Authentication of pre-harvest food process (organic vs conventional) by analysis of microbial communities

CÉLINE BIGOT[1*], SÉBASTIEN CAVAIGNAC[2], JOSÉ EFRAÍN CAMILO[3], JEAN-CHRISTOPHE MEILE[1], DIDIER MONTET[1]

[1]CIRAD-UMR Qualisud, TA B-95/16, 73, Montpellier, France | [2]INVENIO, Fruits & Agroecology Group, Sainte Livrade Sur Lot, France | [3]Dominican Institute of Agricultural and Forestry Research (IDIAF), Santo Domingo, Dominican Republic | [1*] Corresponding Author: Céline Bigot

ABSTRACT

Organic farming has been rapidly developing during the last few years in Europe and gets more and more popular on food markets. Despite the lack of scientific evidence that organic foods are significantly safer or healthier than conventional foods, consumers keep in mind that organic food products are better than conventional products.

The policy of quality and origin, developed for many years as the signs of origin (i.e AOP/GPO in Europe) and agricultural labels (i.e. TSG or traditional speciality guaranteed; the French label AB for organic farming) proves to be in accordance with the current aspirations of the consumers. But food traceability is mostly guaranteed by administrative means (EU Regulation N° 178/2002), that is why it is important to develop reliable analytical tools to ensure traceability and authentication of foods, notably organic foods. Our hypothesis is that agricultural treatments associated with organic and conventional farming types have differential effects on food microbial communities. In other words, we believe that agricultural practices have an impact on the microbial flora of food. Therefore, it should be possible to differentiate organic foods from conventional foods by comparing their food-associated microbial communities.

To test this hypothesis, the microbial communities associated with organic foods were analysed using molecular biology tools and compared to other farming types. The impact of the mode of production on fungal and bacterial flora was observed on different type of fruits: peaches and nectarines, bananas and apples. For each fruit type, sampling was performed on the same variety growing in the same geographical location. This allowed the effect of treatments on the microbial flora of fruits to be measured. Remarkably, statistical analyses of our data showed that fruit samples tend to group according to their farming type (conventional and organic). Data collected from two consecutive harvest years suggest that variability caused by the sampling year or the position in the field is negligible when compared to the variability related to farming type.

So, we demonstrated that the microbial composition of food (on a given geographical location) is mainly related to farming practices and could be used to authenticate organic fruits. This study might lead to the creation of a robust analytical tool, fast and inexpensive to allow the discrimination of organic foods from conventional foods.

celine.bigot@cirad.fr or celine.bigot83@hotmail.fr

$\delta^{18}O$ as authenticity thresholds in differentiating tomato passata from diluted tomato paste

L. BONTEMPO[1], F.A. CEPPA[1], M. PERINI[1], A. TONON[1], G. GAGLIANO[2], R.M. MARIANELLA[3], M. MAREGA[4], A. TRIFIRÒ[5], F. CAMIN[1]

[1]Fondazione Edmund Mach (FEM), Italy | [2]Ministero delle Politiche Agricole, Alimentari e Forestali, Ispettorato Centrale della Tutela della Qualità e Repressione Frodi dei Prodotti Agroalimentari (ICQRF), Catania, Italy | [3]Ministero delle Politiche Agricole, Alimentari e Forestali, Ispettorato Centrale della Tutela della Qualità e Repressione Frodi dei Prodotti Agroalimentari (ICQRF), Roma, Italy | [4]Department of Food Science, University of Udine, Italy | [5]Stazione Sperimentale Industria delle Conserve Alimentari, Parma, Italy

ABSTRACT

Tomato passata is one of the 'pillars' of the Mediterranean diet and is a typical Italian product that by law must be obtained exclusively from fresh tomatoes. For this reason Italian law provides for use of the $\delta^{13}O$ of vegetal water to determine whether passata (Brix of up to 12) is genuine or has been obtained by diluting tomato paste (Brix higher than 12). However, the same law gives no indication of reference limits for this parameter.

In this study an extensive dataset of over 1000 samples were collected in different years (from 2004 to 2012) along the Italian tomato product production chain (tap waters, juices, passata, pastes). In all the samples collected the content of water $\delta^{13}O$ was investigated.

This parameter was shown to be statistically different in the four classes of products, increasing from water to juice and paste, in relation to the different degree of evaporation taking place during the preparation phase. Moreover, the $\delta^{13}O$ of vegetal water, due to the contribution of the lower $\delta^{13}O$ values of tap water during dilution, was highly effective in distinguishing genuine passata from watered down paste, also in the case of passata previously concentrated up to 11.9 Brix. On the basis of these results two lower threshold values are proposed: -1.4‰ for 'raw' passata and -2.9‰ for passata previously concentrated up to 11.9 Brix.

luana.bontempo@fmach.it

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