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Flavoractiv
Structuring Sensory Practices for Excellence in Gin Quality & Innovation
Gin – a widely consumed distilled beverage

Available in different styles of Gin

with predominant taste of juniper berries
Neutrality of base for spirit

• Regardless of style, neutrality of base spirit in Gin is extremely important

• Off-notes from impurities and/or contamination cause adverse effect on aroma & flavour profile

• Consistency and shelf life stability influence the sensory quality of final products
Grain Neutral Spirit (GNS) or Extra Neutral Alcohol (ENA)

- High-purity potable ethanol (96 % ABV) from agricultural crops
- Base for Gin, premium vodka & several speciality spirits
- Neutral smell and taste and identification & removal of negligible impurities (congeners) are critical
- Despite multiple distillations traces of congeners cause unacceptable odours
Why Purity of Neutral Alcohol

• Any off note from impurities/contamination adversely affects
  • Gin sensory quality
  • Gin Aroma & flavour profile
  • Consistency and stability
  • Effect on post-consumption well-being (Taste, Hangover, Toxicity)

• Neutral spirits can exhibit objectionable off notes beyond Method Detection Limit of analytical instruments but fall within sensory threshold of panellists

• Structured sensory panellists training and regular proficiency calibration enhances trustworthiness of sensory quality decisions
# Typical off notes in Neutral Alcohol Affecting Gin Sensory Quality

<table>
<thead>
<tr>
<th>Off-Notes</th>
<th>Associated Terms</th>
<th>Origins</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetaldehyde</td>
<td>Green Apple Skin, Leafy,</td>
<td>Fermentation., Co-distilled with alcohol. Also formed on long storage /</td>
</tr>
<tr>
<td></td>
<td>Grassy, Cardboard, Oxidised</td>
<td>transportation due to oxidation</td>
</tr>
<tr>
<td>Diacetyl</td>
<td>Buttery, Butterscotch, Creamy,</td>
<td>By citrate-metabolising lactic acid bacteria and decarboxylation of a-</td>
</tr>
<tr>
<td></td>
<td>Toffee</td>
<td>acetolactic acid during fermentation</td>
</tr>
<tr>
<td>DMS</td>
<td>Sweet corn, Cooked Cabbage,</td>
<td>DMS Sweet corn, Cooked Cabbage, Tomato, Shellfish, Oyster-like</td>
</tr>
<tr>
<td></td>
<td>Tomato, Shellfish, Oyster-like</td>
<td>By products from biosynthesis of sulphur containing amino acids and from</td>
</tr>
<tr>
<td></td>
<td></td>
<td>the reduction of sulphate salts in wort. Infection due to poor sanitation</td>
</tr>
<tr>
<td>H₂S Sulphury</td>
<td>Rotten Eggs</td>
<td></td>
</tr>
<tr>
<td>Mercaptan</td>
<td>Sulphury, Drain Gas, Butan-like</td>
<td></td>
</tr>
<tr>
<td>Iso Amyl Alcohol, Higher Alcohols /</td>
<td>Impure Spirits, Fruity, Banana</td>
<td>Formed by yeast during fermentation by amino acid deamination and</td>
</tr>
<tr>
<td>Fusel Oils</td>
<td></td>
<td>decarboxylation</td>
</tr>
<tr>
<td>Ethyl Acetate</td>
<td>Fruity, Nail Enamel, Solvent,</td>
<td>Formed during primary fermentation by enzymatic chemical condensation of</td>
</tr>
<tr>
<td></td>
<td>Acetone, Paint, Glue</td>
<td>organic acids and alcohols.</td>
</tr>
<tr>
<td>Isoamyl Acetate</td>
<td>Fruity, Banana</td>
<td></td>
</tr>
<tr>
<td>4-Ethyl Phenol Brettanomyces</td>
<td>Band-aid, Medicinal / Barnyard,</td>
<td>Decarboxylation of p-coumaric acid from grain by yeasts and bacteria</td>
</tr>
<tr>
<td>contamination</td>
<td>Sweaty Horses</td>
<td></td>
</tr>
<tr>
<td>Plastic</td>
<td>Styrene, Acrylic, Solvent</td>
<td>Storage in recycled plastic containers</td>
</tr>
</tbody>
</table>
# Sensory Analysis vs. GC Analysis Data of Neutral Alcohol

<table>
<thead>
<tr>
<th>Neutral Spirits Samples</th>
<th>Strength %</th>
<th>Ester g/100LAA</th>
<th>Acetaldehyde g/100LAA</th>
<th>Higher alcohol / Fusel Oil g/100LAA</th>
<th>Diacetyl, ppm</th>
<th>2,3 Pentanedione ppm</th>
<th>Methanol g/100LAA</th>
<th>Sensory Description, Off- Notes</th>
<th>Sensory Score 0-10 Scale</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>NS 1 Grain</td>
<td>95.9</td>
<td>ND</td>
<td>ND</td>
<td>0.1</td>
<td>ND</td>
<td>ND</td>
<td>1.5</td>
<td>Diacetyl</td>
<td>5.0</td>
<td>GC - OK Sensory - Not OK</td>
</tr>
<tr>
<td>NS 2 Grain</td>
<td>96.4</td>
<td>ND</td>
<td>ND</td>
<td>ND</td>
<td>ND</td>
<td>ND</td>
<td>0.2</td>
<td>Sulphury</td>
<td>5.0</td>
<td>GC - OK Sensory - Not OK</td>
</tr>
<tr>
<td>NS 3 Grain</td>
<td>96.5</td>
<td>ND</td>
<td>ND</td>
<td>ND</td>
<td>ND</td>
<td>ND</td>
<td>2.5</td>
<td>Fusel/Impure Spirit</td>
<td>4.6</td>
<td>GC - OK Sensory - Not OK</td>
</tr>
<tr>
<td>NS 4 Grain</td>
<td>95.8</td>
<td>ND</td>
<td>ND</td>
<td>ND</td>
<td>ND</td>
<td>ND</td>
<td>0.8</td>
<td>Papery /Oxidised</td>
<td>5.2</td>
<td>GC - OK Sensory - Not OK</td>
</tr>
<tr>
<td>NS 5 Grain</td>
<td>96.1</td>
<td>ND</td>
<td>ND</td>
<td>ND</td>
<td>ND</td>
<td>ND</td>
<td>1.1</td>
<td>Kerosene</td>
<td>4.0</td>
<td>GC - OK Sensory - Not OK</td>
</tr>
</tbody>
</table>

g/100LAA (gram per 100 litres Absolute Alcohol)

Neutral spirits can exhibit objectionable off notes beyond MDL of analytical instruments but fall within sensory threshold of panellists.
The Nose & Mouth are connected. Molecules released into the air inside our mouths as we chew and swallow travel up through the retronasal passage into the nose, then move up and contact the olfactory epithelium.

Flavour is the combination of true taste (sweet, salty, sour, bitter) and retronasal olfaction and mouthfeel.
Structured Training in developing sensory skills

- Basic Training: e.g. plant level
- Intermediate Training: e.g. bigger plant level
- Advanced Training: e.g. regional or corporate panels
- Expert Training: e.g. innovation

- Detection
- Recognition & Identification
- Scaling
- Quality Ratings / Brand Specifications
- Detailed Profiling / True to Type

Level of training vs. Sensory Skills
**Sensory Methods & Procedures**

**Analytical (Objective) - Product Oriented**
- Quality /quantity of a Characteristic
- Similarity /Differences between products
- Standardisation
- Fewer People, selected, trained

**Affective (subjective) - People /Consumer Oriented**
- Acceptance/preference of a product
- First impressions
- Personal reaction
- Larger number of panellists, representative of population

**Discriminative**
- Descriptive

**Hedonic (Liking)**
- Acceptability
- Preference
Sensory Evaluation Methods

ANALYTICAL SENSORY ANALYSIS

- Sensitivity
  - Threshold
  - Discrimination (Difference)
    - Duo-trio
    - Triangle

- Quantitative
  - Scaling
    - Ranking
    - Interval
  - Duration
    - Time-Intensity (TI)
    - Temporal Dominance of Sensations (TDS)

- Qualitative
  - Descriptive Analysis
Sensory Evaluation Methods for Neutral Spirits

• Scoring (Ratio Scale 0 -10)

• Threshold or Sensitivity Tests

• Difference Tests
  • Duo Trio, Triangle, Tetrad etc.
  • Difference from Control (DFC)
  • An adaptation of Degree of Difference test
  • Developed to deal with batch to batch variations.
  • A discrimination sensory test with an identified control
  • Evaluation by perceived difference from control
  • Scale range from “Not Different” to “Extremely Different”
<table>
<thead>
<tr>
<th>GMP Flavours For Sensory Panel Training &amp; Proficiency Calibration</th>
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<tbody>
<tr>
<td><strong>Acetaldehyde</strong></td>
</tr>
<tr>
<td>Pungent, Solvent, Green Apple Skin, Leafy, Grassy, Cardboard</td>
</tr>
<tr>
<td><strong>Butyric</strong></td>
</tr>
<tr>
<td>Baby Vomit, Rancid, Cheesy, Putrid</td>
</tr>
<tr>
<td><strong>Brett-Barnyard</strong></td>
</tr>
<tr>
<td>Band-aid, Medicinal, Sweaty Horses</td>
</tr>
<tr>
<td><strong>Diacetyl</strong></td>
</tr>
<tr>
<td>Buttery, Butterscotch, Creamy, Toffee</td>
</tr>
<tr>
<td><strong>DMS</strong></td>
</tr>
<tr>
<td>Sweetcorn, Cooked Cabbage, Tomato, Shellfish, Oyster-like</td>
</tr>
<tr>
<td><strong>Dry Hay / Plastic</strong></td>
</tr>
<tr>
<td>Hay-like, Straw, Husky</td>
</tr>
</tbody>
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Proficiency / Validation – why?

• To demonstrate the reliability of tasters, and therefore of the sensory quality system

• To allow initiation of corrective actions; refresher training / focussed training, removal from the panel, etc.

• To assure that you are measuring what you think you are measuring

• Monitor trends in sensory assessments over time

• Monitor individual capabilities as part of the training programme

• Demonstrate competence to third parties such as accreditation bodies or customers

Validated trained panel = Calibrated Instruments (Objective Results)

Ultimately Improve Quality, Taste and Consistency of your global brands
Sensory Proficiency & Validation

Produced to GMP Quality Standards

Colour coded format for easy use

Provided in Pharmaceutical blister packs – protected from air and moisture and easy to use

Documentation and labels provided

Test to results takes 30 mins
Method of Proficiency Assessment?

- Measures & Calibrate sensory skills of spirit assessors
- Gives a common language of typical off-notes in NS
- Ultimately improves quality of the produced NS & NS based spirits beverages
Sensory Proficiency Scheme – Methods of Validation

Flavour Identification Validation:
  • Individual flavour identification using standard terminology

Rank Rating Validation:
  • Discrimination of different flavour intensities and scale them accordingly

In Profile Validation:
  • Primary focus on IN or OUT / meeting the brand’s sensory profile – used by spirits customers
Assuring Value from best sensory practices
Summary

Off-notes and taints are detrimental to gin.

Combine analytical results with those of a trained and validated
tasting panel to prevent off-note or taint exposure to the public.

Train with GMP Flavour Standards, maintain with taster proficiency.
Any Questions?