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Review

Public and private standards for dried culinary herbs and spices—Part I: Standards defining the physical and chemical product quality and safety

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ABSTRACT

Dried spices and culinary herbs are vulnerable products, which are used for their aroma (and colour). They are important ingredients in many processed foods, e.g. meat products, dairy products, and bakery products, and in most of our dishes. Food processors and consumers have high expectations regarding the organoleptic quality of culinary herbs and spices. Moreover, although used at relatively low amounts, herbs and spices can represent a health threat to the consumer, e.g. when contaminated with mycotoxins or adulterated with harmful colourants. The current review provides an overview from a European perspective on product standards covering (i) general physical and chemical specifications important for product quality and (ii) chemical characteristics concerning the safety of culinary herbs and spices. Focus is given to standards addressing dried culinary herbs and spices on global and European Union (EU) level. At some points, additional information on fresh herbs and on some national standards of non-EU member states is provided.

General specifications for individual herbs and spices based on international agreements are developed by the International Organisation for Standardisation (ISO) and are currently under development by the Codex Alimentarius Commission. Besides global standards, the review outlines product specifications for dried culinary herbs and spices that are defined by national bodies and industry associations. To reduce potential chemical hazards, specific maximum and action levels are laid down for culinary herbs and spices. In EU law, these address besides residues of pesticides certain mycotoxins, heavy metals, persistent organic pollutants, and additives as described in the following.

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1. Introduction

According to the International Organisation for Standardisation (ISO) and the International Electrotechnical Commission (IEC), a standard is a document that is established by consensus and approved by a recognised body for the following scope. It shall provide, for common and repeated use, rules, guidelines or characteristics for activities or their results aiming at the achievement of the optimum degree of order in a given context (ISO/IEC Guide 2:2004, definition 3.2). It is further noted that standards should be based on the consolidated results of science, technology and experience, and aimed at the promotion of optimum community benefits. An international standard is a standard adopted by an international standardising/standards organisation and made available to the public (ISO/IEC Guide 2:2004, definition 3.2.1.1) (ISO/IEC, 2011). In general, standards can be set by official authorities, referred to as public standards, or by non-governmental organisations (both, non-profit and profit ones), usually covered by the term private standards. Public standards are often mandatory; however, official authorities can also develop facultative standards as guidelines.

International standards on food characteristics are an important tool to force global trade activities, but are also essential to ensure food safety—particularly in global commodity flows. The supply chains of spices, of which most are exclusively produced in sub-tropical and tropical regions, have always involved global trade. Nowadays, this also applies to the culinary herb supply chains. Besides local production in the temperate or Mediterranean climates, herbs are also produced in (sub-)tropical regions (CBI, 2010; CBI, 2015). Primary production of spices and culinary herbs often takes place in less developed countries. Their production structures and chains are highly divers and can cover small-scale farming and wild collection (FAO, 2011). Also the diversity of the products themselves is exceedingly high: Herbs and spices comprise different parts of plants from various families and species with differing processing grades. For example, products can vary in their particle size reduction and in their drying status, which comprises for herbs next to (freeze-)dried also fresh and frozen. Thus, also different processing steps and technologies, such as different dehydration techniques, are involved. To harmonise the quality of spices and culinary herbs and to restrict the content of potentially hazardous agents, product-specific standards have been established.

Culinary herbs and spices are usually of high value. Hence, food industry and consumers have high expectations regarding the quality of these aromatic (and often colourful) ingredients to refine foods and dishes. In general, the organoleptic and commercial quality is affected by endogenous parameters as well as unintentional and intentional contaminations. Moreover, although usually used at low amounts, culinary herbs and spices can harbour potential health hazards. Analysing the notifications in the European Union (EU) Rapid Alert System for Food and Feed (RASFF) for the period July 2003 to June 2007 revealed that according to Kleter, Prandini, Filippi, and Marvin (2009) the product category of spices (including herbs) and condiments ranged at top 3 of all product categories counting for 10% of the total notifications. Among the notifications on chemical hazards spices, herbs, and condiments ranked according to this study even at top 2 with 15% of the notifications. This product category accounted for 749 notifications on chemical hazards within the four-year period. At that time, several notifications were related to fraudulent adulteration of spices with Sudan dyes and Para Red (EC, 2004; EC, 2005; Kleter et al., 2009). These azo dyes are occasionally used to enhance the appearance of spices, particularly of chilli/paprika products, but are prohibited in the EU due to their potential to give rise to carcinogenic aromatic amines (see also EFSA AFC, 2005). In general, besides illegal colourants and other illegal food additives, the major groups of chemical hazards in spices and herbs comprise mycotoxins, pesticide residues, and heavy metals. Moreover, contaminations with (persistent) organic pollutants, cross-contaminations with allergens as well as the content of toxic endogenous compounds, such as coumarin, can affect the safety of spices and herbs. Further, physical parameters can be of relevance for food safety, such as contaminations with metal pieces or the moisture content, which can affect microbial growth.

The current article provides an overview on standards defining the physical and chemical characteristics of culinary herbs and spices. First, general product standards are outlined, which particularly aim at defining a harmonised minimum quality regarding physical and chemical parameters to facilitate global trade. Accordingly, such standards are often set by international organisations. Second, the article focuses on product safety standards set at global and European Union (EU) level that define chemical product characteristics relevant for the consumer's health. Microbiological standards are topic of Part II (Schaarschmidt et al., 2016).

However, it should be noted that product categorisation can differ between standards and between countries. Usually, if not listed separately, the term "spices" comprises dried culinary herbs. Moreover, the use of products might vary between countries, which can result in a different classification. For example, poppy and sesame seeds are in several countries used as spices and as ingredients for seasonings (Raghavan, 2006). However, in the EU legislative, sesame and poppy seeds are listed within the oilseeds. Fresh herbs and fresh spices, such as fresh chilli and fresh ginger, usually belong to the product category of fresh vegetables (in case of fresh herbs, if available, to the subcategory or group of fresh leafy vegetables). Due to their higher moisture content, their product requirements strongly differ from that of low moisture foods. Thus, the current article focuses mainly on dried culinary herbs and spices (DCHS) and no claim to be complete is made.

2. General product standards for dried culinary herbs and spices defining the physical and chemical product quality

Standards that define general product specifications particularly aim at harmonising product quality to facilitate international trade and to avoid consumer fraud. Such product standards can cover specifications for product groups and/or for individual products. Examples of general product standards addressing DCHS and the covered physical and chemical parameters are outlined in Table 1.

Global standards for DCHS are mainly established by the ISO (for overview see Table 2). The ISO standards are set up for individual herbs and spices and usually include: (i) a brief botanical and physical product description; (ii) product classification (if applicable); (iii) product requirements in view of flavour, odour, colour, cleanliness (mainly freedom from living and dead insects, insect fragments, moulds, and rodent contamination as well as maximum content of extraneous/foreign matter), and some chemical quality characteristics (mainly maximum contents of moisture, total ash, and acid-insoluble ash, minimum volatile oil content, and for some products explicit mentioning of the absence of artificial colourants); and (iv) information on product packing and marking. Usually, those product specifications do not include limits for specific microbiological or chemical contaminations.

In addition to ISO, global standards are set by the Codex