

If CO2 Levels Rise, Nutritional Value Could Fall

Recent findings show that the higher carbon dioxide levels experienced this century have resulted in some grains and legumes becoming significantly less nutritious. The new findings are reported in the journal *Nature*. Eight institutions, from Australia, Israel, Japan and the United States, contributed to the analysis.

The researchers looked at multiple varieties of wheat, rice, field peas, soybeans, maize and sorghum grown in fields with atmospheric carbon dioxide levels like those expected in the middle of this century. The teams simulated high carbon dioxide levels in open-air fields using a system called Free Air Concentration Enrichment (FACE), which pumps out, monitors and adjusts ground-level atmospheric CO₂ to simulate future conditions. In this study, all other growing conditions (sunlight, soil, water, temperature) were the same for plants grown at high-CO₂ and those used as controls.

The experiments revealed that the nutritional quality of a number of the world's most important crop plants dropped in response to elevated CO₂. The study contributed "more than tenfold more data regarding both the zinc and iron content of the edible portions of crops grown under FACE conditions than available from previous studies", the team wrote.

"When we take all of the FACE experiments we've got around the world, we see that an awful lot of our key crops have lower concentrations of zinc and iron in them (at high CO₂)," said University of Illinois plant biology and [Institute for Genomic Biology](#) [1] professor Andrew Leakey, an author on the study. "And zinc and iron deficiency is a big global health problem already for at least two billion people."

Zinc and iron went down significantly in wheat, rice, field peas and soybeans. Wheat and rice also saw notable declines in protein content at higher CO₂ levels. "Across a diverse set of environments in a number of countries, we see this decrease in quality," Leakey said. Nutrients in sorghum and maize remained relatively stable at higher levels because these crops use a type of photosynthesis, called C₄, which already concentrates carbon dioxide in their leaves," Leakey said.

"C₄ is sort of a fuel-injected photosynthesis that maize and sorghum and millet have," he said. "Our previous work here at Illinois has shown that their photosynthesis rates are not stimulated by being at elevated CO₂. They already have high CO₂ inside their leaves." More research is needed to determine how crops grown in developing regions of the world will respond to higher atmospheric CO₂, Leakey said.

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[1] <http://www.life.illinois.edu/plantbio/>