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Short Communication

Is Plant Nitrogen Depletion Really Linked to the Biosynthesis of Carbon-Rich Defense-Related Compounds in Organic Products?

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Previous studies speculated on the existence of an inverse relationship between the available nitrogen and the accumulation of defense-related secondary metabolites in plants [1], as a consequence of C:N ratio unbalance. According to this hypothesis, the lower nitrogen contents of organically grown plants lead to a shift from the N-containing compounds to the production of carbon-rich defense-related phenylpropanoids. It has been also suggested that this behavior is putatively linked to the increased resilience to pest attacks and damage exerted by organic plants [2-4]. Recent research [5] showed that long-term organic fields have been associated with no consistent difference in nitrogen and carbon content, nor in C:N ratio, between the organic and conventional produces. In parallel, pest attacks were preferentially settled on conventional plants respect to organic ones. Organic management reduced insect population but no evidence about plant nutrient unbalance was directly linked with. The study demonstrated that organic soil management promoted salicylic acid build-up, which resulted in discouraging plant–insect interactions. Indeed, salicylic acid accumulation was not associated with lower nitrogen content of organic plants but it depended on alterations in soil microbial communities associated with long-term organic management. The study showed that over-presence of specific microbial groups induced plant resistance to pest attacks. By this way, it can be postulated that organic practices promotes plant resistance through derived changes in soil microflora.

Several studies have shown that organically grown fruit are richer in antioxidants compared with conventionally grown fruit [6-12]. In accordance with the higher antioxidant values of organic products, the systematic review by Baranski., *et al*. [13], based on an extensive dataset of 343 peer-reviewed publications, showed that organic crops have higher concentrations of polyphenolics and other antioxidants together with a higher antioxidant activity. Since many years, the theory according to which nitrogen deficiency may induce the production of carbon-rich phenylpropanoids has been postulated as an explanation of the higher healthy value of organic products. Based on recent experimental evidence reported on how soil microbiota influences plant resistance to pests, it may also be hypothesized that polyphenolics may accumulate in organic plant due to functional shifts in soil microflora. Further in depth and rigorous studies are needed to better understand how the organic management promote beneficial microbial populations and which are the biochemical mechanisms underlying induced organic plant defense [14,15].

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