QUALEB
برنامج الجودة
QUALITY PROGRAMME

REPUBLIC OF LEBANON
MINISTRY OF ECONOMY & TRADE

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ABC GUIDE

EU MARKET ACCESS WITH SPECIAL REFERENCE TO SPICES

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برنامج تقوية إدارة الجودة وقدراتها وبنيتها التحتية في لبنان

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PREFACE

The Quality unit at the Ministry of Economy and Trade implementing the Quality Programme (QUALEB), hosted at the Ministry of Economy and Trade in Lebanon and funded by the European Union, started in October 2004 where two phases were successfully implemented to develop the foundations of national quality infrastructure.

QUALEB phase III has been launched in September 2012 to ensure sustainability and continuity of the programmes' first two phases results and is being delivered through two tools: Technical Assistance and Twinning projects, under the guidance of HE. Dr Alain Hakim, Minister of Economy and Trade and in collaboration with the Delegation of the EU to Lebanon.

The objective of both projects is to help ensuring the safety of the Lebanese products and increase its competitiveness on international markets through better compliance to national and international standards.

Spices and herbs need no extended introduction since right from antiquity, they have been considered virtually indispensable in the culinary art. Spices and herbs are of minor cost in cooking elements, but important ingredient that contributes a lot to the taste of the food in which they are used.

During the last few years and due to non-compliance to EU and international requirements some Lebanese spices were rejected at EU, USA and some Arab countries

borders. QUALEB took the initiative and met with several Spices producers in collaboration with the Syndicate of Lebanese Food Industries, before started to prepare this Guide on Spices, as a part of its dissemination activities aimed to enhance food safety knowledge targeting Spices producers.

With over 500 million consumers, the EU is an important market for spices and herbs. The EU spice and herb market is increasingly characterized by structural change. Growing scarcity on the world market is an important accelerator of this change. Rising prices are increasingly allowing exporters from developing countries (DCs) to invest in and explore the EU market for value added products.

This Guide addresses the EU and international market access requirements with reference to spices, where Exporters need to understand these requirements by adapting their product portfolio and targeting the right markets.

Finally, this Guide provides producers experience based information that can be translated, integrated and implemented within the production processes.We hope that the producers benefit from this Guide in producing more safe products for consumers and in preserving their markets and penetrating new ones.

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ABBREVIATIONS

ASTA	American Spice Trade Association
CN	Combined Nomenclature
DC	Developing Countries
DIN	Deutsche Industrie Normen
EFSA	European Food Safety Authority
ESA	European Spices Association
EU	European Union
FAO	Food and Agriculture Organization
F N A O	F ood of Non Animal Origin
HS	Harmonized System
RASFF	Rapid Alert System for Food and Feed

1. INTRODUCTION

1.1 European Union (EU)

With agri-food exports reaching €120 billion in 2013, the EU28 became the world's number one exporter of agricultural and food products.

Although globally the modest growth in total world trade in 2013 is attributed to the slowdown of developing economies, the EU export growth was stimulated by demand for particular commodities in the developing countries, and was achieved despite the strong euro in 2013.

Generally a renowned exporter of high value added final products, the EU owes the growth in 2013 largely to more exports in volume of commodities, with cereals (wheat and barley) alone accounting for over two thirds of the total export gain.

While the EU also maintained its top-importer position, imports remained virtually unchanged in 2013 stretching the EU agricultural trade surplus to €18.6 billion.

The standstill in the growth of agricultural imports showed that the EU demand has not fully recovered, although lower prices of some commodities, such as coffee or cotton, also hampered the growth of EU imports in value.

The top ranking product in EU agri-food imports in 2013 was coffee €7.4 billion while other high-ranking imported products were oilcakes from soya and palm.

The tropical fruit and spices category includes various nuts, spices and bananas. The US and Turkey provide the EU with nuts, with the US specializing in almonds, pistachios and walnuts, and Turkey mainly in hazelnuts.

Spices come from various origins, for instance pepper imports are dominated by Vietnam, vanilla is largely supplied by Madagascar, and cinnamon by India and Sri Lanka.

1.2 EU Definitions and List of Spices

ESA, the European Spices Association has defined and listed culinary herbs and spices as follows:

Herbs and spices

Culinary herbs and spices are edible parts of plants which are traditionally added to

foodstuffs for their natural flavouring, aromatic and visual properties.

Herb and spice blends

These mixtures only contain herbs and spices and, if necessary, permitted anti-caking agents: The term blend, mix and mixture are interchangeable.

Seasonings

A seasoning is a blend of permitted food ingredients added as necessary to achieve the purpose for which it is

designed, that is, to improve the taste, eating quality and/or functionality of a food. It typically contains one or more herbs and/or spices and other flavor-enhancing or flavor imparting ingredients.

This category includes also seasonings with functional properties, for example with additives that have thickening, emulsifying, preserving, tenderizing, coloring properties.

The ESA "***List of Culinary Herbs and Spices***" is not comprehensive but covers the most frequently used herbs and spices with the most commonly used botanical names in Europe.

HERBS AND SPICES Common name	BOTANICAL NAME	PART OF PLANT1 Botanical definition	CLIMATE ZONE2	HERB OR SPICE
Aniseed	Pimpinella anisum	Fruit1a)	TE	Spice
Asafoetida	Ferula asafoetida	Rhizome	TE, SU	Spice
Basil	Ocimum basilicum	1b)	TE	Herb
Borage leaf	Borago officinalis	Leaf	TE	Herb
Caraway	Carum carvi	Fruit1a)	TE	Spice
Cardamom seeds	Elettaria cardamomum	Seed	TR	Spice
Cardamom, whole pods	Elettaria cardamomum	Fruit	TR	Spice
Celery leaves	Apium graveolens dulce	1b)	TE	Herb
Celery seed	Apium graveolens	Seed	TE	Spice
Chervil	Anthriscus cerefolium	1b)	TE	Herb
Chilies	Capsicum frutescens or annuum	Fruit	TR, TE	Spice
Chives	Allium schoenoprasum	Leaf	TE	Herb

HERBS AND SPICES Common name	BOTANICAL NAME	PART OF PLANT1 Botanical definition	CLIMATE ZONE2	HERB OR SPICE
Cinnamon	Cinnamomum zeylanicum Cinnamomum burmannii* Cinnamomum loureirii * Cinnamomum aromaticum*	Inner bark	TR	Spice
Cloves	Syzygium aromaticum	Flower bud	TR	Spice
Coriander leaves	Coriandrum sativum	1b)	TE	Herb
Coriander seed	Coriandrum sativum	Fruit1a)	TE	Spice
Cumin seed	Cuminum cyminum	Fruit1a)	TE	Spice
Curry leaf	Murraya koenigii	Leaf	TR, SU	Herb
Dill seed	Anethum graveolens, Anethum sowa	Fruit1a)	TE, SU	Spice
Dill tops	Anethum graveolens	1b)	TE	Herb
Fennel seed	Foeniculum vulgare	Fruit1a)	TE	Spice
Fenugreek	Trigonella foenum-graecum	Seed	TE	Spice
Galangal	Alpinia officinalis, Alpinia officinarum, Kaempferia galangal	Rhizome	TR	Spice
Garlic	Allium sativum	Bulb	TE	Spice
Ginger	Zingiber officinale	Rhizome	TR	Spice
Grains of paradise	Aframomum melegueta	Seed	TR	Spice
Juniper berries	Juniperus communis	Fruit	TE	Spice
Kaffir Lime Leaves	Citrus hystrix	Leaf	TR	Herb
Laurel (Bay) leaves	Laurus nobilis	Leaf	TE	Herb
Lavender flower	Lavandula officinalis	Flower	TE	Herb
Lavender leaf	Lavandula officinalis	Leaf	TE	Herb
Lemon Grass	Cymbopogon citratus	Leaf	TR	Herb
Lovage	Levisticum officinale	Leaf	TE	Herb
Lovage	Levisticum officinale	Rhizome	TE	Spice
Mace	Myristica fragrans, Myristica argentea	Aril	TR	Spice
Marjoram	Majorana hortensis, Syn. Origanum majorana	1b)	TE	Herb
Mexican oregano	Lippia graveolens	Leaf	TE, SU	Herb

HERBS AND SPICES Common name	BOTANICAL NAME	PART OF PLANT1 Botanical definition	CLIMATE ZONE2	HERB OR SPICE
Mustard seed	Sinapis alba, Sinapis nigra Brassica nigra, Brassica juncea	Seed	TE	Spice
Nigella seeds (kaljoni seed, or improperly "onion seeds", or "black cumin seeds", or"black caraway seeds")	Nigella sativa	Seed	TR, SU	Spice
Nutmeg	Myristica fragrans	Seed	TR	Spice
Onion and shallot, dried	Allium cepa & allium cepa var. aggregatum	Bulb	TE	Spice
Oregano	Origanum vulgare Origanum onites	1b)	TE	Herb
Paprika	Capsicum annuum or frutescens	Fruit	TE	Spice
Parsley	Petroselinum crispum, Petroselinum sativum	1b)	TE	Herb
Pepper, green3)	Piper nigrum	Fruit	TR	Spice
Pepper, black	Piper nigrum	Fruit	TR	Spice
Pepper, white	Piper nigrum	Seed1a)	TR	Spice
Pink pepper	Schinus terebinthifolius Schinus molle	Fruit	TR	Spice
Cubeb pepper, Cubebs, Java pepper	Piper cubeba L.	Fruit	TR	Spice
Peppermint	Mentha piperita	Leaf	TE	Herb
Pimento	Pimenta dioica	Fruit	TR	Spice
Pimento (Allspice)	Pimenta dioica	Fruit	TR	Spice
Rosemary	Rosmarinus officinalis	1b) Leaf	TE	Herb
Saffron	Crocus sativus	Parts of pistil	TE	Spice
Sage	Salvia officinalis, Salvia triloba	1b)	TE	Herb
Summer savory	Satureja montana	1b)	TE	Herb
Winter savory	Satureja hortensis	1b)	TE	Herb
Sichuan pepper	Zanthoxylum piperitum	Fruit	TE	Spice
Spearmint	Mentha spicata	1b)	TE	Herb
Star anise	Illicium verum	Fruit	TE	Spice
Tarragon	Arteminisia dracunculus	2)	TE	Herb

HERBS AND SPICES Common name	BOTANICAL NAME	PART OF PLANT1 Botanical definition	CLIMATE ZONE2	HERB OR SPICE
Thyme	Thymus vulgaris ,Thymus zygis, Thymus serpyllum	1b)	TE	Herb
Turmeric	Curcuma longa	Rhizome	TR	Spice
Vanilla	Vanilla planifolia Vanilla tahitensis	Fruit	TR	Spice

Notes:

1-a) The traditional names and definitions developed over time sometimes deviate from the botanical definitions, for example aniseed and other seeds which are botanically fruits and white pepper which is sometimes defined as fruit while the botanical definition is seed.

1-b) For Culinary Herbs part of plant is normally leaves or whole, soft part of the plant.

2) Spices are classified in various ways of which the most used are as per part of the plant or as per indigenous climate zone: TR- Tropical, SU- Subtropical and TE- Temperate

3) Pepper, green, red, and capers in brine are generally defined as condiment.

1.3 Spices Chemical and physical parameters as per ESA Standards

Chemical and physical parameters for spices, dry base for ASH, AIA*, V/O*

PRODUCT	ASH % W/W MAX	AIA % W/W MAX *	H20 % W/W MAX	V/O ml/100g MIN *	NOTES
ANISE	9.0	2.5	12	1.0	
BASIL	16	2.0	12	0.5	
CARAWAY	8.0	1.5	13	2.5	
CARDAMOM	9.0	2.5	12	4.0	
CELERY SEED	12	3.0	11	1.5	
CELERY LEAVES	20	1.0	8.0	Traces	
CHERVIL	17	2.0	8.0	Traces	
CHILLI	10	1.6	11	-	
CHIVES	13	2.0	8.0	Traces	
CINNAMON (CEYLON) (CASSIA)	7.0	2.0	14	0.7 – 1.0 (ISO 6539 ISO 6538) Depending on botanical species	The use of SO2 is only permitted for Ceylon cinnamon, Annex III part B Directive 95/2/EC Styrene off notes can be prevented through the control of moisture content throughout the supply chain.
CLOVES	7.0	0.5	12	14	
PRODUCT	ASH % W/W MAX	AIA % W/W MAX *	H20 % W/W MAX	V/O ml/100g MIN *	NOTES
CORIANDER SEED Microcarpum Macrocarpum	7.0	1.5	12	0.6 Traces	
CORIANDER LEAVES	15	1.0	8.0	Traces	
CUMIN	14	3.0	13	1.5	
DILL SEED	10	2.5	12	1.0	
DILL TOPS	15	2.0	8.0	Traces	

FENNEL	10	2.0	12	1.5	
FENUGREEK	7.0	1.5	11	Traces	
GALANGAL (ground)	9.0	4.0	10	Traces	
GARLIC PRODUCTS	6.0	0.5	6.5	-	Due to the hygroscopic nature of these products lower moisture content may be required
GINGER	8.0	0.2	12	1.5	
JUNIPER BERRIES	5.0	1.0	16	1.4	
LAUREL LEAVES	7.0	2.0	8.0	1.0	
LEMON GRASS	8.0	2.5	10	Traces	
MACE	4.0	0.5	10	5.0	
MARJORAM	10	2.0	12	0.7	
MUSTARD	6.5	1.0	10	-	
NUTMEG	3.0	0.5	10	5 - 6.5 Depending on grade	
ONION PRODUCTS Allium cepa	5.0	0.5	6.0 - 8.0 (depending on origin)	-	Due to the hygroscopic nature of these products lower moisture content may be required.
OREGANO	10	2.0	12	1.5	
PAPRIKA POWDER	10	2.0	11	-	
PARSLEY	14	1.5	7.5	Traces	English origin is not covered.
PEPPER BLACK	7.0	1.5	12	2.0	
PEPPER WHITE	3.5	0.3	12	1.5	
PEPPER GREEN (dried)	3.0	0.3	13*	1.0	If freeze dried: 8 %
PIMENTO Jamaica Other origins	 4,5 5.0	 0.4 1.0	 12 12	 3.0 2.0	
PINK PEPPER (Schinus)	7.0	1.8	14*	2.0	If freeze dried: 8 %
POPPY SEEDS	8	1	8	n.a.	
ROSEMARY	8.0	1.0	10	1.0	
SAFFRON WHOLE	8.0	1.0	12	-	

SAFFRON GROUND	8.0	1.5	10	-	
SAGE	12	2.0	12	1.5	
SAVOURY	12	1.0	12	0.5	
SPEARMINT	12	2.5	13	0.5	
STAR ANISE	3.0	0.5	8.0	7.0	
TARRAGON	12	1.5	8.0	0.5	
THYME	12	3.5	12	1.0	
TURMERIC WHOLE GROUND	8.0 9.0	2.0 2.5	12 10	2.5 1.5	

*AIA=Acid Insoluble Ash, V/O= Volatile Oil

1.4 Analytical methods recommended by ESA

Unless otherwise agreed between buyer and seller, ESA recommends the following methods:

1. Spices and condiments – Sampling EN ISO 948 – 2009
http://www.iso.org/iso/iso_catalogue/catalogue_ics/catalogue_ics_browse.htm?ICS1=67&ICS2=220&ICS3=10

2. Spices and condiments – Preparation of a ground sample for analysis ISO 2825 - 1981
http://www.iso.org/iso/catalogue_detail.htm?csnumber=7821

3. Spices and condiments – Determination of extraneous matter and foreign matter content ISO 927 – 2009
http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=42504

4. Spices and condiments – Determination of total ash ISO 928 – 1997
http://www.iso.org/iso/catalogue_detail.htm?csnumber=26525

5. Spices and condiments – Determination of acid insoluble ash ISO 930 – 1997

http://www.iso.org/iso/catalogue_detail.htm?csnumber=26524

6. Spices and condiments – Determination of moisture content – (Entrainment method) ISO 939 - 1980

http://www.iso.org/iso/catalogue_detail.htm?csnumber=5358

7. Spices and condiments – Determination of volatile oil EN ISO 6571 2009

http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_tc_browse.ht m?commid=47912

8. Analysis of spices and condiments – Determination of loss in mass of capsicum and allium species and of dried vegetables by vacuum oven drying – Deutsche Industrie Normen DIN 10236 (German standard). **The DIN method is attached in Annex 1.**

These methods are available at any national standardization bodies or by cutting and pasting into your browser the provided link

1.5 Analytical Laboratories in Lebanon

Annex 6 provides information on the main Analytical Laboratories in Lebanon which provide analytical services for the food industry as well as related services.

Within the list of analyses which are offered by each laboratory a descriptor specifies if the laboratory has a valid accreditation for the required analysis.

1.6 EU Spice Trade

With over 500 million consumers, the EU is an important market for spices and herbs.

To clearly define spices for trade and statistical purposes, the EU uses the Combined Nomenclature (CN) codes according to the Eurostat classification, to categorize goods, including spices. Table 1 shows the Harmonized System (HS) codes for spices and herbs.

Table 1: HS Codes of some spices and herbs

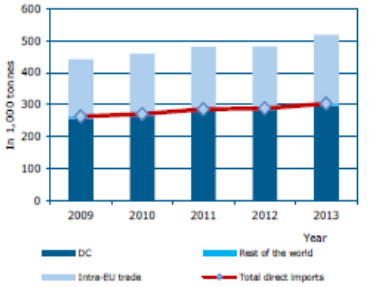
Code	Official product description
0904 11/12	Pepper
0904 20	Fruits of the capsicum genus or of the pimento genus
0905	Vanilla
0906	Cinnamon and cinnamon tree flowers
0907	Cloves: whole fruit, cloves and stems
0908 10	Nutmeg
0908 20	Mace
0908 30	Cardamoms
0909 10	Anise or badian seeds
0909 20	Coriander seeds
0909 30	Cumin seeds
0909 40	Caraway seeds
0909 50	Fennel seeds or juniper berries
0910 10	Ginger
0910 20	Saffron
0910 30	Turmeric – curcuma
091040	Thyme and bay leaves
0910 91	Mixtures of two or more of the products of different headings
0910 99	Other spices

Current volumes and development. In 2013, total EU imports of spices and herbs amounted to 520 thousand

tons with a value of € 1.8 billion. Between 2009 and 2013 the volume of imports grew by an average of 4.1% per year.

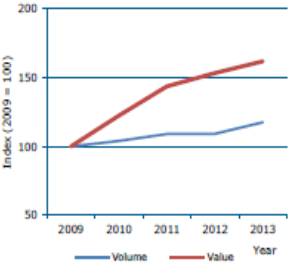
Figure 2 indicates that the value of imported spices and herbs (+13% per year) has increased significantly faster than the volume.

Figure 1: EU28 imports of spices and herbs, 2009-2013, in 1,000 tons



Source: Eurostat, 2014

Figure 2: Development value and volume of EU imports of spices and herbs, 2009-2013



Source: Eurostat, 2014

This shows that prices increased significantly (+8.3% per year on average between 2009 and 2013). Price increases were most significant for cloves (+27% per year), vanilla (+23%), cumin seeds (+22%) and mace (+21%).

Prices are expected to keep rising in the long term (despite short- term fluctuations) as industry sources expect growing global demand (especially in India and China).

Figure 1 and 2 show that:

- Imports of spices and herbs have continued to grow throughout the economic recession in the EU
- and imports do not fall when prices rise.

Spices and herbs are a minor but important ingredient that contributes little to the total cost of the food in which they are used. Therefore the demand tend to be inelastic to price changes.

Not only imports of unprocessed spices from developing countries. In 2013, direct imports from developing countries (DCs) amounted to 303 thousand tons (57% of total EU imports), or € 926 million. This equates to 57% of total EU imports and almost 100% of extra-EU imports.

These data show that DCs are the source of virtually all spices traded in the EU, but after importing them there is substantial intra EU-trade.

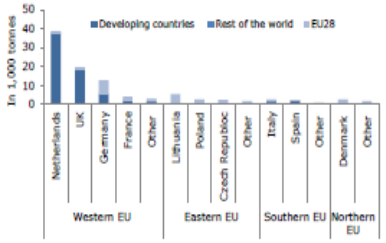
The main imported products were capsicums (22% of imported volume), pepper (23%) and ginger (23%).

China is the largest supplier to the EU with 20% of total imported EU volume, followed by India (8.7%), Vietnam (7.7%), Indonesia (4%), Brazil (3.1%) and Peru (2.4%).

Moreover China is a large supplier of ginger with 56% of imported volume from China and capsicums (40%). China consumes a large share of domestic produced ginger and capsicums.

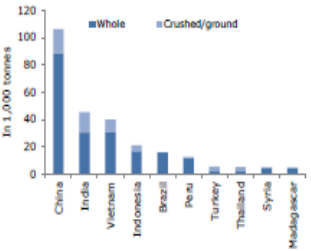
Vietnam produces mainly for export markets and supplies almost all pepper to the EU (91%).

Figure 3: EU spice and herb imports by EU regions and supplier categories, 2013



Source: Eurostat, 2014

Figure 4: Largest DC suppliers of spices and herbs to the EU, 2013



Source: Eurostat, 2014

In 2013, crushed/ground spices and herbs accounted for 30% of imported volume from DCs. In 2009, it was still 24%.

Figure 4 shows that there are major differences between the share of crushed and ground spices and herbs.

Asian countries are increasingly processing while Latin American countries hardly process. The largest global producer is Asia and the region has the economy of scale to invest in processing techniques which care both for export and a large domestic market for processed products.

As a result of low wages, improved processing facilities and detection techniques, grinding and crushing is increasingly taking place in DCs.

EU adding value, not only and importer. In 2013, EU exports of spices and herbs accounted for 273 thousand tons worth € 1.1 billion. The volume of exports grew by an average of 3.6% per year between 2009 and 2013.

The value of exports increased by 11% during this period due to the strong growth of global prices of spices and herbs.

The Netherlands (29% of total exported volume), Spain (20%) and Germany (13%) were responsible for the majority of exports. As can be seen from Figure 6, the Netherlands is an important trader (e.g. re- exporter) of whole spices and herbs. Spain exports largely processed spices and herbs. It processes a large share of capsicums destined for the EU market.

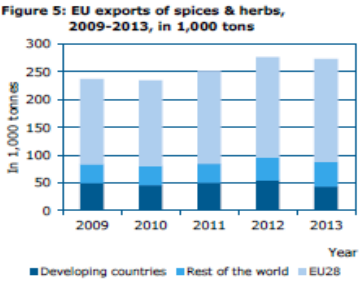


Figure 5: EU exports of spices & herbs, 2009-2013, in 1,000 tons

Source: Eurostat, 2014

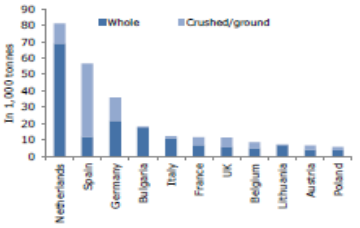


Figure 6: Main EU exporters of spices & herbs, 2013

Source: Eurostat, 2014

EU processors: plenty of added value. The average price of spices and herbs exported by EU countries is about 30% higher than those originating from DCs.

However there are opportunities for direct sales to EU countries that rely on other EU suppliers. These include many of the smaller importers with the exception of

Bulgaria, Slovenia, Spain, Italy and Sweden

Intra trade in the EU plays a big role. 67% of all EU exports was actually intra-EU trade among EU countries (data for 2013). Most exported volume originate from the Netherlands (54% - Germany, the UK, Belgium) and Germany (80% - including the Netherlands, France Poland, Belgium, Austria) and is destined for neighboring countries.

In the case of Spain these figures are lower (23%) because Spain is a spice producer and supplies other EU regions, such as Germany (14% of exporters volume), the UK (13%), France (12%) and the USA.

The USA (18%) is the largest Spanish export destination.

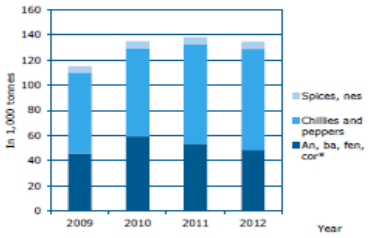
EU, a Spice producer. In 2012, EU production of spices and herbs amounted to 135 thousand tons. In comparison, EU imports were 520 thousand tons.

Production increased by 5.2% per year in volume between 2009 and 2012 however the only spices and herbs produced in the EU that are recorded are: dried chilies and peppers (60% of produced volume), anise, badian, fennel, coriander (36%) and other spices (4.2%).

The most significant rise in production between 2009 and 2012 was observed for chilies and peppers (+7.5% per year).

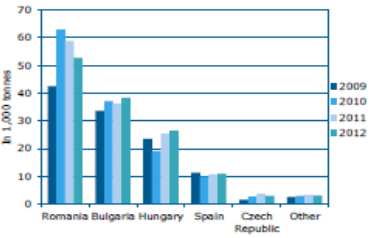
Figure 7 shows that the main producing countries are those that have a significant amount of agricultural land, high domestic consumption of spices (especially pepper) and relatively low wages: Romania, Bulgaria and Hungary.

Figure 7: EU production of spices and herbs, 2009-2012, in 1,000 tonnes



* Anise, badian, fennel and coriander
Source: FAOSTAT, 2014

Figure 8: EU Member States production of spices & herbs, 2008-2011, in 1,000 tons



*Countries with a market share lower than 1%: Greece, Slovenia, Slovakia, the Netherlands, Denmark

Together these countries account for 87% of EU production.

Herbs produced are those that are also used in local diets: for example parsley, basil, bay leaves, coriander, fennel, oregano and thyme. France, Italy and Greece are

major producers of (dried) herbs. The demand for herbs largely originates from local EU suppliers and those in close proximity (e.g. Northern African countries).

If we take a global glance at spices, EU accounts for about 2.7% of global spice and herb production while Asia accounts for 80% and Africa 11% of the world production with and increase by 5.5% per year between 2009 and 2011.

African production increased most significantly (+8.1 per year). Despite increasing production, global trading prices of spices and herbs have risen significantly.

The most important reason is scarcity and increasing global demand, mainly in emerging nations (e.g. China, India).

In the long-term global consumption is expected to keep outpacing supply. Prices will therefore remain high or continue to rise.

Industry sources predict that African countries will become a more important supplier in the next ten years but the development will be slow. It will largely depend on how they address quality and food safety issues.

Although EU processors, those located in the EU, are still responsible for a large share of processing for their domestic market, it is expected that processing will increasingly take place in countries of origin, but provided that these processors supply consistent quality and do not mess with blends. This provides greater opportunities

for suppliers in DCs to add value and increase margins. It also attracts EU processors and traders that are setting up and expanding facilities in countries of origin (for example, Olam and Nedspice).

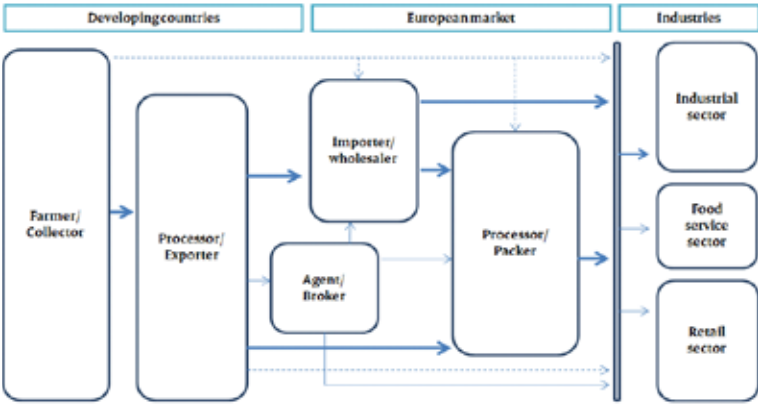
1.7 Market Channels

Market channels are changing rapidly as a result of developments in the sector. The increased power and development of suppliers, scarcity and the growing popularity of sustainability are the most important drivers of change.

This is accompanied by more direct sourcing, cooperation and integration in the trade channel.

Smaller and medium-sized companies should anticipate these changing market dynamics and among other factors should be moving towards added value products to avoid being cut out of the supply chain.

Fig. 1: Market channels for spices



Direct imports are increasing: in a market characterized by an increasing sense of scarcity, especially of produce that meets strict quality and safety requirements, EU actors are looking for ways to gain control of their supply chain and secure supply.

One strategy that is gradually being applied more frequently is cutting out actors through direct sourcing.

The spice trade is too specialized and too small for most food manufacturers to import directly.

However processors and blenders that do not import can cut out EU importers or agents/brokers by importing directly from producers or exporters. Roles in the trade channels are therefore integrating even more.

One company often performs different roles in the trade channel. EU buyers are in some cases moving directly to the farmers for the same reason.

Therefore increased direct sourcing can provide opportunities, but may also pose risks.

EU importers, processors and, in some cases, large food processors responsible for high trade volumes that need to secure supply in the spice and herb sector, are increasingly active in countries of origin. They are working closer together with farmers and exporters.

In some cases, they are taking over companies or setting up their own facilities in countries of origin. For example, the Dutch actors Olam and Nedspice, just to mention two, have recently set up and expanded processing facilities

in Vietnam to deliver high quality processed spices and herbs to international markets.

There are also examples of exporters in sourcing countries moving more towards target markets.

In India there are examples of companies taking over consumer packaging for British retailers such as Tesco from British packagers. Some are also taking over British companies to market their own product lines.

Another result of increased scarcity is that most EU buyers prefer to deal with a select number of larger growers, processors and traders that combine high quality, high volume, and consistency. However the fact that many spice markets have to deal with short-term and/or long-term supply scarcity often forces EU buyers to work with whoever can deliver, including smaller producers.

EU buyers are reducing stocks to cut costs. They are increasingly working on a just-in-time basis, with smaller but more frequent deliveries.

As order sizes are reducing it will make it harder for exporters to fill up a container within the short time frames that make it cost-effective to export to the EU since a container is considered the minimum order size for shipping to the EU market.

Suppliers in origin have benefitted from high prices in recent years and due to better organisation and access to price information, they are better able to play the market.

This is already leading to more cooperation between and the integration of farmers, traders and processors in countries of origin.

Cooperation and integration are important long-term survival strategies for traders and processors in origin that might find their own position threatened by direct sourcing and backward integration by buyers in consumer countries.

Sustainability issues partly arise as a result of the increasing pressure on resources, and partly because of increasing awareness of these issues. This has led EU companies to take initial action to address these issues.

The increasing popularity of sustainability is also changing trade channels. Many operators are now asking suppliers to comply with minimum sustainability criteria as perceived by EU buyers and these include no child labour, responsible pesticide use, healthy and safe working conditions and minimal ecosystem degradation.

Another important aspect is the growing market for certified sustainable products: organic, Fair trade and Rainforest Alliance are the most common certification systems in the EU market. Chain of custody is a crucial element in sustainable certification, requiring every actor handling sustainable products to be certified. This ensures that products can be traced back to their origin and that sustainable products are not mixed with conventional ones.

Due to their growing popularity, sustainable certified products are becoming more mainstream. Many large retail chains sell Fair trade and organic spices. With the increasing integration of sustainable practices in the mainstream market, buyer requirements for certified sustainable spices can change as well. The size of orders, supply continuity and focus on price are even more important in mainstream markets than in niche markets.

Direct sales from SMEs in DCs to purchasing units of retailers, the foodservice sector and food processors are rare.

Large EU buyers are however often involved in sustainable initiatives that aim to train farmers and exporters in sustainable practices and establish a chain of custody. Examples are Unilever and Symrise that have set up different initiatives to train current and future vanilla farmers about sustainable practices.

More value adding processing in origin:

Suppliers in producing countries have been occupied in further processing (e.g. crushing, grinding and mixing) spices and herbs for a long time.

Until recently EU buyers were reluctant to source further processed products due to concerns about quality, food safety and adulteration. This is changing as a result of the rapid development of processing facilities, better compliance with food safety procedures and the desire to cut costs.

This provides opportunities for suppliers in origin, especially those in which economy of scale can be achieved for example for pepper and capsicums.

Entering the EU market with further processed spices and herbs is more difficult than with whole spices and herbs. Suppliers should be able to supply constant quality, taste, aroma, color and guarantee supply. This particularly applies to mixed spices and herbs where knowledge of national taste, custom-made recipes and tough competition with EU suppliers make it even harder to enter the market.

1.8 The EU Spices Market Segmentation

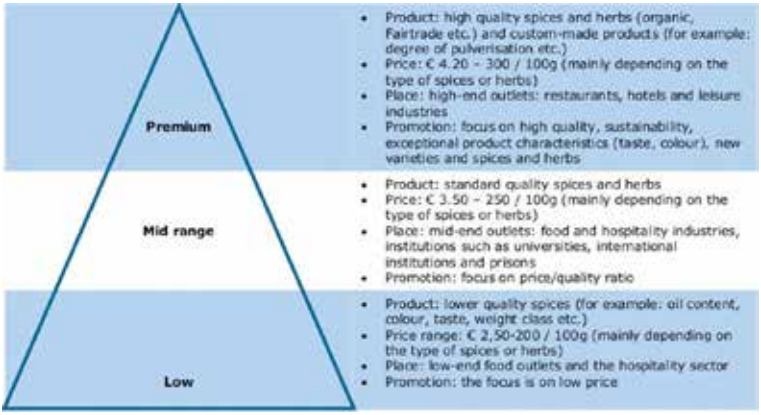
1.8.1 The Industrial Segment

The industrial segment is the largest user of spices and herbs being the meat, bakery and confectionery industries the most important buyers.

The share of turnover from SMEs in the European food and drink industry has increased in recent years and is now about 50% (Source: Food Drink Europe, 2014). This goes to show that the food sector in the EU is highly diverse and that there is a market for products of different quality and origin.

There is a clear trend towards ready-to-eat food and convenience food, basically more prepared food products prepared by the industrial sector. Therefore, although the industrial sector is a mature market, further growth is expected in years to come.

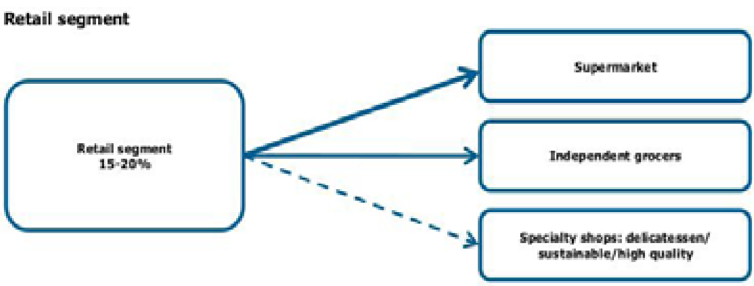
Growing application by food processors in food processing industry: the meat industry is by far the largest user of a wide range of spices and herbs. Specialist spice-mixing companies increasingly assist the meat and bakery trade by producing ready-to-use spice mixtures for meat, as well as for sausage factories and confectioners. They also produce consumer sachets of specific spice and herb mixtures, which are distributed by butchers' shops as point-of-sale material and, more frequently, in the supermarkets.



Natural flavouring: in a large part of the market there is a noticeable shift from artificial flavourings and colorings, whereas essential oils, oil resins and extracts are growing in importance in the industrial seasonings sector, but also in cosmetics, toiletries and pharmaceuticals. These are developments that provide an extra boost in the European demand for spices and herbs, revealing market opportunities for exporters in DCs.

1.8.2 The Retail Segment

The food retail sector is highly concentrated in most EU countries: the market share of the top three retailers ranges from 30% to 50% in most EU member states. It is even above 70% in Ireland, Denmark and Sweden (Source: Food Drink Europe, 2014).



There is a large degree of consolidation. This will continue, especially in countries where the market share of large retail chains is relatively still low (e.g. east and south Europe).It is very difficult to sell directly to retailers and food processors mainly due to order sizes, competition from EU suppliers and the need for just-in-time delivery (JIT).

Ethnic food is becoming more popular in the EU. This has led to more sales through specialized ethnic retail outlets as well as mainstream outlets.

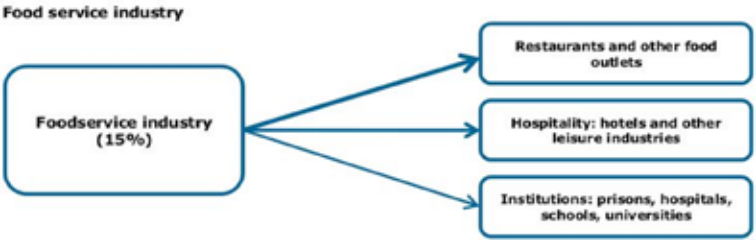
Buyers in these trade channels also import consumer packed spices and herbs.

Food safety and quality requirements often do not go further than legal requirements. The growing interest in this market is also picked up by trade fair organizers.

1.8.3 The Food Service Industry

Food service providers mainly source locally from EU producers, importers, wholesalers, (food) processors and retailers. The foodservice industry ranges from large (multinational) food chains to small food outlets.

They buy whole and processed spices and herbs in addition to mixes, sauces and wet pastes.



There is a lot of focus on the freshness of products in the food service industry and fresh products, including herbs, are an important source of competition.

An important trend in the foodservice industry in recent years is the use of local, seasonal products. This mainly applies to main ingredients and therefore does

not threaten the demand for imported dried spices and herbs.

The food service industry is more prone to economic developments than other segments.

Consumers save money by eating out less when economic development is slow as it has been in recent years to the benefit of the retail sector.

The food service industry is an important consumer of sustainable spices and herbs. Many consumers believe they offer better quality and taste and have a special regard for organically grown herbs and spices. There is a higher degree of attention in Northern Europe to organic if compared to Southern Europe.

1.9 Trends in Spices

The EU spice and herb market is increasingly characterized by structural change. Growing scarcity on the world market is an important accelerator of this change. Rising prices are increasingly allowing exporters from developing countries (DCs) to invest in and explore the EU market for value added products.

The growing awareness of healthier lifestyles and sustainability also provides opportunities in the high-end of the market. In addition, as a result of internationalization of diets and the large ethnic population in the EU, consumers increasingly adopt eating and cooking habits which were once considered foreign.

Exporters need to understands these changes by adapting their product portfolio and targeting the right markets.

Healthy lifestyles: a large segment of the EU market is turning towards food which is perceived as being more healthy.

The growing public concern about health potentially has a positive effect on the demand for spices and herbs. Unhealthier food ingredients like salt, sugar and synthetic additives can be replaced by spices and herbs.

Several large food processors have set ambitious salt reductions goals. For example, Unilever in the Netherlands is changing recipes to reduce the salt-intake of their customers by amongst others using herbs and spices instead.

Another noticeable trend is that the per capita consumption of meat in the EU has stabilised and is even decreasing in some EU countries.

This is to some extent driven by concerns about the environment and animal welfare but also because excessive meat consumption is considered unhealthy. Meat consumption is important for the demand for spices and herbs.

Despite this it is not expected to have a negative impact on the demand for spices and herbs. Demand will however partially switch to other segments in the market using spices and herbs.

For example, vegetarian food products and meat substitutes. Meat substitutes imitate the taste of and/or have a similar nutritional value as meat.

The global market for meat substitutes is expected to grow by 6% per year between 2014 and 2019. The EU accounts for 40% of global consumption.

As meat substitutes are more popular in the sustainable segment of the market the opportunities for sustainable spices and herbs (especially organic) are greater here.

Internationalization: as a result of internationalization, culinary traditions from other continents are being embraced by EU consumers.

The growing curiosity towards new tastes offers an opportunity for ethnic and exotic spices and herbs.

Furthermore, the ethnic groups in the EU are growing steadily as well, in some countries foreigners represent around or above 10% of the residents. For example, in the UK (Indian, Pakistani and Bangladeshi), the Netherlands (Indonesian, Turkish, Moroccan), Germany (Turkish), France (Algerian, other communities from French-speaking Africa), Italy and Spain (north and west Africa, Central America, China). Consumers in some EU countries (such as the western European mentioned above as well as other regions) are more open to international cuisine than in others.

Flavours of Mexican, Moroccan and Thai cuisine are becoming more popular as well.

EU consumers looking for convenience: EU people have busy lives and the number of single households increases. As a result EU consumers spend less time on meal preparation, leading to an increasing demand for easy-to-prepare, semi- prepared and ready-cooked meals that rely on spices and herbs to retain and enhance food flavor (e.g. ready-to-use spices and herb or mixes thereof, seasonings and products that contain ready-to-use spice mixes as a supplement).

The market for processed spices and herbs (e.g. crushed, ground, mixed) is harder for suppliers from developing countries to enter than that for whole products. However, with the growth of processing facilities in countries of origin opportunities for suppliers to add value in this way are also increasing.

Technological market drives.

Steam sterilizing more important: EU buyers are increasingly asking for steam sterilised spices and herbs as a way to treat microbiological contamination.

It can earn a significant premium for suppliers who are able to supply spices and herbs that are steam sterilized at source.

Investment in sterilization equipment can be very costly (up to € 1 million). An important downside of steam sterilization is that it negatively affects the volatile oil content, which produces the flavor.

EU buyers would switch to other methods if they would be just as safe, are accepted by consumers and not

too expensive. At the moment there are no alternatives that meet these requirements.

Increasing yields: due to the growing scarcity on the world market the spice and herb industry is looking at ways to increase yields. Sector initiatives focus on, for example, training in sustainable practices, better water management (e.g. drip irrigation, using clean water for processing) and the (proper) use of pesticides and fertilizers.

In addition, seed companies are developing higher yielding and short-season varieties of spices and herbs.

These initiatives should help increase harvests and therefore farmers' incomes. These new varieties may have different product characteristics (e.g. taste or colour). In the beginning they will be more expensive than 'regular' varieties and it will take some investment on the part of the supplier.

Even if they are accepted by the market it will take time for them to become commercially appealing.

Freeze-drying herbs: freeze-drying is considered to be a good way of conserving taste and aroma. The process involves water in fresh products being extracted by freezing under vacuum the products. Working at low temperatures, volatile aromatic components do not evaporate during the process.

By adding moisture in the cooking process the flavor and aroma of the fresh products return.

The freeze-drying technique is increasingly applied by companies such as Herbafrost (Belgium), Frosta (Germany), Fuchs (Germany) and Euroma (the Netherlands). They supply freeze-dried herbs that are used in the food processing industry and sold directly to consumers in the retail sector. They source herbs locally or internationally.

One negative aspect of freeze-drying is that it is a relatively expensive way of conserving products. In addition, the process can cause the structure of products to change.

Another way of preserving fresh herbs is by individually quick freezing (IQF) them. IQF products combine freshness with convenience and improved shelf life.

Economic market drive. Although the EU economies are slowly recovering after the economic crisis, economic growth is expected to remain moderate for the coming period. However recent years have shown that the demand for spices and herbs has continued to grow despite the economic crisis.

The main reason for this is that spices and herbs are a minor but important ingredient that contributes little to the total cost of the food in which it is used. Consumers might have spent less on eating out but this has not affected the consumption of spices and herbs. Neither has consumers' increased focus on price. Cheaper food products are often heavily seasoned. In this respect the EU market for spices and herbs seems to be largely resistant to economic downturns.

This applies less to more expensive items like saffron and vanilla.

Rising prices: a trend that is relevant for most spices and herbs is the significant increase in market prices. The main reason for this development is growing global consumption and the limited growth in production. Industry experts expect global consumption and prices to continue to grow over the next few years.

Pressure on prices will be relieved somewhat by new suppliers attracted by these high prices. Exporters in developing countries are in a good position to benefit. However they will have to work closely with their suppliers to secure supply. In some product supply chains farmers are however growing more powerful (e.g. pepper) and are better able to dictate prices and moments of sale. In other product supply chains (e.g. vanilla, cinnamon, chilies) prices paid to farmers are still low and/or do not provide them with a stable enough income. In these cases farmers can be reluctant to continue cultivation. Due to high prices EU buyers are looking for ways to work more closely with their suppliers.

This will provide opportunities to build long-term relationships with EU buyers with benefits for both parties. Preferred supplier contracts and better access to market information may be one of the benefits for exporters.

Environmental market drive. Growing awareness of sustainability: Food and retail companies are introducing sustainable sourcing policies, and consumers are

increasingly attracted to food ingredients which are sourced in a sustainable manner. Sustainability programs from companies can help exporters from producing countries with social and environmental issues, but will also include demands that should be met, for example increased traceability and transparency. EU companies have different definitions,

priorities and ambition levels regarding sustainability. Some companies (initially) focus strictly on their own operations. However, because many of the sustainability issues take place in their supply chain, many EU players in the spice and herb sector specifically look at the CSR-performance of their direct suppliers and in most cases (especially with important issues) the entire supply chain. Important issues in the spice and herb sector are the correct use of pesticides, no child labour, health and safe working conditions, loss of biodiversity and fair payment of farmers. Suppliers can be asked to comply with supplier's codes of conduct and/or be assessed. Some EU companies address sustainability issues in their supply chain by setting up programs or participating in initiatives. These are often focused on the training of farmers in good agricultural practices, reducing pesticide use and securing the livelihoods of farmers. In the long-term sustainability can become knock-out criteria for some EU buyers and the difference between sustainable and conventional will likely become smaller.

Growing importance of certification: third party verification can be an important factor in addressing sustainability issues: e.g. process certifications schemes like ISO 14001 and OHSAS 18001. Product certification can also play an important role (organic, Fairtrade, Fair Wild or Rainforest Alliance (RA). Certified sustainable products form a relatively small niche market but the expectation is that the supply of certified products will grow over the next few years. This is especially driven by certification projects initiated by the Sustainable Spice Initiative. It certifies plantations according to RA standards in countries worldwide including Vietnam, Indonesia, India and Madagascar. The premiums that have to be paid to absorb (some of) the costs for certification constitute a barrier for further development of sustainable products. Nevertheless, for exporters in developing countries certification can open up new markets, improve the quality and yield of their products, company's image and relationships with suppliers and buyers.

Animal feed: spices and herbs are increasingly used in animal feed for livestock production. Benefits include improved health, digestion, food intake, protection against E-coli and a reduction in methane emissions. In addition, they offer a sustainable alternative to antibiotic growth promoters. Garlic, Thyme, etc extracts are used to contain bacterial attacks in commercial swine, chicken and rabbit rations in Europe.

The ban of antibiotic growth promoters has opened the market to mixtures of herbs and spices to accelerate growth and maintain health.

Some useful herbs and spices include Garlic, thyme, rosemary, ginger, scent leaf, bitter leaf, black pepper, nutmeg and cinnamon.

Allergens packaging: in December 2014 Regulation 1169/2011 has gone into effect. The new allergen legislation states that pre-packed food products need to state ever more clearly on the packaging that it contain allergens.

Therefore it is relevant for suppliers of pre-packed spices and herbs. Ingredients that make out only a small part of a food product (like spices in ready- to-eat meals) do not have to be specifically mentioned.

For example, all herbs or spices not exceeding 2 % by weight of the food, may be referred to as 'Spice(s)' or 'mixed spices' or 'Herb(s)' or 'mixed herbs'. If however a product includes more than 2% spices, the label must list any allergens, glutens or sulphites contained in the spices. These new labeling rules are meant to make it easier for people with food allergies to determine which products to avoid.

New import tariffs: in January 2014 significant changes were made in the EU's Generalized System of Preferences (GSP). One relevant aspect for the spices and herbs market is that spices from China and Brazil will no longer benefit from preferential import tariffs. For many whole spices and herbs the import tariff for all countries remains at 0%. For whole sweet pepper, vanilla, cloves and bay leaves import tariffs are now higher for China and Brazil than

for developing countries. This also applies to crushed/ground pepper, capsicums, vanilla, cloves, saffron, curry and thyme. Whether this will provide suppliers from developing countries with a competitive advantage depends on the product.

For example, in 2013, China (1% of total volume of EU imports) and Brazil (0.02%) only accounted for a small share of EU imports of crushed/ground pepper. China is however a large supplier of crushed and ground capsicums (56% of direct crushed/ground imports in 2013). Therefore, it is expected to have a major impact on this trade.

2. EU SPICE BUYER REQUIREMENTS

Buyer requirements can be divided into (1) musts, requirements which must meet in order to enter the market, such as legal requirements, (2) common requirements, which are those most of the competitors have already implemented, in other words, the ones that a company needs to comply with in order to keep up with the market, and (3) niche market requirements for specific segments.

2.1 Compulsory requirements

Legal requirements are a must and apply to:

- Food safety and health control
- Contamination
- Irradiation– applicable to spices and herbs
- Consumer labeling – applicable to consumer packed spices and herbs and those that contain allergens
- Other as specified in the laws section

2.1.1.Food safety: Traceability, hygiene and control

Food safety is a key issue in EU food legislation.

The General Food Law is the legislative framework regulation for food safety in the EU. To guarantee food safety and to allow appropriate action in cases of unsafe

food, food products must be traceable throughout the entire supply chain and risks of contamination must be limited.

An important aspect to control food safety hazards is defining critical control points (HACCP) by implementing food management principles. Another important aspect is subjecting food products to official controls. Products that are not considered safe will be denied access to the EU.

Control of food imported to the EU: products will be subjected to official controls. These controls are carried out to ensure that all foods marketed in the EU market are safe, i.e. in compliance with the requirements applicable to them.

In the event of repeated non-compliance of specific products originating from particular countries can only be imported under stricter conditions such as having to be accompanied with a health certificate and analytical test report.

Due to food safety concerns some spices and herbs (e.g. capsicums, ginger, nutmeg, curry powder) from certain countries (e.g. India, Indonesia) are subject to increased level of official controls. These are put on a list included in the Annex of Regulation (EC) 669/2009.

Contaminants are substances that may be present as a result of the various stages of its growing, processing, packaging, transport or storage. Common forms of contamination are:

Aflatoxin: For piper nigrum, capsicums, nutmeg, turmeric and ginger the maximum level of aflatoxin is between 5.0 µg/kg for aflatoxin B1 and 10 µg/kg for total aflatoxin content (aflatoxins B1, B2, G1 and G2).

Ochrotoxin A(OTA): For the same piper nigrum, nutmeg, turmeric and ginger as well as mixtures thereof the maximum level of OTA is set at 15 µg/kg. From 1 January 2015 the limits will also apply to capsicums.

Pesticides: The EU has set maximum residue levels (MRLs) for pesticides in and on food products. Products containing more pesticides than allowed or illegal pesticides will be withdrawn from the EU market. Pesticide legislation is largely harmonised throughout the EU however different limits for a small amount of pesticides can still exist between EU countries.

Salmonella: According to recent data_7% of all spices imported into the USA are contaminated with salmonella. It is therefore a serious problem, also for EU buyers. Salmonella contamination especially occurs often with pepper and capsicums. There are no specific requirements laid in EU legislation for salmonella contamination of spices and herbs as there are for other products. However according Article 11 of the General Food Law food products placed on the EU market must be safe. Food business operators therefore test spices and herbs for salmonella. Food safety authorities therefore can withdraw imported food products from the market or prevent them from entering the EU when salmonella is

found. Steam sterilization and irradiation are two ways to deal with microbiological contamination.

Irradiation: To control contamination caused by micro-organisms, viruses, bacteria or insects it is allowed to use irradiation on dried spices and herbs. The maximum overall average absorbed radiation dose is 10 kGy. In case spices and herbs are irradiated the buyer should be informed and irradiated products will have to be labeled as such.

Food additives: Some herbs and spices or mixtures thereof may contain colourings, flavourings or sweeteners. There is specific legislation for additives (e.g. colours, thickeners) and flavourings that list which E-numbers and substances are allowed to be used. However spices and spice blends may not contain added colours.

Many of the mixtures rejected by custom authorities or buyers have undeclared, unauthorised or too high limits of extraneous materials (e.g. colourants and flavourings).

Especially crushed and ground spices and herbs and mixtures with illegal artificial colourants (azodyes Sudan I, tatrazine, butter yellow) are often rejected and destroyed by EU custom authorities.

Although these may be approved by the food authority in the country of origin, some of them may not be approved in the EU.

Consumer labeling: Pre-packed spices & herbs sold to consumers must adhere to strict EU labeling requirements

concerning labeling, presentation and advertising of foodstuffs according to Directive 2001/13/EC.

Spices and herbs or mixtures thereof can contain extraneous material (e.g. gluten, mustard or sesame seeds, milk, nuts – see Annex III a) that can cause allergic reactions and therefore have to be labeled as containing allergens.

If nutrition or health claims are made these have to be approved in advance by the European Food Safety Agency (EFSA, *www.***efsa***.europa.eu)*

As per December 2014 Regulation1169/2011 has gone into effect and will repeal the above mentioned Directives. The new allergen legislation states that pre-packed food products should state even more clearly whether they contain allergens.

Spices, herbs or mixtures thereof are exempted from the requirement of the nutrition declaration.

2.1.2. Further requirements: Food safety, sustainability, corporate responsibility

As food safety is a top priority in all EU food sectors, extra guarantees may be required by EU importers.

EU buyers (e.g. traders, food processors, retailers) likely require the

implementation of a HACCP-based food safety management system from its suppliers, moreover EU retailers require private standards, with often even more stringent requirements.

Some of the main food safety management systems in the EU are British Retail Consortium (BRC) IFS, FSSC22000 and SQF.

Different buyers may have different preferences for a certain management system, so before considering certification against one of these standards, is advised to check which one is preferred since UK British retailers often require BRC and IFS is more commonly required on mainland Europe.

All the mentioned management systems are recognized by the Global Food Safety Initiative

Corporate responsibility: EU buyers (especially those in western and northern EU countries) increasingly pay attention to their corporate responsibilities regarding the social en environmental impact of their business. This can affect suppliers.

Common requirements are the signing of a suppliers' code of conduct in which the suppliers guarantees and also accepts inspections and auditing regarding the respect of local environmental and labour laws, child labour, health and safe working conditions, fair payment, deforestation and correct use of pesticides.

Importers may participate in initiatives such as the Ethical Trading Initiative (ETI – mainly in the UK), Business Social Compliance Initiative (continental EU) and Sedex.

These initiatives focus on improving social conditions in their members' supply chains. Many large retailers work only with suppliers that are audited.

2.1.3 Niche market for certified sustainable products

A niche market is the market for spices and herbs produced with extra focus on the social conditions in the producing areas and there is a growing market for certified products with well-known consumer logos across the EU. The most popular sustainability certification systems are:

Fair Trade Certification: Fair trade focusses on performance of businesses concerning social conditions in the supply chain. Certification is achieved through an independent third party actor, and once certified the Fair trade logo can be placed onto the product. The market for Fair trade certified spices and herbs however is still a niche market.

The Organic market: Organic spices and herbs are produced and processed according to specific protocols.

The market for organic products has been growing regularly although for organic spices and herbs it is still relatively small.

To market spices and herbs in the EU as organic, they must be grown using organic production methods which are laid down in EU legislation and growing and processing facilities must be audited by an accredited certifier. Traders and/or processors will also be audited to ensure a chain of custody.

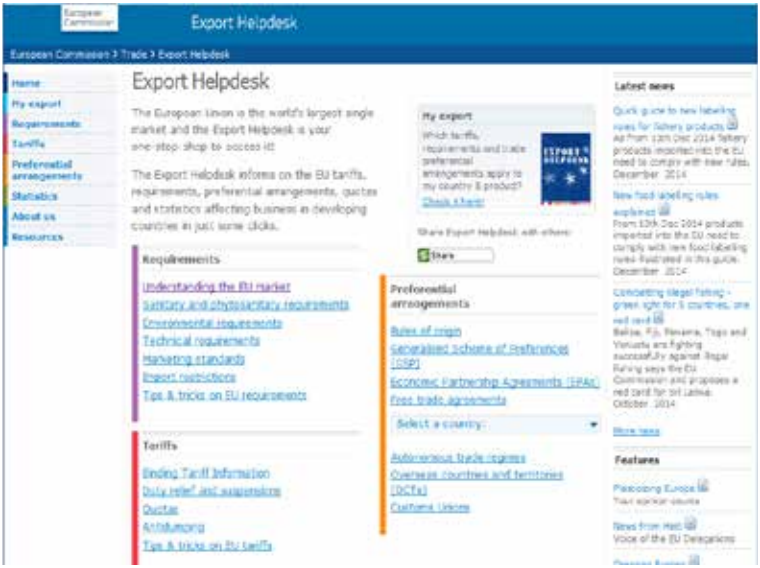
Rainforest Alliance: The Rainforest Alliance (RA) standard is a mainstream sustainability scheme in which social as well as environmental issues are addressed. It is fairly new to the spice market however growing in

popularity fast. The Sustainable Spice Initiative (SSI) was founded by a consortium of leading players in the EU spices market together with civil society organizations. It is a large driver behind RA certification projects in several producing countries. Its ambition is that in 2015 20% of all black and white pepper imported by the EU from Indonesia and Vietnam and 10% of three other spices imported from Vietnam, Indonesia or Madagascar should be sustainably produced.

2.1.4 EU Export Helpdesk, an on-line interactive tool with the EU

For a *complete* list of *EU* requirements *concerning each specific* spice and herb *the EU has issued an interactive on line tool called* EU Export Helpdesk *reachable at:*

http://exporthelp.europa.eu/thdapp/index.htm



And the interactive window for each commodity at:

http://exporthelp.europa.eu/thdapp/display.htm?page=form%2fform_MyExport.html&docType=main&languageId=En

3 LEGISLATION

3.1 EU Legal requirements applicable to herbs and spices

European and national legislations are applicable to all foods of non-animal origin (FNAO) including herbs and spices. The current list is updated to December 2014.

All legal documents are freely available and downloadable at **http://europa.eu.int/eur-lex/lex/.**

3.1.1 General legislation

Regulation (EC) No 178/2002 of 28 January 2002 laying down the general principles and requirements of food law, establishing the European Food Safety Authority and laying down procedures in matters of food safety (O.J. L 31, 1.2.2002).

This regulation addresses amongst others, risk analysis (Art. 6), precautionary principle (Art. 7), food safety requirements (Art. 14), traceability (Art. 18).

3.1.2 Labeling

Regulation (EU) No 1169/2011 on the provision of food information to consumers, amending Regulations (EC) No 1924/2006 and (EC) No 1925/2006 of the European Parliament and of the Council, and repealing Commission Directive 87/250/EEC, Council Directive 90/496/EEC, Commission Directive 1999/10/EC, Directive 2000/13/EC of the European Parliament and of the Council, Commission Directives 2002/67/EC and 2008/5/EC and Commission Regulation (EC) No 608/2004 (O.J. L 304, 22.11.2011)

This Regulation allows the consumer to make an informed choice that suits both their dietary and food intolerance needs. ESA recommends that particular attention is paid to potential for cross contamination within the food chain. This includes items such as cereals containing gluten, peanuts (ground nuts), nuts, celery, mustard, sesame seeds and products thereof. These are within the legislation (see Annex II of the Regulation) identified amongst others as potential allergens within our industry. Also due to allergenic reactions of some consumers the addition of sulphur dioxide also has to be declared if the level is above 10 ppm.

Foodstuffs that have been treated with ionizing must be labeled "irradiated" or "treated with ionizing radiation".

Commission Regulation (EC) No 41/2009 of 20 January 2009 concerning the composition and labeling of foodstuffs suitable for people intolerant to gluten (OJ L 16, 21.1.2009)

Regulation (EC) No 1332/2008 of 16 December 2008 on food enzymes and amending Council Directive 83/417/EEC, Council Regulation (EC) No 1493/1999, Directive 2000/13/EC, Council Directive 2001/112/EC and Regulation (EC) No 258/97 (O.J. L 354, 31.12.2008)

Commission Implementing Regulation (EU) No 1321/2013 of 10 December 2013 establishing the Union list of authorized smoke flavouring primary products for use as such in or on foods and/or for the production of derived smoke flavourings (O.J. L 333 12.12.2013)

Council Regulation (EC) No 834/2007 of 28 June 2007 on organic production and labeling of organic products and repealing Regulation (EEC) No 2092/91 (O.J. L 189, 20.06.2007)

Commission Regulation (EC) No 889/2008 of 5 September 2008 laying down detailed rules for the implementation of Council Regulation (EC) No 834/2007 on organic production and labeling of organic products with regard to organic production, labeling and control (O.J. L 250, 18.09.2008)

Council Regulation (EC) No 967/2008 of 29 September 2008 amending Regulation (EC) No 834/2007 on organic production and labeling of organic products (O.J. L 264, 3 October 2008)

Commission Regulation (EU) No 271/2010 of 24 March 2010 amending Regulation (EC) No 889/2008 laying down detailed rules for the implementation of Council Regulation (EC) No 834/2007, as regards the organic

production logo of the European Union (O. J. L 84 of 24 March 2010)

Commission Regulation (EU) No 471/2010 of 31 May 2010 amending Regulation (EC) No 1235/2008, as regards the list of third countries from which certain agricultural products obtained by organic production must originate to be marketed within the Union

3.1.3 Contaminants

Regulation (EC) No 1881/2006 of 19 December 2006 setting maximum levels for certain contaminants in foodstuffs (O. J. L 364, 20.12.2006)

This regulation covers amongst others, mycotoxins and heavy metals such as cadmium, lead, and mercury.

For aflatoxins EU legislation covers only the spices Capsicum ssp (dried fruits including chilies, chili powder, cayenne and paprika), Piper ssp. (fruits thereof including white and black pepper), Myristica fragrans (nutmeg), Zingiber officinale (ginger), Curcuma longa (turmeric). For other spices national (aflatoxin) legislation is applicable.

The EU limits regarding the abovementioned spices are:

Aflatoxin B1: 5 ppb

Aflatoxin B1 + B2 + G1 + G2: 10 ppb

Commission Regulation (EU) No 165/2010 of 26 February 2010 amending Regulation (EC) No 1881/2006 setting maximum levels for certain contaminants in foodstuffs as regards aflatoxins (O. J. L 50, 27.2.2010)

The Regulation extends the scope to mixtures of spices containing one or more of the abovementioned spices. Moreover it sets maximum limits for oilseeds such as mustard seeds, sesame seeds and poppy seeds.

Commission Regulation (EU) No 105/2010 of 5 February 2010 amending Regulation (EC) No 1881/2006 setting maximum levels for certain contaminants in foodstuffs as regards ochratoxin A (O. J. L 35, 6.2.2010)

The Regulation sets maximum limits for ochratoxin A in the same spices that have a maximum limit for aflatoxin.

Commission Regulation (EU) No 594/2012 of 5 July 2012 amending Regulation (EC) 1881/2006 as regards the maximum levels of the contaminants ochratoxin A, non dioxin-like PCBs and melamine in foodstuffs (O.J. L 176, 6.7.2012)

The Regulation sets maximum limits for ochratoxin A in spices, including dried spices, as follows:

Piper spp. (fruits thereof, including white and black pepper), Myristica fragrans

(nutmeg), Zingiber officinale (ginger), Curcuma longa (turmeric) 15 µg/kg

Capsicum spp. (dried fruits thereof, whole or ground, including chilies, chili powder, cayenne and paprika) 30 µg/kg until 31.12.2014 15 µg/kg as from 1.1.2015

Mixtures of spices containing one of the abovementioned spices 15 µg/kg"

Regulation (EC) No. 401/2006 of 23 February 2006 laying down the methods of sampling and analysis for the official control of levels of mycotoxins in foodstuffs (O.J. L 70, 9. March 2006)

In this Regulation methods of sampling as well as precision criteria for methods of analysis for official control by enforcement authorities are defined.

Commission Regulation (EU) No 178/2010 of 2 March 2010 amending Regulation (EC) No 401/2006 as regards groundnuts (peanuts), other oilseeds, tree nuts, apricot kernels, liquorice and vegetable oil (OJ L 52, 3.3.2010)

This Regulation establishes the official sampling plan for Ochratoxyn A

Guidance document for competent Authorities for the Control of Compliance with EU Legislation on Aflatoxins

The document focuses mainly on the official control of aflatoxin contamination in food products. At: http://europa.eu.int/comm/food/food/chemicalsafety/contaminants/legisl_en.htm

Commission Recommendation of 3 December 2013 on the reduction of the presence of dioxins, furans and PCBs in feed and food (O.J. L 323, 4.12.2013)

The recommendation sets action levels for dioxins in fresh and dried herbs. Additives:

Regulation (EC) No 1333/2008 of the European Parliament and of the Council of 16 December 2008 on food additives

This Regulation replaces the 3 EC Directives on food additives (colours, sweeteners and other food additives). The annexes of the Directives have been merged into one annex.

Commission Regulation (EU) No 1129/2011 of 11 November 2011 amending Annex II to Regulation (EC) No 1333/2008 of the European Parliament and of the Council by establishing a Union list of food additives (O.J. L 295, 12.11.2011)

Spices and spice blends are included in the Annex as foodstuffs which may not contain added colours.

Specific limits for SO2 are provided for dried ginger (150 ppm) and onion, garlic and shallot pulp (300 ppm).

SO2 in cinnamon (Cinnamomum ceylanicum) is permitted as additive (150 mg/kg).

Regulation (EC) No 1332/2008 of the European Parliament and of the Council of 16 December 2008 on food enzymes and amending Council Directive

83/417/EEC, Council Regulation (EC) No 1493/1999, Directive 2000/13/EC, Council Directive 2001/112/EC and Regulation (EC) No 258/97

This regulation requires that food enzymes are officially registered and permitted for use in foodstuffs. They are regarded as food ingredients and must be declared on the label.

Regulation (EC) No 1334/2008 of the European Parliament and of the Council of 16 December 2008 on

flavourings and certain food ingredients with flavouring properties for use in and on foods and amending Council Regulation (EEC) No 1601/91, Regulations (EC) No 2232/96 and (EC) No 110/2008 and Directive 2000/13/EC.

This regulation fixes limits for active principles in composite food. Active principles may be incorporated into food by herbs and spices or flavourings or other food ingredients with flavouring properties.

Commission Regulation (EC) No 669/2009 of 24 July 2009 implementing Regulation (EC) No 882/2004 as regards the increased level of official controls on imports of certain food of non-animal origin (O.J. L 194 of 25.7.2009).

This Regulation lays down rules concerning the increased level of official controls to be carried out pursuant to Article 15(5) of Regulation (EC) No 882/2004 at the points of entry into EU on imports of the feed and food of non- animal origin listed in Annex I to this Regulation.

3.1.4 Irradiation

EU overview at:

http://ec.europa.eu/food/food/biosafety/irradiation/comm_legisl_en.htm

Directive 1999/2/EC of 22 February 1999 on the approximation of the laws of the Member States concerning foods and food ingredients treated with ionizing radiation (O.J. L 66, 13.3.1999)

Condition for authorizing food radiation:

1. Food irradiation may be authorized only if:

- there is a reasonable technological need,

- it present no health hazard and is carried out under the conditions pro- posed,

- it is of benefit to the consumer,

- it is not used as a substitute for hygiene and health practices or for good manufacturing or agricultural practice.

2. Food irradiation may be used only for the following purposes:

- to reduce the incidence of food-borne disease by destroying pathogenic organisms,

- to reduce spoilage of foodstuffs by retarding or arresting decay processes and destroying spoilage organisms,

- to reduce loss of foodstuffs by premature ripening, germination or sprouting,

- to rid foodstuffs of organisms harmful to plant or plant products.

Directive 1999/3/EC of 22 February 1999 on the establishment of a Community list of foods and food ingredients treated with ionizing radiation (O.J. L 66, 13.3.1999)

Category of foodstuff	Maximum overall average absorbed radiation dose (kGy)
Dried aromatic herbs, spices and vegetable seasonings	10

Communication from the Commission on foods and food ingredients authorized for treatment with ionizing radiation in the Community (O.J. C 241, 29.8.2001)

Commission Decision of 23 October 2002 adopting the list of approved facilities in third countries for the irradiation of foods (O.J. L 287, 25.10.2002) amended by Decision of 7.10.2004 (O.J. L 314, 13.10.2004) and Decision of 4.12.2007 (O.J. L 323, 8.12.2007)

List of Member States' authorizations of food and food ingredients which may be treated with ionizing radiation (O.J. C 56, 11.3.2003)

List of approved facilities for the treatment of foods and food ingredients with ionizing radiation in the Member States (According to Article 7(4) of Directive 1999/2/EC of the European Parliament and the Council on the approximation of the laws of the Member States concerning foods and food ingredients treated with ionizing radiation.

This text cancels and replaces the text published in the Official Journal of the European Union C 336 of 17 November 2011, p. 14) (2012/C 265/04) (O.J. C 265, 1.9.2012)

Commission Decision of 7 October 2004 amending Decision of 23 October 2002 adopting the list of approved

facilities in third countries for the irradiation of foods (O.J. L 314, 13.10.2004) and amendments

Commission Decision of 22 March 2010 amending Decision 2002/840/EC as regards the list of approved facilities in third countries for the irradiation of foods (O.J. L 75 of 23 march 2010)

3.1.5 Pesticides

Regulation (EC) No 396/2005 on maximum residue levels of pesticides in or on food and feed of plant and animal origin and amending Council Directive 91/414/EEC (O. J. L70, 16. 03. 2005)

This Regulation harmonizes legislation on pesticide residues within the EU.

Regulation (EC) No 299/2008 of the European Parliament and of the Council of 11 March 2008 amending Regulation (EC) No 396/2005 on maximum residue levels of pesticides in or on food and feed of plant and animal origin, as regards the implementing powers conferred on the Commission

Commission Regulation (EU) No 212/2013 of 11 March 2013 replacing Annex I to Regulation (EC) No 396/2005 of the European Parliament and of the Council as regards additions and modifications with respect to the products covered by that Annex (O.J. L 68, 12.3.2013)

Spices and the aromatic herbs can be found in the categories VEGETABLES FRESH OR FROZEN – Fruiting vegetables – Solanacea (paprika) and Leaf vegetables and fresh herbs and SPICES.

Commission Regulation (EC) No 149/2008 of 29 January 2008 amending Regulation (EC) No 396/2005 of the European Parliament and of the Council by establishing Annexes II, III and IV setting maximum residue levels for products covered by Annex I thereto.

Dehydration factors may be applied to dried peppers and dried herbs and all active substances listed in the Annexes of Regulation 396/2005 or not.

Based on these provisions ESA has proposed dehydration factors to be applied when assessing pesticide residues in dried peppers and dried herbs. These dehydration factors have been presented to the EU Commission for consideration and inclusion into Annex VI of Regulation 396/2005. They have been published on the ESA website and in the Journal of Consumer Protection and Food Safety, German Federal Office for Consumer Protection and Food Safety (BVL), Heft 4, November 2008).

Commission Regulation (EC) No 839/2008 of 30 August 2008 amending Regulation (EC) No 396/2005 of the European Parliament and of the Council as regards Annexes II, III and IV on maximum residue levels of pesticides in or on certain products.

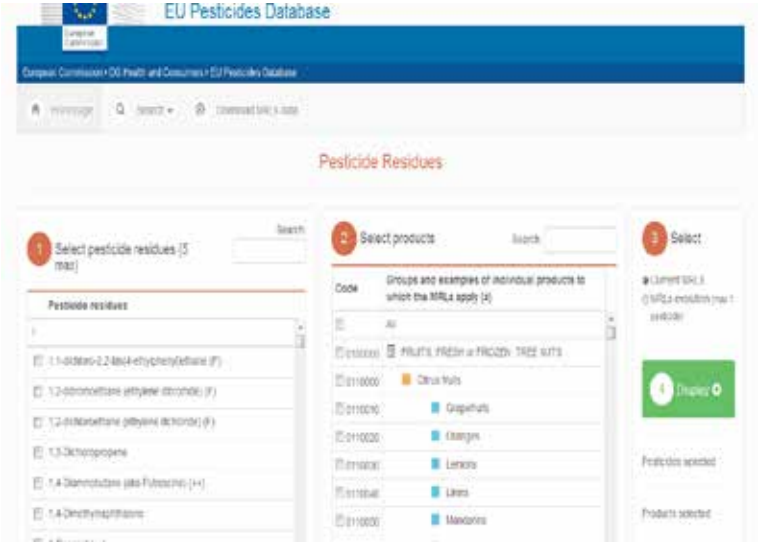
Commission Regulation (EC) No 260/2008 of 18 March 2008 amending Regulation (EC) No 396/2005 of the European Parliament and of the Council by establishing Annex VII listing active substance/product combinations covered by a derogation as regards post-harvest treatments with a fumigant

Risk evaluation and revision of pesticides status by the EU, as well as MRLs are an ongoing process, therefore it is very important to have firsthand information always available.

Risk evaluation and revision of pesticides status by the EU, as well as MRLs are an ongoing process, therefore it is very important to have firsthand information always available.

The EU has an interactive pesticide database website in which a commodity and/or a pesticide MRL can be searched.

http://ec.europa.eu/sanco_pesticides/public/?event=pesticide.residue.selection&language=EN



Please refer to this facility to assess the limits imposed by the EU.

3.1.6 Hygiene

Regulation (EC) No 852/2004 of the European Parliament and of the Council of 29 April 2004 on the hygiene of foodstuffs (OJ L 139, 30.4.2004)

This regulation stipulates that Food business operators producing or harvesting plant products are to take adequate measures, to ensure hygienic production, transport and storage conditions for, and the cleanliness of, plant products. Food business operators are to keep and retain records relating to measures put in place to control hazards in an appropriate manner, commensurate with the nature and size of the food business. Food business operators are to make relevant information contained in these records available to the competent authority and receiving food business operators on request.

As regards the hygiene of imported food, the following hygiene requirements are applicable to the operators:

- Are to ensure that the products are protected against contamination and to use potable water, or clean water, whenever necessary to prevent contamination;

- Are to comply with appropriate Community and national legislative provisions relating to the control hazards in primary production and associated operation;

- Are to keep clean and, where necessary after cleaning, to disinfect, all the equipment, containers and places the spices are in contact with;

- Are to take account of the results of any relevant analyses carried out on samples taken from plants or other samples that have importance to human health

- Are to take appropriate remedial action when informed of problems identified during official controls;

Guidance Document – Implementation of certain provisions of Regulation (EC) No 852/2004 on the hygiene of foodstuffs. At:

http://ec.europa.eu/food/food/biosafety/hygienelegislation/guidance_doc_852-2004_en.pdf

Corrigendum to Regulation (EC) No 882/2004 of the European Parliament and of the Council of 29 April 2004 on official controls performed to ensure the verification of compliance with feed and food law, animal health and animal welfare rules (O.J. L 191, 30.4.2004)

3.1.7 Food Contact Materials – FCMs

All packaging of food products must comply with the EU requirements on food contact materials in order to be allowed to be sold in the EU.

Regulation (EC) 1935/2004 is the framework legislation for all materials and articles intended to or already in contact with food, or for which it can be expected that they will come into contact with food under normal, foreseeable conditions.

The Regulation does not apply to covering or coating materials (e.g. the materials covering cheese rinds or fruits), which form part of the food and may be consumed with it.

For 17 types of food contact materials specific requirements may be adopted. These materials are listed hereafter:

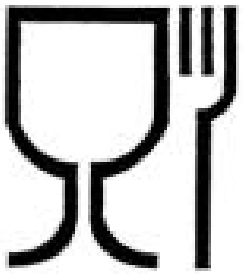
Active and intelligent materials, adhesives, ceramics, cork, rubbers, glass, ion-exchange resins, metals and alloys, paper and board, plastic materials (including recycled plastic materials), regenerated cellulose, printing inks, silicones, textiles, varnishes and coatings, waxes, and wood

Materials already regulated on EU level are written in bold. Materials for which no harmonised EU legislation has been laid down may be regulated in individual EU Member States. In such a case, it is recommended to contact the national competent authority of the relevant EU Member State.

Presentation and labeling

There are specific requirements for labeling of all materials that are not yet in contact with food when placed on the EU market, but intended as food contact applications.

Requirements	
For retail	This must be placed on: The materials and articles or on the packaging; The labels fixed to the materials and articles or to their packaging; or A notice in the immediate vicinity of the materials and articles and clearly visible to purchasers; The information must be in the language of the relevant EU Member State.
Other than retail	This must be placed on: The accompanying documents; The labels or packaging; or The materials and articles themselves

Active material	Must indicate *'active materials'*
Intelligent material	Must indicate *'intelligent materials'*
	Labelling must include: The words 'for food contact', or a specific indication of their intended use (such as a coffee machine, wine bottle, soup spoon), or the symbol reproduced in the box on the left; Special instructions for safe and appropriate use; The name/trade name, address or registered office of the manufacturer, processor or seller established within the EU responsible for placing the product on the market; Adequate labeling or identification of the material or article; · In the case of active materials and articles, information on the permitted use and other relevant information (e.g. name and quantity of the substances released by the active component); · Clear information.

Regulation (EC) 450/2009 covers **active materials and articles** which intend to extend the shelf-life or to maintain or improve the condition of packaged food which are designed to incorporate components that would release or absorb substances into or from the packaged food or the environment and **intelligent materials and articles** that monitor the condition of packaged food or the environment surrounding the food.

Examples of active and intelligent materials are:

- antimicrobial materials
- bio-active materials
- selective and adjusting barriers
- indicating and sensing materials
- flavor maintenance and enhancing materials

These materials must be labeled accordingly:

Requirements	
Authorisation	• Only substances that are included in a EU list of authorised substances may be used in active and intelligent components.[1]
 Symbol "active and intelligent materials"	• Active and intelligent materials and articles or parts thereof must be labelled (whenever they give the impression that they are edible): o the words "DO NOT EAT" (font size of at least 3 mm), and o with the symbol on the right (where technically possible).
Declaration of compliance	• The EU importer must issue a declaration in which is confirmed the compliance of the specific requirements of the Regulation on active and intelligent materials and the Framework Regulation. This declaration must accompany active and intelligent materials and articles at each stage of the manufacturing process.[2]

The EU list published in December 2009

Annex II of the Regulation prescribes the information the declaration should contain.

Directive 2007/42/EC applies to regenerated cellulose film which constitutes a finished product in itself or forms part of a finished product containing other materials. The cellulose can be uncoated or coated with coating derived from cellulose or consisting of plastics. The Directive does not apply to synthetic casings of regenerated cellulose.

Directive 2002/72/EC regulates plastic food contact materials and articles and parts thereof:

consisting exclusively of plastics and/or

composing two or more layers of materials, each consisting exclusively of plastics.

Furthermore, specific Directives on substances or groups of substances (BADGE.HCL, Nitrosamine, Vinyl chloride monomer, etc.) set limits for the use of these substances in food contact materials.

3.1.8 Marketing Standards

Regulation (EC) 1234/2007 in conjunction with Regulation (EC) 1580/2007 provide the marketing standards for all Fresh Fruits and Vegetables (FFV) unprocessed.

Marketing standards are requirements that intend to guarantee EU consumers a particular minimum quality of the products they buy. Furthermore, they intend to enable comparison among products.

As such, the EU marketing standards are mainly related to quality and labelling of products at the retail stage.

Regulation (EC) 1580/2007 provides for general and specific marketing standards for all FFV.

FFV not covered by a specific marketing standard ('SMS') have to comply with the general market standards ('GMS') laid down in part A of Annex I to the Regulation.

As regards the SMS, there are specific marketing standards for the following FFV:

FFV that are not covered by a SMS must comply with the requirements of the GMS. Some products are exempted from compliance with the GMS. These are:

- Areca and cola nuts
- Bananas
- Basil, Melissa, mint, origanum vulgare (oregano/wild marjoram), rosemary, sage, fresh or chilled
- Bitter almonds
- Capers
- Dried plantains
- Fruit of the genus Capsicum or Pimenta (for the industrial manufacture of capsicum or capsicum oleoresin dyes, essential oils or resinoids and chili peppers)
- Mushrooms other than cultivated mushrooms
- Olives
- Potatoes
- Pine nuts
- Saffron
- Shelled almonds
- Shelled hazelnuts
- Shelled walnuts
- Sweet corn
- Thyme, fresh or chilled

Furthermore, FFV do not have to comply with the GMS if they:

Are intended for industrial processing, animal feed or other non-food use;

Have undergone a trimming or cutting making them 'ready to eat' or 'kitchen ready' (e.g. fresh cut salads, washed cut-up fruit and vegetables and cooked vegetable courses).

3.1.9 Import controls

Commission Regulation (EC) No 669/2009 of 24 July 2009 implementing Regulation (EC) No 882/2004 of the European Parliament and of the Council as regards the increased level of official controls on imports of certain feed and food of non-animal origin and amending Decision 2006/504/EC (O.J. L 194, 25.7.2009)

Commission Regulation (EU) No 212/2010 of 12 March 2010 amending Regulation (EC) No 669/2009 implementing Regulation (EC) No 882/2004 of the European Parliament and of the Council as regards the increased level of official controls on imports of certain feed and food of non-animal origin (OJ L 65, 13.3.2010)

Commission Regulation (EU) No 878/2010 of 6 October 2010 amending Annex I to Regulation (EC) No 669/2009 as regards the increased level of official controls on imports of certain food and feed of non-animal origin (O.J. L 264 of 7.10.2010)

3.1.10 Rapid Alert System

The EU has created an information network called RASFF (Rapid Alert System for Food and Feed) to avoid that if a

commodity is intercepted at one entry point for a specific non conformity an unscrupulous trader takes chances in sending it to another entry point to try to get through.

Every intercepted consignment is entered into the RASFF System and the full information on the interception is broadcasted throughout the EU.

Interceptions can be consulted at the following website:

http://ec.europa.eu/food/food/rapidalert/archive_en.htm

4. GOOD PRACTICES, GMP AND HACCP IN SPICE PRODUCTION

4.1 Introduction to quality systems

The Global Food Safety Initiative (GFSI), coordinated by CIES - The Food Business Forum, was launched in May 2000. Under the umbrella of the Global Food Safety Initiative (GFSI), 7 European major retailers have come to a common acceptance of four GFSI benchmarked food safety schemes.

The benchmarking work undertaken by the standard owners and other key stakeholders on five food safety schemes:

- BRC
- IFS
- SQF
- FSSC 22000
- Dutch HACCP

Each scheme has now aligned itself with common criteria defined by food safety experts from the food business, with the objective of making food manufacture as safe as possible. As a result, this will also drive cost efficiency in the supply chain and reduce the duplication of audits.

FSSC 22000, Food Safety System Certification standard, is the latest certification scheme for food manufacturers.

The scheme is based on the integration of ISO 22000:2005 Food Safety Management Systems standard and Publicly Available Specification (PAS) 220. Supported by the Confederation of the Food and Drink Industries of the European Union (CIAA), FS 22000 has been fully approved by the Global Food Safety Initiative (GFSI).

ISO 22000 takes a whole chain approach to food safety, providing a standard that isn't just for food processors, but goes all the way from the farm to the fork including packaging and ingredient suppliers, caterers, storage & distribution facilities, chemical and machinery manufacturers and can be applied to primary producers such as farms.

The ISO22000 scheme is an EN45012 accredited scheme designed to ensure safe food supply chains worldwide.

Good manufacturing practices (GMPs) is the aspect of quality assurance that ensures that products are consistently produced and controlled to the quality standards appropriate to their intended use and as required by the product specification.

GMP defines quality measures for both production and quality control and defines general measures to ensure that processes necessary for production and testing are clearly defined, validated, reviewed, and documented, and that the personnel, premises and materials are suitable for their production. GMP also has legal components, covering responsibilities for

distribution, contract manufacturing, and responses to product defects and complaints.

HACCP (Hazard Analysis and Critical Control Points), compulsory in the food industry, can be part of a GMP scheme; it is a risk management system that identifies, evaluates, and controls hazards related to food safety throughout the food supply chain. While all seven HACCP principles are included in the ISO 22000 standard, it may still be implemented as a separate risk management system. Therefore HACCP is not necessarily a stand-alone program but can be part of a larger quality systems.

HACCP It is an analytical tool which involves the systematic assessment of the steps involved in a food manufacturing operation and the identification of those steps that are critical to the safety of the product.

The analysis allows management to concentrate resources into those manufacturing steps that critically affect product safety.

A Hazard analysis will produce a list of Critical Control Points (CCPs), together with control parameters (with critical limits), monitoring procedures and corrective actions for each CCP. For continuing safety and effectiveness of the plan, records must be kept of each analysis and the efficacy of the study must be verified on a regular basis, and when aspects of the operation change.

HACCP can be applied to a wide range of simple and complex operations. It is used to ensure food safety at all stages of the food chain. For manufacturers to implement

HACCP, they must investigate not only their own product and production methods but also apply HACCP to their raw material supplies, final product storage, and consider distribution and retail operations up to and including the point of consumption.

The HACCP system may be applied equally to new or existing products. It should be used when introducing new products or new production methods or when making modifications to parts of a process.

Documentation is very important for all quality programs.

A well written program clearly lists what procedures should be performed, at what frequency, who has responsibility, and what actions should be taken if the procedures are not performed according to the written protocol or if there are any problems occurring with the program

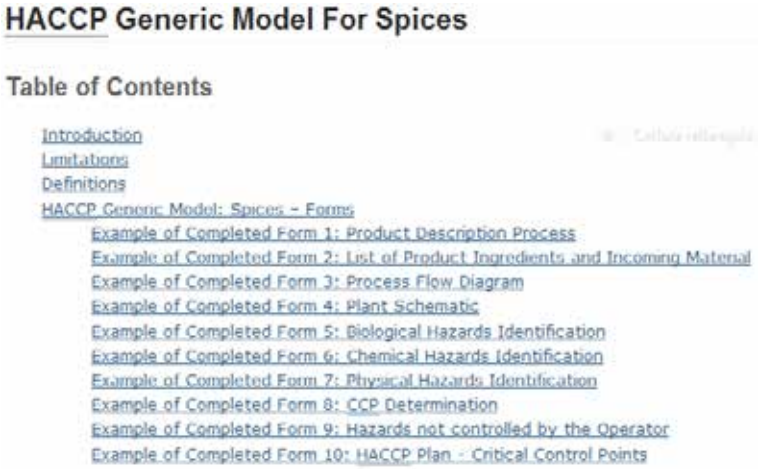
Several spices international organizations have issued GMP and HACCP plans which are specific for spices. The following guidelines have been adapted from the "HACCP Guide for Spices & Seasonings" published by ASTA.

4.2 Introduction to GMP and HACCP

4.2.1 Canadian Food Inspection Agency HACCP generic model for spices

The Canadian Food Inspection Agency has placed on line a generic HACCP model template that can be adapted to most spice-producing operations. The

process flow diagram in this generic model which reflects the entire line, from the receipt of the spices through to the shipping/distribution of the spices for further processing or to institutions or retail outlets, and includes the treatment of spices with ethylene oxide. A snapshot of the webpage is shown hereafter:


HACCP Generic Model For Spices

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Example of Completed Form 10: HACCP Plan - Critical Control Points

and the web page can be accessed at:

http://www.inspection.gc.ca/food/safe-food-production-systems/haccp-generic-models-and-guidance-documents/generic-model-spices/eng/1364478208697/1364478402035?chap=0

4.2.2 ASTA HACCP Guidelines

Before implementing a GMP or HACCP plan prerequisite programs are needed.

Prerequisite programs are essential to the overall management of food safety issues and provide the basic environmental and operating conditions for a manufacturing facility.

Following is a list of prerequisite programs that typically apply to manufacturing facilities. The programs will vary by application to different products and processes.

Premises/Facilities

- Building structures and utility systems
- Pest prevention / proofing
- Outside property
- Waste management
- Water quality (Treatment and Testing)
- Air quality (Testing)

The entire building structure and surrounding areas and equipment need to be considered. The goal is to minimize potential contaminants from coming into contact with the food and cross- contamination risks of different food products. For example, the building can pose a safety risk with porous surfaces, poor sanitation and maintenance. Surfaces should be non-porous and easy to clean. Buildings must have tight-fitting windows, screens, and doors.

Any openings in the walls, floor, or ceiling where insects, rodents, and birds can enter or hide must be cleaned. Good pest control systems must be in place, both inside and outside of the building.

It is important that the areas surrounding the outside of the building be kept clean and free from debris, refuse, and other unrelated material.

Store items away from the walls. Having a clean plant or warehouse that is surround by debris will cause problems.

Ensure that waste is removed from the facility without the risk of it contaminating on route and make sure its storage does not give harborage to pests.

Receiving/Storage/Distribution

- Raw materials
- Receiving/storage/distribution areas
- Letters of guarantee
- Container/truck inspection
- Hold and release
- Label review for instructions, (e.g. "Keep Refrigerated")
- Pallet controls

All raw materials should be purchased from an approved supplier and to up-to-date specifications. All raw materials should be kept separate from finished products. Upon receipt, all raw materials, packaging, and containers/trucks should be inspected prior to acceptance.

Various guarantees may be required from suppliers.

Proper environmental conditions such as temperature and humidity must be controlled, monitored, and documented to assure raw material safety and wholesomeness.

Raw materials can act as cross-contaminants to other ingredients. This is particularly important for those

products that are considered allergens. Products must be carefully segregated. Therefore, storage areas must be properly planned to minimize damage and cross-contaminations issues. It is important that pallets do not become a source of contamination, thus design, condition and use should be specified.

General Quality Systems/GMPs

- Chemical Control Program
- Approved suppliers
- Rework practices
- Macro analytical testing
- Microbiological testing
- Environmental monitoring for pathogens
- Formula monitoring
- Product sequencing
- Glass and Brittle Plastic policy

Written specifications should be in place for all chemicals, ingredients, and packaging. An approved supplier program is helpful in controlling raw materials while assuring that the suppliers are complying with applicable laws, using GMPs and have food safety programs in place.

A control program for use and storage of cleaning and sanitation chemicals, fumigants, and other items used in or around the facility is necessary. Chemicals must be properly labeled and stored in areas separate from

food storage areas. The chemical storage area should be accessible to appropriately trained personnel only.

Documented systems and procedures must be in place for macroanalytical and microbiological testing. Laboratories for testing, whether internal or external, should be audited on a regular basis.

Training

The need for HACCP training is paramount. The success of the HACCP program is dependent on nearly everyone in the company. The personnel involved in HACCP must understand their role within the HACCP program. Thus, those involved must understand what HACCP is, they must have the skills necessary to make the HACCP system operate properly and also understand what is expected of them.

Recall/Traceability

- Hold and release
- Recall procedures
- Traceability/coding

Every company must be able to trace all raw materials and finished goods. Proper lot coding of all materials and appropriate records are necessary. Good records may limit the amount of material to be recalled.

It is recommended that trial recalls (or mock recalls) are performed on a regular basis. Typically target success parameters are determined including successful recall percentage and recall time elapsed.

Equipment Performance and Maintenance

- Proper design
- Preventative maintenance
- Contractor control
- Equipment calibration
- Temporary repair procedures

Equipment should be designed to minimize the cross-contamination of food, the accumulation of food residues during the production and for ease of cleaning. If equipment is difficult to clean, or poorly cleaned, microbiological growth can occur that will contaminate the product.

Consideration should be given to air intakes into production lines to ensure that the risk of potential contamination via the air flow is managed.

There must be pre-scheduled servicing of all equipment, including replacement of warn parts. Schedules should also be established for equipment calibration.

Pest Control

- The goal of the pest control program is to primarily prevent the entry of pests into the food plant, as well as, eliminate pests that do enter the facility. Pests include (but are not limited to): rodents, insects and birds.

- The pest control activity can be carried out through a combination of pest control contractor and in-house involvement, which meets all regulatory requirements.

• The pest control practices that assist a company in maintaining a pest free environment include (but are not limited to):

• Regular inspections by a certified/licensed pest control company or employee.

• A process that eliminates pests and/or circumstances which permitted a pest presence, if pests are found.

• Follow-up to verify effective elimination of pests and circumstances that permitted a pests presence.

• Utilization of approved chemicals and baits, according to written procedures.

• Thorough documentation of pest control activity.

• Analysis of trends to monitor and optimize performance of the Pest Control Program.

• On-going training program for company personnel to keep them up to date with regulatory and technical developments in pest control.

Sanitation Program

• The goal of a sanitation program is to maintain a sanitary environment, necessary for the production of food of the highest quality and safety.

• The sanitation program encompasses all working areas and equipment utilized in the manufacture or warehousing of food products.

• A company will maintain documented sanitation procedures.

• Written sanitation procedures and forms for each cleaning task typically include (but are not limited to) the frequencies, sequence of steps involved, tools and utensils used, approved materials and documentation requirements.

• Sanitation procedures will be used as tools for training new personnel, as well as, for refresher training of existing employees.

Allergen Control

• The ultimate goal of the Allergen Control Program is to protect consumers with food related allergies.

• This is accomplished through, but not limited to: ingredient review, labeling, rework, segregation, scheduling, sanitation and training.

• Procedure(s) outlining allergen ingredient review, labeling, rework, segregation, scheduling, sanitation and training will be documented.

Process Control

To ensure that the manufacturing environment does not add to the risk of introducing a hazard into the product there can be programs to ensure this contamination controlled or eliminated. Process control procedures can include but are not limited to:

• Bag opening controls – to ensure that raw material packaging does not introduce a potential hazard.

• Knife control programs – to ensure correct sanitation and identification of potential breakage.

- Control of bag stitching needles – to ensure that a broken needle does not get into the product
- Control of magnets – to ensure they are cleaned and maintained correctly
- Control of utensil, such as brushes and scoops, to ensure they remain in good condition and are not a risk for cross contamination (particularly allergens)
- Sampling procedures – to prevent contamination and to ensure that sampled product is correctly sealed
- Control of screens / sieves – to ensure that they do not break and become potential contaminants and to ensure that they remain undamaged.

Personnel

Procedures should be in place to ensure that all personnel entering the manufacturing environment do not pose a risk to food safety. Some of the personnel programs may include:

- Hand washing / sanitation controls
- Protective clothing regimes
- Company hygiene code
- Return to work procedure
- Visitor controls

As an example the company hygiene code may include such items as eating and drinking procedures, smoking controls, illness reporting, removal of jewellery, etc.

HACCP consists of the following basic seven principles:

PRINCIPLE 1: Conduct a hazard analysis

Step 1: Identify the hazards to human health that may be introduced into the food product, microbiological, chemical, and physical.

Step 2: Identify preventative measures that could be used to control the food safety hazard.

PRINCIPLE 2: Identify Critical Control Points

A Critical Control Point (CCP) is a step in a food process at which control can be applied and, as a result, a food safety hazard can be prevented, eliminated, or reduced to acceptable levels.

PRINCIPLE 3: Establish Critical Limits for Each CCP

Critical limits are the boundaries of safety for preventive measures put in place at CCPs. A critical limit will usually be a reading or observation such as temperature, time, pH, etc. A critical limit can be an upper limit where a set amount or level cannot be exceeded. A critical limit can also be a lower limit where a minimum amount is required to produce the safe effect.

PRINCIPLE 4: Establish Monitoring Procedures

Monitoring procedures are routine tasks, either by employee or by mechanical means, that measure the process at a given CCP and create a record for future use. Continuous monitoring is preferred when it is possible. It is important that the person responsible for the CCP monitoring is give specific, documented, CCP training.

PRINCIPLE 5: Establish Corrective Actions

Establish corrective actions to be taken when monitoring shows that there is a deviation from a critical limit. Listed below are some questions that might help when developing corrective actions:

- How will people be informed when the deviation occurs?
- Who will be responsible for controlling the product that may have been affected by the deviation?
- How will we decide what caused the deviation?
- Who will be involved in deciding how to get the process back in control?
- Who in the company needs to sign off on any modifications to plan?
- Who will be responsible for keeping the records of things done in response to a deviation from a critical limit?

PRINCIPLE 6: Establish Recordkeeping Procedures

Record keeping is an essential feature of a HACCP plan. Use simple understandable forms. Make sure employees know exactly what is expected if they are responsible for making a record entry. Make sure the records are signed and dated at the time a specific event occurs.

PRINCIPLE 7: Establish Verification Procedures

Verification procedures are needed to make sure the plan is working correctly. There are three types of verification:

- Validation, the initial phase in which the plan is tested and reviewed.

- Ongoing verification, that ensures that the HACCP plan is working effectively on a day-to-day basis. Typically verification includes management review and sign off.

- Reassessment, an overall review of the plan that must be performed at least annually, or whenever any changes occur that could affect the hazard analysis or alter the HACCP plan.

4.3 Implementing the HACCP plan

PRELIMINARY STEPS

1. Assemble the HACCP Team

Selection of correct team members is essential. Various areas of expertise are required and one member of the team should have HACCP training. The HACCP-trained member does not need to be a member of your company. Other members of the team should at least be trained in the principles of HACCP. Other areas of expertise required are:

- In-depth product knowledge
- Knowledge of processing and equipment
- Knowledge of different types of hazards

An example of a HACCP team:

- HACCP trained employee or outside consultant

- Product development employee or outside consultant

- A QA/QC employee who understands the microbiological hazards, the Quality
- Management System (if applicable) and the details of any pre-requisite programs.
- A maintenance technician and/or engineer who knows the equipment and how it
- functions.
- A sanitation employee who cleans equipment
- A production worker who operates the equipment / process being evaluated
- A receiving employee who inspects incoming materials
- A management/supervisory employee
- A member from a department who has exposure to customer complaints
- A member from the purchasing department

2. Describe the food and its method of production and distribution

- What is the product name?
- How is the product to be used?
- What type of packaging is used?
- What is the product shelf-life?
- Who is the intended consumer? (Will it go to susceptible groups?)

- Are there regulatory requirements?
- What are the labeling instructions?
- Is special distribution control needed?

3. Develop and verify process flow diagram(s)

- What specific process or production line will be studied?
- At what points does the process begin and end?
- What are the all the steps in the process that could have a hazard risk?
- What are the technically unique characteristics of the process or line?
- Which types of hazards are included?
- A plan / layout of the facility will aid in looking for potential cross contamination routes

HACCP Plan Documentation

These documents will not always be available at the beginning of the HACCP study, but you should ensure that they are all documented by the end of the process.

HACCP plan documentation should include:

- Product description
- Process flow diagram
- Hazard analysis
- Critical Control Point (CCP) Documentation

Product description should include:

- Process/product name, type, and general description
- Food safety characteristics
- How the product is used by the customer
- Packaging
- Label instructions
- Special distribution and storage control
- Shelf-life

Process flow diagram should include:

- All processing equipment and steps that affect product characteristics
- Each process step can be assigned a unique number to allow easy reference
- All CCPs clearly labeled and numbered

Hazard Analysis should include:

- Documentation to support the designations of CCPs

CCP Documentation should include:

- CCP number and description of the step in the process
- Hazard that is being controlled
- Control mechanism
- Critical limits for control of the hazard
- Monitoring (method, frequency)
- Corrective action plan(s)

- Record and its location
- Minimum CCP verification activity

Hazard types

There are three primary types of hazards to consider when conducting a hazard analysis. They include the following:

- Chemical Hazards
- Physical Hazards
- Biological Hazards

When undertaking a risk assessment for all of the above potential contaminants, whether physical, chemical, or microbiological, consideration should be given to the potential vectors that can transfer a hazard for one location to another.

Chemical Hazards

A wide variety of chemicals are used in food production and processing. Some chemicals, such as pesticides used in growing spices, cannot be removed by a subsequent process thus their control needs to be prior to the intake of the facility. This would normally be through controls in GAP or through product testing / rejection upon arrival. However, there are chemicals in processing facilities and manufacturing plants that should be rigorously controlled. These include such items as sanitizers, lubricants, pest control chemicals used within a processing facility and water treatment additives, plus chemicals added to the

manufacturing process for a specific process. While most of these chemicals do not pose a health hazard when used properly, some are capable of causing serious health problems if used incorrectly.

Some chemical hazards occur in foods due to poor growing or handling conditions or natural conditions that cannot be controlled. Some toxins originating from microorganisms, molds or bacteria, are often considered 'naturally occurring'. Types of chemical hazards found with spices and seasonings, in addition to those used in the processing facilities include:

- Naturally occurring
- Mycotoxins such as aflatoxin
- Added Chemicals
- Agricultural products, pesticides, fertilizers, antibiotics, other field chemicals
- Toxic elements, lead, mercury, and other heavy metals
- Food additives, such as preservatives, flavor enhancers, color additives

As with pesticides and heavy metals, Mycotoxins will not be affected by the process so their control should take place prior to entering the facility.

Allergens are a major concern today for all food manufacturers. Since very small amounts of an allergen are capable of causing reaction in sensitive individuals, the

control of potential allergic ingredients and the possibility of cross-contamination is essential in all manufacturing facilities. It is critical that all routes of cross-contamination must be considered including airborne contaminants, reworked products, storage of potential contaminants, etc.

Numerous prerequisite programs are needed to control chemical hazards. Included are suppliers/vendor specifications and certifications, and control programs for facility operations, storage, sanitation and maintenance with a well-designed and integrated pest management program.

Physical hazards

For the spice and seasoning industries, a major objective is to remove physical hazards. This is true for any industry that deals with field or comparable materials. Physical hazards usually result in personal injuries, such as a cut from glass or a case of choking from foreign materials.

ASTA has prepared "Cleanliness Specifications", ESA has similar specifications as well and both are in annex 2.

These lists provide information on extraneous/foreign matter that are considered to be a physical hazard.

The list includes, but is not limited to; stones, dirt, wire, string, stems, sticks, nontoxic foreign seeds, excreta, manure and other animal contamination. For HACCP plans, the hazards should be classified as a health risk, legal requirement, aesthetic or ethical problem.

Physical hazard points of entry into the products are in the field, in-transit, deliberate by employees or others, equipment failure, and poorly maintained facilities and equipment. Controlling foreign objects in raw materials can be started by specifications, letters of guarantee and vendor inspection and certifications.

A list of equipment capable of removing the physical impurities that can contaminate raw spices is shown hereafter (source: ASTA).

The chart, which matches the spices and typical contaminants to the machines best suited for separation, follows on the next page.

The major attributes used for separating impurities include: size and dimension of products, specific gravity, different behavior in air currents (aspiration), and magnetic properties. The following machines are generally used for spices:

1. Aspirator (Air separator)
2. Rotary knife cutter
3. Destoner
4. Vacuum gravity separator (Air table)
5. Clinder separator (Indent)
6. Sifter Aspirator
7. Plain sifter
8. Spiral gravity separator
9. Air screen separator

Contaminants in facilities can be controlled with strict compliance to GMPs and having prerequisite programs that include insect and pest control, properly protected light fixtures, sanitation, etc. Adherence to regulatory guidelines regarding proper clothing for employees and the absence of jewelry will prevent many problems. Employee education is necessary to help control these foreign materials.

Recommended Cleaning Equipment

This Chart matches the spices and typical contaminants to the machines best suited for separation. (Machines listed on previous page)

Name of Spice, Seed or Herbs	Whole Insects Dead	Excreta Rodent	Excreta/ Other	Insect Defiled	Extraneous Matter
Allspice	8	8	8	2+9	8
Anise	4	4	4		4
Annatto	4	4	4		4
Sweet Basil	5+3	5+3	5+3		4+3
Caraway	4	4	4		4+3
Cardamom	9	9	9	2+9	9+3
Cassia/Cinnamon	9	9	9	2+9	9+3
Celery Seed	4	4+3	4+3		4+3
Chilies	9	9	9	2+9	9+3
Cloves	9	9	9	2+9	9+3
Coriander	8	8	8	2+9	8
Cumin Seed	4	4	4		4+3
Dill Seed	4	4	4		4+3
Fennel Seed	4	4a	4		4+3
Fenugreek	4	4	4		2+3
Ginger (Whole & Split)	9	9	9	2+9	2+9+3

Name of Spice, Seed or Herbs	Whole Insects Dead	Excreta Rodent	Excreta/ Other	Insect Defiled	Extraneous Matter
Laurel (Bay) Leaves	7	7	7	2+7	2+7+3
Mace	9	9	9	2+9	9+3
Marjoram	5+3	5+3	5+3		5+3
Nutmeg (Broken)	9	9	9		9
Nutmeg (Whole)	7	7	7	2+9	9
Oregano	5+3	5+3	5+3		5+3
Parsley	9	9	9		9+3
Pepper, Black	8	8	8		8
Pepper, White	8	8	8		8
Poppy Seed	4	4	4		4+3
Rosemary Leaves	7	7	9		9+3
Sage	9	9	9		9+3
Savory	7	7	9		9+3
Sesame Seed (Natural & Hulled)	6	6	6	6	6+3
Tarragon	7	7	9		9+3
Thyme	4	4	4		4+3
Turmeric	7	7	9	2+9	2+9+3

a. If Rodent excreta has same size and SP.Gr. as Fennel Seed, Use 2+9

Microbiological hazards

For an illness to occur, the pathogen must be present in the food and must grow to high enough numbers to cause an infection or to produce toxin. The food must be capable of supporting growth of the pathogen and must remain in the growth temperature range long enough for the organism to multiply. Some organisms, such as *E. coli* 0157:H7, have a very low infectious dose.

Due to the environment in which they are grown, spices and herbs often harbor large numbers of bacteria and fungi, including potential spoilage organisms and occasionally organisms of public health significance. In general, roots, berries, and herbs carry a greater microbial load than bark and seed products. Although a number of microorganisms are killed during the drying of spices and herbs, many bacteria and molds survive. If the products are not stored and shipped properly, problems may occur. In addition, when spices are incorporated into various food products, such as processed meats or dairy ingredients, the foods are capable of supporting growth of the microorganisms.

The bacterial and fungal species in spices include aerobic spoilage organisms, spore forming bacteria, high heat stable toxin producing bacteria, proteolytic and gas-producing bacteria, and mycotoxin-producing microorganisms. Of all the spices, black pepper typically has the highest aerobic plate counts, usually in excess of 10^6 cfu/ g. Paprika, celery seed, coriander, turmeric, thyme, basil and other spices can also have plate counts in the millions per gram. Common microorganisms found in spices are listed below:

Bacteria

- *Salmonella*
- *C. perfringens*
- *Bacillus cereus*
- *E. coli*
- *Staphylococcus aureus*

Fungi, Yeast and Molds

- *Aspergillus*
- *Penicillium* ssp.

Mycotoxins

- Aflatoxin
- Ochratoxin
- Vomitoxin.

Sources of microbial contamination are:

- Growing, drying, and harvesting
- Poor import/export procedures
- Processing
- Improper storage and distribution temperatures and handling
- Poor personal hygiene among food handlers and production workers.

Indicator Organisms

Indicator organisms do not usually represent a direct health hazard. In come cases, however, they serve to indicate that the potential is present for a health hazard to exist. Common indicator organisms include:

- Standard Plate Count
- Coliforms
- Fecal Coliforms
- *E. coli*

Control of Microorganisms in Spices and Herbs

Many methods for controlling microorganisms in spices/herbs during growing, planting, harvesting, storage, and export are outlined in the ASTA Clean Spices Manual. ASTA has presented the Clean Spices Program in a number of spice producing countries over the past few years in an effort to help these countries produce cleaner product.

Many controls for microbiological hazards will be implemented through HACCP prerequisite programs. The most common controls for the biological hazards include:

- Micro specifications for raw material and finished spices and seasonings
- Time/temperature applications, used mainly for seasonings
- Prevention of cross contamination
- Environmental monitoring programs
- Food handling practices
- Equipment sanitation
- Employee hygiene
- Storage/distribution
- Packaging

However, processes for Microbial Reduction (MRPs) are recommended for imported spice and herb products. Three general treatments are used:

- Ethylene oxide/propylene oxide fumigation

Fumigation is the oldest of the MRP treatments. It is widely used in the United States, but is banned in the EU and a number of other countries.

- Steam

Treatment with high temperature steam is a safe and efficient process for reducing microbial loads. It is particularly useful for whole spices and is good with some herb products. However, the control of water activity after treatment is essential to prevent spoilage and potential microbial growth.

- Irradiation

Irradiation is a simple, safe, and efficient way to reduce microorganisms in almost all spices. Irradiation allows the processing of spices in the final packaging, which eliminates the problem of recontamination during re-packaging.

Chemical hazards

Chemical hazards arise from machinery lubricants, cleaning and disinfectants used in the plant for sanitization, and any other chemicals that might be present in the production plant and do not belong in the food.

Post-Process Contamination

Often a product is treated and sanitized and leaves the production line in the best possible condition, only to be re-contaminated after processing.

Post process contamination can be reduced with GMPs and prerequisite programs for sanitation, pest control, storage, packaging, and distribution. This point in a hazard analysis consists of asking a series of questions that are appropriate to each step in the flow diagram. The hazard analysis should question the effect of a variety of factors on the safety of the food.

Ingredients

Does the food contain any sensitive ingredients that are likely to present microbiological hazards (e.g. *Salmonella, Staphylococcus aureus*), chemical hazards (e.g. aflatoxin, antibiotic or pesticide residues) or physical hazards (stone, glass, bone, metal)?

Intrinsic factors of food

- Physical characteristics and composition (e.g. pH, type of acids, fermentable carbohydrates, water activity, preservatives) of the food during and after preparation which can cause or prevent a hazard.

- Which intrinsic factors of the food must be controlled in order to ensure food safety? Does the food permit survival or multiplication of pathogens and/or toxin formation before or during preparation?

- Will the food permit survival or multiplication of pathogens and/or toxin formation during subsequent steps of preparation, storage, or consumer possession?

- Are there other similar products in the market place? What has been the safety record for these products?

Procedures used for preparation/processing

- Does the preparation procedure or process include a controllable step that destroys pathogens or their toxins? Consider both vegetative cells and spores.

- Is the product subject to recontamination between the preparation step (e.g. cooking) and packaging?

Microbial content of the food

- Is the food commercially sterile (i.e. low acid canned food)?

- Is it likely that the food will contain viable spore forming or nonperforming pathogens?

- What is the normal microbial content of the food stored under proper conditions?

- Does the microbial population change during the time the food is stored before consumption?

- Does the change in microbial population alter the safety of the food?

Facility design

- Does the layout of the facility provide an adequate separation of raw materials from ready-to-eat foods?

- Is positive air pressure maintained in product packaging areas? Is this essential for product safety?

- Is the traffic pattern for people and moving equipment a potential source of contamination?

Equipment design

- Will the equipment provide the time/temperature control that is necessary to meet critical limits?
- Is the equipment properly sized for the volume of food that will be prepared?
- Can the equipment be controlled so that the variation in performance will be within the tolerances required to produce a safe food?
- Is the equipment reliable or is it prone to frequent breakdowns?
- Is product contamination with hazardous substances (e.g. glass) likely to occur?
- What product safety devices such as time/temperature integrators are used to enhance consumer safety?

Packaging - for food contact

- Does the method of packaging affect the multiplication of microbial pathogens and/or the formation of toxins?
- Is the packaging material resistant to damage, thereby preventing the entrance of microbial contamination?
- Is the package clearly labeled "Keep Refrigerated" if this is required for safety?
- Does the package include instructions for the safe handling and preparation of the food by the consumer?

- Are tamper-evident packaging features used?

- Is each package legibly and accurately coded to indicate production lot? Does each package contain the proper label?

Sanitation

- Can the sanitation practices that are employed impact the safety of the food that is being prepared?

- Can the facility be cleaned and sanitized to permit the safe handling of foods?

- Is it possible to provide sanitary conditions consistently and adequately to ensure safe foods?

Employee health, hygiene, and education

- Can employee health or personal hygiene practices impact the safety of the food being prepared?

- Do the employees understand the food preparation process and the factors they must control to ensure safe foods?

- Will the employees inform management of a problem that could impact food safety?

Conditions of storage between packaging and the consumer

- What is the likelihood that the food will be improperly stored at the wrong temperature? Would storage at improper temperatures lead to a microbiologically unsafe food?

- Intended use
- Will the food be heated by the consumer? Will there likely be leftovers?

Intended consumer

- Is the food intended for the general public (i.e. a population that does not have an increased risk of becoming ill)?
- Is the food intended for consumption by a population with increased susceptibility to illness (e.g. infants, the elderly, the infirm, and immune compromised individuals)?

4.4 ASTA Practical HACCP for processed Spices

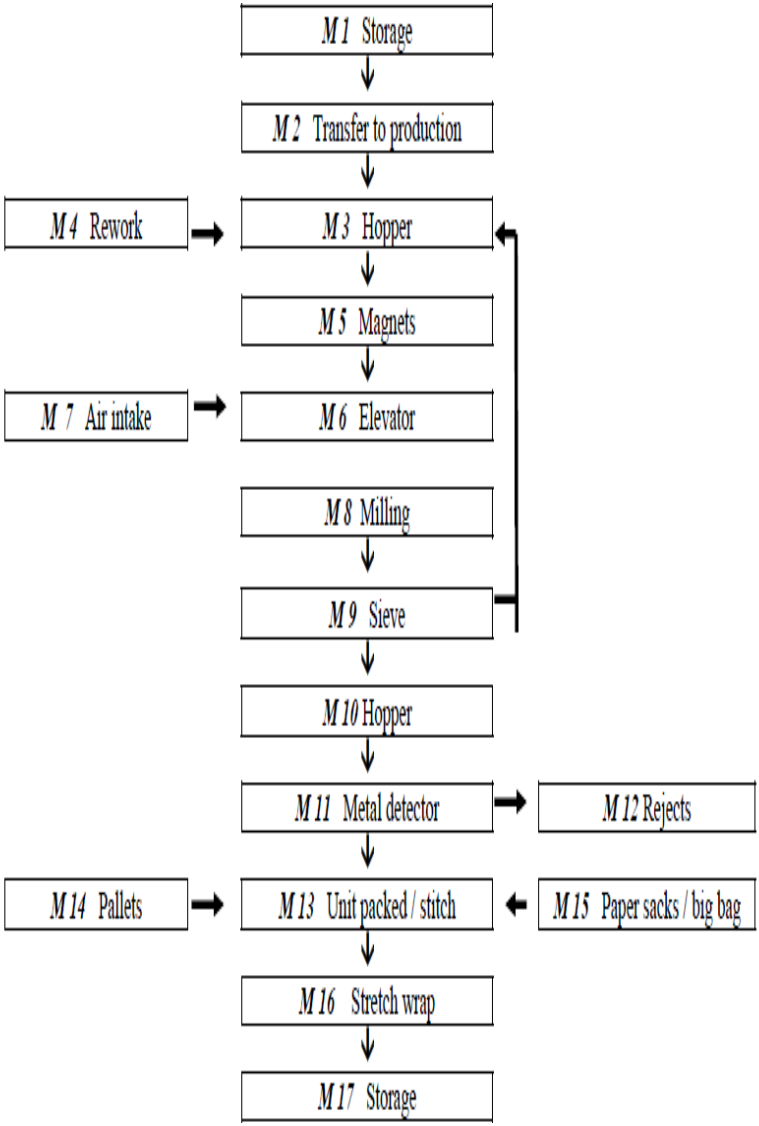
ASTA Provides these Practical Guidelines for processing of Black Pepper and Seasoning for Snacks

4.4.1 Production of 30 mesh black pepper

Name:	Black Pepper
Origin:	India/Indonesia
Packaging:	Bags or Boxes
Shelf-life / Temperature:	1 year / ambient temperature
Food Safety:	Microbial control; foreign material control

Within a HACCP process flow diagram, a process step could be assigned to any action where the product is stored, moved or processed in any way, which may add a risk to the product. All input and outputs from the process should be included to ensure that their risk is considered.

The following flow diagram is intended to be an example of how a HACCP process step diagram for a milling operation may look.



Ingredient: Black Pepper

Ingredient	Potential Hazard	Examples	Type 1	Is this likely to occur? (Y/N)	Does hazard need to be in HACCP plan (Y/N)	Why?	Can this be controlled by prerequisite program? (Y/N)	What measures can be applied to prevent, eliminate, or reduce hazards
Black Pepper	Metal		P	Y	Y	Material inherent with the growing and collection process. Significant risk of choking for particles between 7-25mm	N	Metal Detection
	Foreign Material	Wood, Glass and other non-metallic material	P	Y	N	Material inherent with the growing and collection process. Also, potential rogue contamination from incoming pallets; dirty containers	Y	Cleaning and sifting
	Micro	Salmonella	M	Y	N	Significant risk of illness	Y	Microbial Reduction Process
	Allergens	Top 8 Soy, Wheat, Milk, Eggs, Nuts, Tree nuts, Fish, Shellfish	C	N	N	No evidence of allergenic properties	Y	Program to preclude shipment with allergens

1 Type – P=Physical; M=Microbiological; C=Chemical

Process Steps

Process Step	Potential Hazard	Type[2]	Does hazard need to be in HACCP plan (Y/N)	Why?	Can this be controlled by prerequisite program? (Y/N)	What measures can be applied to prevent, eliminate, or reduce hazards. Define Prerequisite Program that is applicable	Is this a critical control point (CCP)? (Y/N)
Receiving	Physical		N	Although incoming spice items may arrive at the facility with physical contaminants there are cleaning steps further down the process to eliminate or reduce these down to an acceptable level	Y		N
	Biological – Salmonella Spp.		N	Although incoming spice items may arrive at the facility with microbiological contaminants there are microbial reduction steps further down the process to eliminate or reduce the threat to an acceptable level	Y	GMP's SSOP's, Microbial Reduction Process	N
	Chemical – Mycotoxins		N	Mycotoxins have been associated with black pepper or many spices in which there is improper storage or handling.	Y	Vendor Selection and Evaluation. Supplier Certificates of Analysis	N

Process Step	Potential Hazard	Type[2]	Does hazard need to be in HACCP plan (Y/N)	Why?	Can this be controlled by prerequisite program? (Y/N)	What measures can be applied to prevent, eliminate, or reduce hazards. Define Prerequisite Program that is applicable	Is this a critical control point (CCP)? (Y/N)
Storage	Contamination by Pests	M	N	Good prerequisite programs offer control	Y	GMPs and Pest Control Program	N
	Sanitation Chemicals	C	N	Good prerequisite programs offer control	Y	Master Sanitation Programs	N
	Physical		N	The opportunity for additional physical contamination is limited	Y	GMP's, Pest Control and Warehouse Sanitation Programs	N
	Chemical		N	The opportunity for additional contamination is limited	Y	GMP's, Pest Control, Chemical Control Programs and Warehouse SSOP's	N

Process Step	Potential Hazard	Type[2]	Does hazard need to be in HACCP plan (Y/N)	Why?	Can this be controlled by prerequisite program? (Y/N)	What measures can be applied to prevent, eliminate, or reduce hazards. Define Prerequisite Program that is applicable	Is this a critical control point (CCP)? (Y/N)
	Microbiological		N	The opportunity for additional contamination is limited	Y	GMP's	N
Treatment	Physical		N			Preventative Maintenance	N

2 Type – P=Physical; M=Microbiological; C=Chemical

Process Steps

Process Step	Potential Hazard	Type2	Does hazard need to be in HACCP plan (Y/N)	Why?	Can this be controlled by prerequisite program? (Y/N)	What measures can be applied to prevent, eliminate, or reduce hazards. Define Prerequisite Program that is applicable	Is this a critical control point (CCP)? (Y/N)
						Program, GMP's, Self-Inspection Programs	
	Chemical		N			GMP's Allergen Control Program, Label Control Program	N
	Microbiological		N			GMP's SSOP's, Microbial Reduction Process	N
Cleaning, Milling and Sifting	Physical		N	This step is designed to reduce and or eliminate physical contaminates	Y	Preventative Maintenance Program, GMP's, Self-Inspection Programs, Quality Testing	N
	Chemical		N		Y	GMP's Allergen Control Program, Label Control Program, SSOP's	N
	Microbiological		N		Y	GMP's SSOP's, Microbial Reduction Process	N

Rework	Physical		N	Rework typically re-introduced at the Cleaning, Milling or sifting stage(s)	Y	Preventative Maintenance Program, GMP's, Self-Inspection Programs, Quality Testing	
	Chemical		N	Typically a "same into same" or "like into like" approach	Y	GMP's Allergen Control Program, Label Control Program, SSOP's	
	Microbiological		N		Y	GMP's SSOP's, Microbial Reduction Process	
Metal Detection CCP 1	Physical - Metal	P	Y	Choking and/or laceration hazard	N	Detection at preset levels typically 1.0-1.5mm for ferrous and 2.0-2.5mm for non-ferrous	Y
	Chemical		N		Y		N
	Microbiological		N		Y		N

Process Step	Potential Hazard	Type2	Does hazard need to be in HACCP plan (Y/N)	Why?	Can this be controlled by prerequisite program? (Y/N)	What measures can be applied to prevent, eliminate, or reduce hazards. Define Prerequisite Program that is applicable	Is this a critical control point (CCP)? (Y/N)
Filling	Physical		N	The opportunity for additional physical contamination is limited	Y	Preventative Maintenance Program, GMP's, Self-Inspection Programs	N
	Chemical		N		Y	GMP's Allergen Control Program, Label Control Program	N
	Microbiological		N		Y	GMP's SSOP's, Microbial Reduction Process	N

Process Steps

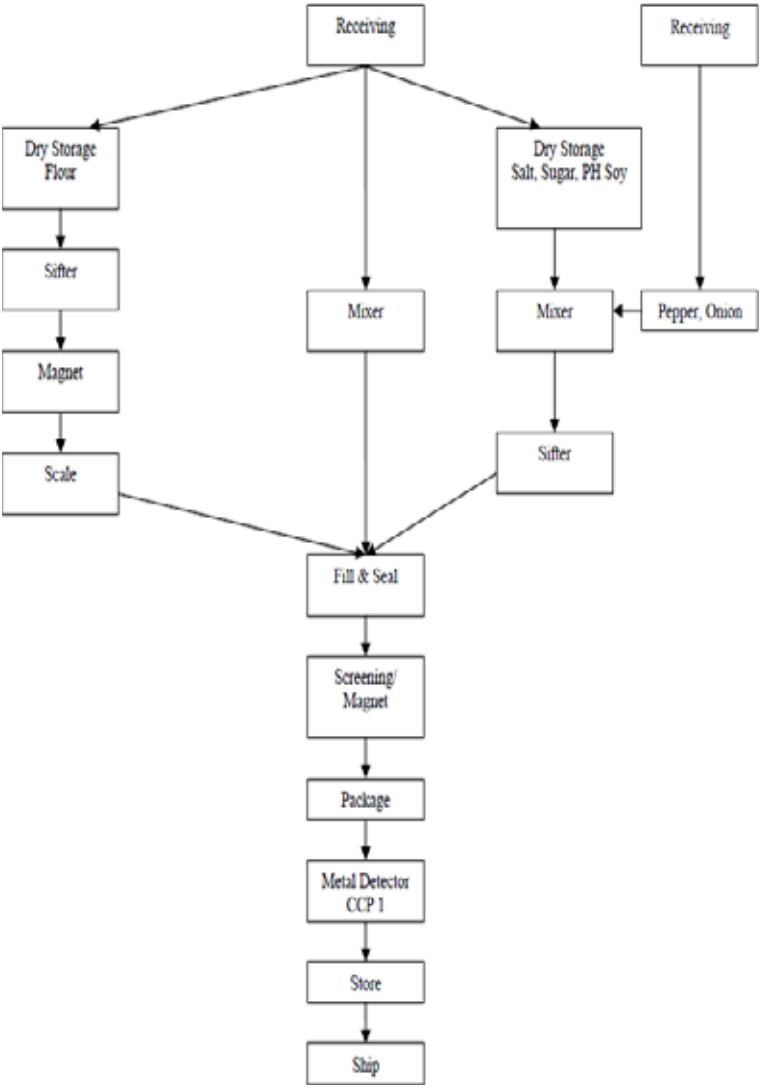
Process Step	Potential Hazard	Type2	Does hazard need to be in HACCP plan (Y/N)	Why?	Can this be controlled by prerequisite program? (Y/N)	What measures can be applied to prevent, eliminate, or reduce hazards. Define Prerequisite Program that is applicable	Is this a critical control point (CCP)? (Y/N)	
CCP	Process Step	Hazard	Adverse Effects	Control Measures	Critical Limits	Monitoring Procedures	Corrective Actions	Monitoring Records
CCP 1	Metal Detection	Metal	Choking or lacerations	Metal detector	Ferrous – 1.0mm Non-ferrous – 1.5mm Stainless – 2.0mm	On-line detector inspection	Hold and review including inspection of rejects	Metal detector log and inspection results

4.4.2 Production of Seasoning for Snacks

Product Description:	Seasoning for snacks
Food Safety Characteristics:	Spices (microbial control, foreign materials), dry ingredients (foreign material), dairy blends(refrigeration, microorganisms)
Target Customer:	Snack manufacturer Used as a topical seasoning
Packaging:	25 Kg multiwall bags or boxes
Food Safety:	Microbial control; foreign material control

Production of Seasoning for Snacks

Raw Materials: Flour, salt, sugar, nonfat milk, part hydrogenated soy oil, natural and artificial flavor, MSG, onion powder, black pepper, silicon dioxide.



Ingredient or process step	Potential hazard	Type3	Does the hazard need to be in HACCP plan (Y/N)	Why?	Can this be controlled by prerequisite program? (Y/N)	What measures can be applied to prevent, eliminate, or reduce hazards	Is this a critical control point? (CCP) (Y/N)
Receiving	Salmonella, aflatoxin, mislabeled product, pesticides and/or colorants	P, M, C	N	Salmonella, aflatoxin, mislabeled products can be health concerns	Y	COA's from suppliers, raw material specs, trailer inspections, sampling and raw material testing for pesticides, colorants, micro, label verification	N
Warehouse	Micro contamination, pest infestation	M, P	N	Can be controlled by appropriate programs	Y	GMPs for warehouse including insect and pest programs, sanitation schedules	N
Staging/Mixing	Cross contamination, contamination from employees, use of incorrect ingredients, allergens	P, C, M	N	Can be controlled by appropriate operational and material handling programs	Y	GMPs with stringent cleaning procedures for equipment, process controls, employee training, ingredient verification	N

3 Type – P=Physical; M=Microbiological; C=Chemical

Ingredient or process step	Potential hazard	Type4	Does the hazard need to be in HACCP plan (Y/N)	Why?	Can this be controlled by prerequisite program? (Y/N)	What measures can be applied to prevent, eliminate, or reduce hazards	Is this a critical control point? (CCP) (Y/N)
Mixing/Blending	Foreign Materials	P	N	Foreign material hazards addressed with screening, magnets and/or metal detection	Y	Discharge Screening, Magnets post blending	N
Packaging	Foreign material from damaged packaging, cross contamination. Incorrect labels relating to allergens	P, M, C	N	Can be controlled by appropriate programs	Y	GMP's, package inspection, label verification procedures, Allergen Control Plan	N

Ingredient or process step	Potential hazard	Type4	Does the hazard need to be in HACCP plan (Y/N)	Why?	Can this be controlled by prerequisite program? (Y/N)	What measures can be applied to prevent, eliminate, or reduce hazards	Is this a critical control point? (CCP) (Y/N)
Metal Detection CCP1	Foreign Materials non-ferrous metal	P	Y	Metal that may not be caught at discharge screening or on magnets	N	Metal Detector	Y
Rework	Foreign material, allergens	P,M,C	N	Rework is typically overseen by management an re-run through the above system(s) reducing or eliminating the threat of physical, microbiological or chemical hazards	Y	GMP's, package inspection, label verification procedures, Allergen Control Plan, Rework Control Procedure	N
Shipping	Hazards due to unsanitary trailers, damaged packaging	P, C, M	N	Can be controlled by appropriate programs	Y	GMPs, trailer and packaging inspection	N

4 Type – P=Physical; M=Microbiological; C=Chemical

Ingredient or process step	Potential hazard	Type[4]	Does the hazard need to be in HACCP plan (Y/N)	Why?	Can this be controlled by prerequisite program? (Y/N)	What measures can be applied to prevent, eliminate, or reduce hazards	Is this a critical control point? (CCP) (Y/N)	
CCP	Process Step	Hazard	Adverse Effects	Control Measures	Critical Limits	Monitoring Procedures	Corrective Actions	Monitoring Records
CCP-1	Metal Detection	Foreign materials, Metals	Choking or lacerations	Final sifting, Metal detector	Ferrous 1.0mm, Nonferrous 1.5mm Stainless 2.0mm	On-line inspection	Hold and review including inspection of rejects	Inspection results, Metal detector log

LIST OF TYPICAL RECORDS FOR A HACCP SYSTEM IN OPERATION

1. **Ingredients**

Records from all monitored CCPs.

Supplier certification documenting compliance with establishment's specifications.

Establishment's audit records verifying supplier compliance.

Storage temperature record for temperature-sensitive ingredients.

Storage time records for limited shelf-life ingredients.

2. **Preparation**

Records from all monitored CCPs.

Records verifying the continued adequacy of the food preparation procedures.

3. **Packaging**

Records indicating compliance with specifications for packaging materials.

Records indicating compliance with sealing specifications.

4. **Finished Product**

Sufficient data and records to establish the efficacy of barriers in maintaining product safety.

Sufficient data and records to establish the safe shelf-life of the product if age of product can affect safety.

Documentation of the adequacy of the HACCP procedures from an authority knowledgeable of the hazards involved and necessary controls.

5. **Storage and distribution**

Temperature records.

Records showing no product shipped after shelf-life date.

6. **Deviation and corrective action**

Records of all actions taken following deviations at a CCP.

Reassessment records and modifications to the HACCP plan indicating approved revisions and changes in ingredients, formulations, preparation, packaging, and distribution control, as needed.

7. **Employee training**

Records indicating that employees responsible for the HACCP plan have been trained and understand the hazards, controls, and procedures. Including records for refresher HACCP training.

HACCP VERIFICATIONS

Types:

- CCP Verification: Evaluates day to day compliance to the HACCP plan.
- Audit: Evaluates effectiveness of employee training and plan implementation.

• HACCP Plan Verification: Conducted by management or other specifically trained personnel. Ensures all hazards have been identified and every hazard is being controlled.

Verification Examples include but are not limited to:

- Calibration: accurate measurement of factors such as pH, temperature, flow rate, etc.

Necessary to ensure safe operations; records should include date, time, who performed, calibration method and data. Signature/date of review

- CCP Monitoring Records: Include the appropriate information and designed to facilitate review. Ensure monitoring activity is performed as required by the Plan and no monitoring activities are missed. Visually review documentation. White outs, missing information, will prompt corrective action. All results are within critical limits or any deviating is properly identified.

- CCP Corrective Action Records: Ensure the report was prepared correctly. The nature and extent of the deviation was recorded. Affected product was identified and isolated. Final disposition of the affected product must be documented. Must identify responsible individuals.

HACCP VALIDATIONS

Conduct an initial HACCP assessment

Conduct a plan validation for new or significantly changed plans, engineering changes,and impact assessments. In particular this should apply to each CCP where the company should take all reasonable steps to

ensure that the control being specified will reduce or eliminate the hazard to an acceptable level. This will often require the company to do challenge testing to assure this compliance.

Conduct plan validation on a schedule that is no longer than one year or per regulatory requirements.

Conducted by the HACCP Team or external authorities.

Evaluate if the Plan is (still) effective.

Review the current System in order to improve Plan.

Reassessment after any major critical failures.

Reassessment of the Plan based on HACCP records and information.

Must record all validation/reassessment activities.

May require retraining

Does the scientific data still support the Hazard Analysis?

Conduct an initial HACCP assessment

- Conduct a plan validation for new or significantly changed plans, engineering changes and impact assessments. In particular this should apply to each CCP where the company should take all reasonable steps to ensure that the control being specified will reduce or eliminate the hazard to an acceptable level. This will often require the company to do challenge testing to assure this compliance.

- Conduct plan validation on a schedule that is no longer than one year or per regulatory requirements

- Conducted by the HACCP Team or external authorities.
- Evaluate if the Plan is (still) effective.
- Review the current System in order to improve Plan.
- Reassessment after any major critical failures.
- Reassessment of the Plan based on HACCP records and information.
- Must record all validation/reassessment activities.
- May require retraining
- Does the scientific data still support the Hazard Analysis?
- Reference Study*

RECOMMENDED HACCP MANUAL LAYOUT

- Title/Location/Effective Date
- HACCP Team Member List, include titles
- Review/Revision History, chronological
- Definition of Terms
- Description of Prerequisite Programs
- HACCP Description
- Hazard Description
- Product Descriptions
  - Name, general description
  - Allergen Statement
  - Intended use/application

- Storage guidelines
- Ingredient list
- Packaging

• Detailed Process Flow Diagram

- All processing steps that affect product characteristics
- Clearly identify Critical Control Points

• Process Hazard Analysis

- Process Step
- Potential hazard introduced, controlled, or enhanced at this step.
- Include each type of hazard: biological, chemical, physical. If not present indicate none.
- Why potential hazard must be controlled.
- Measures to eliminate the hazard(s)
- Is this step a Critical Control Point?

• Critical Control Point Plan

- Description of CCP
- Hazard(s) that are addressed
- Critical limits
- Monitoring: what, how, frequency, who
- Corrective action
- Verification activities
- Record keeping procedures

- Deviation Procedure
- Description of Verification and Validation Programs

CONTROL MEASURES: Those actions and/or activities that are required to eliminate hazards or reduce their occurrence to an acceptable level.

CORRECTIVE ACTION: The action to be taken when results of monitoring the CCPs indicate a trend towards loss of control.

CRITICAL CONTROL POINT (CCP): A step which, if controlled, will eliminate or reduce a hazard to an acceptable level.

A step in any stage in food production and/or manufacture. This includes production of ingredients, or harvesting of raw materials, together with transport to the processing plant and formulation, processing and storage of product. Where appropriate, it includes distribution to the retail outlet consumer, and instructions for safe use.

CRITICAL LIMIT: A maximum and/or minimum value of controlled at a CCP to prevent, eliminate, or reduce to an acceptable level the occurrence of a food safety hazard.

DECISION TREE: A sequence of questions applied to each process step with an identified hazard to identify which process steps are CCPs.

DEVIATION: Failure to meet a critical limit.

DEVIATION REPORT: Record of nonconformance to critical process limits with reference to any product

involved in the deviation. May include but is not limited to: date, description of deviation, reason for hold, number of containers held, hold date, product code/identification, product disposition, and responsible individuals.

FLOW DIAGRAM: The detailed sequence of operations for the product/process under study.

HACCP COORDINATOR: Individual that is overall responsible for the development, organization, and management of the HACCP Program.

HACCP PLAN: The written document based on seven principles of HACCP which delineates the procedures to be followed.

HACCP TEAM: A multidisciplinary group of individuals that undertakes a HACCP study. The team should consist of specialists, a chairperson, and a technical secretary.

HAZARD: A biological, chemical, or physical agent that is reasonably likely to cause illness or injury in the absence of its control.

HAZARD ANALYSIS: Process of collecting and evaluating information on potential food hazards to decide which are significant and must be addressed in the HACCP plan.

MONITORING: A planned sequence of observations or measurements of a CCP target level and tolerance. These are designed to produce an accurate record and to provide evidence for future use in verification that the CCP is under control.

PREREQUISITE ENVIRONMENTAL PROGRAMS: Procedures and/or programs that provide the basic and operating conditions necessary for the production of safe, wholesome food.

RISK: An estimate of the probability of a hazard occurring. Probability determined by using severity and likelihood of occurrence.

TARGET LEVEL: A predetermined value for the control measure which has been shown to eliminate or control a hazard at a CCP. (see also TOLERANCE)

TOLERANCE: The absolute value for the control measure at a CCP (i.e. the specified degree of latitude); values outside this tolerance indicate a deviation.

VALIDATION: Activities focused on collecting and evaluating scientific and technical information to determine if the overall HACCP plan, when properly implemented, will be effective in controlling hazards.

VERIFICATION: Activities, other than monitoring, that determine whether the HACCP plan is working properly, i.e. equipment calibration, records review, micro testing, or application of test pieces.

4.5 Supplier Evaluation and Product Development through Sensory Analysis

Have you ever established a relationship with a supplier, only to realize, later, that you'd made the wrong choice? Your new supplier offering a good price, but later you have realized that its quality standards were low, or that

its communication was unacceptably poor. Mismatches between your needs and a supplier's offerings can add costs, cause delays, and even damage your organization's reputation – for example, if the resources supplied are substandard.

Therefore a proper selection of the supplier, jointly with a thorough analytical quality control support will avoid unnecessary surprises.

We all strive to have products that have high standards, are competitive and have a very high degree of consumer acceptance.

However it may happen that even a high quality product, with excellent microbiological profile does not have the expected consumer acceptance.

There is more than one cause that may lead to such a situation, and among these incorrect market positioning, cost, labeling or packaging but more often than expected this may be due to poor product design and lack of consumer testing.

Hereafter we shall provide a few introductory hints on product design and sensory testing.

Sensory testing or evaluation has been defined as a scientific discipline used to **evoke**, **measure**, **analyse** and **interpret** those responses to products as perceived through **the senses** of sight, smell, touch, taste and hearing.

When a product is developed especially in SMEs grading methods for new products traditionally involve

assigning quality scores on the appearance, flavor and texture of the products based on the presence or absence of predetermined defects. The assessment is usually done by the owner, some employees, family members and sometimes neighbors.

These traditional judging methods have several shortcomings: they can't predict consumer acceptance since quality assessments are subjective and assigning quantitative scores is difficult. Moreover , without sensory evaluation, development efforts reflect the personal feelings, views and choices of the product developer, product development team, marketer(s) and/or top management.

Product developers are usually left at the mercy of decision-makers (either in their company or their clients) that insist on the constant reformulation of products with no end in sight when decisions are ruled by personal judgments, preference or intuition (without facts).

Sensory evaluation becomes an invaluable tool since users of products experience them holistically with their own senses reducing the risk of product failure.

For today's consumers, the primary consideration for selecting and eating a food commodity is the product's palatability or eating quality, and other quality parameters, such as nutrition and wholesomeness are most of the time, secondary.


Thus if we accept that food quality is that "which the consumer likes best" and that the grades of quality are understood more by the degree of desirable attributes and absence of undesirable characteristics which are primarily detected by the consumer's sensory organs, then a good method of deciding quality of a food is through sensory evaluation.

There are many types of sensory analysis methods, the most popular being difference tests, descriptive analysis and consumer acceptance testing. Difference tests include the triangle test, where the panel member attempts to detect which one of three samples is different from the other two, and duo-trio tests, w here the panel member selects which one of two samples is different from the identified standard. Difference tests estimate the magnitude of sensory differences between samples, but one limitation of these tests is that the nature of the differences is not defined. It is usually a common practice to use a combination of difference tests and descriptive sensory analysis for problem-solving. Descriptive sensory analysis uses several techniques that seek to discriminate between a range of products based on their sensory

characteristics and also to determine a quantitative description of the sensory differences that can be identified, not just the defects.

No judgment of "good" or "bad" is made as in traditional quality judging methods because this is not the purpose of the evaluation.

Here the panel is a powerful instrument that identifies and quantifies a product's sensory properties. Sensory profiling is as simple as having several assessors rating samples for a number of identified sensory attributes. For example, sweetness may be rated on a five-point scale, with a rating of one indicating not sweet and a rating of five meaning very sweet.

Using a standardized vocabulary, or sensory lexicon, is an essential part of sensory profile work and is done in an objective manner.

4.5.1 Uses of Sensory Analysis in the Food Industry

Sensory analysis testing has many different purposes. It can be used to:

- evaluate a range of existing food products
- analyse a test kitchen sample for improvement
- gauge consumer response to a product
- check that a final product meets its original specifications
- evaluate differences in similar products
- analyse specific attributes e.g. shortness in biscuits.

It is important that the test chosen should suit the particular purpose. Very often more than one type of test will have to be carried out on products. Companies often develop products to taste like another, e.g. own label foods to taste like the brand leader. If a food is designed to taste like another, then a difference test is used. This may be followed by a preference test to find out the acceptability of the new product among consumers.

Preference tests can be used to research how a company's product compares to that of its competitors. A ranking test may be done and if the results of this are favourable to the company, this may be presented to retailers to persuade them to allocate more shelf space to the company's product.

Cost and quality are important factors in the food industry. A company may consider changing the supplier of one of the ingredients in a product for economic reasons. It is important that consumers do not detect that the product has been changed in any way. In this case the company may use a panel of trained testers to carry out difference tests to determine if the testers can detect a difference from the original product.

Companies may contemplate changes to their existing product based on consumer demand e.g. healthy eating, by replacing salt with a low sodium alternative. It is important that food companies are attentive to the demands of the consumer in order to retain their market share.

Therefore sensory analysis may be used for:

Making a completely new food product - developing ideas for a new product by drawing up the product profile

Modifying an existing food product - making changes to an original recipe e.g. adding or removing an ingredient to improve flavour or changing cost of a product

Matching an existing food product - copying other popular branded products of similar types.

4.5.2 Performing a Sensory Evaluation

1. Decide on the type of test you want to perform.

- Preference test - asks whether people like or dislike a product, e.g. hedonic scale

- Discrimination test - asks people to describe a particular attribute of a product, e.g. paired comparison test.

2. Find a clear area to hold the sensory test. Try to make sure that it is away from noise and cooking smells which may distract the people taking part in the test.

3. Place as many samples in serving containers as there are people taking part in the test. Code each sample with a random number, letter or symbol.

4. Check that you have enough glasses of water for the people taking part.

5. Make sure the people taking part know what is expected from them.

6. Ask each person to taste one sample at a time, and record their responses. Allow time between samples so that tasters can record their opinions.

What tests are used? There is a set of standard tests which can be used by industry. These are laid down by British Standard (BS5929).

Preference Tests - these supply information about people's likes and dislikes of a product. They are not intended to evaluate specific characteristics, such as crunchiness or smoothness. They are subjective tests and include pair comparison, hedonic and scoring.

Discrimination Tests - these aim to evaluate specific attributes, i.e. characteristics of products (crunchiness). They are objective tests and include pair comparison, duo trio and triangle.

Hedonic Scale

1. Prepare the samples.

2. Ask each person to taste each sample in turn and tick a box, from "Hate" to "Love" to indicate their preference.

3. The person may also wish to make remarks about the products appearance, taste, odour and texture.

4. Analyse the results. Which sample received the greatest/lowest scores?

Scorecard - Hedonic Rating Scale

Tray number ..... Name .....

Taste the sample and tick ✓ how much you like or dislike each of the characteristics. You can taste the sample more than once.

	 HATE	 DON'T LIKE	 DON'T MIND	 LIKE	 LOVE
COLOUR					
SMELL					
TASTE					
SWEETNESS					
MOUTHFEEL					

Practical Example n.1 : developing a healthy granola bar snack, Fruity Nutritional Bar.

Choose primary ingredients, develop recipes and make cost analysis. Run lab labs tests (water activity, water content, sugar content, penetration test etc.). After the finished bar is deemed suitable for consumption run sensory evaluation tests.

Carry out tests in an evaluation room, with white light, controlled ventilation, and away from distractions noise, odors and the preparation room.

To calculate the score assign a score value for each descriptor:

Liked extremely = 9, like very much = 8, like moderately = 7, like slightly = 6, neither like nor dislike = 5, dislike slightly = 4, dislike moderately = 3, dislike very much = 2, dislike extremely = 1.

Record Sheet
Hedonic Rating Scale

Food Characteristics - Appearance/colour, Taste/Flavour, Smell/Odour, Texture/Mouthfeel, Sweetness

Score Value Assigned:
Liked extremely = 9, like very much = 8, like moderately = 7, like slightly = 6, neither like nor dislike = 5, dislike slightly = 4, dislike moderately = 3, dislike very much = 2, dislike extremely = 1

	Tester					Total Score	Average Score (total score ÷ number of testers)
	1	2	3	4	20		
Appearance (colour, shape)	9	9	9	8	7	165	8.3
Taste/Flavour	9	8	7	5	4	148	7.4
Smell/Odour	9	7	8	6	6	152	7.6
Texture/ Mouthfeel	4	7	7	5	6	124	6.2
Sweetness	7	7	8	8	6	150	7.5

If you wish to run your own hedonic tests 3 templates are provided below to help gather and analyse the data.

- Hedonic scale for 3.xls (16 kB)
- Hedonic scale for 4.xls (16 kB)
- Hedonic scale for 5.xls (16.5 kB)
- Hedonic scale.doc (32 kB)

Scoring Tests

1. Samples are scored on a scale, between like and dislike.

2. Allow people to evaluate samples and score (place) in order of preference.

3. Record their responses.

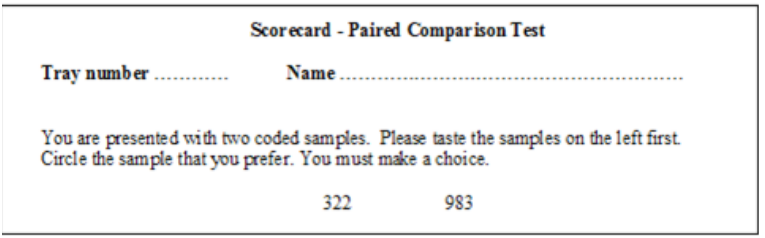
Paired Comparison Tests 1

- Paired Comparison Test (Preference)

1. Prepare two samples of the food product you wish to test.

2. Ask each taster which product they prefer.

3. Record the response from the tasters.



Scorecard - Paired Comparison Test

Tray number ..... Name .....

You are presented with two coded samples. Please taste the samples on the left first. Circle the sample that you prefer. You must make a choice.

322 983

A template is provided to help gather and analyze data.

- Paired comparison sheet.xls (15 kB)

Paired Comparison Tests 2

Paired Comparison Test (Discrimination)

1. Prepare two samples of the food product you wish to test.
2. Compare one attribute, e.g. which one is smoother?
3. Record the response from the tasters.

A template is provided to help gather and analyse data.

- Paired comparison sheet.xls (15 kB)

Triangle Test

1. Prepare three samples, two of which are the same.
2. Arrange the samples in a triangle.
3. Decide which of the samples is the odd one out.
4. Record the responses from the tasters.

A template to help gather and analyse the data is provided below.

- Triangle excel chart.xls (15.5 kB)

Duo Trio Test

1. Prepare three samples, two of which are the same.
2. Using one of the two identical samples as a control, decide which of the other samples is the same as the control.
3. Record the tasters responses.

A template is provide to help gather and analyse data.

- Duo trio excel chart.xls (15 kB)

Ranking

1. Decide on the attribute to be ranked, e.g. crunchiness.

2. Allow people to evaluate samples and place them in rank order.

3. Record the responses.

Star Diagram/Star Chart

This type of test allows a single food products, or range of food products, intensity of its sensory attributes to be recorded. They are NOT intended to model general attributes such as 'nutrition', 'cost' or 'appearance', as they are more complex are better dealt with in other ways.

The test can be used to:

- evaluate differences in similar products;
- gauge consumer response;
- analyse specific attributes, e.g. shortness;
- check that a food product meets its original specification;
- compare similarities in a range of products show new opportunities for product development.

How to Model Sensory Attributes

1. Choose a range of attributes that describe the characteristics of the product, e.g. crunchy, spicy or smooth.

2. Decide on the intensity of each attribute, using a scale from 0 to 10 (the higher the number the greater the intensity).

3. Use the information to product a star diagram/chart of the product's attributes.

A number of Excel templates are provided to help gather and analyse data.

Although the files suggest comparing 2-5 'products', the same star diagrams can be used to gather information from 2-5 'people' about the same product.

- Excel chart 5 points 1 product.xls (15.5 kB)
- Excel chart 5 points 2 products.xls (16 kB)
- Excel chart 5 points 3 products.xls (16.5 kB)
- Excel chart 5 points 4 products.xls (16 kB)
- Excel chart 5 points 5 products.xls (16.5 kB)
- Excel chart 10 points 1 product.xls (15.5 kB)
- Excel chart 10 points 2 products.xls (16.5 kB)
- Excel chart 10 points 3 products.xls (17.5 kB)
- Excel chart 10 points 4 products.xls (18 kB)
- Excel chart 10 points 5 products.xls (18.5 kB)

Practical example.

We are producing a food/drink and our major competitors are Mr. Fun and Mr. Strong. We want to understand what sensory components are better in our competitors so that we can make changes to our product in order to have all the best sensory attributes and make it a winning product.

After our panel has done the tasting we enter the data into the interactive chart, as below and visualize the results.

We can now appreciate that our product, if compared to our competitors is:

Lacking: Sweetness, taste, color

Superior: Aroma

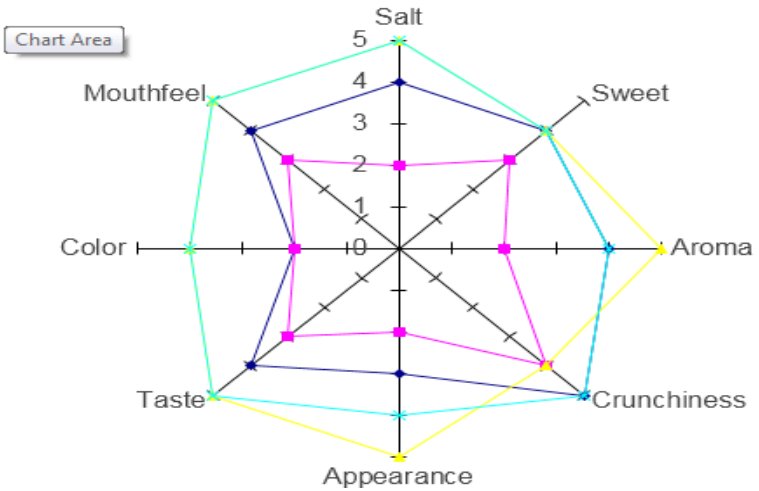
Equal: Presentation, mouth-feel, saltiness

O any of the characteristics that we are testing for.

Therefore we will redesign our product changing only the characteristics that are inferior to our competitors until we achieve an equal or superior product.

Star Chart/Diagram for Comparing Four Similar Products

Attributes	Product 1	Product 2	Product 3	Product 4
Salt	4	2	5	5
Sweet	4	3	4	4
Aroma	4	2	5	4
Crunchiness	5	4	4	5
Appearance	3	2	5	4
Taste	4	3	5	5
Color	2	2	4	4
Mouthfeel	4	3	5	5



5. GAPS IN SPICE PRODUCTION

The International Organisation of Spice Trade associations (IOSTA) has published GENERAL GUIDELINES FOR GOOD AGRICULTURAL PRACTICES ON SPICES & CULINARY HERBS with assistance from the International Trade Centre, Geneva

5.1 GAP in spices production from IOSTA

Good Agricultural Practices or GAP are "practices that need to be applied on farms to ensure food safety during pre-production, production, harvest and post-harvest. In many cases such practices also help protect the environment and safety of workers". They are a collection of principles to apply for farm production and post-production processes resulting in safe and healthy food and non-agricultural products while taking into account economic, social and environmental sustainability. Their purpose varies from fulfillment of trade and government regulatory requirements, in particular with regard to food safety and quality, to more specific requirements of specialty or niche markets. In addition to facilitation of market access, reduction in non- compliance risks regarding pesticide residues and microbial and other contaminant hazards may be achieved. GAP schemes are predominantly consumer driven and incorporate traceability requirements as an important part of their food safety measures.

MYCOTOXINS

Introduction

Among the many subjects affecting food safety are contaminants caused by mould formation. Some moulds produce toxins that can be harmful to human health. Collectively these are known as mycotoxins. For spices there are two mycotoxins of concern, ochratoxin A (OTA) and aflatoxin. These are potentially carcinogenic to humans. Aflatoxins are produced by moulds/fungi of the genus Aspergillus and ochratoxini A is produced by both Aspergillus and Penicillum - hence one of the reasons why OTA can be produced in temperate storage.

They are predominantly produced by two fungal species, Aspergillus and Penicillum. The toxin cannot be removed by further processing nor inhibited by heat treatment.

Ochratoxin A and aflatoxins are found in many foodstuffs, predominantly in fruit and cereals but also it is sometimes found in spices, however globally aflatoxin appears to be the toxin of concern.

These moulds will typically grow on foodstuffs that have been subjected to high temperatures and elevated humidity levels. Note: OTA can be formed at lower temperatures. Similarly it has been shown that, while the initial contamination may occur at farm level, the actual mycotoxin formation may happen throughout the entire supply chain, in every stage of transportation, storage and production.

Preventative measures taken by all stakeholders in the chain from field to fork are the best way to prevent mould formation and thus enhance spice quality. The Authorities in consuming countries have already set maximum permitted levels for aflatoxins in spices and are currently discussing limits for OTA. Presence of these toxins, above the permitted levels, will result in the destruction of these deliveries.

This Code of Practice is intended to assist operators throughout the chain to apply Good Agricultural Practices, Good Practices in Transport and Storage and Good Primary Processing Practices preventing mycotoxin formation.

Growing Controls

In general terms spices will have few mycotoxins problems if the spice is healthy and undamaged. Nevertheless, contact with any obvious sources of fungal contamination (soil, poor water quality and mouldy spices) should be minimized to help the spices natural defenses.

Harvesting

The soil under the plant should be covered with a clean sheet of plastic during picking to avoid fruits getting contaminated by dirt or mixed up with mouldy fruits that have fallen prior to harvesting. Fallen fruit and leaves should be removed from the area as they provide the correct growing conditions for moulds.

Fruits that have fallen to the ground are known to be susceptible to mould growth. Fruits that are affected by mould or infected should be removed. Alternatively, the raw spice fallen to the ground should be collected separately, washed, cleaned, dried and evaluated prior to any inclusion within the main lot.

Process fresh spices as quickly as possible. Avoid storage of fruits, especially ripe and over-ripe ones, as any period of storage (in a bag or in a pile) increases the likelihood of mould growth. Wherever possible start drying on the day of harvesting.

Wherever possible a system for differential harvesting should be applied, so that once products are ripe they are harvested. This ensures good quality and helps prevent mould growth and mycotoxins generation from overripe fruits.

Wet Processing (if applicable)

The above procedures (dry processing) should be used following the wet processing of product, such as the washing and peeling of Ginger. Particular attention should be paid to spices once they have been removed from the wash tanks.

For reasons of microbiology and other contaminants it is essential that any wet processing is done using potable water.

Once the product has been removed from the water it is best practice to remove any excess as quickly as

possible so that the combination of excess water and heat does not encourage microbial growth.

Sun Drying

Do not dry on bare soil. Use trays, tarpaulins, bamboo mats or drying yards and make sure that these are clean as it is known that mould spores from previous use could re-contaminate product during drying. Techniques for cleaning all of the above should be taught to the farmers.

The layer of drying fruits or leaves should not be more than 4 cm thick. Drying fruits or leaves must be regularly raked (5-10 times per day).

Protect fruits during drying from rain and night dew and make sure that any fruit does not get any re-wetting during storage or any other time.

Drying areas should be raised from the ground to prevent pest ingress and the potential effect this could have on mycotoxins generation, amongst other issues.

Pathways should be made in the drying area to prevent anyone walking on the crop, as this can damage the pods and allows mould growth to occur.

Controlled Drying

To give better quality, reduced bacterial loads and ensure less risk of mycotoxin growth a system of controlled drying can be employed.

Solar drying is one method, where crops are protected in polythene tunnels and the temperature is controlled

through the use of air movement. Such tunnels should be designed so that the risk of condensation falling onto the drying crop is eliminated.

Hot air drying can also be employed and care should be taken to ensure that there is no risk of fumes from the fuel coming into contact with the product. This can be best achieved through the use of a heat exchanger so that only clean air comes into contact with the product.

A solar heat exchanger can also be used where hot air generated from the sun's rays on a heat exchanger are fed into a unit which contains the spice spread on a fine wire mesh.

Dry Processing

The site processing plant should be in a dry area, as moist, humid conditions such as those found on swampy land, encourage the growth of mould.

There should be separation between raw material receipt, cleaning, washing, processing and storage, to prevent any cross contamination.

Dispose of waste from wet processing, such as the washing and peeling of ginger, away from clean dry spices.

Keep equipment and facilities clean, make sure they have any debris removed prior to using and make sure the equipment is dry before use.

Use clean dry bags for storing and transporting dry, cleaned spices and keep dried spices away from any damp material or areas.

Processing should achieve a uniform moisture content that is as low as feasible and certainly not higher than 12.0% using ISO 6673 as the measuring method or using equipment calibrated to the same standard. Other comparable methods, such as AOAC, may also be used for this analysis.

The drying area should be elevated, to prevent pest ingress and potential flooding, and should be constructed of a material that will not contaminate the spices in question.

A concrete pad can serve this purpose and in this case it should have a slightly sloping surface to allow water to run away from the product and should have a perimeter fence to prevent farm animals, pets, pest etc. from walking on the crop as it is drying.

It is important to ensure that the drying yard is cleaned prior to use.

Storage and Transportation

Under this chapter it must be stressed that, in view of the importance of temperature and humidity in relation to the formation of moulds and hence the possible occurrence of mycotoxins, improper harvesting, drying and rewetting are by far the most significant risks.

Product should be stored in good, well maintained warehouses that do not allow the ingress of water whether through leaks in the roof or walls or under doors, through open windows etc.

It is also important to ensure that product is stored off the floor and away from the walls so that any potential condensation does not rewet the product. In addition there should be good air movement through the warehouse to prevent sweating and mould formation.

Temperatures within large warehouses can achieve levels ideal for mould growth, particularly towards the roof, thus suitable ventilation should be provided to ensure that both temperature and humidity are correctly managed.

When product is moved into or out of the warehouse ensure it is protected from the rain during transportation.

Make regular checks to ensure that the truck is covered and that there are no rips in the covers and no leaks on the undersides of trucks which would allow water from the road to get into the truck. Check from the inside by closing all doors and looking for holes where daylight is visible.

Trucks must be clean, dry and odor-free. This also prevents cross contamination from previously transported products (see allergens).

Do not load and unload trucks if the product is exposed to rain. Provide shelter so that the spice does not get wet during this operation.

Containers

Do not use damaged containers. Ensure there are no water leaks. Rust spots on the roof and sides of containers can be an indication of leakage. Check from the inside during daylight hours by closing all doors and looking for holes and undesirable smells.

Ensure that the containers have not been previously used for dangerous and hazardous cargoes according to the criteria set by IMCO (International Maritime Organization). These are cargos such as solid or liquid chemicals and other materials, gases and products for and of the oil refinery industry, and waste chemicals and other cargos which have a damaging effect on foodstuffs.

Make transit times as short as possible and avoid long stops to ensure that excessive heat does not build up within the container. In particular do not stuff any container too soon as it could get very warm sitting around awaiting shipment.

Preferably use a shaded area or put another container on top to help to minimise the temperature increase within the container. The roof of an unprotected container can reach temperatures of over 80°C. The subsequent cooling off during the night results in condensation on the internal walls.

Stuffing and Shipping

Make sure that pallets or wooden floors of containers are dry. Spices absorb moisture quickly if the bags

get wet and as a result the moisture content increases considerably.

Lining a container using cardboard, (single-side corrugated and waxed on the inside) has proven to be the best protection against condensation for bags in containers. Kraft paper has also been used successfully. Control that the lining is properly fastened, particularly in the ceiling so that the lining will not fall down and settle on the top bags.

When stuffing the container, bags or bulk, keep spices away from the roof. Bags should preferably be placed on a layer of pallets to avoid contact with the floor where condensation from the ceiling and walls may gather.

If available, fully ventilated containers are preferable for spices in bags, especially if shipped from a high humidity origin. Alternatively the standard dry container with added paper / cardboard protection (top, sides and doors) is fully acceptable.

Ventilation holes in the container are to be kept clear. Do not cover with tape. Absormatic poles or boxes filled with calcium chloride absorb around 100% of their own weight in moisture and may be used for added protection if parties so agree. The number of bags used should be recorded on the documentation so that when being unloaded, they can all be accounted for. It is important that care is taken not to damage these dry-bags and any spillages should be cleaned up immediately.

Enough top space between bags and the roof is

important. Use the saddle stow method, which minimises side contact and maximises airflow between the bags.

The storage, transportation and shipping advice in this section is also applicable to all other sections of this document.

HEAVY METALS

Introduction

Heavy metals are chemicals that are known to be toxic to humans and are often impossible for the human body to metabolise. Therefore, there presence need to be controlled, and should not exceed the Codex maximum residue limits, to prevent a buildup in the body over a period of time.

Within the spice industry a number of potential heavy metal problems exist, and, whilst their presence is not currently considered to be a major problem, this guide offers advice to ensure that their presence in spices is prevented.

Typical heavy metals found in spices are lead, cadmium, zinc, tin, arsenic and copper.

Potential Sources

It is important that in spice growing and processing areas the disposal of batteries, whether car or portable device batteries, should be disposed of correctly to ensure that they do not decay and contaminate growing areas.

MISSING DATA

A monitoring programme should be established to ensure that any naturally occurring heavy metals, for example from natural ores present in the soil, do not become a potential problem for the spices. This is particularly important for spices where ore is processed locally having the potential to contaminate the local water supply.

PESTICIDE RESIDUES

Introduction

The use of pesticides is often a key requirement in ensuring that products are produced in an economic manner and are supplied to the market free from insect damage.

As our understanding about the effect of pesticide residues on the human population increases it is now key that any potential residues present are controlled, to both demonstrate good agricultural practices and protect the well-being of the consumer.

Integrated Pest Management (IPM)

The principle of integrated pest management is to have a systematic approach to the use of plant protection chemicals so that their residues do not become a problem.

IPM uses methods and disciplines that take care to minimize environmental impact and risks, and optimize benefits. It is a systems approach to pest management that utilizes decision making procedures based on either quantitative or qualitative observations of the pest problem and the related host or habitat.

A key concept in IPM programmes is the application of decision making processes to determine whether a chemical pesticide or other action is needed or not. Such decisions depend on evaluation of the pest problem often in a quantitative manner.

In the evaluation of agricultural crop pests, the point at which the economic benefit of pesticide use exceeds the cost of treatment is commonly referred to as the economic threshold. Academic definitions of the threshold concept may vary from discipline to discipline. Another term commonly accepted is action threshold, which is commonly applied to a set of conditions where action is warranted and may be based more on practical experience and judgment than on refined mathematical models relating biological and economic parameters.

Since IPM decision making depends on field observations, the role of the pest scout, pest management advisor, or field biologist has emerged. Although do-it-yourself field observations may be widely practiced, most IPM programmes require a person in the field to collect relevant information on the pest populations in question and related parameters concerning the crop or host habitat.

In addition, the restricted use of plant protection chemicals not only has the benefit that there is less chance of pests becoming tolerant to those chemicals but also has the benefit of achieving higher quality products within the m

Growing Location

The location of the growing area should be such that there is no additional risk of pest or disease attack of the plant due to the growing environment. This could be by ensuring that materials are grown away from waste disposal areas, or that they are grown away from other plants which are known to attract high levels of pests or disease.

For any growing area it is important to identify which crops are growing adjacent to that area and also pay particular attention to any crops that are non-food that are sited up wind of the growing area. If these crops are non-food, such a cotton, when pesticides are applied the wind can carry these pesticides on to the food crop resulting in detectable levels of pesticide that are not permitted for a food crop.

The presence of weeds within a growing area not only competes for nutrients but also encourages pests into the area. Before using weed killer chemicals mechanical removal of the weeds should be undertaken wherever possible.

Pest Monitoring

The use of trap crops, i.e. those crops that are more attractive to a particular pest than the spice being grown, can have a significant effect in identifying any potential pest before the level of pests become unacceptable. For example, a trap crop of castor can be a very good indicator of potential pest activity within a capsicum

growing area as the pests that attack capsicums are more attracted to castor than they are to capsicum. In this scenario, regular inspections of the trap crop helps to identify any potential pest problems at an early stage in the process and removal of any affected leaves helps reduce pest population.

The use of pheromone traps within a growing area not only helps to reduce the target pest by capturing them but also allows close monitoring of the pest so that when plant protection chemicals are applied it is done in an appropriate manner.

The use of perimeter crops, where perhaps a band of crop is grown around the spice growing area, not only prevents physical entry to the growing area for pests but can also help reduce wind drift effects and insect attacks.

The use of bird perches within a growing area can have the benefit of providing a perch for the bird to roost and thus the bird will stay in a particular growing area and will eat a proportion of any pests that are present on the crop. Wherever possible these bird perches should be located so that they are not directly above any individual plant, thus reducing the risk of bird excreta on the plant, and should be removed for a period prior to harvesting for the same reason.

Irrigation

With regard to disease spread it is better if trickle irrigation can be used as this has the benefit of ensuring that water supplies are used sparingly and also has

the benefit that if plant protection chemicals are required these can be delivered directly to the plant.

Flood irrigation techniques use excessive amounts of water and also increase the risk of spreading disease throughout any particular growing area.

Pesticides

If plant protection chemicals are required then, wherever possible, natural systems such as neem can be used as these types of plant protection chemicals are more acceptable to the importing countries.

When synthetic plant protection chemicals are used it is important that these chemicals are permitted for the crop in question. It is important to establish whether this permission also extends to any country where it is envisaged the crop will be exported.

It is important that when a plant protection chemical is used that it is purchased from an authorised dealer who can give assurances that the chemical that they are selling is authentic. PPCs should not be purchased from any other source as the active principles in these chemical may be at the wrong concentration or could even be prohibited chemical

Once acceptability of the plant protection chemical has been established the levels of dose for a crop should be set which not only establishes the dilution to be used but also the number of applications that are permitted.

There should be documentation on the use of plant protection chemicals. This should include their trade

name, their active chemical ingredient, the product expiry date, the date that it is applied, the dilution that has been applied and also the target pest in question.

Plant protection chemical operatives should be provided with suitable equipment to ensure that they can dose the plant protection chemical correctly, especially when this is done at field level. In this case the use of measuring cylinders, or measuring caps, as some plant protection chemical manufacturers provide, will ensure that the application level is acceptable and thus residue will be within accepted tolerances.

It is important that the equipment being used for pesticide application is washed thoroughly to ensure that there is no cross contamination from previous use.

A pesticide holiday, typically a period of 10 days where pesticides are not applied, will help ensure that any plant protection chemicals used have the opportunity to dissipate throughout the plant prior to harvesting. Note: many plant protection chemicals state on their labels the minimum length of time that should be allowed between the last application of the chemical and the harvest and this advice should always be taken into account.

It is important that pesticide containers, whether pouches or bottles, should be disposed of correctly and not left within the growing fields where the application was carried out.

It is important that any water used for irrigation is tested to ensure that it is free from pesticide residues from other crop run-off further upstream.

ALLERGENS

Introduction

For reasons that are still to be fully understood it is now clear that in some parts of the world more and more people are becoming sensitive to potential allergens. This sensitisation can, in some instances, result in anaphylactic shock with the smallest amount of food ingredient causing this problem. It is therefore particularly important to ensure that spices are protected from potential allergens if they are destined for use on the world market.

Details of applicable allergens are posted on the IOSTA section of the ASTA website.

Cross Contamination

Particular attention should be paid to ground nuts (peanuts) as it is now clear that these pose one of the highest risks for certain consumers and therefore it is imperative that during the growing, processing, storage and transportation periods that spices are protected to prevent contamination from peanuts.

Care should be taken when rotating crops to ensure that a previous allergenic crop is has not left any potential cross contaminants in the growing area.

It is also important that peanut derivatives, such as ground nut oil, are not used in any way for the processing of spices or for the lubrication of any spice processing equipment.

With regard to allergenic materials that are sensitizers it is important to ensure that spices are kept separate from cereal products containing gluten, such as wheat, and other allergenic materials such as Soya beans and tree nuts.

Care should be taken while harvesting spice and allergen crops which are grown side by side in the same area. If the harvest is more or less during the same period a suitable harvest gap should be given among these crops to avoid contamination.

Certain spices have now been classified as having potential allergenic properties. It is therefore important that systems are put in place to ensure that when these spices are grown or processed there are suitable clean-down systems to ensure that there is no carryover of these spices into other spice products.

At present the list of spices that come into this category are; Mustard, Celery and Sesame seed. In some countries Coriander is considered as an allergen, so please check the website for the most up to date information (see www.astaspice.org)

It is now clear that certain consumers have allergic reactions to the presence of sulphur dioxide. Traditionally sulphur has been used within the spice industry, either

to improve the visual appearance of spices or as a pest prevention method. The risk associated with sulphur dioxide should be carefully considered within any HACCP study.

In the EU, for example, if a spice contains more than 10ppm of sulphur dioxide residues then it has to be clearly labeled as such so that the consumer can make an informed choice as to whether they should purchase and eat this material.

One area that needs careful consideration is the transportation of spices, especially from farm to exporter or processing unit, where in the past it has not been uncommon for bags to be recycled for this purpose. In this instance it is important that these recycled bags are suitably controlled and that if they have had allergenic materials present then they are not used for spices.

Care and attention should be taken in any common trading yard, where both allergenic materials and spices are handled, to prevent cross contamination. A suitable cleaning operation needs to be adopted to ensure this risk is eliminated.

COLOURINGS

Introduction

It is well documented in recent years that there has been an occurrence of deliberate adulteration of spices with artificial colours. In some cases these colours were not permitted as food colours and in other case these

colours were not declared and thus were deemed to be misleading to the consumer.

As a result of these adulteration incidents it became clear, through the thorough investigation that was carried out by the spice industry, that it is now possible using the most up to date analytical equipment to detect the presence of very low levels of colour which can be present in spices due to environmental contamination such as marking inks, colours to assist in applying plant protection products, fuel or dye contaminated water.

Bag Markings

To ensure that spices are not coloured when bag markings are used a food grade dye should be used wherever possible.

Bags that have an open structure, such as jute bags, should not have bag marking made on the jute when the bag is already full of spices. In this case the use of liquid dyes can go through the bag and contaminate a small portion of the contents so it is better that the bags are marked prior to filling or are marked using a label or tag.

Plant Protection Chemicals

When purchasing plant protection chemicals particular attention should be given to the colour of any chemical purchased. Highly coloured pesticides have the risk of leaving minor traces of colour on the crop, especially if there has been a late application in the growing cycle.

Fuel Emissions

The fuel used for transportation and water pump operation is often coloured. Consideration should be given to the location of these pumps to ensure that the fuel itself or its exhaust residues do not add to the environmental and colours contamination. In addition, consideration should be given to the location of growing areas to avoid vehicle exhaust emissions becoming a problem if there are high traffic levels next to the growing area.

PROCESSING AIDS

Introduction

With regard to this guide a processing aid is a chemical that is used to help improve the processing of spices whilst it has no technological function within the finished spice.

For many years bleached spices have been a traded commodity, such as ginger, cardamom etc., and it is important that their packaging declares this bleaching and that the residues of any bleaching conform to international guidelines.

For many years there have been a number of processing aids used in spices and thus it is important that it is fully justifiable, safe and gives the buyer an informed choice.

Any processing aid must be food safe and approved for use within the country of consumption, and declared to the buyer.

White Pepper

During the manufacture of white pepper, microbial reduction agents such as Chlorine are used to ensure that the quality of the processing water is maintained. If agents like this are used then their dose should be controlled to prevent a carry-over from the process onto the finished products, and the final product levels should be in accordance with International standards.

Where this type of process is used it should be declared to the buyer so that he is aware of this and can make any labeling declaration required.

Dressing

The use of mineral oil to coat the surface of black pepper, paprika or other spices is not permitted. The use of vegetable oil (not peanut oil for reasons mention earlier in the guide) should be declared to the buyer.

GENERAL

Worker Hygiene

Personnel handling the harvest should not be suffering from any contagious disease which will cause or act as a precursor to cause food born health problems. In the event of observing such signs of diseases the person responsible for supervising the harvesting should take the necessary measures to prevent the person(s) from handling the harvest until they are fully cured from the disease(s).

Basic sanitary practices should be practiced by personnel before and during harvesting and handling of harvest.

Where ever possible, especially in primary sorting centres or drying yards, care should be taken to prevent the potential ingress of glass. This includes the removal of jewelry, the replacement of windows with non-glass material (such as Perspex), prohibiting the use of any glass container or bottle, etc.

Workers involved in the handling of spices should be aware of the risk of contaminating the crop and thus eating and drinking should be prohibited in these areas.

Field Sanitation

The field sanitation standards require the person supervising the harvesting of the crop to provide toilets, potable drinking water and hand-washing facilities to personnel in the field, ensure that each person reasonable use of the above and make sure that each person understands the importance of good hygiene practices.

MICROBIAL CONTAMINATION

Introduction - Food Safety Begins on the Farm

Outbreaks of food borne illness make news headlines around the world on a regular basis. In the U.S. alone, it is estimated that as many as 48 million people contract some type of food borne illness each year. As a result, over 128,000 are hospitalized and about 3,000 deaths occur.

All agricultural commodities carry the risk of being contaminated with pathogenic bacteria. From planting

to consumption, there are many opportunities for bacteria, viruses, and parasites to contaminate produce. On the farm, soil, manure, water, animals, equipment, and workers may spread harmful organisms.

How much food borne illness originates on the farm? *No one knows*. Are there reasonable steps that a grower can take to reduce the risk that pathogens will contaminate the food produced on the farm? *Absolutely.*

There is no way to guarantee that everything we grow and consume is free of harmful microbial contamination. However, the risk can be reduced if preventative steps are taken before produce leaves the farm. This guide contains detailed suggestions on how you can reduce risks of microbiological contamination on the farm.

Clean Soil

The improper use of manure can be a risk factor contributing to foodborne illness. Pathogens such as *E. coli* 0157:H7, *Salmonella,* and *Campylobacter* can be present in manure slurry and soil for three months or more, depending on temperature and soil conditions.

Composting manure, incorporating it prior to planting, and avoiding top-dressing with fresh manure are important steps that can reduce the risk of contamination while making use of this important source of nutrients. Excluding domestic and wild animals as much as possible from production fields will help reduce the risk of manure (fecal) contamination.

Manure Application

Manure should not be applied to the crop area for three months prior to harvesting. If the field is side dressed with manure, only well composted manure should be used and care must be taken to make sure it does not touch the crop. Fresh manure and liquid manure should not be used once the crop is in the field.

Irrigation Water

When using surface water for irrigation, test quarterly for fecal coliforms, especially if water passes close to sewage treatment or livestock areas. Water may be filtered or put through a settling pond to improve water quality.

Use potable water for crop protection sprays, such as fertilizer, herbicide or pesticide application.

Where feasible, use drip irrigation to reduce crop wetting and minimize the risk of microbial contamination and spread of contamination or disease. If overhead irrigation is used, use it early in the day, so that leaves dry quickly and thus microbial growth is minimized.

Clean Hands

Attention should be paid to worker hygiene in the field especially during harvesting and during any on farm post-harvest treatment. Workers who pick, sort, grade, or pack produce must wash their hands after using the restroom. Hepatitis A outbreaks have been linked to infected workers. Teach workers about microbial

risks. Provide soap, clean water, and single-use towels in the field and insist that all workers wash hands before handling harvested products.

Clean Surfaces

Before harvesting or packing and at the end of each day, clean all bins or container that are being used.

Harvesting and Post-Harvest Processing

Do not use decayed, mouldy or wormy fruit and remove and excess soil from crop before it is put into the transfer container. Do not use fruits that have been lying in contact with the soil for long periods of time, unless specific programs are in place to remove the contamination risk. Make sure that water used for produce washing, dipping, and soaking is drinkable (potable).

As some spices undergo primary processing at the farm level, ensure that any equipment used, such as pepper threshers, etc. are thoroughly cleaned before being used. This is particularly important on equipment that has been sitting unused since the last harvest. Equipment like this should be cleaned to remove product debris before it is put into storage, to prevent pest and microbial contamination during the storage period.

Ensure that any vehicle used to transport that crop around the farm is clean and dry. Pay particular attention to the previous use of the vehicle and clean it accordingly.

Sun Drying Operations

Ensure that sun drying surfaces are cleaned prior to use. If the cleaning involves water, ensure the water is potable and make sure the surface is dry before placing the crop on the surface. Through elevation or perimeter controls make sure that domestic animals, agricultural animals and pests are excluded from the sun drying area. Ensure that sun drying surfaces have sufficient slopes to prevent water from pooling. As with the mycotoxins guidance in this document, ensure that product is dried in thin layers and turned regularly to ensure that microbial growth during drying is prevented.

On Farm Storage

Sun dried product should be stored in an area that is free from contamination and where the product can be kept dry. The area should be able to be pest proofed to prevent contamination. The storage area should be well ventilated to prevent mould growth and it should be inspected on a regular basis.

Transportation

The vehicle being used for shipping should be cleaned prior to loading for shipment. Particular attention should be paid to the truck's previous use; it should be dry, pest free and undamaged. If the truck is open, a suitable tarpaulin or other cover should be used to prevent the crop from getting wet during transportation.

Worker Hygiene

In addition to the practices mentioned above, make sure that workers who are sick are either excluded from areas where they could contaminate the product or are given no food handling jobs. Provide workers with a suitable area where they can take a break, educate them on hygienic practices, and provide them with hand wash facilities. Ensure that workers understand the food safety risk of smoking or eating, and where appropriate prohibit these activities.

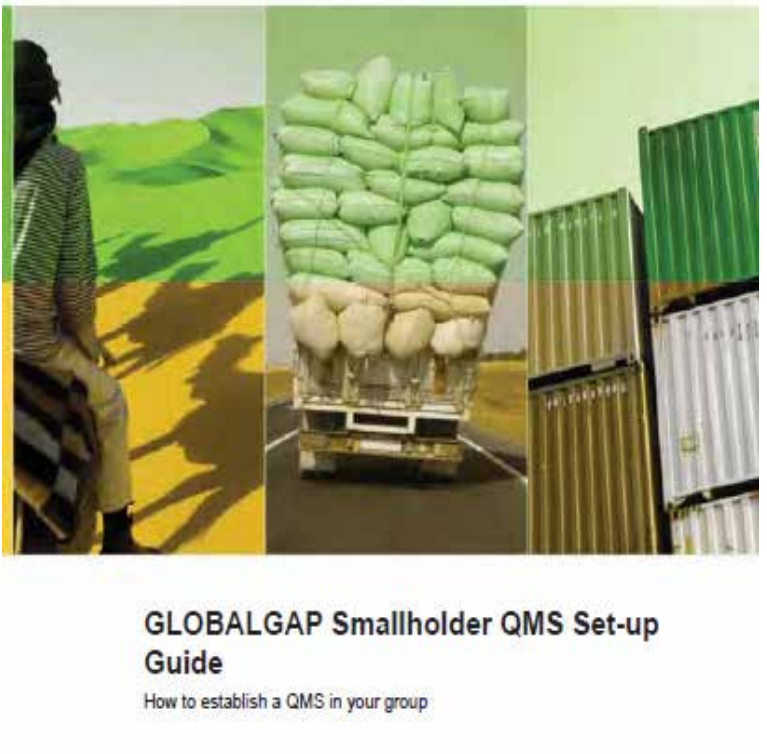
CONCLUSION

As the use of spices continues to expand and develop it is now even more important to ensure that all stages of the supply chain play their role in ensuring food safe products, which are free from potential hazards, are provided to the global consumer market.

Global food safety standards continue to develop, as do analytical techniques, and thus it is important to ensure that if you are using this guide you are using the most up to date version.

5.2 GAPs for smallholders from Global Gap

Annexed to this report is a pdf file called GLOBALGAP Smallholder QMS Set-up Guide, which has been prepared by GTZ. It is based on GLOBALGAP IFA Ver. 3.0-2 QMS Checklist_Mar08, and provides an introduction on how to establish a QMS in a group of agricultural producers.



GLOBALGAP Smallholder QMS Set-up Guide

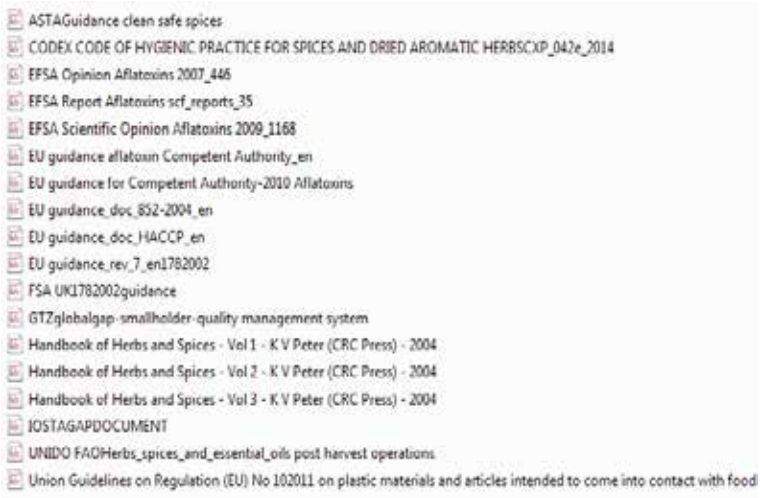
How to establish a QMS in your group

Based on: GLOBALGAP IFA Ver. 3.0-2 QMS Checklist_ Mar08, English version

6. ANNEXES

6.1 EU Guidance Documents

As part of this guide there are a number of useful papers and books in eformat as per following list:



6.2 ESA and ASTA cleanliness specifications

6.2.1 ESA Specifications:

PURITY	
Botanical Species	To be agreed between buyer and seller.
Adulteration	Must be free from.
Infestation	Should be free in practical terms from live and/or dead insects, insect fragments and rodent contamination visible to the naked eye (corrected if necessary for abnormal vision).
Extraneous matter	Herbs max. 2%, Spices max. 1%
Foreign Matter	The European food operator has to evaluate if products fully comply with safety requirements before selling them to the final consumer. If not, additional processing will be necessary.
SENSORY PROPERTIES	Must be free from off odour or off flavour.

6.2.2 ASTA Specifications

Name of spice, seed, or herb	Δ Whole insects, dead	Excreta, mammalian	Excreta, other	Mold	Insect defiled/ infested	Extraneous/ foreign matter
	By count	By mg/lb	By mg/lb	% By Weight	% By Weight	% By Weight
Allspice	2	5	5.0	2.00	1.00	0.50
Anise	4	3	5.0	1.00	1.00	1.00
Sweet basil	2	1	2.0	1.00	1.00	0.50*
Caraway	4	3	10.0	1.00	1.00	0.50
Cardamom	4	3	1.0	1.00	1.00	0.50
Cassia	2	1	1.0	5.00	2.50	0.50
Cinnamon	2	1	2.0	1.00	1.00	0.50
Celery seed	4	3	3.0	1.00	1.00	0.50
Chillies	4	1	8.0	3.00	2.50	0.50
Cloves*	4	5	8.0	1.00	1.00	1.00
Coriander	4	3	10.0	1.00	1.00	0.50
Cumin seed	4	3	5.0	1.00	1.00	0.50
Dill seed	4	3	2.0	1.00	1.00	0.50
Fennel seed	SF[12]	SF[12]	SF[12]	1.00	1.00	0.50
Ginger	4	3	3.0	SF[13]	SF[13]	1.00
Laurel leaves**	2	1	10.0	2.00	2.50	0.50
Mace	4	3	1.0	2.00	1.00	0.50
Marjoram	3	1	10.0	1.00	1.00	1.00*
Nutmeg (broken)	4	5	1.0	SF[14]	SF[14]	0.50
Nutmeg (whole)	4	0	0.0	SF[15]	SF[15]	0.00
Oregano***	3	1	10.0	1.00	1.00	1.00*
Black pepper	2	1	5.0	SF[16]	SF[16]	1.00
White pepper****	2	1	1.0	SF[17]	SF[17]	0.50
Poppy seed	2	3	3.0	1.00	1.00	0.50
Rosemary leaves	2	1	4.0	1.00	1.00	0.50*
Sage**	2	1	4.0	1.00	1.00	0.50
Savory	2	1	10.0	1.00	1.00	0.50*
Sesame seed	4	5	10.0	1.00	1.00	0.50
Sesame seed, hulled	4	5	1.0	1.00	1.00	0.50
Tarragon	2	1	1.0	1.00	1.00	0.50*
Thyme	4	1	5.0	1.00	1.00	0.50*
Turmeric	3	5	5.0	3.00	2.50	0.50

And for paprika:

Spices	Whole equivalent insects	Insect fragments	Mites	Other insects	Rats/mouse hairs	Animal hairs
Ground paprika		Average of more than 75 fragments/ 25 g			Average of more than 11 rodent hairs/25 g	

* Clove stems: Less than (<) 5% allowance by weight for unattached clove stems over and above the tolerance for Other extraneous matter is permitted.

** Laurel leaves and sage: "Stems" will be reported separately for economic purposes and will not represent a pass/fail criteria.

*** Oregano: Sumac negative-Analysis for presence of Sumac shall not be mandatory if samples are marked "Product of Mexico."

**** White pepper: "Percent black pepper" will be reported separately for economic

purposes and will not represent pass/fail criteria.

(2) Fennel seed: In the case of fennel seed, if 20% or more of the subsamples contain any rodent, other excreta or whole insects, or an average of 3 mg/lb or more of mammalian excreta,

the lot must be reconditioned.

(3) Ginger: More than 3% moldy pieces and/or insect infested pieces by weight

(4) Broken nutmeg: More than 5% mold/insect defiled combined by weight.

(5) Whole nutmeg: More than 10% insect infested and/or moldy pieces, with a maximum of 5% insect defiled pieces by count.

(6) Black pepper: 1% moldy and/or infested pieces by weight.

(7) White pepper: 1% moldy and/or infested pieces by weight.

Δ Whole insects, dead: Cannot exceed the limits shown.

§ Extraneous matter: Includes other plant material, e.g., foreign leaves

6.3 Residue values in Spices for EtO (ppm)

USA	7
EU (EtO Banned)	0,1*-0,2*
New Zealand and Australia	20
OAU	Codex

* Lower detection limit

6.4 CODEX Commission: Code of Hygienic Practices

During the joint FAO/WHO Food Standards Programme of the CODEX Alimentarius Commission meeting held in Geneva, Switzerland, from 14 to 18 July 2014 a revision of the Code of Hygienic Practice for Spices and Dried Aromatic Herbs (CAC/RCP 42-1995) was decided**,** salmonella being among the main concerns for which a FAO/WHO opinion has been sought.

Hereafter the proposed draft text:

PROPOSED DRAFT *CODE OF HYGIENIC PRACTICE FOR SPICES AND DRIED AROMATIC HERBS* (CAC/RCP 42 – 1995) (At Step 5/8)

INTRODUCTION

1. Dried, fragrant, aromatic or pungent, edible plant substances, in the whole, broken or ground form, e.g. spices and dried aromatic herbs, impart flavour, aroma or colour when added to food. Spices and dried aromatic herbs may include many parts of the plant, such as aril, bark, berries, buds, bulbs, leaves, rhizomes, roots, seeds, stigmas, pods, resins, fruits, or plant tops.

2. The production, processing, and packing of spices and dried aromatic herbs is very complex. For example, source plants for spices and dried aromatic herbs are grown in a wide range of countries and on many types of farms, e.g. from very small farms to, in rare instances, large farms. Agricultural practices for growing source plants for spices and dried aromatic herbs also vary tremendously from virtually no mechanization to highly mechanized practices. Drying of source plants may be performed mechanically (for rapid drying) or naturally (e.g. slower drying under the sun for several days). The distribution and processing chain for spices and dried aromatic herbs is also highly complex and can span long periods of time and include a wide range of establishments. For example, spices and dried aromatic herbs grown on small farms may pass through multiple stages of collection and consolidation before reaching a spice processor and packer or a food manufacturer. Dried

product processing generally involves cleaning (e.g. culling, sorting to remove debris), grading, sometimes soaking, slicing, drying, and on occasion grinding/cracking. Some spices and dried aromatic herbs are also treated to mitigate microbial contamination, typically by steam treatment, gas treatment (e.g. ethylene oxide), or irradiation. Processing and packing/repacking may also take place in multiple locations over long periods of time, since spices and dried aromatic herbs are prepared for different purposes.

3. The safety of spices and dried aromatic herbs products depends on maintaining good hygienic practices along the food chain during primary production, processing, packing, retail, and at the point of consumption. Spore forming bacteria, including pathogens such as *Bacillus cereus, Clostridium perfringens,* and *Clostridium botulinum*, as well as non-spore forming vegetative cells of microorganisms such as *Escherichia coli, Staphylococcus aureus,* and *Salmonella* spp. have been found in spices and dried aromatic herbs. There have been a number of outbreaks of illness associated with spice and seasoning consumption, with most being caused by *Salmonella* spp. that have raised concerns regarding the safety of spices and dried aromatic herbs. The complex supply chain for spices and dried aromatic herbs makes it difficult to identify the points in the food chain where contamination occurs, but evidence has demonstrated that contamination can occur throughout the food chain if proper practices are not followed.

4. The safety of spices and dried aromatic herbs can also be affected by mycotoxin-producing moulds, e.g. those producing aflatoxin (such as *Aspergillus flavus* or *Aspergillus parasiticus*) or ochratoxin A (such as *Aspergillus ochraceus*, *Aspergillus carbonarius*, or *Penicillium verrucosum*). Chemical hazards such as heavy metals and pesticides, as well as physical contaminants such as stones, glass, wire, extraneous matter and other objectionable material, may also be present in spices and dried aromatic herbs.

SECTION I – OBJECTIVES

5. This Code of Hygienic Practice addresses Good Agricultural Practices (GAPs) and Good Manufacturing Practices (GMPs) that will help minimize contamination, including microbial, chemical and physical hazards, associated with all stages of the production of spices and dried aromatic herbs from primary production to consumer use. Particular attention is given to minimizing microbial hazards.

SECTION II - SCOPE, USE AND DEFINITION

2.1 Scope

6. This Code applies to spices and dried aromatic herbs - whole, broken, ground or blended. Spices and dried aromatic herbs may include the dried aril (e.g. the mace of nutmeg), bark (e.g. cinnamon), berries (e.g. black pepper), buds (e.g. clove), bulbs (e.g. dried garlic), leaves (e.g. dried basil), rhizomes (e.g. ginger, turmeric), seeds

(e.g. mustard), stigmas (e.g. saffron), pods (e.g. vanilla), resins (e.g. asafoetida), fruits (e.g. dried chilli) or plant tops (e.g. dried chives). It covers the minimum requirements of hygiene for growing, harvesting and post-harvest practices (e.g. curing, bleaching, blanching, cutting, drying, cleaning, grading, packing, transportation and storage, including disinfestation and fumigation) processing establishment, processing technology and practices (e.g. grinding, blending, freezing and freeze-drying, treatments to reduce the microbial load) packaging and storage of processed products. For spices and aromatic herbs collected from the wild, only the measures for handling and post-harvest activities (i.e. from section 3.2.3 onward) apply.

2.2 Use

7. This Code follows the format of the *General Principles of Food Hygiene* (CAC/RCP 1-1969) and should be used in conjunction with it and other applicable codes such as the *Code of Hygienic Practice for Fresh Fruits and Vegetables* (CAC/RCP 53-2003) and the *General Standard for Contaminants and Toxins in Food and Feed* (CODEX STAN 193-1995).

8. This Code is a recommendation to which producers in different countries should adhere as far as possible taking into account the local conditions while ensuring the safety of their products in all circumstances. Flexibility in the application of certain requirements of the primary production of spices and dried aromatic herbs can be exercised, where necessary, provided that the product

will be subjected to control measures sufficient to obtain a safe product.

2.3 Definitions

9. Refer to definitions in the *General Principles of Food Hygiene* (CAC/RCP 1–1969) and the *Code of Hygienic Practice for Fresh Fruits and Vegetables* (CAC/RCP 53-2003). In addition, the following expressions have the meaning stated:

10. **Spices and Dried Aromatic Herbs –** dried components or mixtures of dried plants used in foods for flavouring, colouring, and imparting aroma. This term equally applies to whole, broken, ground and blended forms.

11. **Disinfest** – to eliminate harmful, threatening, or obnoxious pests, e.g. vermin

12. **Microbial Reduction Treatment** – process applied to spices and dried aromatic herbs to eliminate or reduce microbial contaminants to an acceptable level.

13. **Source Plant** –plant (non-dried) from which the spice or dried aromatic herb is derived.

SECTION III - PRIMARY PRODUCTION

3.1 Environmental Hygiene

14. 14. Source plants for spices and dried aromatic herbs should be protected, to the extent practicable, from contamination by human, animal, domestic, industrial and agricultural wastes which may be present at levels

likely to be a risk to health. Adequate precautions should be taken to ensure that these wastes are disposed of in a manner that will not contaminate plants and constitute a health hazard to consumers of the final product.

3.1.1 Location of the production site

15. The proximity of production sites that pose a high risk for contamination of source plants, such as animal production facilities, hazardous waste sites and waste treatment facilities, should be evaluated for the potential to contaminate production fields for source plants for spices and dried aromatic herbs with microbial or other environmental hazards.

16. Consideration of production site location should include an evaluation of the slope and the potential for runoff from nearby fields, the flood risk as well as hydrological features of nearby sites in relation to the production site.

17. When the environmental assessment of the site of production identifies a potential food safety risk, measures should be implemented to prevent or minimize contamination of source plants for spices and dried aromatic herbs at the production site.

3.1.2 Wild and domestic animals and human activity

18. Many wild and domestic animal species and humans that may be present in the production environment are known to be potential sources of foodborne pathogens. Domestic and wild animals and human activity can present

a risk both from direct contamination of the crop and soil as well as from contamination of surface water sources and other inputs. The following should be considered:

• Domestic and wild animals should be excluded from production and handling areas, to the extent possible, using appropriate control methods. Methods selected should comply with local, regional, and national environmental and animal protection regulations.

• If animals are used in the harvest of source plants for spices and dried aromatic herbs, care should be taken to ensure that the animals do not become a source of contamination, e.g. by animal feces.

• Production and handling areas for source plants for spices and dried aromatic herbs should be properly maintained to reduce the likelihood of pest attraction. Activities to consider include efforts to minimize standing water in fields, to restrict access by animals to water sources, and to keep production sites and handling areas free of waste and clutter.

• Source plant production sites and handling areas for spices and dried aromatic herbs should be evaluated for evidence of the presence of wildlife or domestic animal activity (e.g. presence of animal feces, large areas of animal tracks, or burrowing).

3.2. Hygienic production of food sources

19. Source plants for spices and dried aromatic herbs should be grown, harvested and cleaned of extraneous

matter in accordance with Good Agricultural Practices (e.g. *Code of Hygienic Practice for Fresh Fruits and Vegetables* (CAC/RCP 53-2003)).

20. Arrangements for the disposal of domestic and industrial wastes in areas from which raw materials are derived should be acceptable to the competent authorities.

3.2.1 Agricultural input requirements

21. Refer to the *Code of Hygienic Practice for Fresh Fruits and Vegetables* (CAC/RCP 53-2003).

3.2.1.1 Water for primary production

22. Refer to the *Code of Hygienic Practice for Fresh Fruits and Vegetables* (CAC/RCP 53-2003). In addition, the following should be considered.

23. Source plants for spices and dried aromatic herbs should not be grown or produced in areas where the water used for irrigation might contaminate plants. Growers should identify the sources of water used on the farm (e.g. municipal water, well water (deep vs. shallow), surface water (e.g. rivers, reservoirs, ponds, lakes, open canals) re- used irrigation water, reclaimed wastewater, discharge water from aquaculture. It is recommended that growers assess and, where practicable, manage the risk posed by these waters as follows:

• Assess the potential for microbial contamination (e.g. from livestock, human habitation, sewage treatment, manure and composting operations) and the waters

suitability for its intended use. Reassess the potential for microbial contamination if events, environmental conditions (e.g. temperature fluctuations, heavy rainfall, etc.) or other conditions indicate that water quality may have changed.

- Assess the potential for chemical contamination (e.g. from mine drainage, agricultural run-off, industrial waste) and the waters suitability for its intended use. Reassess the potential for chemical contamination if events or environmental or other conditions indicate that water quality may have changed.

- Identify and implement corrective actions to prevent or minimize contamination. Possible corrective actions may include fencing to prevent large animal access, properly maintaining wells, filtering water, not stirring the sediment when drawing water, building settling or holding ponds, and water treatment facilities. Settling or holding ponds that are used for subsequent irrigation may be microbiologically safe, but may attract animals or in other ways increase the microbial risks associated with water for irrigating plants. If water treatment is needed, consult with water safety experts.

- Determine if microbial and chemical analysis should be done to evaluate the suitability of water for each intended use. Analytical testing may be necessary after a change in irrigation water source, flooding or a heavy rainfall when water is at a higher risk of contamination.

3.2.1.2 Manure, bio solids and other natural fertilizers

24. Refer to the *Code of Hygienic Practice for Fresh Fruits and Vegetables* (CAC/RCP 53-2003).

3.2.1.3 Soil

25. Refer to the *Code of Hygienic Practice for Fresh Fruits and Vegetables* (CAC/RCP 53-2003).

3.2.1.4 Agricultural chemicals

26. Refer to the *Code of Hygienic Practice for Fresh Fruits and Vegetables* (CAC/RCP 53-2003). Growers should only use agriculture chemicals according to the procedures authorized by the competent authorities. In addition: Soil fungicides may be used on seedbeds or fields if necessary to reduce the amount of spores of mycotoxin-producing moulds.

• If appropriate, for preventive purposes, fungicides may be used on source plants, e.g. fruits, to avoid the introduction of mycotoxin-producing moulds.

3.2.3 Personnel health, hygiene and sanitary facilities

27. Refer to the *Code of Hygienic Practice for Fresh Fruits and Vegetables* (CAC/RCP 53-2003). In addition, the following should be considered:

• Where appropriate, each business engaged in primary production operations should have written procedures that relate to health, hygiene and sanitary facilities. The written procedures should address worker training, facilities and supplies to enable agricultural

workers to practice proper hygiene, and company policies relating to expectations for worker hygiene as well as illness reporting.

• All agricultural workers should properly wash their hands using soap and clean running water, followed by thorough drying, before handling source plants or dried spices and dried aromatic herbs, particularly during harvesting and post-harvest handling. If running clean water is not available, an acceptable alternative hand washing method should be agreed to by the relevant competent authority. Agricultural workers should be trained in proper techniques for hand washing and drying.

• Non-essential persons, casual visitors and, to the extent possible, children, should be deterred from entering the harvest area as they may present an increased risk of contamination. When such persons are present, care should be taken to ensure they do not become a source of contamination.

3.2.3.1 Personnel hygiene and sanitary facilities

28. Growers should consider providing, where practicable, areas away from the growing/harvest area for agricultural workers to take breaks and eat. For worker convenience, these areas should provide access to toilet and hand-washing and drying facilities so agricultural workers can practice proper hygiene.

29. As far as possible, sanitary facilities should be readily accessible to the work area.

• Sanitary facilities should be located in a manner to encourage their use and reduce the likelihood that agricultural workers will relieve themselves in the growing/harvest area.

• Portable facilities (if used) should not be located or cleaned in cultivation areas or near irrigation water sources or conveyance systems. Growers should identify the areas where it is safe to put portable facilities and to prevent traffic in case of a spill.

• Facilities should include clean running water, soap, toilet paper or equivalent, and single use paper towels or equivalent. Multiple use cloth drying towels should not be used. Hand sanitizers should not replace hand washing and should be used only after hands have been washed.

3.2.3.2 Health status

30. The following should be considered:

• Growers should be encouraged to observe symptoms of diarrheal or food-transmissible, communicable diseases and reassign agricultural workers to duties that do not involve direct handling of food as appropriate.

• Agricultural workers should be encouraged and, where feasible, be motivated with appropriate incentives to report symptoms of diarrheal or food-transmissible, communicable diseases.

• Medical examination of agricultural workers should be carried out if clinically or epidemiologically indicated.

3.2.3.3 Personal cleanliness

31. Refer to the *Code of Hygienic Practice for Fresh Fruits and Vegetables* (CAC/RCP 53-2003).

32. When personnel with cuts and wounds are permitted to continue working the injury should be covered by water-proof dressings firmly secured. In addition, there should be a secondary barrier between the cut or wound and the source plants handled, such as gloves or protective clothing, to cover the water-proof dressing.

3.3 Handling, Storage and Transport

33. Each source plant should be harvested using a method suitable for the plant part to be harvested in order to minimize damage and the introduction of contaminants. Plant matter that is damaged or other plant waste material should be disposed of properly and removed from the growing/harvest area in order to minimize the potential for it to serve as a source of mycotoxin-producing moulds. If possible, only the amount that can be processed in a timely manner should be picked in order to minimize growth of mycotoxin-producing moulds prior to processing. When the amount harvested exceeds processing capabilities, the excess should be stored under appropriate conditions.

3.3.1 Prevention of cross-contamination

34. Specific control methods should be implemented to minimize the risk of cross-contamination from

microorganisms associated with harvesting methods. The following should be considered:

- Where appropriate, the soil under the plant should be covered with a clean sheet of plastic or clean plant material such as straw during picking/harvest to avoid contamination by dirt or plant matter that has fallen prior to harvesting. Plastic that will be reused should be easy to clean and disinfected. Plant material should be used only once.

- Source plant material that has fallen to the ground should be disposed of properly if it cannot be made safe by further processing.

3.3.2 Storage and transport from the growing/ harvest area to the packing establishment

35. The containers and conveyances for transporting the source plant material or spices and dried aromatic herbs from the place of production to storage for processing should be cleaned and disinfested, as appropriate, before loading. Products should be protected, where practicable, against outdoor conditions when transported.

36. Prevent field debris from entering packing and storage facilities by cleaning the outside of harvest bins and requiring workers to wear clean clothes in those areas.

37. Spices and dried aromatic herbs should be kept in areas where contact with water or moisture is minimized.

38. Spices and dried aromatic herbs should be stored on raised platforms or hung under a non-leaking roof in a cool dry place. The storage location should prevent access, to the extent practicable, by rodents or other animals and birds and should be isolated from areas of excessive human or equipment traffic.

3.3.3 Drying

3.3.3.1 Natural Drying

39. Refer to the *Code of Practice for the Reduction of Contamination of Food with Polycyclic Aromatic Hydrocarbons (PAH) from Smoking and Direct Drying Processes* (CAC/RCP 68-2009) with regard to the location of the drying area.

40. Plants or parts of plants used for the preparation of spices and dried aromatic herbs may be dried naturally, e.g. air dried, provided adequate measures are taken to prevent contamination of the raw material during the process. The drying time depends on the environmental conditions surrounding the product, i.e. temperature, relative humidity, and air velocity.

41. If dried naturally, plants or parts of plants should be dried on clean, elevated racks, clean concrete floors, or clean mats or tarps or by hanging under a non-leaking roof and not on the bare ground or in direct contact with the soil. Pathways should be made in the drying area to prevent anyone from walking on the crop. The drying plant material should be raked/turned frequently to limit moulds growth.

42. Concrete floors or slabs poured specifically for drying source plants should be subject to an appropriate cleaning program and, where appropriate, disinfected. New concrete slabs should be used for drying only when it is absolutely certain that the new concrete is well-cured and free of excess water. A suitable plastic cover spread over the entire new concrete slabs can be used as a moisture barrier; however, the sheet should be completely flat to prevent the pooling of water. Suitable precautions should be taken, where practicable, to protect the spices and dried aromatic herbs from contamination and damage by domestic animals, rodents, birds, mites, insects or other objectionable substances during drying, handling and storage. If drying outdoors, drying platforms should be placed under a roof/tarp free of tears, holes or frayed material that will prevent rewetting by rainfall and contamination from birds overhead.

43. Drying time should be reduced as much as possible by using optimal drying conditions (e.g. temperature, humidity and ventilation) to avoid fungal growth and toxin production. The thickness layer of the drying source plant material should be considered in order to consistently achieve a safe moisture level.

3.3.3.2 Mechanical Drying (see Section 5.2.2.1).

3.3.4 Packing in the growing/harvest area

44. Packing activities can occur in the growing/harvest area. Such packing operations should include the same sanitary practices, where practical, as packing spices and

dried aromatic herbs in establishments or modified as needed to minimize risks. To prevent germination and growth of spores, the products must be dried to a safe moisture level prior to packing.

45. When packing spices and dried aromatic herbs in the growing/harvest area for transport, storage, or for further sale, new bags should be used to prevent the potential for microbial, physical and chemical contamination. When bags are marked, food-grade ink should be used to minimize the potential for contamination with ink. When bags have an open structure, such as jute bags, the bag should not be marked when filled with spices and dried aromatic herbs to prevent liquid ink from contaminating the contents and increasing the moisture in the spices and dried aromatic herbs. It is recommended that paper tags be used instead of liquid ink for marking.

46. Removal of discarded plant material should be done on a regular basis in order to avoid accumulation that would promote the presence of pests.

3.4 Cleaning, Maintenance and Personnel Hygiene at Primary Production

47. *Refer to the Code of Hygienic Practice for Fresh Fruits and Vegetables (CAC/RCP 53-2003).*

3.4.1 Cleaning programs

48. The following should be considered:

• Harvesting equipment, including knives, pruners, machetes, that come into direct contact with source

plants for spices and dried aromatic herbs should be cleaned at least daily or as the situation warrants and, when necessary, disinfected.

- Clean water should be used to clean all equipment directly contacting spices and dried aromatic herbs, including farm machinery, harvesting and transportation equipment, containers and knives.

- Equipment should be allowed to dry before use.

3.4.2 Cleaning procedures and methods

49. Cleaning and disinfection programs should not be carried out in a location where the rinse water might contaminate source plant material used for spices and dried aromatic herbs.

SECTION IV - ESTABLISHMENT: DESIGN AND FACILITIES

4.2 Premises and rooms

50. Where practicable, buildings and facilities should be designed to provide separation, by partition, location or other effective means, between operations that could result in cross contamination. They should be designed to facilitate hygienic operations according to the one-way flow direction, without backtracking, from the arrival of the raw materials at the premises to the finished product, and should provide for appropriate temperature conditions for the process and the product.

51. The application of appropriate hygienic design standards to building design and layout is essential to

ensure that contaminants are not introduced into the product. Hygienic design should ensure that if a pathogen such as *Salmonella* spp. is introduced it does not become established in specific areas that can serve as a source of contamination of the product. Premises and rooms used for spices and dried aromatic herbs should be physically separated from wet processing areas and designed such that they can be cleaned routinely with little or no water, when wet cleaning is required, premises and rooms should be thoroughly dried before introducing spices and dried aromatic herbs again.

52. Since limiting water is the primary means to control microbial growth from pathogens such as *Salmonella* spp. or mycotoxin-producing moulds in establishments processing and packing spices and dried aromatic herbs, premises and rooms should be designed to exclude moisture from the environment. In general, areas in which spices and dried aromatic herbs are handled should not have drains, however, if drains are present, the surrounding floor should be properly sloped for effective drainage and kept dry under normal conditions.

53. Procedures should be established to inspect the integrity of the establishment (e.g. for roof leaks); such problems should be corrected as soon as they are detected.

54. Proper ventilation should be in place to correctly manage temperature, humidity and dust in the establishment. Calibrated electronic sensors may be used to monitor temperature and humidity. In addition,

airflow in the establishment should provide for higher air pressures in the packaging areas and lower air pressures in rooms where incoming materials are handled. Exhaust vents should be hygienically designed to prevent the formation and accumulation of condensation around the vent exit and to prevent water from re-entering the establishment. Exhaust ducts should be cleaned on a regular basis and should be designed to prevent reverse air flow.

55. Premises and rooms should be designed with a means of dust control, since spices and dried aromatic herbs are likely to generate particulate matter that can be carried to other parts of the room or premises by air currents.

56. Elevated infrastructure should be designed to minimize the accumulation of dust and dry material, especially when pipes, overhead structures and platforms are directly above exposed spices and dried aromatic herbs.

57. Construction and major maintenance activities can dislodge microorganisms from harborage sites where they have become established and lead to widespread contamination of the establishment. Because some microorganisms such as *Salmonella* spp. can survive in dry environments for long periods of time, construction activities may release these microorganisms from hidden harborage sites. Preventative measures such as temporary isolation of the construction or maintenance sites, rerouting of employee and equipment traffic, proper handling of construction material entry and

waste material egress, maintaining negative pressure in the work site, and other appropriate measures should be implemented during construction and maintenance.

4.3 Equipment

58. Equipment should be designed to facilitate cleaning and disinfection with little or no water and, when wet cleaning is required, to allow thorough drying before reusing the equipment for spices and dried aromatic herbs. Alternatively the design should allow disassembly such that parts can be taken to a room designed for wet cleaning and disinfection, when applicable. The equipment design should be as simple as possible, with a minimal number of parts and with all parts and assemblies easily accessible and/or removable for inspection and cleaning. Equipment should not have pits, cracks, corrosion, crevices, recesses, open seams, gaps, lap seams, protruding ledges, inside threads, bolt rivets, or dead ends.

59. Hollow areas of equipment as well as cracks and crevices should be eliminated whenever possible or permanently sealed. Items such as bolts, studs, mounting plates and brackets should be continuously welded to the surface and not attached via drilled and tapped holes. Welds should be ground and polished smooth.

60. Push buttons, valve handles, switches and touch screens should be designed to ensure product and other residues (including liquid) do not penetrate or accumulate in or on the enclosure or interface.

61. Equipment should be installed so as to allow access for cleaning and to minimize transfer of dust particles to other pieces of equipment or to the environment.

62. The risk of contamination from equipment should be assessed and controlled. Wherever possible, forklifts, utensils, and maintenance tools for the finished product and packaging areas should be different from those used in the "raw" material area (e.g. prior to the microbial reduction treatment).

4.4 Facilities

4.4.8 Storage

63. Spices and dried aromatic herbs are susceptible to mould contamination and/or growth if storage conditions are not appropriate. Spices and dried aromatic herbs should be stored in an environment with humidity that does not result in product moisture that can support the growth of moulds.

SECTION V - CONTROL OF OPERATION

5.1 Control of food hazards

64. Measures should be taken at each step in the food chain to minimize the potential for contamination of spices and dried aromatic herbs by microbial pathogens (including mycotoxin-producing moulds), chemical contaminants, excreta, rodent hair, insect fragments and other foreign materials.

65. Depending on the activities conducted at the establishment, it may be useful to separate the

establishment into areas or zones, such as the raw material (pre-processing) area and the post-processing area, with stricter controls in areas post-processing where a microbial reduction treatment has been delivered and in the areas where product is being packaged.

66. Traffic patterns should be established with respect to movement of personnel and materials (e.g. ingredients used in dry-mixing, packaging materials, pieces of equipment, carts and cleaning tools) according to the one-way flow direction, without backtracking, with partitioning/separation of operations in order to minimize tracking of materials from other areas, e.g. the raw material area to the finished product area, in order to prevent cross- contamination.

67. Should the spices and dried aromatic herbs become contaminated with a pathogen such as *Salmonella* spp., the pathogen can become established in a specific area. If the harborage site becomes wet, the pathogen can grow to large numbers and the harborage site can serve as a source of contamination to other places in the establishment, including food contact surfaces and products exposed to the environment. Therefore, potential harborage sites should be identified and kept as dry as possible.

68. In the case of an unusual event, such as a roof leak or a faulty sprinkler that introduces water into the dry production or packaging environment, production should be stopped. The leak should be fixed, and the area cleaned, disinfected and dried before production

resumes. Products damaged from the unusual event should be evaluated based on risk and, where appropriate, properly treated or kept from entering the food chain.

5.2 Key aspects of hygiene control systems

5.2.2 Specific process steps

5.2.2.1 Mechanical Drying

69. Plants or parts of plants used for the preparation of spices and dried aromatic herbs may be dried mechanically (e.g. forced air drying), provided adequate measures are taken to prevent contamination of the raw material during the process. To prevent the growth of microorganisms, especially mycotoxin-producing moulds, a safe moisture level should be achieved as rapidly as possible.

70. Mechanical drying methods should be used instead of natural (open) air drying, where possible, to limit exposure of spices and dried aromatic herbs to environmental contaminants and to prevent growth of moulds. If hot air drying is used, the air should be free of contaminants and precautions should be made to prevent combustion gases from contacting the plant material or stored plant material in the area.

71. Drying time should be reduced as much as possible by using optimal drying conditions to avoid fungal growth and toxin production. The thickness layer of the drying source plant should be considered in order to consistently achieve a safe moisture level.

5.2.2.2. Cleaning of spices and dried aromatic herbs

72. Spices and dried aromatic herbs should be cleaned properly (e.g. culled and sorted) to remove physical hazards (such as the presence of animal and plant debris, metal and other foreign material) through manual sorting or the use of detectors, such as metal detectors. Raw materials should be trimmed to remove any damaged, rotten or mouldy material.

73. Debris from culling and sorting should be periodically collected and stored away from the drying, processing and packaging areas to avoid cross-contamination and attracting pests.

5.2.2.3 Microbial Reduction Treatments

74. In order to control microbiological contamination, appropriate methods of treatment may be used in accordance with the regulations set by the competent authority. When necessary to reduce risk, spices and dried aromatic herbs should be treated with a validated microbial reduction treatment prior to reaching the consumer in order to inactivate pathogens such as *Salmonella*. For additional information on validation, refer to the *Guidelines for the Validation of Food Safety Control Measures* (CAC/GL 69-2008). Commonly used methods involve the application of steam, fumigation or radiation. Where spices and dried aromatic herbs are irradiated, refer to the *Code of Practice for Radiation Processing of Food* (CAC/RCP 19-1979) and the *General Standard for Irradiated Foods* (CODEX STAN 106-1983).

75. Factors that should be controlled when using steam include exposure time and temperature. The process should ensure that all of the product achieves the desired temperature for the full length of time required. A drying step may be necessary to remove added moisture.

76. Factors that should be controlled when using irradiation include radiation dose and the size and shape of the package, as well as the penetrability of the packaging material to the type of radiation used. The process should ensure that all of the product is exposed to the minimum dose of radiation needed to provide the intended effect.

77. Factors that should be controlled when using fumigation treatments such as ethylene oxide or propylene oxide include chemical concentration, exposure time, vacuum and/or pressure, density of the product, and gas permeability of the packaging material. The process should ensure that all product is directly exposed to the gas for the full length of time required.

78. For pathogen inactivation treatments the adequacy of the selected control measure (thermal or non-thermal) and associated critical limits for processing should be determined, considering the increased heat resistance reported for *Salmonella* at low water activities and the increased resistance of spores to most microbial reduction treatments. In some cases, challenge studies may be needed to support validation. Once the lethality of the process is validated by scientific data, the establishment should periodically verify that the process

continues to meet the critical limits during operation and the process criteria intended to achieve microbiocidal effects in the establishment.

5.2.3 Microbiological and other specifications

79. Refer to the *General Principles of Food Hygiene* and the *Principles and Guidelines for the Establishment and Application of Microbiological Criteria Related to Foods* (CAC/GL 21-1997).

80. Where appropriate, specifications for pathogenic and toxigenic microorganisms, chemical residues, foreign material, and decomposition should be established that take into account subsequent processing steps, the end use of the spice or dried aromatic herb and the conditions under which the product was produced.

81. When tested by appropriate methods of sampling and examination, the products should:

(a) Be free from pathogenic and toxigenic microorganisms in levels that may present a risk to health; and should comply with the provisions for food additives;

(b) Not contain any substances originating from microorganisms, particularly mycotoxins, in amounts that exceed the tolerances or criteria established by the Codex Alimentarius Commission or, where these do not exist, by the competent authority;

(c) Not contain levels of insect, bird or rodent contamination that indicate that spices and dried aromatic herbs have been prepared, packed or held under unsanitary conditions;

(d) Not contain chemical residues resulting from the treatment of spices and dried aromatic herbs in excess of levels established by the Codex Alimentarius Commission or, where these do not exist, by the competent authority;

(e) Comply with the provisions for contaminants, and with maximum levels for pesticide residues established by the Codex Alimentarius Commission or, where these do not exist, by the competent authority.

82. In view of the limitations of end-product testing, food safety should be assured through the design of an appropriate food safety control system and by verification of the implementation of the system and the effectiveness of the control measures e.g. through appropriate Quality Assurance or Quality Control auditing methods.

83. Microbiological testing can be a useful tool to evaluate and verify the effectiveness of food safety and sanitation practices, provide information about an environment, a process, and even a specific product lot, when sampling plans and methodology are properly designed and performed. The intended use of information obtained (e.g. evaluating the effectiveness of a sanitation practice, evaluating the risk posed by a particular hazard, etc.) can aid in determining what microorganisms are most appropriate to test for. Test methods validated for the intended use should be selected. Consideration should be given to ensure proper design of a microbiological testing program. Trend analysis of testing data should be undertaken to evaluate the effectiveness of food safety control systems.

84. Verification activities may include, as necessary, appropriate environmental and/or product testing. When monitoring control measures and verification results demonstrate deviations, appropriate corrective action should be taken and the finished product should not be released until it is shown that it complies with appropriate specifications.

5.2.4 Microbiological cross-contamination

85. Effective measures should be taken to prevent cross-contamination of uncontaminated spices and dried aromatic herbs by direct or indirect contact with potentially contaminated material at all stages of the processing. Raw products that may present a potential hazard should be processed in separate rooms, or in areas physically separate from those where end-products are being prepared. Spices and dried aromatic herbs that have undergone a microbial reduction treatment should be processed and stored separately from untreated spices and dried aromatic herbs. Equipment should not be used for both treated and untreated products without adequate cleaning and disinfection before use with treated products.

86. Persons handling raw materials or semi-processed products capable of contaminating the end-product should not come into contact with any end-product unless and until they discard all protective clothing worn during the handling of the material at earlier stages of the processing and have changed into clean protective

clothing. Hands should be washed and disinfected thoroughly before handling products at different stages of processing.

5.2.5 Physical and chemical contamination

87. Appropriate machines should be used to remove physical hazards such as pebbles or heavier stones. To separate foreign matter from the product, air tables or gravity separators can be used for particles of the same size and different density. Sieves of different diameters may be used to obtain the size required for each product and to remove foreign matter.

88. Regardless of the type of separator used, the following parameters should be considered: size of particles, density, weight and size, air speed, inclination of the sieve plate, vibration, etc. for the highest effectiveness of the procedure.

89. Magnets/metal detectors should be used to detect and separate ferrous from non-ferrous/metallic matter. For good extraction, magnets should be as close as possible to the metals to be extracted. Magnets work more efficiently when product flows freely. If needed, more than one magnet should be placed in the line. Magnets should be cleaned frequently. Equipment should be designed in such a way as to prevent metals extracted by magnets from being swept by the flow of product. Spices and dried aromatic herbs should be arranged in a fine layer to facilitate this operation.

90. In all cases, particles identified by the metal detector should be removed and records kept of how much and what type of foreign matter was collected and when it was cleaned. This data should be used in determining how the metals or foreign matter got there in order to implement appropriate corrective measures.

5.3 Incoming material requirements

91. Spices and dried aromatic herbs or their source plants should not be accepted by the establishment if they are known to contain contaminants which will not be reduced to acceptable levels by normal processing procedures, sorting or preparation. Precautions should be taken to minimize the potential for contamination of the establishment and other products from incoming materials that may be contaminated. Plants, parts of plants, spices and dried aromatic herbs suspected of being contaminated with animal or human fecal material should be rejected for human consumption. Special precautions should be taken to reject spices and dried aromatic herbs showing signs of pest damage or mould growth because of the potential for them to contain mycotoxins such as aflatoxins.

92. Raw materials should be inspected and sorted prior to processing (foreign matter, odor and appearance, visible mould contamination). Laboratory tests, e.g. for moulds or pathogens such as *Salmonella*, should be conducted when necessary.

93. Spices and dried aromatic herbs and blends of these are often manufactured without a step that would inactivate pathogens. Spices and dried aromatic herbs should be obtained from approved suppliers. An approved supplier is one that can provide a high degree of assurance that appropriate controls in accordance with this Code have been implemented to minimize the possibility that chemical, physical and microbiological contamination occurs in the ingredient. Because of the diversity of production practices for spices and dried aromatic herbs, it is important to understand the controls in place for production of the incoming material. When the control measures used to produce the spices and dried aromatic herbs are not known, verification activities such as inspection and testing should be increased.

94. Consideration should be given to a program for testing spices and dried aromatic herbs to be used without a lethality step for relevant pathogens, e.g. *Salmonella*. Spices and dried aromatic herbs in which *Salmonella* is detected should not be used unless they are subjected to an effective microbial reduction treatment.

5.4 Packaging

95. Non-porous bags/containers should be used to protect the spices and dried aromatic herbs from contamination and the introduction of moisture, insects and rodents. In particular, the reabsorption of ambient moisture in humid tropical climates should be prevented. Contamination should be prevented by the use of liners where appropriate. It is recommended that new bags or

containers be used for food contact packaging. If reusable containers are used, they should be properly cleaned and disinfected before use. All bags/containers should be in good condition and particular attention paid to the potential for loose bag fibers that can become potential contaminants. Secondary containment bags/containers providing additional protection can be reused but should not have been previously used to hold non-food materials such as chemicals or animal feed.

96. Spices and dried aromatic herbs, e.g. dried chili peppers, should not be sprayed with water to prevent breakage during packing. This may result in growth of moulds and microbial pathogens, if present.

97. Finished products may be packed in gas tight containers preferably under inert gases like nitrogen or under vacuum in order to retard possible mould growth.

5.5 Water

98. The presence of water in the food processing environment, even in very small amounts for short, sporadic time periods, may allow microorganisms, including mycotoxin-producing moulds and pathogens such as *Salmonella,* to grow in the environment. At times, moisture is obvious in the form of water droplets or puddles; or it may be from sporadic sources such as roof leaks. Other sources of moisture may be less visually apparent, including high relative humidity or moisture accumulating inside of equipment. Care should be taken to identify and eliminate such sources of water in the

environment to prevent the development of harborage sites that can become a source of product contamination.

5.7 Documentation and records

99. Refer to the *Code of Hygienic Practice for Fresh Fruits and Vegetables* (CAC/RCP 53-2003).

100. Where practicable, a written food safety control plan that includes a description of each of the hazards identified in the hazard analysis process, as well as the control measures that will be implemented to address each hazard, should be prepared by food business operators. The description should include, but is not limited to, the following: an evaluation of the production site, water and distribution system, manure use and composting procedures, personnel illness, reporting policy, sanitation procedures and training programs.

101. The following are examples of the types of records that should be retained:

- Microbiological testing results and trends analysis
- Water monitoring and test results
- Manure composting records
- Records of plant protection products used (e.g. pesticides, fungicides, herbicides)
- Employee training records
- Pest control records
- Cleaning and sanitation reports

- Equipment monitoring and maintenance records (e.g. calibration)
- Inspection/audit records

5.8 Traceability/Product tracing and Recall procedures

102. 102. Records should identify the source (or lot number) of incoming raw materials and link the source or lot to the lots of outgoing products to facilitate traceability/product tracing. Reference should also be made to *Principles for Traceability/Product Tracing as a Tool within a Food Inspection and Certification System* (CAC/GL 60-2006).

SECTION VI - ESTABLISHMENT: MAINTENANCE AND SANITATION

6.1 Maintenance and cleaning

103. Du st accumulation from product in establishments (i.e. on walls, ceilings, conveyor belts, lids and walls of batch tanks or mixing tanks, and the bottom of a bucket elevator) should be removed in a timely fashion through routine housekeeping. This is particularly important for products that are hygroscopic or in environments of high humidity leading to moisture absorption and localized condensation.

6.2 Cleaning programmes

104. A cleaning and disinfection schedule should be established to ensure that all areas of the establishment are appropriately cleaned and that special attention

is given to critical areas including equipment and materials. The air handling system should be included in the cleaning and disinfection schedule. The cleaning and disinfection schedule should describe whether to use wet or dry cleaning. The presence of water in the dry processing environment can result from improper use of water during cleaning.

105. Dry cleaning is the preferred means of cleaning establishments handling spices and dried aromatic herbs, since the use of water can enhance the probability of contamination from pathogens such as *Salmonella.* Dry cleaning should collect, remove and dispose of residues without redistributing them or cross contaminating the environment. Dry cleaning involves the use of tools such as vacuum cleaners, brooms, and brushes. Brooms, brushes and vacuum cleaners should be dedicated to specific areas to minimize cross-contamination. By dedicating individual vacuum cleaners to specific areas, vacuumed material can be tested as part of an environmental monitoring program.

106. Compressed air should generally not be used for dry cleaning except in special situations (e.g. to dislodge dust from inaccessible points). Moreover, if and when compressed air is used, it should be dried and filtered to exclude microorganisms and moisture prior to use.

107. Dry cleaning is especially important in older establishments in which, in spite of regular maintenance, there may be a potential for the presence of cracks or other harborage sites that may be difficult to eliminate.

Even if residues of spices and dried aromatic herbs enter such a site, potential problems can be minimized if the residues and the sites are dry and kept dry. Once water enters the harborage site, microbial growth can occur and the potential risk of contamination to the environment and eventually to the product is increased.

108. Wet cleaning may be appropriate in certain circumstances, e.g. when *Salmonella* has been detected in the environment. When water usage is necessary, minimal amounts should be used, and the use of high pressure hoses should be avoided. When wet cleaning is used, it should be followed by disinfection to inactivate microorganisms. Disinfectants that will rapidly evaporate after contact, such as alcohol-based disinfectants, provide a means to spot-disinfect equipment with a very minimal introduction of water. Wet cleaning and disinfection should be followed by thorough drying in order to keep the environment of the establishment as dry as possible.

6.3 Pest control systems

109. Drains should be trapped or otherwise equipped with appropriate means to prevent entry of pests from drainage systems.

6.4 Waste management

110. Suitable provision must be made for the storage and removal of waste. Storage areas for waste should be kept clean. Care should be taken to prevent access to waste by pests.

6.5 Monitoring effectiveness

111. Verification of sanitation should include an environmental monitoring program that has been designed to identify pathogens such as *Salmonella* in the processing areas. Environmental monitoring should be conducted under normal operating conditions and will usually involve non-product contact surfaces. Product contact surface testing may be done, particularly as part of corrective actions for an environmental positive. Testing of the spices and dried aromatic herbs may also be conducted based on the results of environmental monitoring. Corrective actions should be taken when the microbiological criterion for the test organism is exceeded in an environmental monitoring or finished product sample.

SECTION VII - ESTABLISHMENT: PERSONAL HYGIENE

112. Refer to the *General Principles of Food Hygiene* (CAC/RCP 1-1969).

SECTION VIII - TRANSPORTATION

113. Refer to the *Code of Practice for the Packaging and Transport of Fresh Fruit and Vegetables* (CAC/RCP 44-

1995). In addition, bulk transport of spices and dried aromatic herbs, such as by ship or rail, should be well ventilated with dry air to prevent moisture condensation, e.g. resulting from respiration and when the vehicle moves from a warmer to a cooler region or from day to night. Prior to bulk transport, the products must be

dried to a safe moisture level to prevent germination and growth of mould spores.

8.1 General Requirements for Transportation

114. Spices and dried aromatic herbs should be stored and transported under conditions that maintain the integrity of the container and the product within it. Vehicles should be clean, dry, and free from infestation. Spices and dried aromatic herbs should be loaded, transported, and unloaded in a manner that protects them from any damage or water. Care should be taken to prevent condensation when unloading spices and dried aromatic herbs from a refrigerated vehicle or while taking out of a cold storage. In warm, humid weather, the products should be allowed to reach ambient temperature before exposure to external conditions. Spices and dried aromatic herbs that have been spilled are vulnerable to contamination and should not be used as food.

SECTION IX - PRODUCT INFORMATION AND CONSUMER AWARENESS

115. Refer to the *General Principles of Food Hygiene* (CAC/RCP 1-1969).

SECTION X - TRAINING

10.2 Training Programs

116. A training program should be established to educate employees on the potential sources of contamination of spices and dried aromatic herbs during

production, harvesting, processing, transportation and storage Training should address proper hygienic practices to follow in order to minimize the entry or spread of pathogens such as *Salmonella* spp. Such training should include personnel who enter areas on a temporary basis (e.g. maintenance workers, contractors).

6.5 EU spice Support Organizations

Hereafter the list published by the European Spice Association (ESA) concerning member and associates for the spice sector for the year 2014

Full Member Associations:

Austria	FIAA FACHVERBAND DER NAHRUNGS-UND GENUSSMITTELINDUSTRIEÖSTERREICHS Zaunergasse 1-3 **A–1030 Wien**	0043/1/7122121 0043/1/712212135 fiaa@dielebensmittel.at
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Finland	FINNISH FOOD&DRINK INDUSTRIESFEDERATION POBox115 Pasilankatu2 **FIN–00241Helsinki**	00358/9/148871 00358/9/14887201 info@etl.fi
France	FEDEMET FEDERATIONNATIONALE DES EPICES, AROMATES ETMELANGESTECHNOLOGIQUES 66 Rue La Boétie **F–75008Paris**	0033/1/53423386 0033/1/141305718

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6.6 DIN 10236: The procedure for capsicum and allium.

DIN 10236: Determination of loss in mass of capsicum and allium species and of dried vegetables by vacuum oven drying

DEUTSCHE NORM **Dezember 2001**

Untersuchung von Gewürzen und würzenden Zutaten
Bestimmung des Trocknungsverlustes in Capsicum- und Alliumarten sowie in getrocknetem Gemüse mittels Vakuumtrocknung

DIN 10236

ICS 67.220.10

Analysis of spices and condiments –
Determination of loss in mass of capsicum and allium species and of dried vegetables by vacuum oven drying

Analyse des épices, des aromates et des herbes –
Détermination de la perte de dessiccation en Capsicum et Allium ainsi qu'en légumes secs par dessiccation à vide

Vorwort

Diese Norm wurde vom Normenausschuss Lebensmittel und landwirtschaftliche Produkte, Arbeitsausschuss „Gewürze und würzende Zutaten", erarbeitet.

Der Anhang A ist informativ.

1 Anwendungsbereich

Diese Norm legt ein Vakuumtrockenschrank-Verfahren zur Bestimmung des Trocknungsverlustes in Capsicumarten, wie Paprika, Chili, Chilipfeffer usw., und in Alliumarten, wie getrockneten Zwiebeln und Knoblauch sowie in getrocknetem Gemüse einschließlich Pilzen, fest.

Zur Bestimmung des Wassergehaltes in allen übrigen Gewürzen wird das in DIN 10229 festgelegte Destillationsverfahren angewendet.

2 Normative Verweisungen

Diese Norm enthält durch datierte oder undatierte Verweisungen Festlegungen aus anderen Publikationen. Diese normativen Verweisungen sind an den jeweiligen Stellen im Text zitiert, und die Publikationen sind nachstehend aufgeführt. Bei datierten Verweisungen gehören spätere Änderungen oder Überarbeitungen dieser Publikationen nur zu dieser Norm, falls sie durch Änderung oder Überarbeitung eingearbeitet sind. Bei undatierten Verweisungen gilt die letzte Ausgabe der in Bezug genommenen Publikation (einschließlich Änderungen).

DIN 10220, *Untersuchung von Gewürzen und würzenden Zutaten – Probenahme für chemische, physikalische und sensorische Untersuchung.*

DIN 10229, *Untersuchung von Gewürzen und würzenden Zutaten – Bestimmung des Wassergehaltes – Destillationsverfahren.*

DIN 10230, *Gewürze und würzende Zutaten – Herstellung einer gemahlenen Untersuchungsprobe.*

Fortsetzung Seite 2 bis 4

Normenausschuss Lebensmittel und landwirtschaftliche Produkte (NAL)
im DIN Deutsches Institut für Normung e.V.

3 Begriffe

Für die Anwendung dieser Norm gilt der folgende Begriff.

3.1
Trocknungsverlust

der nach dem in dieser Norm festgelegten Verfahren bestimmte Trocknungsverlust, angegeben als Massenanteil in Prozent der Probe

4 Kurzbeschreibung

Die Prüfmenge wird bei einer Temperatur von (70 ± 2) °C im Vakuumtrockenschrank mindestens 6 h bis zur Gewichtskonstanz getrocknet. Der dabei entstehende Massenverlust wird durch Wägung ermittelt.

5 Geräte

Die übliche Laboratoriumsausrüstung und im Einzelnen folgende Geräte:

5.1 Schalen aus Glas oder Porzellan

etwa 80 mm Durchmesser.

5.2 Analysenwaage

für Wägungen auf 0,000 1 g.

5.3 Exsikkator

mit handelsüblichem Trockenmittel.

5.4 Vakuumtrockenschrank

6 Probenahme

Nach DIN 10220.

7 Probenvorbereitung

Nach DIN 10230.

8 Durchführung

In die vorgetrocknete und gewogene Schale (5.1) werden 2 g bis 5 g der Untersuchungsprobe auf 1 mg eingewogen. Dabei ist so viel Probenmenge einzuwiegen, dass der Boden der Schale gerade bedeckt ist, mindestens jedoch 2 g.

Anschließend werden die Schalen in den auf (70 ± 2) °C eingestellten Vakuumtrockenschrank (5.4) gestellt. Die Schalen dürfen nicht übereinander gestellt werden.

Anschließend wird der Vakuumanschluss geöffnet. Der Druck wird auf mindestens 50 mbar eingestellt.

Es wird mindestens 6 h getrocknet.

Das Vakuum wird abgestellt. Der Vakuumtrockenschrank wird langsam belüftet, bis wieder der normale Atmosphärendruck erreicht ist.

Die Schalen werden aus dem Vakuumtrockenschrank genommen und unverzüglich in den Exsikkator (5.3) zur Abkühlung auf Umgebungstemperatur gestellt.

Die Schalen werden auf 1 mg gewogen.

Die Trocknung wird 2 h wie oben beschrieben wiederholt. Ein konstantes Gewicht ist erreicht, wenn die Massendifferenz zwischen zwei nacheinander folgenden Wägungen nicht mehr als 2 mg beträgt.

9 Auswertung

Die Berechnung des Trocknungsverlustes m_w, angegeben als Massenanteil in Prozent der Probe, erfolgt nach folgender Gleichung:

$$m_w = \frac{m_1 - m_2}{E} \cdot 100 \qquad (1)$$

Dabei ist

m_1 die Masse der Schale mit der Prüfmenge vor dem Trocknen, in Gramm;

m_2 die Masse der Schale mit der Prüfmenge nach dem Trocknen, in Gramm;

E die Prüfmenge.

Der Wert ist auf die erste Kommastelle zu runden.

10 Präzision

10.1 Ringversuch

Einzelheiten des Ringversuchs zur Präzision des Verfahrens sind im Anhang A zusammengefasst. Die aus diesen Untersuchungen abgeleiteten Werte müssen nicht unbedingt auf andere Konzentrationsbereiche und Matrizes als die angegebenen anwendbar sein.

10.2 Wiederholpräzision

Die absolute Differenz zwischen zwei voneinander unabhängigen einzelnen Prüfergebnissen, die derselbe Untersucher an identischem Probenmaterial nach dem gleichen Verfahren in demselben Laboratorium mit denselben Geräten innerhalb einer kurzen Zeitspanne erhält, sollte die in Tabelle 1 angegebenen Werte für die Wiederholgrenze r in nicht mehr als 5 % der Fälle überschreiten.

Tabelle 1 – Wiederholpräzision

Probe	$\bar{x}$ %	r %
Paprika, süß	7,193	0,635
Karottengrieß	6,284	0,324
Knoblauchpulver	3,431	0,376

10.3 Vergleichpräzision

Die absolute Differenz zwischen zwei einzelnen Prüfergebnissen, die nach dem gleichen Verfahren an identischem Probenmaterial in verschiedenen Laboratorien von verschiedenen Untersuchern erhalten wird, sollte die in Tabelle 2 angegebenen Werte für die Vergleichgrenze R in nicht mehr als 5 % der Fälle überschreiten.

Tabelle 2 – Vergleichpräzision

Probe	$\bar{x}$ %	r %
Paprika, süß	7,193	0,978
Karottengrieß	6,284	0,904
Knoblauchpulver	3,431	1,566

11 Untersuchungsbericht

Der Untersuchungsbericht muss folgende Angaben enthalten:

a) alle erforderlichen Angaben zur Identifizierung der Probe;

b) das angewendete Verfahren unter Verweis auf diese Norm;

c) die erhaltenen Ergebnisse und die Einheiten, in denen sie angegeben sind;

d) das Datum und das Verfahren der Probenahme, falls bekannt;

e) das Eingangsdatum;

f) das Untersuchungsdatum;

g) alle besonderen Einzelheiten, die im Verlauf der Untersuchung beobachtet wurden;

h) alle Arbeitsgänge, die nicht in dieser Norm festgelegt sind, wahlweise vorgenommen wurden, sowie Einzelheiten aller Umstände, die bei der Durchführung der Untersuchung auftraten und die das (die) Ergebnis(se) möglicherweise beeinflusst haben.

Anhang A
(informativ)

Ergebnisse des Ringversuchs

Durch den Arbeitsausschuss „Gewürze und würzende Zutaten" wurde im Jahr 2000 ein Ringversuch an drei verschiedenen Proben unter Beteiligung von 7 Laboratorien durchgeführt und nach DIN ISO 5725-1 und E DIN ISO 5725-2 ausgewertet. Die statistischen Ergebnisse sind in Tabelle A.1 zusammengefasst.

Tabelle A.1 – Statistische Ergebnisse des Ringversuchs

Probe / Parameter	Paprika, süß	Karottengrieß	Knoblauchpulver
Jahr des Ringversuchs	2000	2000	2000
Anzahl der Laboratorien	7	7	7
Anzahl der Eliminierungen	–	–	–
Mittelwert %	7,193	6,284	3,431
Wiederholstandardabweichung s_r %	0,224	0,115	0,133
Wiederholgrenze r %	0,635	0,324	0,376
Vergleichstandardabweichung s_R %	0,346	0,319	0,553
Vergleichgrenze R %	0,978	0,904	1,566

Literaturhinweise

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6.7 List of laboratories and the type of analyses that are carried out

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