HarvestPlus

ABSTRACT

Abstract no. 1

Grain Position Affects Grain Macronutrient and Micronutrient Concentrations in Wheat

Daniel F. Calderini and Ivan Ortiz-Monasterio

Which part of the spike of a wheat grain holds the highest concentration of nutrients? Researchers Daniel Calderini and Ivan Ortiz-Monasterio are among a pioneering group of scientists systematically examining this basic question of plant physiology and nutrition in wheat. The answers suggested by their research may help determine breeding strategies and continue progress in increasing bread grain production while also increasing life-sustaining micronutrients for people around the world.

Research findings

Using three varieties of wheat and testing two separate harvests planted on two different sowing dates, the researchers measured the amount of macro- and micro -nutrient concentrated in grains from the base, mid-range, and top of the wheat spike.

The weights and nutrient content of grains located closer to the main, central shaft of the wheat spike was compared with the weights and nutrient content of the outermost grains. The study found that micro- and macronutrient concentrations decreased further from the main shaft of the grain spike and grain yield was generally highest in the middle sections of the grain.

Much of wheat breeding research to date has aimed at increasing the number of grains on each wheat spike rather than increasing individual grain size.

Wheat research has also tended to concentrate on increasing numbers of grains further from the central stem of the wheat plant.

The differences in grain weights and nutrient concentration observed by Calderini and Ortiz-Monasterio potentially suggest new priorities in breeding programs, favoring selection for higher grain yield by breeding to increase individual grain weight as opposed to the alternative strategy of attempting to increase the number of grains.

Concentrating study on the inner layers of the grain spike instead of the grains physiologically distant from the center shaft of the grain spike might yield better, more nutritious crops.

The research results suggest the alternative strategies could mean both higher micro and macro-nutrient levels with increased yields.

Implications

According to recent projections[1], by 2020 the demand for wheat is expected to be 40 percent greater than its current level of some 552 million tons per year. Breeding better staple crops with higher nutrient concentrations has been widely proposed as a low cost strategy for reducing micronutrient deficiencies in humans. A group of international research organizations including the International Maize and Wheat Improvement Center (CIMMYT) and other HarvestPlus partners has engaged in research to study the feasibility of increasing micronutrient concentrations in wheat, rice, maize, and beans, among other crops. Calderini and Ortiz-Monasterio's research on wheat, part of a larger, international effort to understand nutrient physiology in wheat, suggests ways to accomplish the twin goals of increasing yields to meet increased demand while also reducing both energy and nutrient malnutrition by targeted breeding for increased nutrient potential in crops.

HarvestPlus is working with partners and researchers across the world to combat iron, zinc and vitamin A deficiencies exacerbated by poverty and inadequate nutrition.

HarvestPlus Abstracts

Abstract no. 2

Are Synthetic Hexaploids a Means of Increasing Grain Element Concentrations in Wheat? Calderini, Daniel F. and Ivan Ortiz-Monasterio, 2003. Euphytica 134, Kluwer Academic Publishers: 169-178.

Abstract no. 3

Coliforms in the water and hemoglobin concentration are predictors of gastrointestinal morbidity of Bangladeshi children aged 1-10 years. Bhargava, Alok, Bouis, Howard E., Hallman, Kelly and Hoque, Bilqis. Am J Human Biol 2003;**15** (2):209-19

SOURCE

Daniel F. Calderini and Ivan Ortiz-Monasterio. 2003. *Grain Position Affects Grain Macronutrient and Micronutrient Concentrations in Wheat.* Crop Science 43:141-151.

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HarvestPlus is an international, interdisciplinary, research program that seeks to reduce micronutrient malnutrition by harnessing the powers of agriculture and nutrition research to breed nutrient-dense, staple foods.