Standard microbiological specifications for the flavour industry

Flavours are common ingredients in numerous foods. Even if they are used in small amounts, they are important ingredients of the recipes for food stuffs. Therefore, flavours have to comply with the analytical, sensorial and in particular the microbiological requirements of these foods. At the same time, their composition and structure are as varied as the products for which they are used.

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Flavours can be liquids, pastes or powders. Therefore, several technologies are used for their production. These include simple blending, complicated drying technologies, biotechnological methods, encapsulation, extrusion, or extraction/distillation. This complexity and variety in production processes and formulations is even increased by the raw materials used. The range of ingredients extends from micro-inhibiting essential oils to materials which can be heavily contaminated by micro-organisms such as herbs and spices.

Flavours and their raw materials do show therefore a wide range of micro-organism species and of micro-organism content as a function of production technologies and types of raw materials. Of course, a high level of hygiene in the supply chain is required including the application of GMP, prerequisite requirements and HACCP systems. It must be ensured that no unexpected micro-organisms contamination occurs during the handling of materials. In order to give all parties associated with handling flavours, for example purchasing, development, sales along with our suppliers and customers, a good understanding of microbiological risk, Symrise implemented a simple numbering system with microbiological risk groups.

High sample throughput in a laminar flow.

### RISK GROUP 9 = VERY LOW RISK: No microbiological testing required

Based on the product formulation, the raw materials used and/or the production process, the following product groups do not contain a risk of a microbiological contamination and hence considered as safe without testing:

**Powder flavours/flavour raw materials:**
- Blended products with the carrier salt ≥90% and raw materials from risk group 9 (for example plated spice oleoresins or spice extracts or flavours made from flavours chemicals).
- Extruded (melted) flavours.

**Liquid flavours/flavour raw materials:**
- Liquid flavours or flavour raw materials with Ethanol ≥20%.
- Liquid flavours or flavour raw materials with Propylene glycol ≥30%.
- Liquid flavours or flavour raw materials with an aW-value <0.6 (solvents, flavour chemicals, oleoresins, distilled raw materials, extracts, macerates).
- Products heated at a minimum of 90°C for 10 minutes or a minimum of 80°C for 30 minutes (heated oil extracts, high temperature distillates, smoke condensate, onion fried extracts).
- Reaction flavours heated at a minimum of 90°C for 10 minutes.
- Multi concentrated oils.
- Oils from vegetable origin.

*Flavours containing or made from microbiologically sensitive ingredients (for example vanilla beans) are individually assessed whether micro testing is required.

**Solutions and bases:**
- Solutions of preservatives.
- Solutions of vitamins with preservatives.
- Cola-beverage bases, preserved with Benzoate, Phosphoric Acid (75% strength) >13%.
- Beverage bases, sugar- and sweetener free with the main component citric acid (50% strength) >35%.

Synthesised and single chemical materials with an aW-value <0.6.

It is possible to also categorise other products in risk group 9, if scientific evidence or other reasons are published and the reasons for the categorisation are documented. A microbiological check is only necessary by way of exception.

The numbering scheme goes from risk group 9, which is equivalent to a very low risk (which, in reverse, is a high level of safety) down to risk group 1 representing a high microbiological risk or respectively sensitive regarding the safety.

The risk groups are recorded in the Symrise internal EDP system SAP. They can be used both for flavour raw materials and in the context of a whole formula. It goes without saying that the microbiological risk groups for flavours do not substitute mandatory specifications with individually agreed methods and limits.

### Stability

Predominantly, flavours have to be classified as microbiologically safe. Under correct storage conditions and within the shelf life, appreciable micro-growth should not be expected. This can be deduced from the following criteria.

- **Liquid flavours** frequently contain high fractions of solvents like Ethanol, Glycols, Di- and Triacetin or edible oil and acids. They often additionally contain ingredients with inhibitory properties.
- Water-based flavours (like fruit juice concentrates, emulsions) are stable because of low pH values and/or added preservatives.
- Pasty flavours are often run through heating steps for concentration or for flavour building. Because of their low water content
Blended products made from uncritical carriers and flavours/flavour raw materials from risk group 9, 6 or 4.
- Microencapsulated products (spray dried or fluidised bed granulation or vacuum dried) made from uncritical carriers and flavours/flavour raw materials from risk group 9, 6 or 4 with or without Gum Arabic as a carrier.
- Spices/herbs/vegetable/fruit powders with Ethylenoxid treatment (in countries where permitted). The results of Total Plate Count testing should provide an indication of the initial microbiological loading.
- Flavours/flavour raw materials with heat treatment step as part of the production/processing steps.
  - Vegetable/fruit powders including a pasteurisation step additionally to the drying process.

Liquid flavours/flavour raw materials
- Flavours/flavour raw materials with pasteurisation step.
  - vegetable/fruit extracts.
  - Vegetable/fruit juice concentrates
  - Processed dairy products.
  - Enzyme modified dairy flavours in which the milk, cheeses and the final product has undergone a pasteurisation step meeting the specific country’s legislation.

Meat and fish products
- Dry and cooked meat products and fish products derived from meat/fish.
- Liquid and dry meat products and fish products derived from broth including a pasteurisation step.

For flavours/flavour raw materials that may be only a source of spoilage organisms (but not pathogens) additional testing of indicator organisms and/or spoilage organisms is required (for example spore formers, coliforms, enterobacteriaceae, yeasts, moulds, lactic acid bacteria, etc).

**Risk groups**

For risk group 9 raw materials and products microbiological contamination is not expected. Therefore the corresponding tests can be skipped.

This risk group 9 has pre-existed at Symrise for many years. Risk groups 6, 4, and 1 are newly defined.

**Risk Group 6 = Low Risk:** No risk for spoilage organisms and pathogens

Flavours/flavour raw materials with low microbiological risk regarding their composition and/or production process or treatment leaving no risk for spoilage organisms and pathogens:

**Powder Flavours/Flavour Raw Materials**
- Blended products made from uncritical carriers and flavours/flavour raw materials from risk group 9 or 6.
- Microencapsulated products (spray dried or fluidised bed granulation or vacuum dried) made from uncritical carriers and flavours/flavour raw materials from risk group 9 or 6.
- Highly processed products:
  - Maltreated, lactose, dextrin, less processed starches (potato starch).
  - Roasted flavours.
  - Yeast with sterilisation step*.
  - Irradiated spices and vegetable powders (in countries where legally permitted).

**Liquid Flavours/Flavour Raw Materials**
- Sensitive ingredients with validated kill-step or proven effective reduction with regular effectiveness tests.
  - HVPs with hydrolysis and pasteurisation steps*.
  - Molasses and molasses powders with pasteurisation steps.
  - Heated products heated at a minimum of 80°C for 10 minutes, 60°C for 30 minutes.
  - Reaction flavours heated at a minimum of 60°C for 30 minutes.

*Due to the experience with raw materials like yeast extracts and HVP a reclassification to RG 4 might be appropriate.

**Summary**

Flavours do have an enormous variety in terms of composition, characteristics and applicability.

This correlates to the potential for microbiological contamination. The implementation of a few risk groups provides an easy and comprehensible system for microbiological risk assessment. The introduced risk management tool ensures microbiological safety as an integral part of our food safety initiative in a transparent and traceable manner.

**Risk Group 4 = Medium Risk:** Risk for spoilage organisms and/or pathogens

Sensitive ingredients without a kill-step (for example materials might have some sort of micro-organism reduction during the processing).

**Powder Flavours/Flavour Raw Materials**
- Blended products made from raw materials mainly correlated to risk group 1.
- Microencapsulated products (spray dried or fluidised bed granulation or vacuum dried) made from raw materials mainly correlated to risk group 1.
- Herbs, spices without validated steam treatment or pasteurisation.
- Seeds without steam treatment or pasteurisation (sesame).
- Spices/herbs/vegetable/fruit powders with Ethylenoxid treatment (in countries where permitted). The results of Total Plate Count testing should provide an indication of the initial microbiological loading.
- Flavours/flavour raw materials with heat treatment step as part of the production/processing steps.
  - Vegetable/fruit powders including a pasteurisation step additionally to the drying process.

**Liquid Flavours/Flavour Raw Materials**
- Flavours/flavour raw materials with pasteurisation step.
  - vegetable/fruit extracts.
  - Vegetable/fruit juice concentrates
  - Processed dairy products.
  - Enzyme modified dairy flavours in which the milk, cheeses and the final product has undergone a pasteurisation step meeting the specific country’s legislation.

**Meat and Fish Products**
- Dry and cooked meat products and fish products derived from meat/fish.
- Liquid and dry meat products and fish products derived from broth including a pasteurisation step.

For flavours/flavour raw materials that may be only a source of spoilage organisms (but not pathogens) additional testing of indicator organisms and/or spoilage organisms is required (for example spore formers, coliforms, enterobacteriaceae, yeasts, moulds, lactic acid bacteria, etc).

**Exception:**

Flavour raw materials and intermediate products intended only for processing with a kill-step (for example herbs for extraction) can be used without micro testing. Analytical tests should be enough for evaluation of this specific group. Sensory tests should be used after a risk assessment only.

Wherever necessary the testing (especially for pathogens) for specific products based on a risk analysis can be totally or partly transferred to the raw materials or an intermediate level.

This would increase the detection limit of the pathogen testing because critical raw materials are not “diluted” by low-germ raw materials at this step. For example, if a spice (Risk Group 1) is used in a seasoning only (Risk Group 1 either then) it may be possible to determine (after a risk assessment), that only the raw material is tested for pathogens intensively and not the seasoning.

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**Risk Group 1 = High Risk:** Risk for spoilage organisms and/or pathogens

Sensitive ingredients without a kill-step for specific materials might have some sort of micro-organism reduction during the production.

**Powder Flavours/Flavour Raw Materials**
- Blended products made from raw materials mainly correlated to risk group 1.
- Microencapsulated products (spray dried or fluidised bed granulation or vacuum dried) made from raw materials mainly correlated to risk group 1.
- Herbs, spices without validated steam treatment or pasteurisation.
- Seeds without steam treatment or pasteurisation (sesame).
- Gum Arabic.
- Raw meat products and fish products.

Testing of pathogens (for example salmonella, Listeria monocytogenes, etc) and indicator organisms and/or spoilage organisms is required (for example spore formers, coliforms, enterobacteriaceae, yeasts, moulds, lactic acid bacteria, etc).

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*Due to the experience with raw materials like yeast extracts and HVP a reclassification to RG 4 might be appropriate.*

Only Total Plate Count will be tested for monitoring reasons.