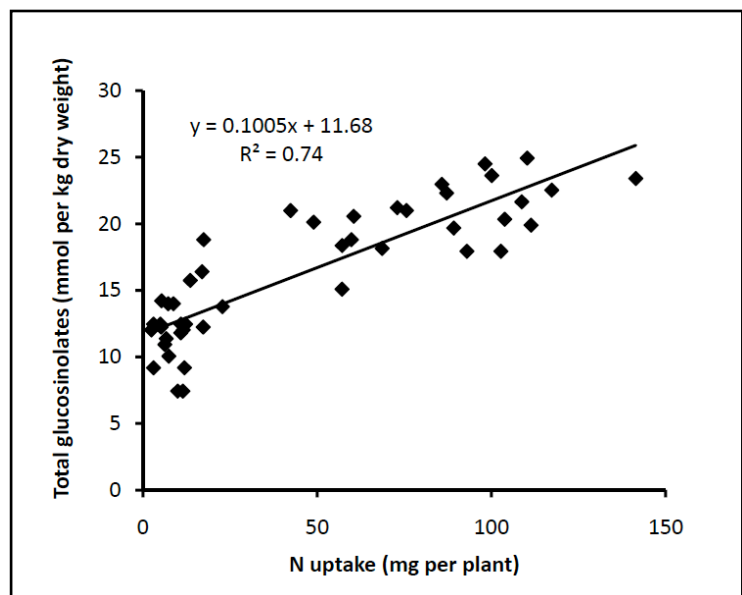


Farming for Functionality:
Enhancing phytonutrients in vegetables through crop management
Ted Radovich, PhD, TPSS

A diet high in vegetables is thought to protect against disease, with the evidence increasingly indicating that plant products such as glucosinolates, flavonoids, polyphenols and carotenoids are beneficial to consumers. Epidemiology studies that follow populations over time have concluded that the consumption of vegetables in the cabbage family (*Brassicaceae*) are associated with a decreased risk for cancer, largely attributed to glucosinolate content of these vegetables. Glucosinolates are amino acid-derived, sulfur containing compounds that also affect vegetable flavor (e.g. pungency in radish) and influence the behavior of pests.

The levels of glucosinolates and other phytonutrients in vegetables are determined by many factors, including genotype, plant part, tissue age, and climate. The word *Terroir*, often used in reference to wine, poetically articulates the reality that the living and non-living components of the crop environment can significantly influence the chemical foundation of taste, aroma and human health potential. Our work, along with the work of many others, has demonstrated that management decisions such as cultivar selection, planting date, irrigation, and plant nutrition can influence the content of glucosinolates in vegetables, often in a reasonably predictable manner (Verherk et al., 2009).



*Figure 1. Relationship between Nitrogen uptake and total Glucosinolates in Pak Choi. N= 45.
(Pant, Radovich and Hue, unpublished data).*

Glucosinolates and other phytochemicals are thought to play an important role in plant defense, and they frequently increase in concentration under stress conditions such as supra-optimal temperatures or water shortages (Radovich et al., 2004; Radovich et al., 2005). However, the impact of environmental factors varies depending on the factor itself and on the plant compounds. For example, our collaborators and ourselves recently observed that glucosinolate (Figure 1) and carotenoid concentrations in Pak Choi are positively related to nitrogen uptake and subsequent growth of Pak Choi, while total phenolics was negatively related to the plant's nitrogen status (Pant et al., 2009).

Chile peppers, pumpkins and other crops have been added to our list as our collaborators and ourselves continue to investigate the independent and interactive effects of genotype and environment on the chemical quality of vegetables. The possibility of managing food systems for optimum chemical quality of crops is exciting and grounded in good science. However,



Photo Courtesy Dr. C.N. Lee

realizing the full potential of “Farming for Functionality” will not be simple or easy, and will require the continued cooperative efforts of researchers, industry groups and growers.

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