FAST MOVING FRONTS - 2008

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Alisdir R. Fernie talks with *ScienceWatch.com* and answers a few questions about this month's Fast Moving Front in the field of Plant & Animal Science.

Article: Metabolic profiling of transgenic tomato plants overexpressing hexokinase reveals that the influence of hexose phosphorylation diminishes during fruit development
Authors: Roessner-Tunali, U;Hegemann, B;Lytovchenko, A;Carrari, F;Bruedigam, C;Granot, D;Fernie, AR
Journal: PLANT PHYSIOL, 133 (1): 84-99 SEP 2003
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Agr Res Org, Volcani Ctr, Inst Field & Garden Crops, IL-50250 Bet Dagan, Israel.

SW: Why do you think your paper is highly cited?

This is probably due to a couple of factors—it addressed the hot topic of sugar sensing but also was one of the first papers describing metabolic profiling in the tomato. The second factor is probably more crucial in terms of collected citations.

SW: Does it describe a new discovery, methodology, or synthesis of knowledge?

Ours is largely a new methodology, but the approach we used, which took into account developmental changes in metabolism, also represents a large synthesis of knowledge.

SW: Would you summarize the significance of your paper in layman's terms?

The importance of a specific reaction step in the initial pathway of non-photosynthetic energy metabolism was investigated during the fruit ripening process. The approach taken was to analyze genetic variants of tomato expressing different levels of the enzyme responsible for catalyzing the first chemical conversion of the pathway.

Fruit and leaf material was harvested at different developmental stages and its chemical composition analyzed by gas chromatography-mass spectrometry (GC-MS). The results of these studies revealed that the importance of this particular enzyme declines throughout the ripening process.

SW: How did you become involved in this research and were there any particular problems encountered along the way?

The research was prompted by the initial description of these tomatoes by the group of

David Granot at the Volcani Institute in Israel. When I initiated the project I was a post-doc in the laboratory of Lothar Willmitzer working on sugar sensing in potatoes. Frustratingly, genetic variants of potato, altered in their hexokinase activities, did not display such dramatic phenotypic differences. Switching to tomato was therefore an easy decision to make.

"...it addressed the hot topic of sugar sensing but also was one of the first papers describing metabolic profiling in the tomato."

SW: Where do you see your research leading in the future?

We have in recent years applied this metabolite profiling method, as well as others that have been subsequently developed, in quantitative *trait loci* studies which harness wide genetic variance abundant in tomato and its wild relatives. In taking this approach we have been able to identify a number of genomic regions of high importance for the determination of chemical composition of the fruit at harvesting.

Coupling this profiling to that of standard agronomic traits allows us to identify lines which have elevated metabolite content without major morphological changes, thus circumventing the common problem of yield penalties which are often associated with metabolic engineering strategies.

SW: Do you foresee any social or political implications for your research?

The follow-up work has high potential for use in breeding strategies, particularly among those intent on producing healthier and more nutritious foodstuffs.

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Keywords: metabolic profiling, transgenic tomato plants, hexokinase activities, hexose phosphorylation, genetic variance, sugar sensing, gas chromatography-mass spectrometry, non-photosynthetic energy metabolism, agronomic traits, elevated metabolite content.

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