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Comparative analysis of Illumina and Ion Torrent high-throughput sequencing platforms for identification of plant components in herbal teas



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ABSTRACT

The rapid development of high-throughput sequencing (HTS) methods offers new opportunities for food quality control and identification of food components using the DNA barcoding approach (metabarcoding in cases of complex mixes). However, the protocols of DNA barcoding applied to food analysis are not yet fully established; testing and optimization are required to achieve the highest accuracy and cost efficiency. We report here a comparative study of the two most widely used sequencing platforms - Illumina and Ion Torrent - for composition analysis of herbal teas, and show that both technologies yield congruent results, both qualitatively and quantitatively. They have revealed the substitution of fireweed (*Epilobium angustifolium* L.) by *Lythrum* sp. in one of the samples. It was confirmed by classic methods of botanical analysis (anatomy and palynology). In most samples, undeclared components have been detected, such as bindweed (*Convolvulus*) and ragweed (*Ambrosia*), which are known toxic and allergy-causing plants.

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1. Introduction

Food quality control is the essential part of public health care. One of the problems that quality control is facing is the incongruence between declared and actual composition. This incongruence is caused by contamination and accidental mistakes of raw materials or economically motivated adulteration during processing, which poses a threat to the health of the consumer and may reduce potential health benefits of the product (e.g., lack or substitution of

a medicinal component), even causing allergic or toxic reactions (Cupp, 2000).

Tea is one of the most widely consumed drinks in the world. Most commonly called “tea”, it is a beverage made from the leaves of the *Camellia sinensis* (L.) Kuntze plant. Additionally, there are various so-called “herbal” or “phyto-” teas, which include mixes of different plant species apart from *C. sinensis*, often with medicinal or aromatic characteristics. More than a third of herbal teas sold by stores contain ingredients not indicated on the labels (Newmaster, Grguric, Shanmughanandhan, Ramalingam, & Ragupathy, 2013; Stoeckle et al., 2011). Due to flaws in the quality control of plant raw material collection and manufacture processing, herbal teas are often subject to simple mistakes or substitution and adulteration, especially if they consist of rare or expensive medicinal plants, e.g., (Boer et al., 2017; Vassou, Kusuma, & Parani, 2015). With the development of technologies for processing raw ingredients for the food industry and the globalization of food markets, it is becoming

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