

CO₂ Threatens Food Quality

Rising CO₂ levels in the atmosphere inhibit nitrate assimilation into proteins in many crop plants, causing a decline in food quality.

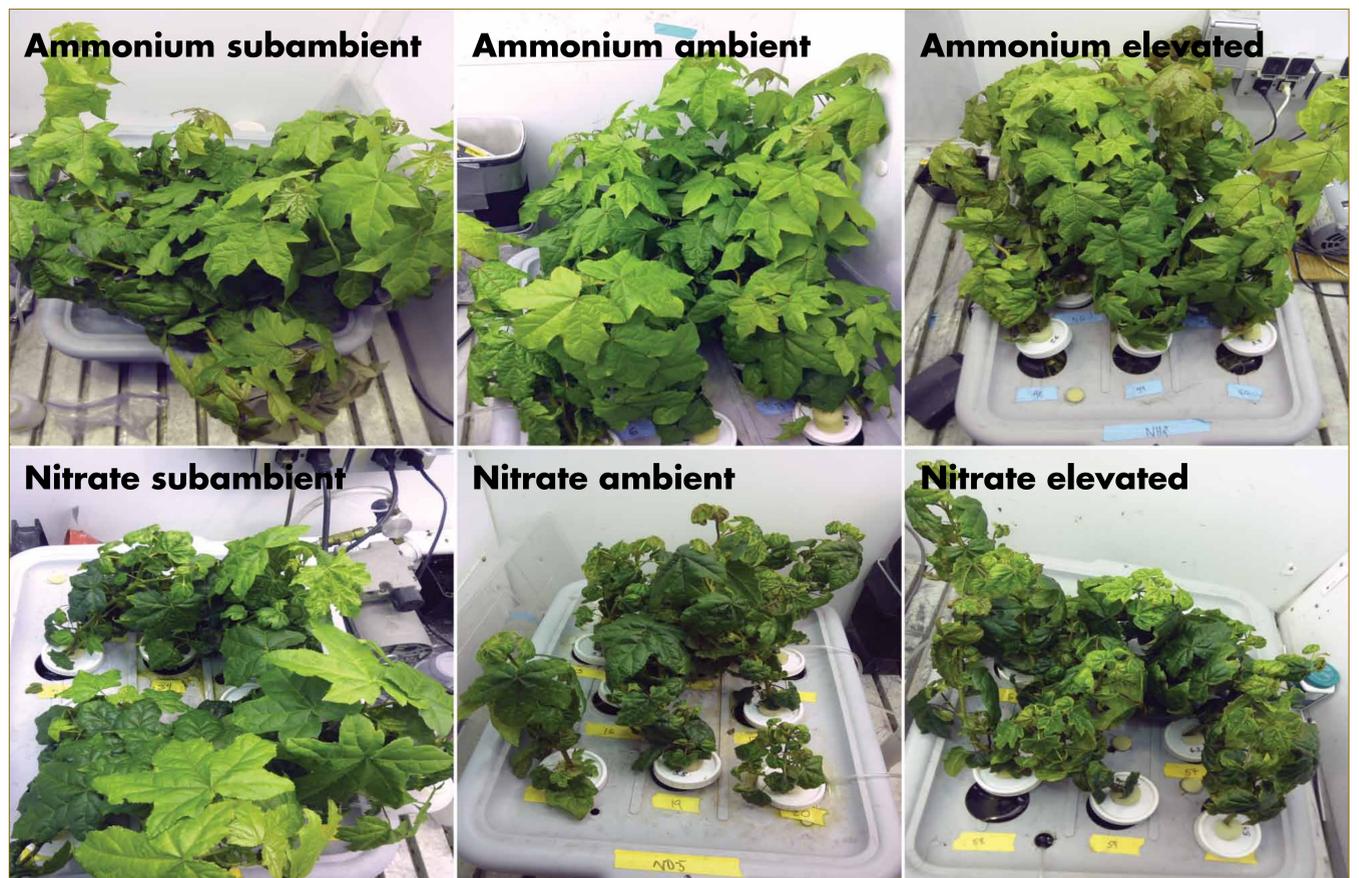
NITRATE IS THE PREDOMINANT FORM of nitrogen in most agricultural soils, and so inhibition of nitrate assimilation decreases the protein contents of many crops.

For example, wheat provides about 20% of the protein in the human diet, and CO₂ enrichment decreases grain protein by over 10%.

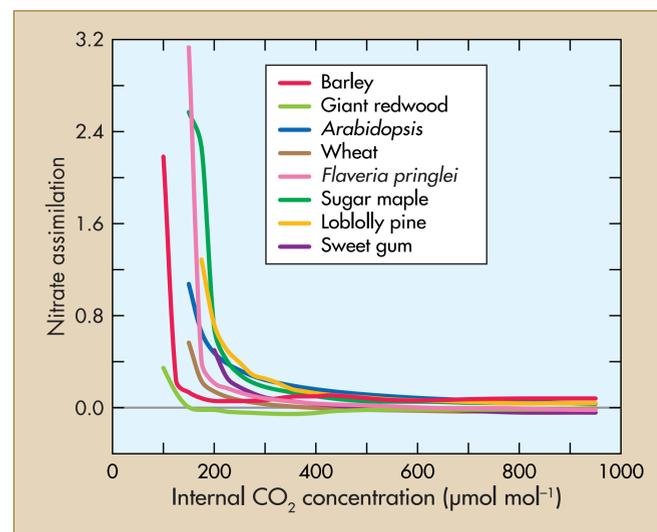
Plants benefit from CO₂ enrichment when supplied with ammonium, the other major source of nitrogen available from soils.

I am identifying genotypes that tolerate higher levels of soil ammonium.

Such genotypes should mitigate the influence of rising CO₂ levels on food quality and help meet the nutritional needs of a growing human population.



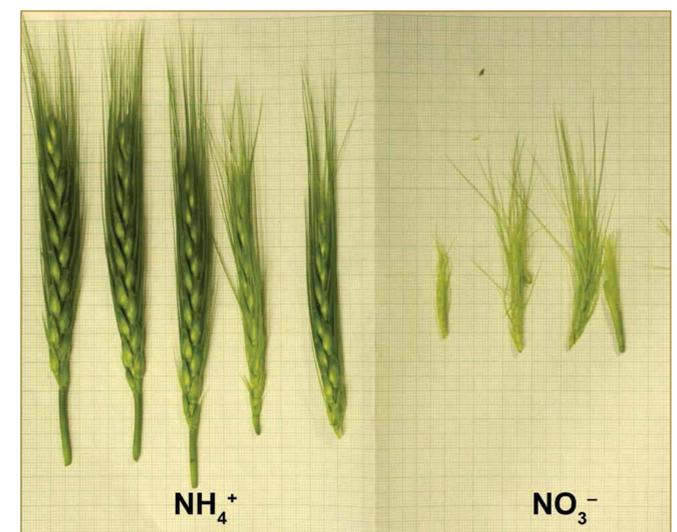
Sweet gum *Liquidambar styraciflua* in controlled environment chambers after 10 weeks of growth under either ammonium or nitrate nutrition at subambient (310 $\mu\text{mol mol}^{-1}$), ambient (400 $\mu\text{mol mol}^{-1}$), or elevated (720 $\mu\text{mol mol}^{-1}$) atmospheric CO₂ concentrations. Growth under nitrate declines with CO₂.



Nitrate assimilation into amino acids as a function of shoot internal CO₂ concentration in 8 taxonomically diverse C₃ species (mean \pm standard error, solid line \pm shaded area). Nitrate assimilation becomes negligible at high CO₂.



Wheat plants growing in a controlled environmental chamber under CO₂ enrichment. The dark green plants on the left are receiving ammonium as a nitrogen source, whereas the light green plants on the right are receiving nitrate.



Wheat ears grown in a controlled environmental chamber under CO₂ enrichment. The dark green ears on the left received ammonium as a nitrogen source, whereas the light green ears on the right received nitrate.

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