little understanding of the influence of climate change on terrestrial food chain.

Question

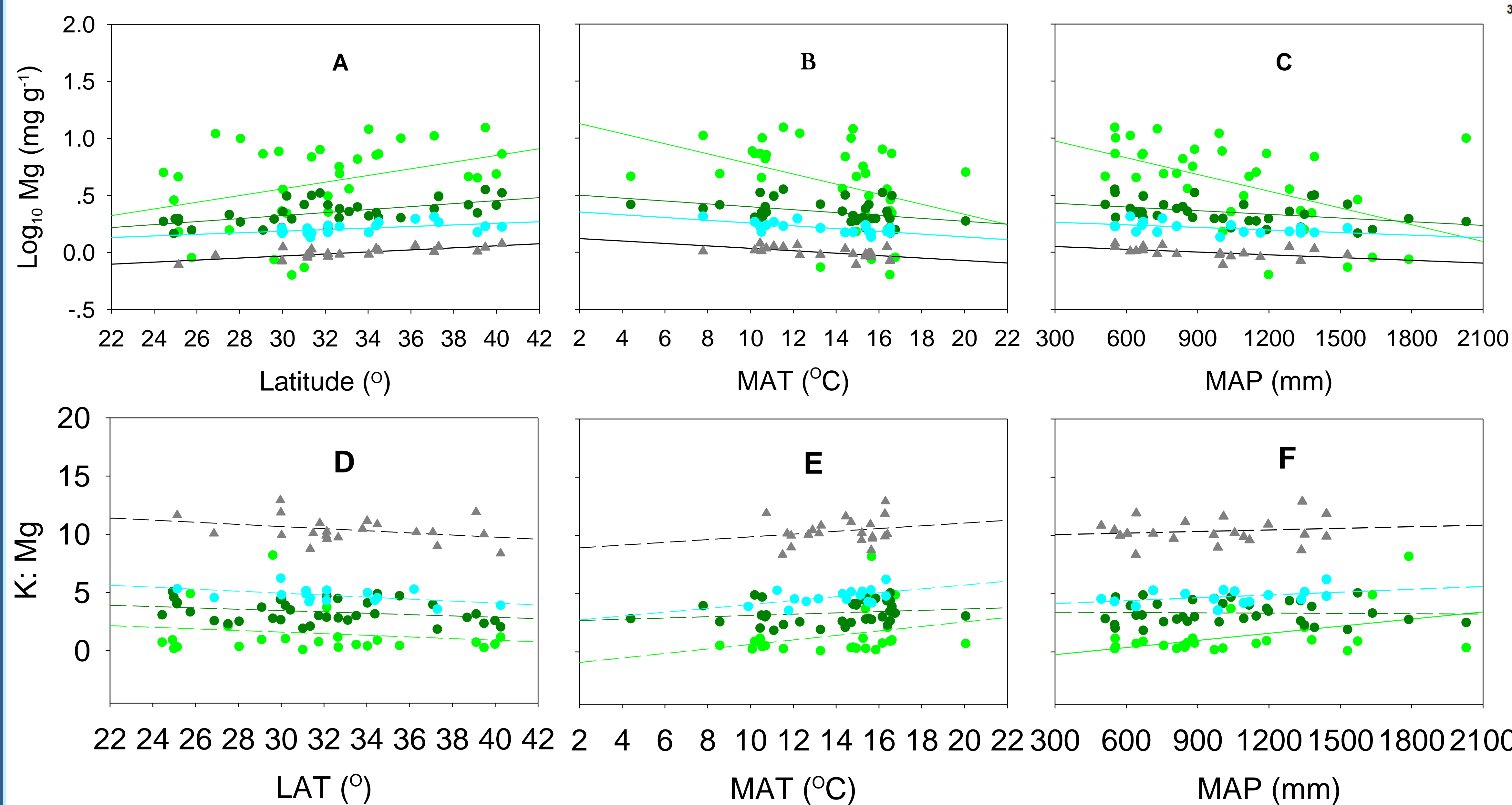
- How Mg concentration and K:Mg vary with climate across multiple trophic levels?

Methods

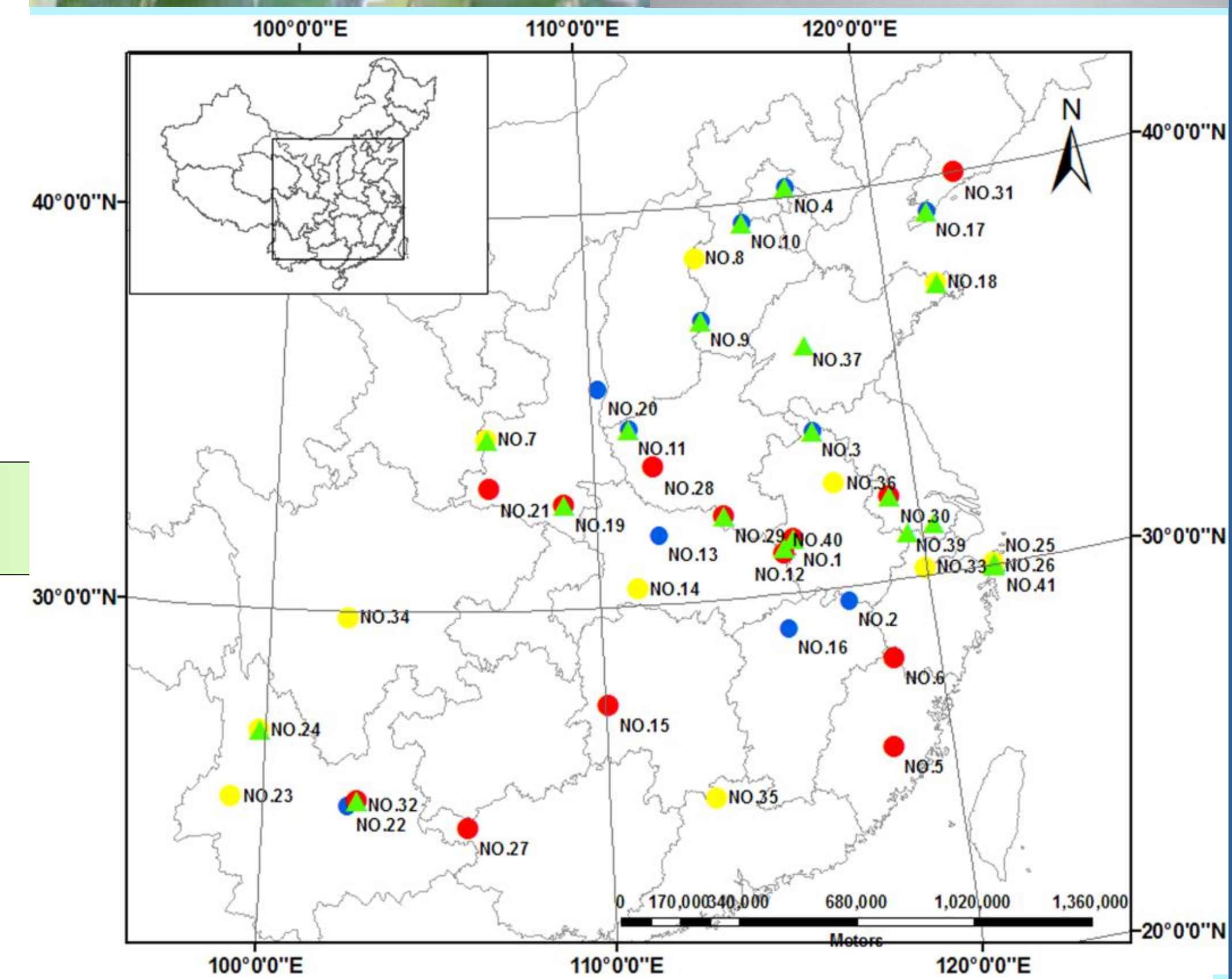
- We used macroclimatic variation induced by latitude;
- We collected samples (*Quercus variabilis* leaf, acorn and acorn predator--weevil larvae) from eastern China (c. 25 – 41°N and 99 – 123°E), and investigated how Mg concentration and K:Mg vary with climate across multiple trophic levels.



Main Result



Trends of soil, leaf, acorn and weevil larva Mg concentration and K:Mg along the latitude (LAT: A, D), mean annual temperature (MAT: B, E), and mean annual precipitation (MAP: C, F). Full lines show significance ($p < 0.05$) and that dotted lines delineate non-significance ($p > 0.05$).



Distribution map of *Q. variabilis* stands sampled across eastern China. Solid circles *represent* soil and leaf *sampling sites* (yellow circles *sampled in 2009*, red circles *sampled in 2007-2009*, and blue circles *sampled in 2008-2009*), and the green solid triangles *represent* acorn and weevil larva *sampling sites* in 2009.

Conclusions

- Distinct mechanisms may drive geographical patterns of Mg variation at different trophic levels, leading to different latitudinal sensitivity to climate change.
- These clear consistent patterns suggest ways in which Mg in ecosystems may vary with climate change.
- Shifts in climate may most affect final crop consumer by altering Mg concentration rather than K:Mg.

References

- Reinbott T, Blevins D (1994) Phosphorus and temperature effects on magnesium, calcium, and potassium in wheat and tall fescue leaves. *Agronomy journal* 86: 523–529.
- Han W, Fang J, Reich PB, Ian Woodward F, Wang Z (2011) Biogeography and variability of eleven mineral elements in plant leaves across gradients of climate, soil and plant functional type in China. *Ecology Letters* 14: 788–796.
- Sun, X., Kang, H., Du, H., Hu, H., Zhou, J., Zhou, J., et al., 2012. Stoichiometric traits of oriental oak (*Quercus variabilis*) acorns and their variations in relation to environmental variables across temperate to subtropical China. *Ecological Research* 27:765-773.

