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Do We Need More Drought for Better Nutrition? – Water-Stress Effects on Nutrient Content of Food

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Abstract

Plants are the main source of nutrients for humans, and in turn gather their nutrients from the soil. Soil properties and environmental factors such as weather determine the bioavailability of nutrients to plants, and consequently, to food. With increasing extreme weather events, sudden drought periods can affect plant growth, bioavailability of nutrients and quality of produced food. This study compared two regions in East Africa (Kapchorwa, Uganda and Busia, Kenya) that experienced drought during the second growing season in 2016. Thus, the main research questions were: (i) does drought have an impact on the nutrient composition of produced food; (ii) does drought affect crops differently when grown on soils of varying fertility?

A total of 127 maize grains (*Zea mays*) samples and paired soil samples were collected per region and season from randomly selected households during the long rain (March-August) (LRS) and the short rain (October-December) (SRS) seasons 2016. Crop and soil samples were analysed using a portable X-Ray Fluorescent Spectrometer (pXRF, Bruker) for magnesium, phosphorus, sulphur, potassium, calcium, manganese, iron, zinc, and copper. Soil properties including nitrogen, carbon, C:N, texture, pH, and eCEC were additionally measured.

Kapchorwa had a higher soil fertility compared to Busia. Additionally, nutrient concentration of monitored grains during the LRS were significantly higher in Kapchorwa than Busia. In both regions, yields decreased significantly between LRS and SRS due to drought. In Kapchorwa, maize grain showed a significant decrease in mean nutrient concentration of 42 % from the LRS to the SRS. In contrast, a significant increase in mean nutrient concentration of 41 % was observed in maize from Busia. The contradicting results were due to a complete cessation of rainfall in Kapchorwa before grain filling, whereas in Busia rainfall, although lower than in other years, ceased directly thereafter. The unexpected results of decreased nutrient concentration despite high fertility in Kapchorwa, compared to increased nutrient concentration with low fertility in Busia allude that extreme weather events have unpredictable effects on nutritional quality of food crops. There is need for further investigation to make best use of drought phenomena, to improve the nutritional value of crops.

Keywords: Drought, food composition, human nutrition, plant nutrition, water stress

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