

Mineral, Phytate, Carotenoids, and Vitamin E Content in Wheat From Farm to Table

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Nutrient content is available for many foods, but few studies follow the changes in these nutrients from the agricultural starting point. This study tracked key nutrients in a single wheat sample from kernel to flour to bread. The wheat was stone-milled to produce (1) intact whole wheat flour, or roller-milled to produce (2) reconstituted whole wheat flour or (3) refined white flour with bran and germ removed. The three flour types were then used to make test breads using the same baking protocol.

Kernels, flours, and breads were all analyzed for major (calcium, magnesium, phosphorous, & potassium) and trace (copper, iron, molybdenum, & zinc) minerals by inductively coupled plasma spectrometry, phytate (functional phosphorous) by colorimetric assay, carotenoids by ultrahigh performance liquid chromatography mass spectrometry, and vitamin E isoforms by high performance liquid chromatography.

Major mineral levels were similar in kernels, whole wheat flours, and whole wheat breads, but were reduced by up to 72% in refined flour and bread. Trace minerals were more variable, with increases in copper, iron, and zinc ranging from 8-66% in whole wheat flours and breads, but were reduced by up to 64% in refined flour and bread. Phytate levels were similar in kernels and whole wheat flours, but were reduced by up to 83% in refined flour and bread. The major carotenoids in wheat were lutein and zeaxanthin. Carotenoid levels appeared elevated by 18-30% in whole and refined flour, but were reduced by up to 77% in breads. The major vitamin E isoforms in wheat were alpha & beta-tocopherols and alpha & beta-tocotrienols. Vitamin E levels were reduced by up to 20% in whole wheat flours and up to 82% in refined flour and breads from all flour types.

Overall, each nutrient demonstrated unique changes in content based on how the wheat was prepared. Tracking nutrient content from farm to table is key for appraising what agricultural products actually contribute to the diet.

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