



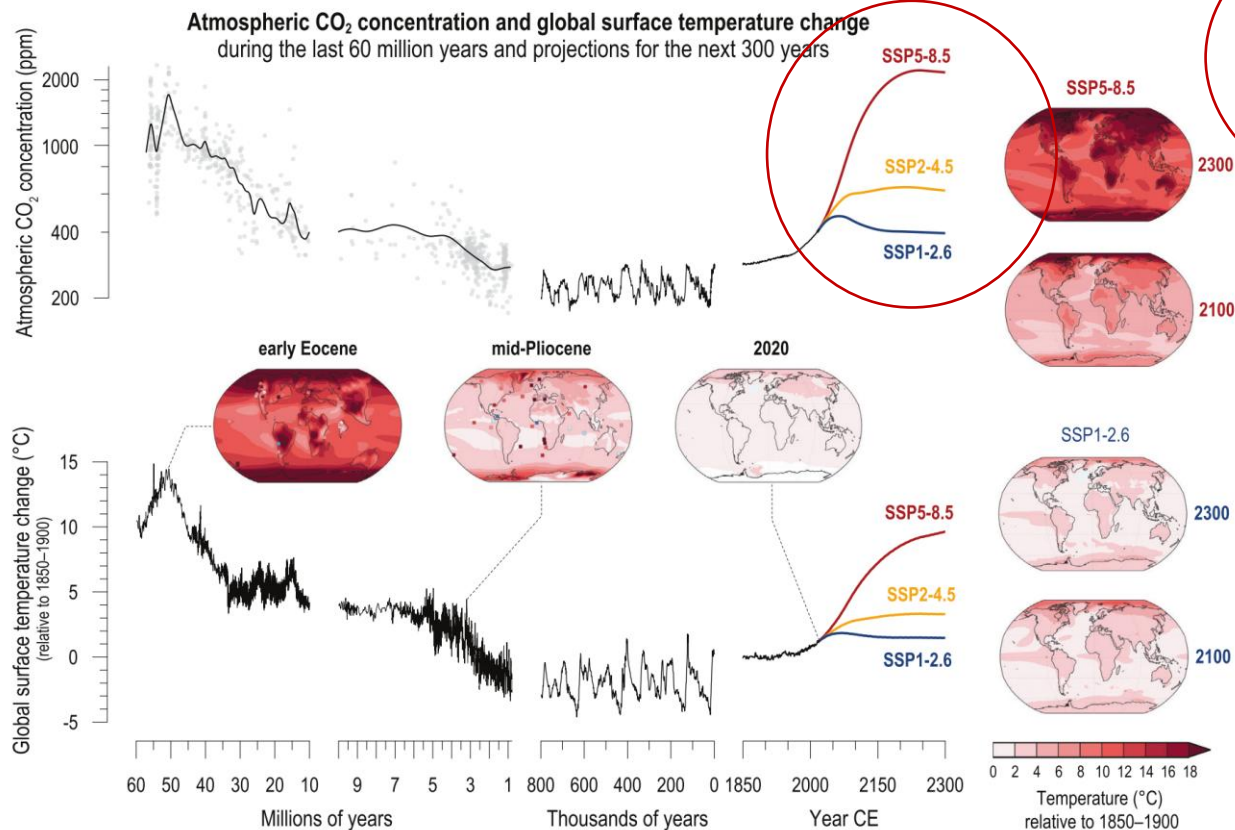
Effects of elevated atmospheric [CO₂] on grain starch characteristics in different specialized wheat

Liang Zheng

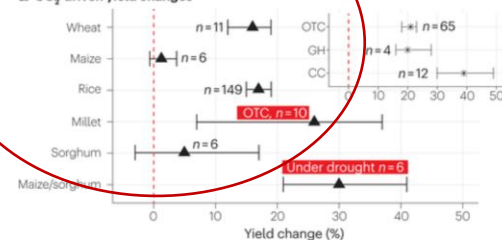
Henan Agricultural University

2026-03-13

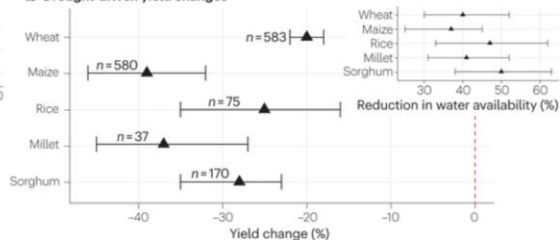
Elevated CO₂ is a key driver of climate change with crop impacts



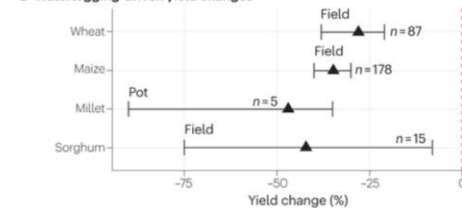
a CO₂-driven yield changes



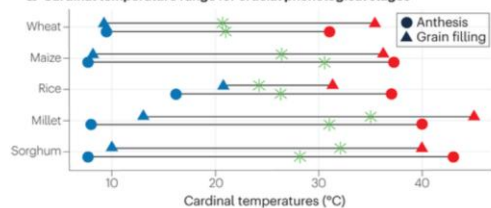
b Drought-driven yield changes



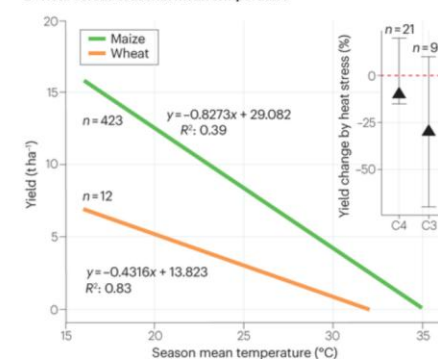
c Waterlogging-driven yield changes



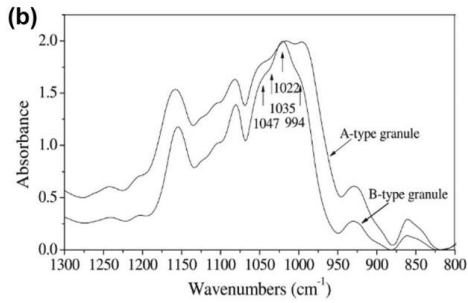
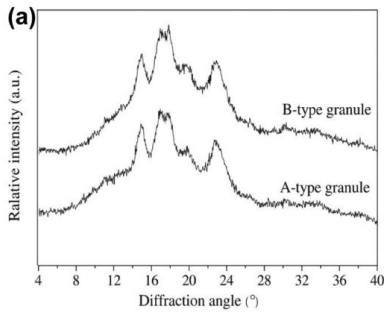
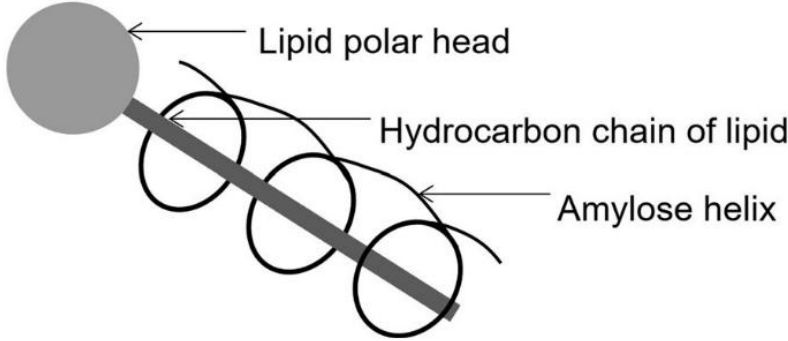
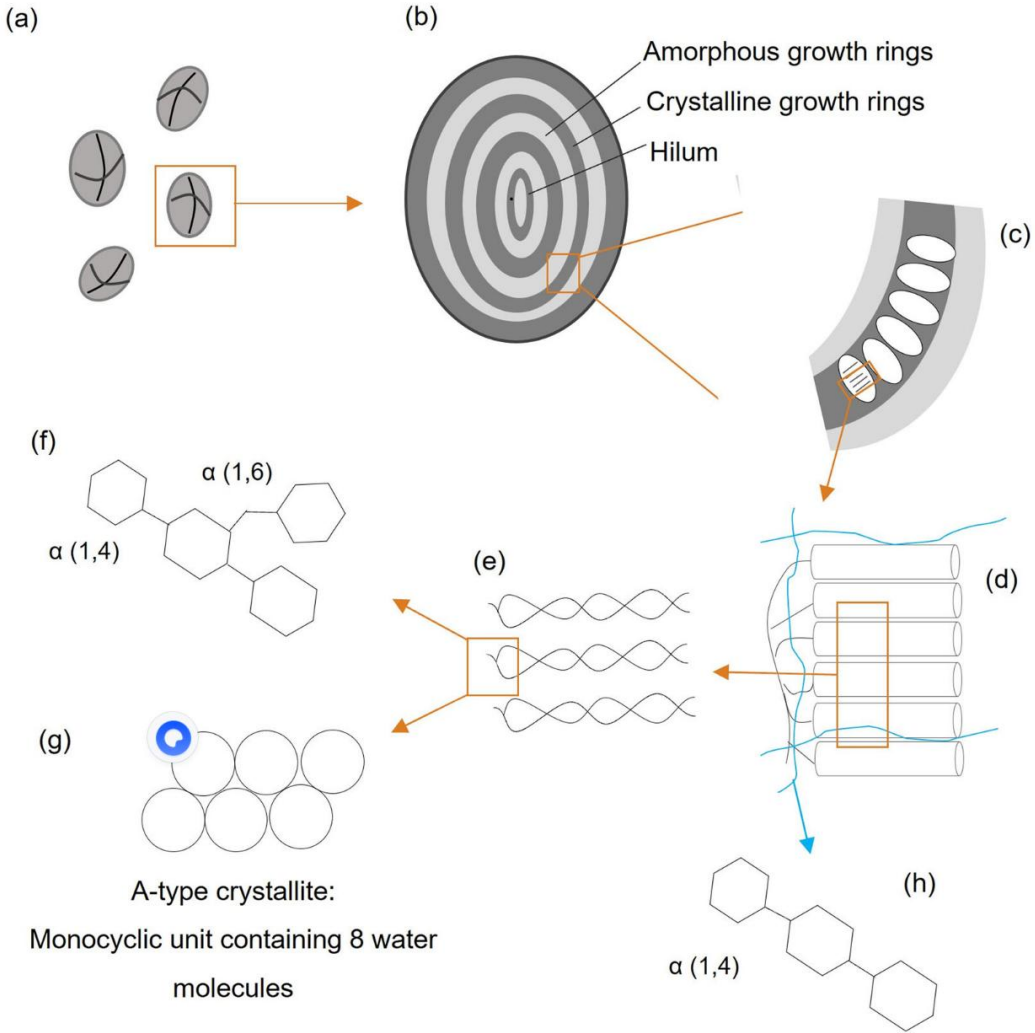
d Cardinal temperature range for crucial phenological stages



e Yield versus seasonal mean temperature

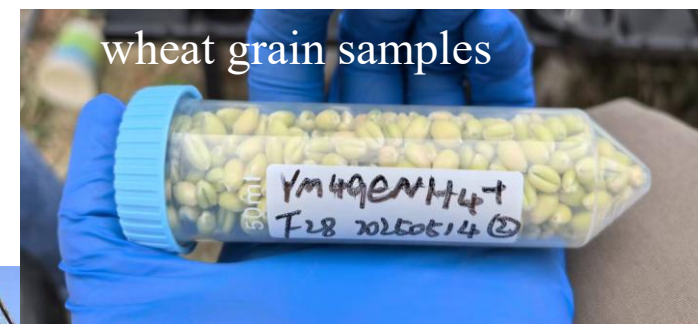


Starch Structure Determines Wheat Processing Quality

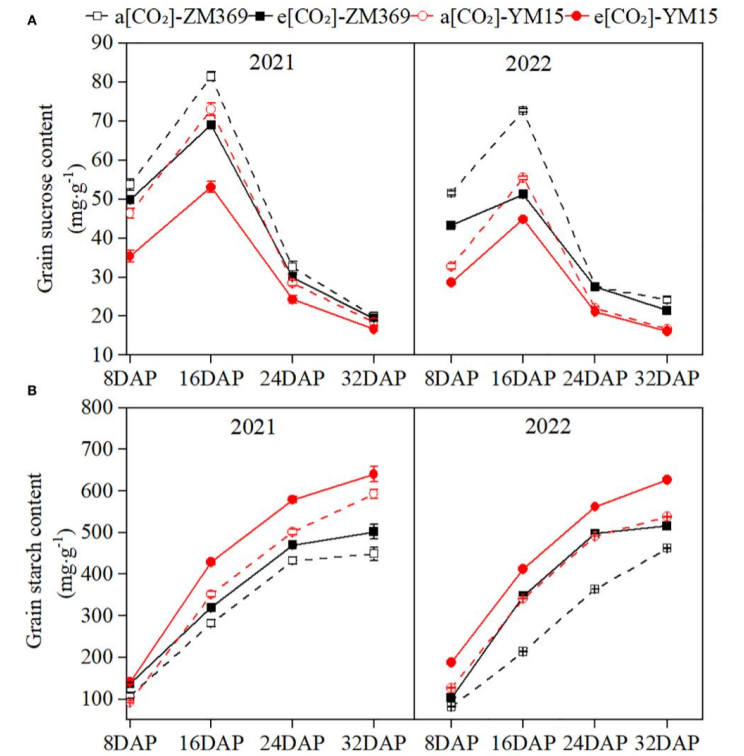
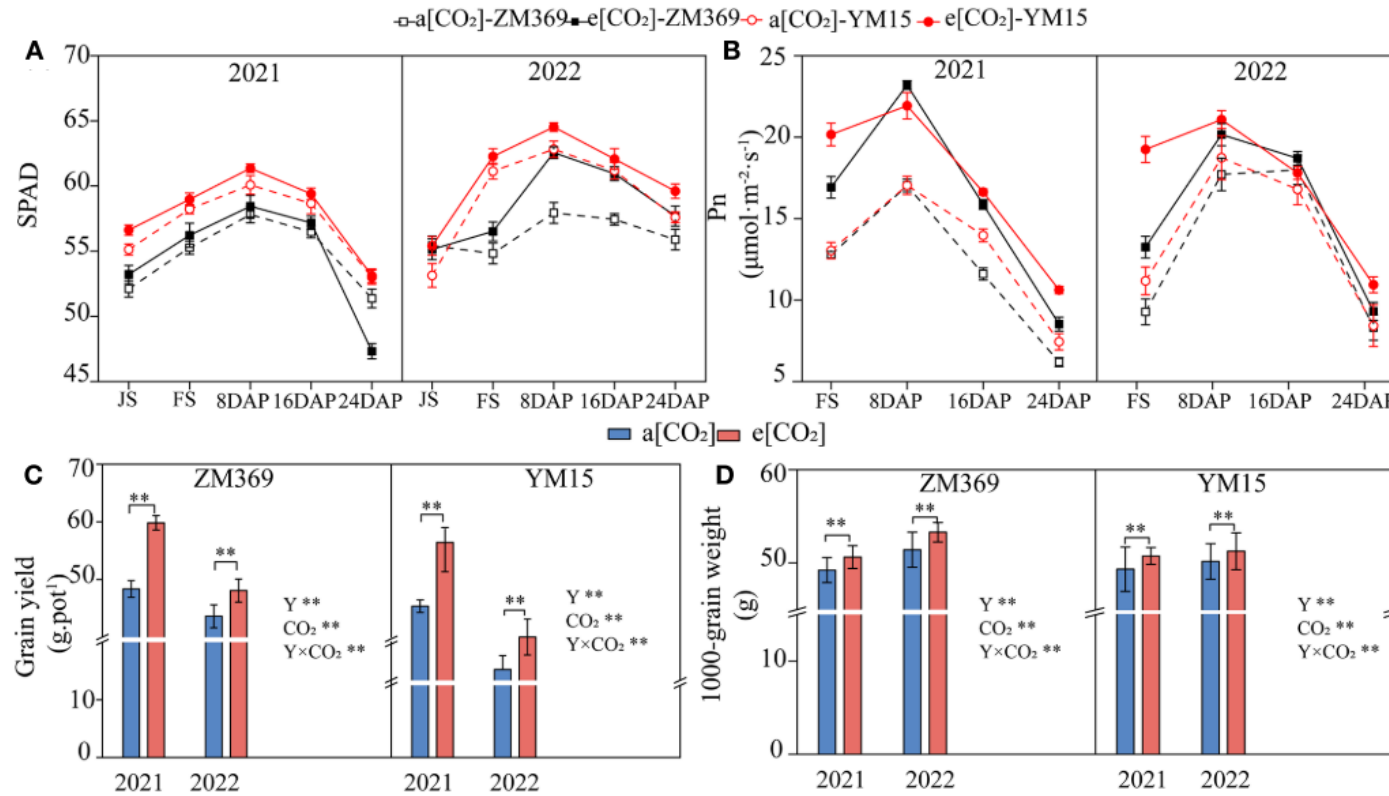


Materials and methods

External view of the open-top chamber (OTC)

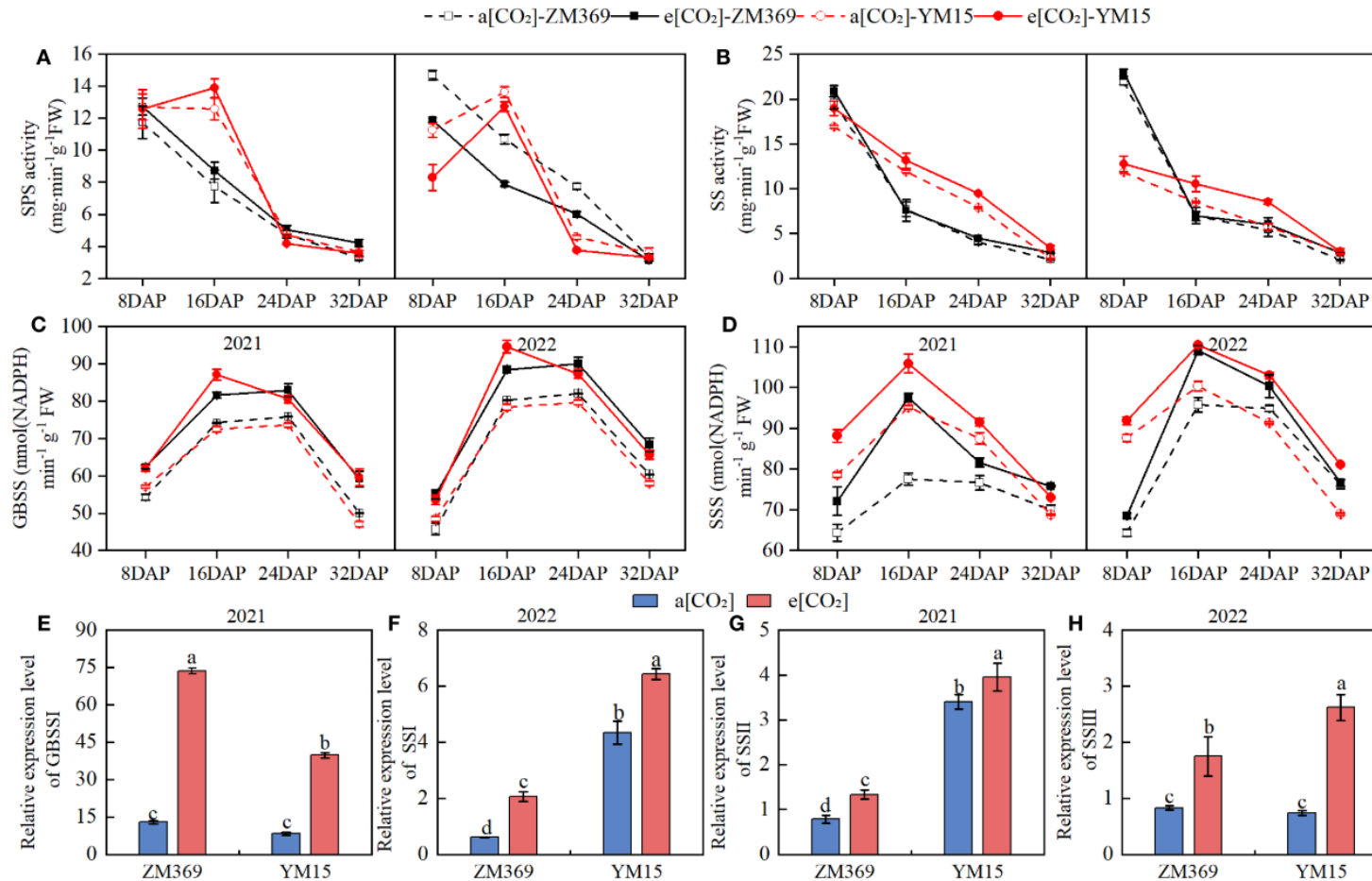


eCO₂ enhances photosynthesis and grain filling, increasing wheat yield



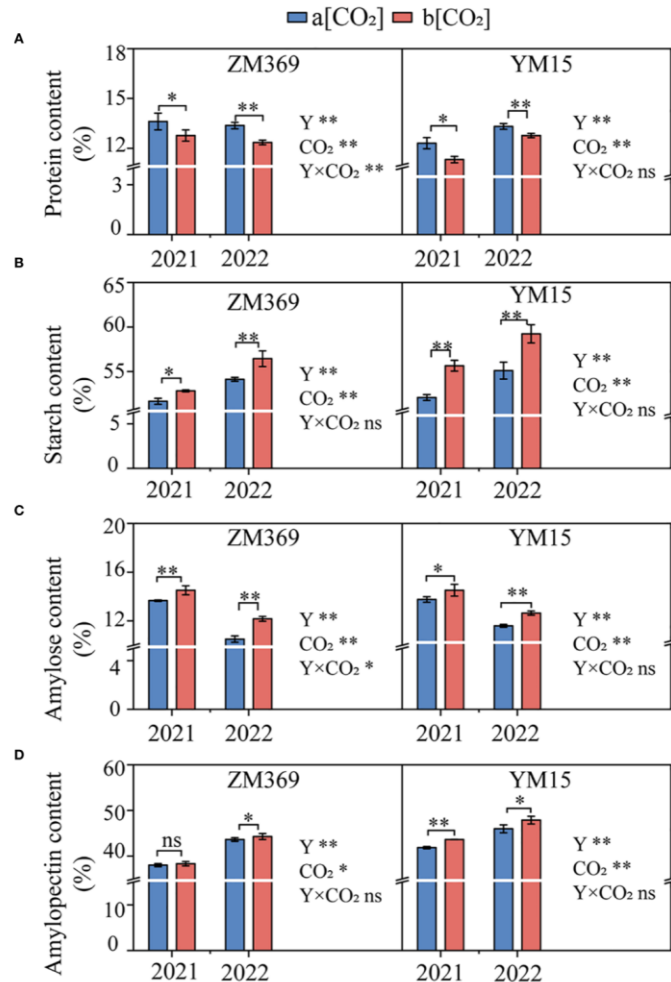
eCO₂ enhances light absorption and boosts photosynthetic rate, accelerating the accumulation of starch during the grain-filling process, thereby achieving the effect of increasing yield.

eCO₂ up-regulates starch synthesis genes and enhances enzyme activities



eCO₂ increases the expression levels of genes related to starch synthesis and the activities of starch synthesis-related enzymes, ultimately increasing the contents of amylose and amylopectin at the mature stage (with a more significant increase in amylose content).

eCO₂ increases amylose and amylopectin content with cultivar specificity

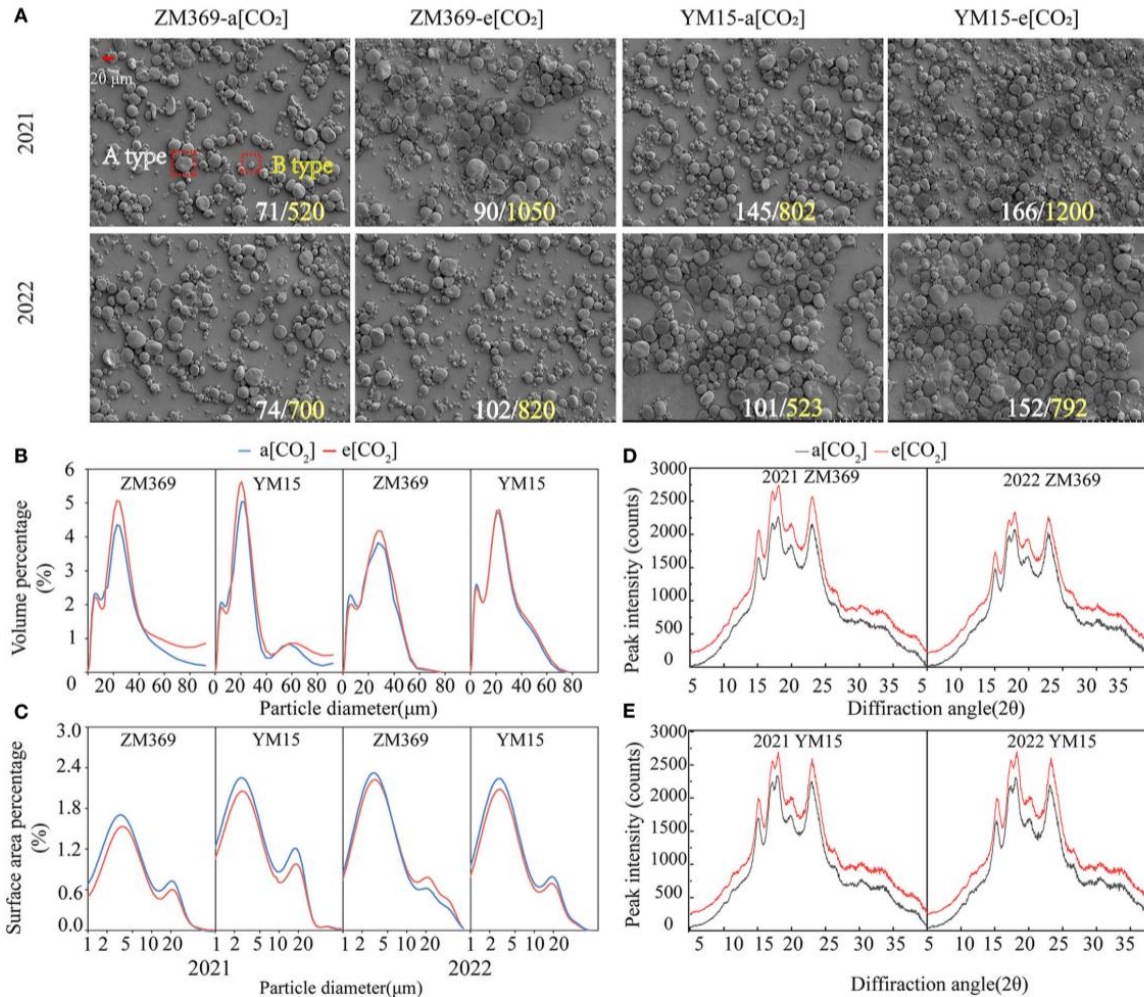


① eCO₂ increased amylose and amylopectin content in both cultivars;

② Amylose content had a more significant increase (P<0.01) than amylopectin;

③ ZM369 (bread wheat) showed higher starch component accumulation than YM15 (biscuit wheat).

eCO₂ increases A-type starch granule proportion and starch crystallinity

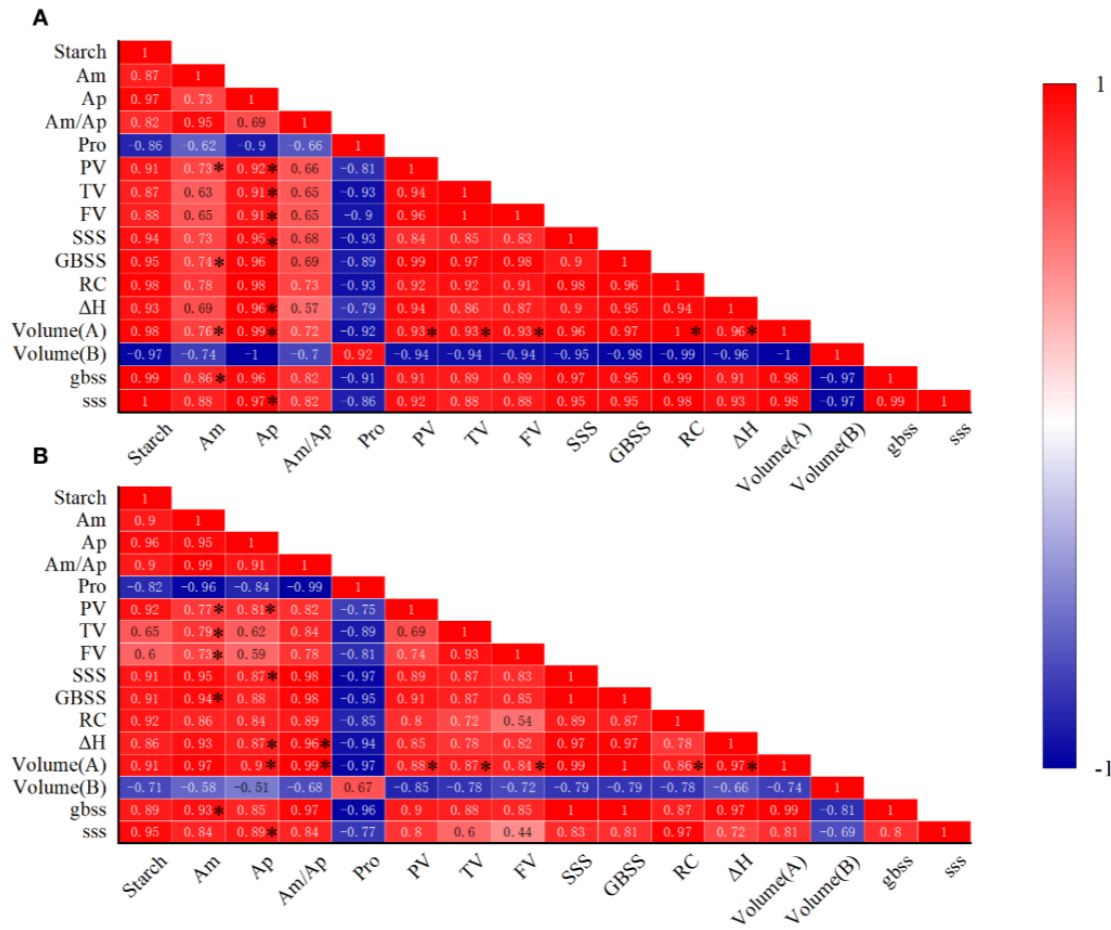


① eCO₂ significantly increased A-type granule proportion (P<0.01) and starch crystallinity (P<0.05);

② ZM369 had a larger increase in A-type granule proportion than YM15;

③ Crystallinity increase was positively correlated with amylose content.

Key Insights from eCO₂ Effects on Wheat Starch



Cultivar specificity: The stronger response of ZM369 may be related to its genetic background (higher starch synthesis potential of bread wheat);

Processing quality implication : eCO₂-induced starch structure changes are beneficial to biscuit wheat (higher A-type granule) but adverse to bread wheat (reduced crumb fineness);

**Thank You For Your
Attention!**