BIO-MOLECULAR MARKERS FOR TRACEABILITY OF ORGANIC VS CONVENTIONAL POTATO TUBERS: A PRELIMINARY INVESTIGATION

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Organic products are withstanding increasing appreciation and diffusion in the global market scenario. However, most of the comparative analyses regarding organic vs conventional products have focused on few classical nutritional parameters or have addressed the issue of contamination by exogenous factors (as pesticide residues in conventional produce or fungal toxins in organic produce). On the other hand, little or no effort has been made to investigate possible biochemical differences among the two types of products. These differences would be valuable resources to be exploited both as markers for traceability and diversification/qualification of the products. Also, the nature and magnitude of these putative physiological differences are likely to be influenced by the genotype.

Here we report a pilot experiment regarding comparative analysis of protein patterns in a potato cv, Vivaldi, grown in the field according to conventional vs organic regimes. SDS-PAGE followed by MALDI-TOF of tuber extracts loaded on equal FW basis was used to quickly analyze, quantitate and identify proteins. At least two proteins, i.e. patatin and granule-bound starch-synthase I (GBSSI), were induced in organic tubers. Patatin class I genes are known to bear sugar-responsive elements in the promoter region. GBSSI induction was accompanied by an overall stimulation of starch synthesis machinery, as tuber starch content was higher in organic tubers, whereas no significant changes were observed in other starch parameters (e.g. amylose/amylopectin ratio). Further analyses are being conducted to assess the amounts of other relevant compounds as glucose, fructose, sucrose and ascorbic acid to gain a better overall picture of the event(s) underlying these physiological alterations.

Since it is well-established that higher NO3 levels are detectable in conventional produce, lower N bioavailability is likely to be a major distinctive feature of organic regimes. Our preliminary findings would thus be consistent with altered C/N balance in the two types of tubers. The lower N assimilation in organic products would stimulate C fixation towards N-poor compounds as carbohydrates to be ultimately stored as starch, and the increased sucrose supply to the tuber would drive enhanced expression of patatin. The opposite would happen in conventional tubers since high N would divert assimilated C to other sinks (e.g. biomolecules involved in vegetative growth, amino acids, alkaloids, production of C-skeletons for N assimilation). Future investigations will be conducted in order to i) confirm this experimental trend in independent field trials ii) assess the role of different genotypes in the observed responses iii) identification – based on the hints obtained from physiological informations - of highly specific markers (e.g. bio-molecules undergoing pronounced
and selective up- or down-regulation) allowing easy and cost-effective traceability of the two types of produce.