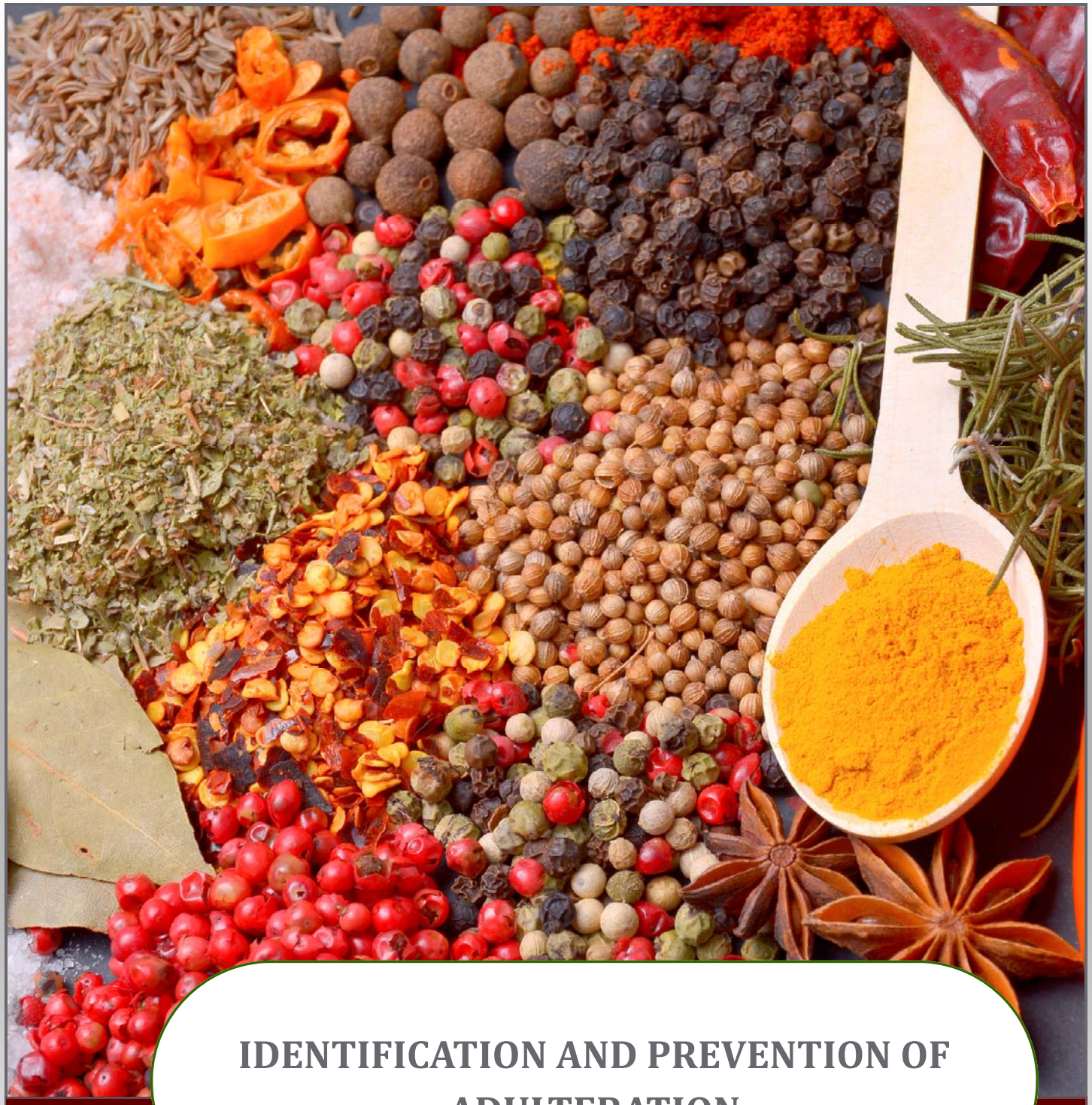

IDENTIFICATION AND PREVENTION OF ADULTERATION

Guidance from the American Spice Trade Association

AMERICAN SPICE TRADE ASSOCIATION™
asta

FOREWORD

During the early part of 2015 the Food Standards Agency (FSA) in the United Kingdom was advised by the Food and Drink Federation (FDF) and the Seasoning and Spice Association (SSA), in liaison with the British Retail Consortium (BRC), that there was concern in Canada and the United States after certain batches of ground cumin and paprika tested positive for undeclared peanut protein. The level of contamination suggested that the products had most likely been adulterated with cheaper materials for financial gain and the levels posed a potential public health risk to people with peanut allergies.

Representatives from across the UK food industry met at a specially organized workshop to determine if potential weaknesses in supply chains associated with spices in the UK existed and to discuss what further measures might be needed to strengthen consumer protection across this sector.

The workshop focused on identifying steps within a variety of supply chains where there might be opportunity for fraudulent practices involving adulteration. Solutions for addressing these vulnerabilities were also explored and ways of migrating potential threats to product integrity were identified.

A key recommendation arising from this workshop was that an expert Joint Industry Working Group should be established to develop best practice guidance for UK businesses providing advice on how to identify vulnerabilities in their supply chains and the types of preventative measures they could consider.

The BRC, FDF and SSA published a guidance document in mid-2016 and have given permission for ASTA to adapt it to incorporate information specific to the U.S. market, such as our regulations pertaining to adulteration. A working group of the ASTA Food Safety Committee has worked on the adaptation to incorporate key information from ASTA's existing White Paper on Adulteration and is pleased to make this information and guidance available.

ASTA would like to thanks our colleagues in the UK for their work and their willingness to share their expertise and guidance with ASTA.

DISCLAIMER

The American Spice Trade Association (ASTA) provides this guidance document solely to assist its members in addressing issues associated with trading in clean, safe spices. This guidance is not directive in nature and compliance with it is solely at the discretion of the user. ASTA does not provide any warranties of any kind, either express or implied, including but not limited to warranties of merchantability, fitness for a particular purpose, accuracy, design, usage, quality, performance, compatibility, or title. ASTA is not responsible for the use or nonuse of any information presented or discussed in this document. It is the responsibility of each ASTA member to verify information presented in this document before acting on it, and to comply with all relevant federal, state, and local laws. ASTA urges users of any of the information presented in this document to consult with appropriate experts before acting on any of the information in it involving adulteration. Solutions for addressing these vulnerabilities were also explored and ways of mitigating potential threats to product integrity were identified.

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I. INTRODUCTION

What is Adulteration?

Adulteration can be defined as the inclusion in foods of constituents whose presence is prohibited by regulation, custom and practice or "making impure by adding inferior, alien or less desirable materials or elements." Adulteration can also include the removal of a valuable constituent.

The most common practice is the intentional addition of an adulterant to a food to increase the food's value through deception i.e. using an adulterant to make a food seem more valuable than it appears. Often, the adulterant is safe for human consumption although it may not be expressly permitted for addition to food. Adulteration may occasionally be a public health issue as when a toxic substance is added to food as an adulterant or a known allergen is added and then not subsequently labeled.

The addition of adulterants to food to increase attractiveness and value is often referred to as economically motivated adulteration (EMA) and it is this type of adulteration that is the primary subject of this guidance.

History/Background

The adulteration of food products was first seen hundreds of years ago, with Greek botanist Theophrastus (370 – 285 BC) reporting on the use of artificial flavors in the food supply and on the use of adulterants for economic reasons in some items of commerce. Pliny the Elder (23 – 79 AD) detailed adulteration in a variety of food products, including the use of juniper berries in pepper. Ancient physician Galen (131 – 201 AD) also raised concern about food adulteration, including pepper.

Efforts to address the adulteration of food date back to Roman civil law. Early efforts were seen in England beginning in 1266 and spices were eventually seen as a specific food commodity. Adulteration of food products grew in significance as society began the transition from largely agrarian to industrial, and in 1860 the English Parliament enacted statutes broadly prohibiting any form of food adulteration. These laws were the models for legislation enacted in the United States years later.

A number of particularly egregious adulteration incidents led to the first extensive legislative action in the U.S. on food safety. The first U.S. Federal statute to establish food safety mechanisms, the Federal Pure Food and Drugs Act of 1906, came about largely because of rampant adulteration of dairy products and other foods. The 1906 Act didn't solve problems with adulteration and the 1938 Federal Food, Drug, and Cosmetic Act went much further, and is the statute (with more modern amendments) that provides the modern FDA with its legal authority over adulteration and misbranding.

Adulteration has continued in recent times, with several notable instances involving the spice industry. In 1994, ground paprika in Hungary was found to be adulterated with lead oxide, causing the deaths of several people, while dozens of others became sick. Beginning in 2003, ground capsicums were found to contain dyes not approved for use in food and over the next several years, a series of recalls in the United Kingdom for foods contaminated with the dyes, is estimated to have cost the companies involved hundreds of millions of dollars.

Everyone involved in the spice industry has a stake in ensuring that adulterated spice is not being traded. One need only look to the case of John Park to understand the seriousness of that responsibility. Mr. Park was president of Acme Food and in 1975 was found criminally liable as a "responsible corporate officer" for violations of the Federal Food, Drug, and Cosmetic Act even though he personally had not participated in any wrongdoing. The U.S. Supreme Court upheld his conviction, supporting the trial judge's instructions to the jury that Park could be found guilty if the jury determined he had a responsible relation to the situation even though he may not have participated personally.

Implications of Economically Motivated Adulteration

The economically motivated adulteration of spices can have serious implications. In some instances, spices have been adulterated with highly toxic materials such as lead-bearing pigments and other unapproved color additives. In these instances, adulteration may have serious public health consequences. There have also been instances when the bulking material added was an allergen and when unlabeled, poses a serious public health threat to individuals with food allergies.

In most instances of EMA, spices are adulterated with material that is not highly toxic or carcinogenic, and therefore do not present a significant, immediate public health risk. For example, oregano is commonly adulterated with non-toxic,

less expensive leaves, such as sumac, cistus or myrtle. In these instances, while there is no immediate public health risk, the spices are still illegally adulterated and subject to regulatory action that may cost spice and food manufacturers millions of dollars in recall expenses should a regulatory agency determine that action is warranted. Additional changes in industry practices as a result, such as increased testing and auditing, can also add significant costs.

When EMA can simply result in inferior products with no safety risks, there are still significant implications for the spice industry because any reported adulteration damages the spice industry's reputation and credibility.

Why Economically Motivated Adulteration Occurs

A key step in the prevention of EMA is to understand why it occurs. Why would an individual or company adulterate a spice and risk making people ill in addition to risking exposure to criminal charges and the economic ramifications that discovery and prosecution may bring? There are a variety of reasons.

The most obvious and simplest reason is to increase profit. A manufacturer may use a cheap filler that is easily disguised in the spice to increase the volume sold thereby cutting the cost of pure spice, and increasing the ultimate profit margin.

The second reason is to be able to compete. If a manufacturer cannot meet the quality criteria of the customer he may adulterate the product either in an attempt to meet a specification or to compete to meet a price by offering an admittedly inferior product. For example, in some cases the adulterated product may be more visually appealing than the pure spice. Cistus has a dark green color that, when added to oregano, makes the adulterated spice more visually appealing than pure oregano. In many instances, blending of different color grades to meet a color specification is acceptable, however, if defatted capsicums is used for standardization without being labeled, the product would be considered adulterated. Customers who are not aware of the adulteration then wind up believing they are getting a bargain. In some instances, adulteration can encourage copy cat actions as others in the market adopt similar practices to allow them to compete with the adulterating manufacturer.

Adulteration may be market driven, the result of cost-cutting pressures. If suppliers are squeezed to reduce costs, there comes a point when the supplier can no longer sustain his margin. At that point, instead of turning down the business, the supplier may adulterate the product to lower the cost and maintain a workable margin. Adulteration results in a number of problems for reliable and honest suppliers as they find it difficult to compete on price.

Other reasons behind adulteration involve world events. Natural disasters, such as adverse weather and earthquakes, as well as crop failures can impact both product availability and prices, resulting in the introduction of alternative materials to help extend the crop to meet world demand and make it available at typical costs. Events such as political unrest, wars and nuclear catastrophe can also impact product availability and result in similar instances of adulteration.

II. LEGAL AND REGULATORY ASPECTS OF ADULTERATION

Most national regulatory programs are constructed to clearly prohibit the presence of adulterants regardless of how they came to be present in food, whether intentional or inadvertent. For example, in the United States, under the general adulteration provisions of Section 402 of the Federal Food, Drug and Cosmetic Act (FFDCA), the primary food safety law administered by the Food and Drug Administration (FDA), a food, including a spice, is considered adulterated if it:

- Contains any added "poisonous or deleterious substance"
- Contains filth
- Contains unapproved food or color additives

Or

- If any valuable constituent has been omitted or removed
- If any substance has been substituted for it
- If inferiority is concealed
- If any substance has been added to increase bulk or weight, or to make it appear more valuable

Also important to the consideration of adulteration in the spice industry is the FDA definition of "spice." FDA defines spice as: ". . . any aromatic vegetable substance in the whole, broken, or ground form, except for those substances which have been traditionally regarded as foods, such as onion, garlic and celery; whose significant function in food is seasoning rather than nutritional; that is true to name; and from which no portion of any volatile oil or other flavoring principle as been removed." 21 CFR 101.22(a)(2).

Two key parts of this definition relevant to the issue of adulteration of spices are the requirements:

- That a spice be "true to name" (i.e. that it be what it is represented to be).
- That the spice has "no portion of any volatile oil or other flavoring principle" removed. This definition is consistent with the requirements of FFDCA Section 402 that a food is adulterated if any valuable constituent has been removed.

The FDA definition of spice at 21 CFR 101.22(a)(2) also contains a list of materials considered spices that is largely consistent with the ASTA spice list, and the FDA list of GRAS spices at 21 CFR 182.10. The definition also points out that paprika, turmeric, saffron, and other spices may be multi-functional and may be used for their coloring properties in addition to their contribution to a food's flavor.

Another important legal issue associated with adulteration is that a situation that could be considered adulteration may be rectified by appropriate labeling. For example, paprika used as a spice that contains defatted paprika as a filler may be legal for sale provided that the label clearly states that the contents of the package (either retail or in bulk) includes paprika and defatted paprika, and that the contents are not labeled in such a way as to lead the consumer to believe that it contains only paprika.

III. PREVENTION OVERVIEW

Preventing adulteration from occurring in the first place is essential to maintaining the confidence of customers and consumers. One of the key elements in preventing and discouraging adulteration is awareness of the problems that can exist and an understanding of the importance of buying to a specification not a price. Be aware that if the price is too good to be true, it probably is.

Companies should ensure that suppliers undertake an appropriate risk assessment and ensure that all relevant systematic controls are in place to prevent adulterated materials from entering the food chain. Risk assessments and controls should be based upon known and foreseeable food safety issues. The following elements should be considered as part of any risk assessment.

- Country of origin of the product
- Nature of the material (e.g. whole, ground or crushed)
- Type of spice
- Supplier selection and approval:
    - Raw material control
    - History of supply
    - Capability of meeting U.S. requirements
    - Adherence to Good Manufacturing Practices (GMPs)
    - Adherence to HACCP principles
    - Traceability
    - Third party certification
    - Testing capabilities and accreditation

IV. THE DECISION TREE AND SPECIFIC PREVENTIVE MEASURES

This decision tree and specific preventive measures have been developed to provide guidance on industry best practices for vulnerability assessments for spices including blends, in order to mitigate against potential adulteration and substitution. It is focused on the authenticity of spices and therefore does not cover general food safety controls.

However, food safety and labeling requirements still apply. It is prudent for users also to consider the potential for cross-contamination as a part of Good Agricultural and Manufacturing Practices, which are beyond the scope of this document (See Additional References for useful links to further information).

The intent is to facilitate the sharing of best practices and assist companies using spices in understanding their role in assuring the integrity of their products. The guidance has been developed from the perspective of providing an oversight of the whole supply chain, from sourcing to placing the product on the market, whether to businesses or to the final consumer.

Every part of the supply chain has a role to play in ensuring product integrity, whether as growers, primary processors, spice agents and brokers, packers, food manufacturers, retailers, foodservice operators or wholesalers/cash and carry businesses. The principles of this guidance can be used by any part of the supply chain. Brand owners will wish to consider their specific legal responsibilities for the safety and authenticity of their products when using this guide. Companies should also ensure that they have strong links between procurement and regulatory/technical functions.

Preventive Measures

The Decision Tree will lead you through this Guidance.

Decision Tree to Protect Spices against Supply Chain Vulnerabilities

Q1. Do you know what you are buying and have you requested specifications?
- NO → I. See IIIA
- YES ↓

Q2. Are you buying from an approved/ certified supplier? (See IIIB)
- NO → *Are there alternative controls in place? (See IIIB)*
  - YES → **YES**
- YES ↓

Q3. Are you buying in Whole form?
- NO → ! *If Ground, Crushed or Chopped—See IIIC*
- YES ↓

Q4. Do you have an understanding of the factors which may influence the market?
- NO → **See IIID**
- YES ↓

Q5. Is the price reflective of the material being purchased?
- NO → ! *You should consider this when deciding whether or not to proceed to purchase*
- YES ↓

Q6. Are you aware and have assessed vulnerabilities in the supply chain? (See IIIE)
- NO → **Q6.1.** Are you confident that your supplier is aware of and has assessed vulnerabilities in the supply chain?
  - NO → **See IIIE**
  - YES
- YES ↓

Q7. Are appropriate controls in place to protect against vulnerabilities (preventive and/or verification and detection measure)?
- NO → **See 2 and 3**
- YES ↓

Q8. Have you reviewed the material on receipt to ensure that it meets the agreed specifications?
- NO → **See 4**
- YES ↓

Q9. Do you have procedures in place to deal with any material that does not meet the agreed specifications and/or is not legally compliant
- NO → **See 4**
- YES → **COMPLETED**

NB: Assessment of Supply Chain Vulnerabilities is an ongoing process which requires regular review.

A. Product Specification

The foundation of any purchasing agreement is a comprehensive specification, including method of analysis to be used, which allows clear understanding of the nature and detail of the spice in question. Detailed specifications should include:

- The full description of the product and all ingredients should be listed. Standardization processes for heat and color may be listed, although they are required if defatted materials is used. In developing your product specification, you should also take into account any claims made on the final product (e.g. organic or origin) and any known cross-contamination or allergen risks.
- Key attributes, including citation of method used eg: Volatile Oil Content; Piperine for pepper; Curcumin for turmeric; ASTA units for paprika; Scoville Heat Units (or Capsaicin content) for chillies; Coloring Strength/ Safranal content for saffron; and Physical Attributes (e.g. particle size, grade, bulk density).
- For further reference, Annex 1 provides examples of types and methods of adulteration, including recommended controls.

B. Supplier Assurance

Supplier assurance, an important factor in ensuring the integrity of products and supply chains, is required under the Foreign Supplier Verification Program (FSVP) under the Food Safety Modernization Act (FSMA). Supplier verification may encompass the following:

- On-site supplier audits as required to comply with FSVP.
- Using approved/certificated suppliers (e.g. GFSI approved scheme such as the BRC Global Standard) may assist with the objective of building a secure, assured supply chain;
- Based on identified risks, targeted audits of the supply chain to ensure visibility and transparency as to the original source of the raw material, processing, ownership and storage at each point in the supply chain; and
- Good Agricultural and Manufacturing Practices (e.g. storage, segregation).

C. Product Type

For ground, crushed or chopped materials it is critical to know where the first and any subsequent such process took place and who owned the material at point of size reduction. Grinding or blending of spices is the point in the supply chain with the greatest risk of adulteration and knowledge of ownership of the product at this point in the supply chain forms a key part of the risk assessment. As historically evidenced, reduction of particle size can hide adulteration and make it more difficult to detect. Dependent on the exact nature of the adulterant, suitable analytical methods to identify adulteration may already be available or may be under ongoing development.

D. Knowing Your Supply Market

Having an understanding of the factors which may influence the market will assist you in building preventive measures into your purchasing decisions. Factors which you may wish to consider include:

- Being aware of and understanding the trading market, e.g. seeking clarification if ground product is being offered below the market price of whole product, as this could suggest that the product purity is in question and further investigation may be required. Market intelligence data to track price trends is available, often as a subscription service.
- Being aware of the harvest cycle which can influence availability and quality (See Typical Harvest Chart at Annex III). In general terms, new crop material typically arrives in the U.S. two months or more after harvest begins. Therefore, if a producing origin suffers some type of extraordinary event (e.g. hurricane) the supply can be affected either immediately or up to 18 months later, depending on the pipeline stock position.

E. Understanding Vulnerabilities in Your Supply Chain

Knowing your supply chain is a key factor in understanding vulnerabilities and mitigating against them. This is an ongoing process which requires regular reviews according to the most updated and available market information. To map your supply chain from a food authenticity perspective, consider possible vulnerabilities at each stage of the supply chain (See Annex II) and take into account the following points:

- Number of countries/regions/places and intermediaries through which the original ingredient has been processed or transited – ensure visibility and transparency of your supply chain;

- History of fraud for a particular ingredient/category of ingredients, as this can point towards possible future vulnerabilities.
- Seasonality and availability of supply (See Typical Harvest Chart at Annex III).
- Weather events or natural disasters (ie drought, flood, earthquakes) that may impact supply availability.
- Cultural and geo-political events (ie food security, terrorism, political instability) which may impact the global supply chain of spices.
- Economic indicators making fraud more attractive.
- Food safety laws and their enforcement (ie the level of advancement of food controls and regulatory frameworks).
- Prevalence of corruption or any other cultural influences on business ethics.
- Advances in technology to mask food fraud.

Additionally bear in mind the time-lag from events that may impact supply availability to noticing / identifying a food fraud issue could be as much as 12-18 months, based on time to market for some crops. Once you have mapped your supply chain from a food authenticity perspective and identified vulnerabilities you should assess and prioritize your findings and take action to mitigate the identified risks. Mitigating actions may include the preventative measures set out in Section V as well as the verification and detection measures set out in Section VI. The Assessment of Supply Chain Vulnerabilities is an ongoing process which requires regular review.

V. VERIFICATION AND DETECTION

Prevention is always better than detection, however, testing may be used to verify that preventive measures are effective and may assist in detecting issues but should not be relied on as a single control point.

A. Sampling and Inspection Programs

Sampling and inspection programs should be informed by knowledge from supply chain assurance activities as well as known vulnerabilities and horizon scanning activities (See Annex II).

You should use a recognized statistical sampling and inspection approach, which is appropriate for the substance being tested/inspected, fit for purpose and applied consistently, to ensure that the sampling is representative of the batch.

B. Devising a Testing Strategy

It is important that you are clear about the objective of testing and what information you hope to obtain, as this will assist you in assessing whether testing is necessary and in devising a suitable testing strategy and selecting a test capable of meeting your requirements.

Factors to consider in selecting an appropriate test method include the:

- type of material to be tested and how the sample will be selected; and
- suitability of available test methods, including their limitations.

The type of material being tested (the matrix) can have a considerable effect on the ability to accurately detect and, where applicable, quantify the substance of interest. A test may also indicate that a substance is present when it is not due to cross-reactivity, for example, with other related species. Some cross-reactivity will be known and therefore predictable but this is not always the case.

Spices are potentially one of the most complex and challenging matrices to analyze as they may be highly colored and can contain chemically reactive components. These challenges are increased with blended products, which may bring about other chemical changes, as well as with composite products containing spices due to the added complexity of the matrix.

There will be cases where suitable and accurate testing methods are not currently available for the matrix of interest and the focus of assurance activity will therefore be on preventive measures.

C. Selecting a Test Method and Laboratory

Having an informed dialogue with your testing laboratory should give you the confidence that:

- the laboratory is appropriately accredited and competent to perform the test on the required matrix;
- the test method is appropriate for the matrix to be tested and meets your testing objectives; and
- you understand how the results of the test will be reported, to assist you in interpreting the results.

The laboratory should be able to provide assurances that the test method is appropriate. See Annex I for details on types of adulteration and recommended analytical methods for detection.

D. Supply Chain Verification Measures

In addition to companies' own checks, verification measures may include:

- Submission of pre-delivery samples for approval prior to purchase and/or approval on arrival; and
- Evidence of authenticity by the provision of appropriate test certificates from the supplier using approved methods and accredited laboratories when possible, traceable to the batch codes and confirming conformance to specification parameters.

VI. RECEIPT OF MATERIALS

You should review the material on receipt to ensure that it meets the agreed specification

[See also Section V. on sampling and inspection programs].

Non-compliant materials should be disposed of and/or returned to the supplier in a timely manner.

Companies are required to report issues that have food safety consequences to the FDA as required by the Reportable Food Registry (RFR). The RFR was called for by Congress in 2007 and required FDA to create a mechanism by which the food industry must report incidents in which there is a reasonable probability that a food (including spices) will cause serious adverse human (or animal) health consequences. Congress' intent was to help FDA track patterns of food and feed adulteration and target inspection resources. Registered Food Facilities that manufacture, process, pack, or hold food for human or animal consumption in the U.S. are required to report within 24 hours any "reasonable probability that the use of, or exposure to, an article of food will cause serious adverse health consequences or death to humans or animals."

Federal, state, and local government officials may also use the RFR portal to report information they receive about reportable foods. RFR submissions include primary reports, the initial submissions about reportable foods, and subsequent reports, those submitted by either a supplier or a recipient of a food for which a primary report has been submitted. The RFR applies to all FDA-regulated categories of food and feed with the exceptions of dietary supplements and infant formula, which are assigned to other mandatory reporting systems.

APPENDIX

GLOSSARY

Adulteration
Adulteration is the deliberate and intentional inclusion in spices of substances whose presence is not legally declared, is not permitted or is present in a form which might mislead or confuse the consumer, leading to an imitated food and/or a product of reduced value, as well as the deliberate and intentional removal of any valuable constituent from a spice or herb.

Blending / Mixing
Spices provide a distinct, characteristic color and/or flavor to food but, being a natural product, these can vary depending on where they are grown, weather conditions, crop season and other natural reasons. The blending together of different qualities of the same ingredient in order to reduce the natural variation in the aromatic profile (so called "standardization") cannot be considered adulteration. In other cases, blending together different qualities of the same ingredient can be done in order to achieve specific results (e.g. more or less pungency, improved machinability, improve color). This cannot be considered adulteration either (see also Annex I).

Extraneous matter
Extraneous matter is defined as everything foreign to the product itself and includes, but is not restricted to: stones, dirt, wire, string, stems, sticks, nontoxic foreign seeds, excreta, manure and animal contamination. ASTA has established Cleanliness Specifications that set limits on these items. The ASTA Cleanliness Specifications were designed to meet or exceed the FDA's Defect Action Levels (DALs). These levels can normally be achieved through a combination of Good Agricultural Practice followed by thorough physical cleaning (Good Manufacturing Practice).

Spent, partially spent or exhausted material
Spent, partially spent or exhausted material is the by-product of essential oil or oleoresin production. By-products may have had a valuable constituent, such as color removed or have lost their intrinsic bioactive characteristics completely or partially depending on the extraction method applied.

Standardization
See Definition for 'Blending/Mixing'

Brokers
Companies that facilitate a transaction between a domestic or foreign supplier and a buyer. Responsibilities include negotiating contract terms and handling paperwork and other logistics if requested by either party.

Agents
Businesses that provide similar services as Brokers, typically through an exclusivity agreement representing a foreign seller.

Traders/Distributors
Businesses that take title of product for resale to others in the marketplace.

Additional References

Food Authenticity

The U.S. Pharmacopeial Convention (USP) Guidance on Food Fraud Mitigation:
http://www.usp.org/food/food-fraud-mitigation-guidance
The U.S. Pharmacopeial Convention (USP) Food Fraud Database
www.foodfraud.org

Food Safety and Labeling

ASTA Clean, Safe Spices Guidance
http://www.astaspice.org/food-safety/clean-safe-spices-guidance-document/
ASTA's HACCP Guide for Spices and Seasonings
http://fsl.nmsu.edu/documents/haccpguideforspicesseasonings2006-2.pdf
ASTA's Principles of Physical Cleaning Guide
http://www.astaspice.org/food-safety/principles-of-physical-cleaning-guide/
Food Allergen Labeling and Consumer Protection Act of 2004
http://www.fda.gov/Food/GuidanceRegulation/GuidanceDocumentsRegulatoryInformation/Allergens/ucm106187.htm

Good Agricultural and Manufacturing Practices

Codex Code of Hygiene Practices for Spices and Dried Aromatic Herbs CAC/RCP 42-1995
http://www.fao.org/fao-who-codexalimentarius/download/standards/27/CXP_042e_2014.pdf
ASTA Good Agricultural Practices Guide
http://www.astaspice.org/food-safety/good-agricultural-practices-guide-gap-guide/
ASTA's Good Manufacturing Practices Guide
http://www.astaspice.org/food-safety/good-manufacturing-practice-gmp-guidelines-for-spices/

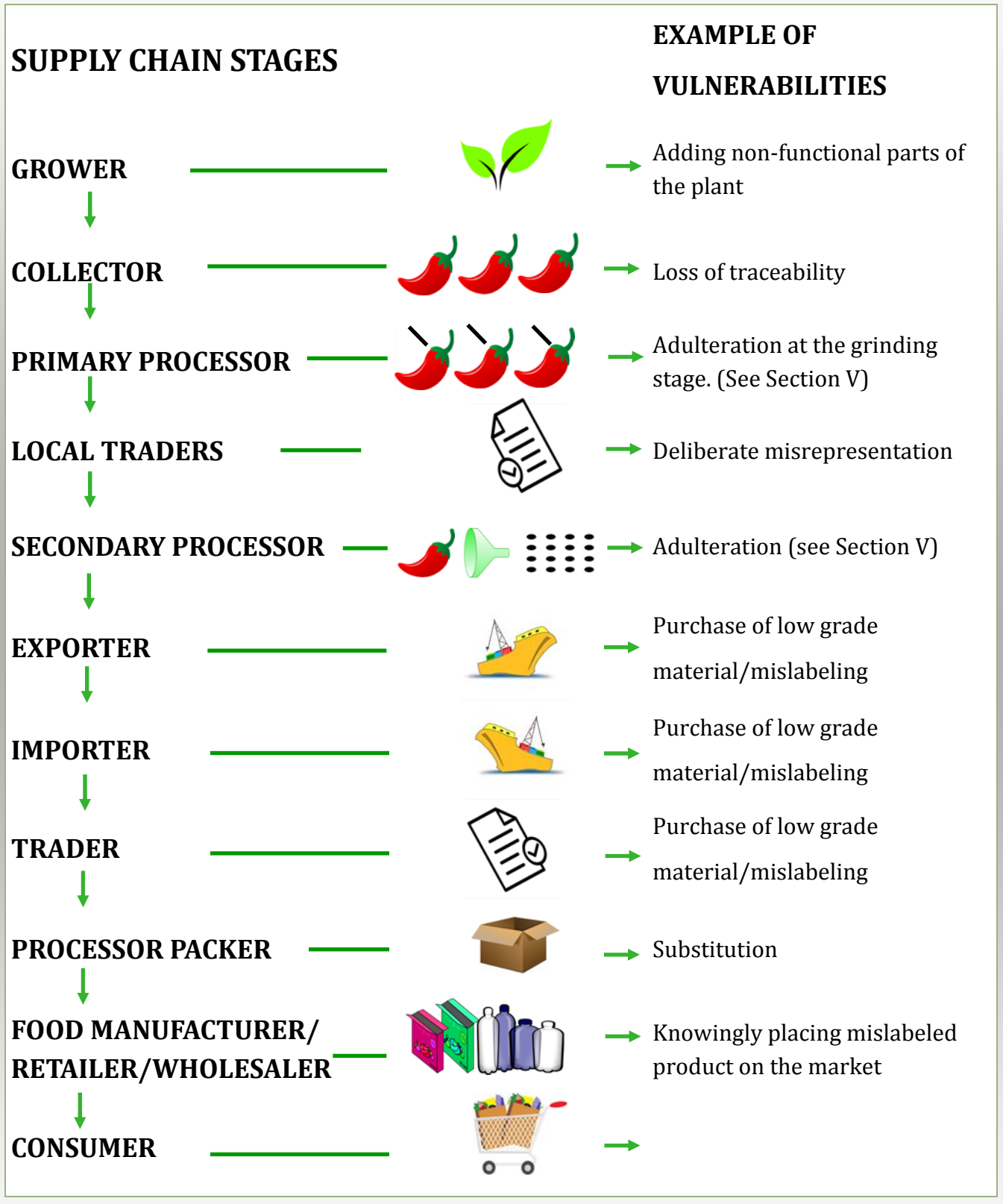
US Regulatory Compliance

Federal Food, Drug, and Cosmetic Act (FD&C Act)
http://www.fda.gov/RegulatoryInformation/Legislation/FederalFoodDrugandCosmeticActFDCAct/default.htm
Food Safety Modernization Act
http://www.fda.gov/Food/GuidanceRegulation/FSMA/

ANNEX I. The table sets types and methods of adulteration, including recommended controls. Please note where a product is adulterated with an allergen or non-food product, it becomes a food safety issue.

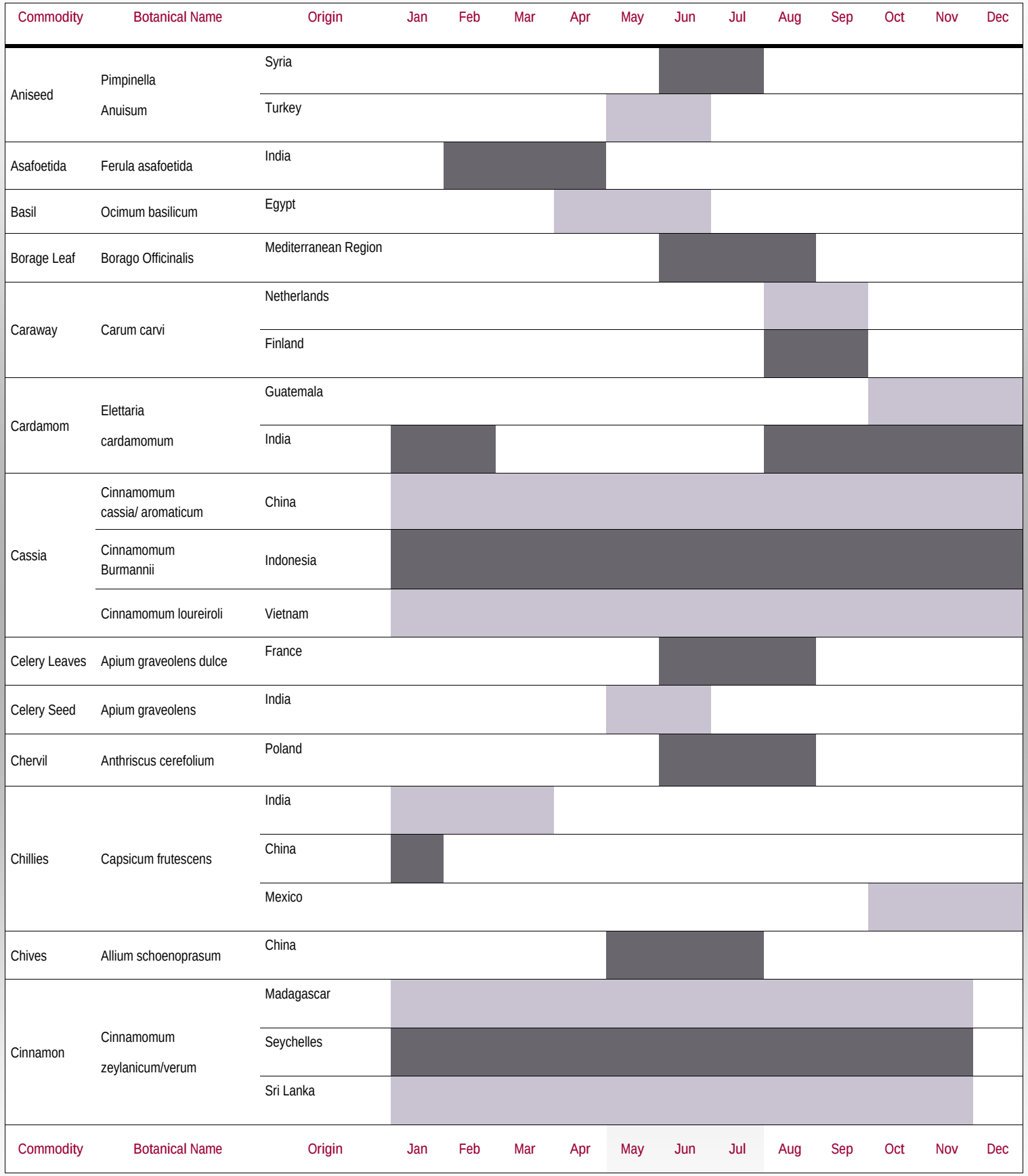
Types of Adulteration	Examples	Recommended Controls/ Methods
Extraneous matter from the same plant: Non-functional part of the plants, typically added at the grinding/blending stage	Sticks and stems in ground black pepper	Standard sanitation (macroscopic examination)
	Floral waste in saffron	ASTA Microscopic Identification of Spices (July 2003)
	Pomace added to capsicums	Microscopic ID
Extraneous matter from a different plant: Parts of other plants of similar appearance, typically added at the cutting/ grinding/blending stage	Sumac, cistus in oregano	ASTA Method 26.0
	Non compliant herbs, such as savory, thyme or marjoram in oregano	Microscopic ID
	Tomato skin added to capsicums	Lycopene
Exhausted (spent, defatted or depleted material): the undeclared addition of a by-product of essential oil, oleoresin and extrusion extraction at the grinding/blending stage	Spent pepper in ground black pepper	ASTA Methods 26.1 and 27.0
Color enhancement: Addition of non-permitted or undeclared color at the grinding/blending stage	Sudan Red and related dyes in capsicums	ASTA Method 28.0 and 29.0
	Artificial color added to saffron	TLC and HPLC
	Oleoresin turmeric added to ground turmeric	LCMS-MS/HPLC
Bulking: Addition of undeclared bulking agents at the grinding/ blending stage	Starch and Maltodextrins	ASTA Starch Method, Microscopic
	Buckwheat or millet seed added to ground black/white pepper	Microscopic ID
	Coffee husks added to cinnamon or nutmeg	Microscopic ID
	Peanut shells or peanut cake (waste product from peanut oil production) added to ground cumin	ELISA for detection of allergens
	Addition of grains	Gluten testing/ Microscopic ID
	Dextrose or other mono or di-saccharides added to capsicums	HPLC Carbohydrate Profile
	Hulls added to ground spice	Microscopic ID

ANNEX II. **Generic Supply Chain with Examples of Fraud Vulnerabilities.**

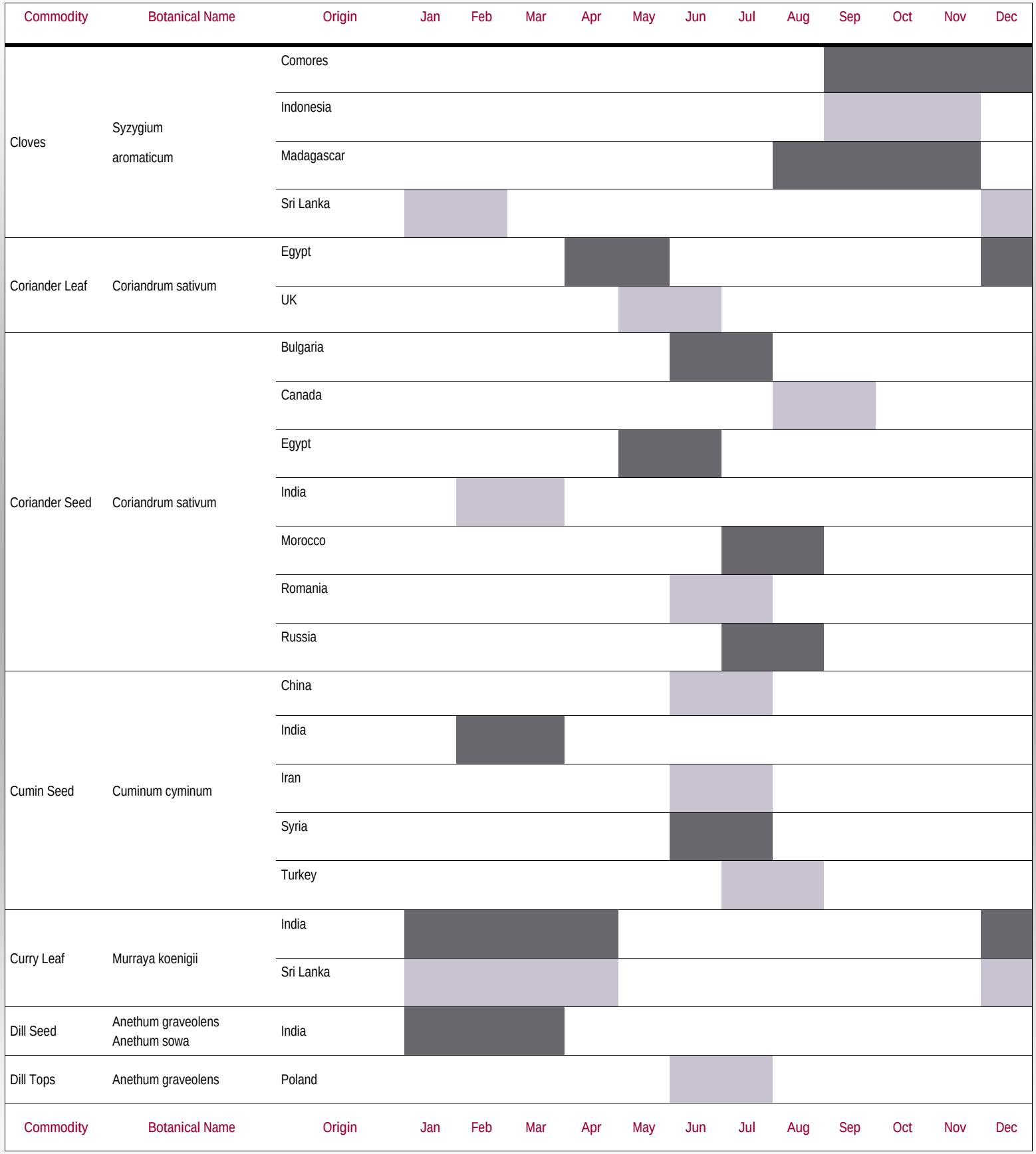


NB: Additional steps may take place during the supply chain e.g. blending. Consideration should also be given to typical food safety vulnerabilities which are not included in the diagram.

ANNEX III. Typical Harvest Charts (Major Products and Origins)



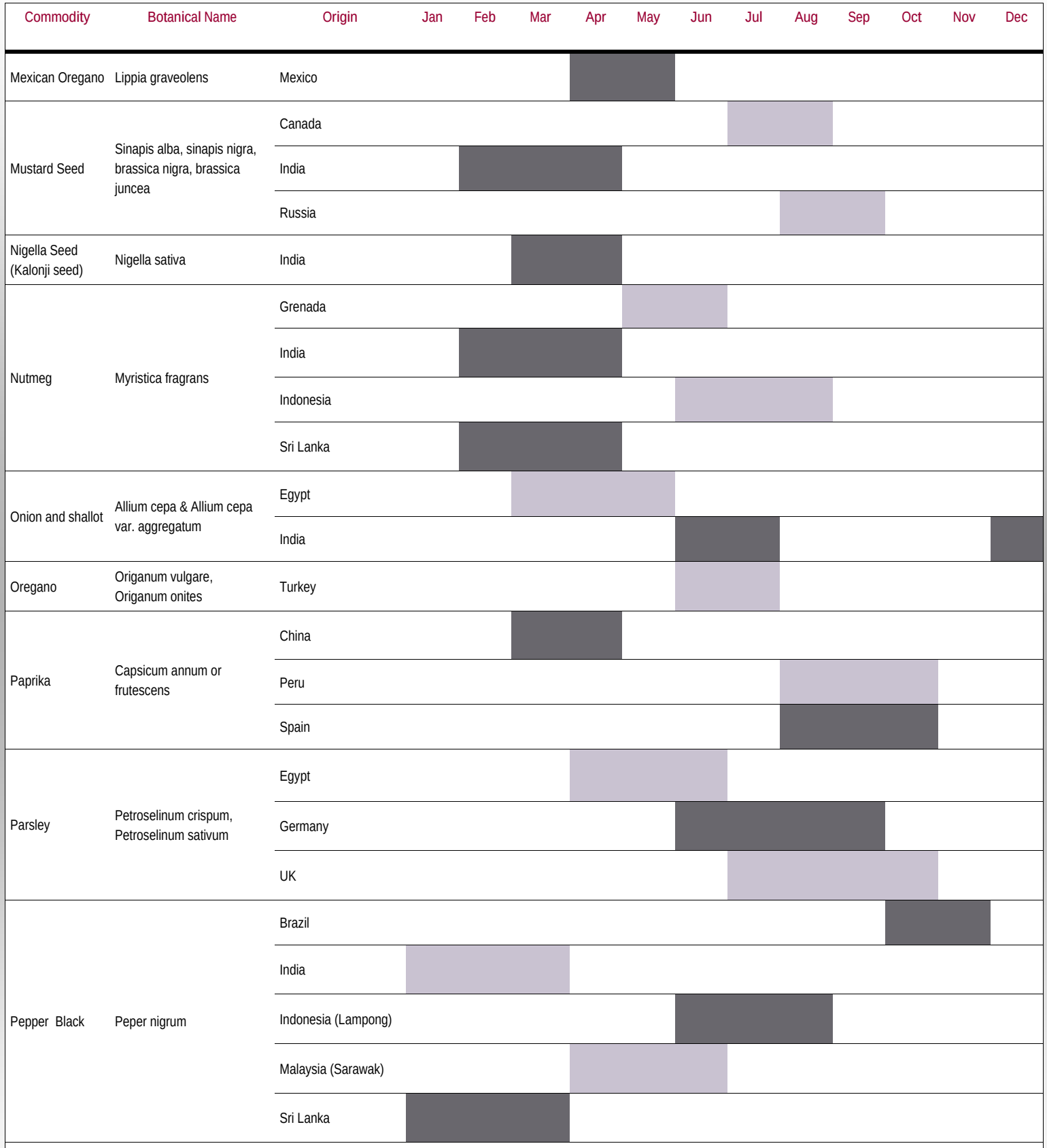
ANNEX III. Typical Harvest Charts (Major Products and Origins)



ANNEX III. Typical Harvest Charts (Major Products and Origins)

Commodity	Botanical Name	Origin	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Fennel Seed	Foeniculum vulgare	Egypt												
		India												
Fenugreek Seed	Trigonella foenum-graecum	Egypt												
		India												
Galangal	Alpina officinalis, Alpina officinarum, Keampferia galangel	Thailand												
Garlic	Allium sativum	China												
Ginger	Zingiber officinale	China												
		India												
		Nigeria												
Grains of Paradise	Aframomum melegueta	West Africa												
Juniper Berries	Juniperus communis	Italy												
		Macedonia												
Kaffir Lime Leaf	Citrus hystix	Thailand												
Laurel (Bay) Leaf	Laurus nobilis	Turkey												
Lavender Flower	Lavandula officinalis	UK												
Lavender Leaf	Lavandula officinalis	UK												
Lemongrass	Cymbopogon citrates	Thailand												
Lovage Leaf	Levisticum officinale	Poland												
Lovage Root	Levisticum officinale	Poland												
Mace	Myristica fragrans, Myristica argentea	Grenada												
		Indonesia												
Margoram	Marjorana hortensis, Syn. Origanum marjorana	Egypt												
Commodity	Botanical Name	Origin	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

ANNEX III. Typical Harvest Charts (Major Products and Origins)



ANNEX III. Typical Harvest Charts (Major Products and Origins)

Commodity	Botanical Name	Origin	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Pepper Black	Peper nigrum	Vietnam												
Pepper Green	Piper Nugrum	India												
Pepper Pink	Schinus terebinthifolius, Schinus molle	Brazil												
		Madagascar												
		Reunion Islands												
Pepper White	Piper Nigrum	China												
		Indonesia (Muntok)												
		Malaysia (Sarawak)												
		Vietnam												
Pepper Cubeb, Java Pepper	Piper cubeba L.	Indonesia												
Peppermint	Mentha peperita	Egypt												
Pimento (Allspice)	Pimenta dioica	Guatemala												
		Honduras												
		Jamaica												
		Mexico												
Rosemary	Rosmarinus officinalis	Morocco												
		Spain												
		Turkey												
Saffron	Crocus sativus	Iran												
		Spain												
Sage	Salvia officinalis, Salvia triloba	Turkey												
Sumac	Rhus coriaria	Turkey												
Commodity	Botanical Name	Origin	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

ANNEX III. Typical Harvest Charts (Major Products and Origins)

Commodity	Botanical Name	Origin	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Savory Summer	Satureja montana	Albania												
Savory Winter	Satureja hortensis	Albania												
Szechuan Pepper	Zanthoxylum peperitum	China												
Spearmint	Mentha spicata	Egypt												
Star Anise	Illicium verum	China												
		Vietnam												
Tarragon	Artemisia dracunculus	France												
Thyme	Thymus vulgaris, Thymus zygis, Thymus serpyllum	Morocco												
		Spain												
Turmeric	Curcuma longa	Ethiopia												
		India												
		Indonesia												
		Myanmar												
		Vietnam												
Vanilla	Vanilla planifolia, Vanilla tahitensis	Madagascar												
Commodity	Botanical Name	Origin	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec

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