REQUEST FOR COMMENTS AND INFORMATION

The 23rd Session of the Codex Alimentarius Commission approved that a meeting of the Codex Committee on Sugars should be convened to discuss the completion of the Revised Standard for Honey hosted by the United Kingdom. A new Draft Revised Standard for Honey has been prepared by the Government of the United Kingdom. Government and interested international organizations wishing to submit comments on the proposed amendments to the Draft Revised Standard for Honey are invited to do so no later than 17 December 1999 as follows: Mr. Grant Meekings, Food Labelling and Standards Division, Joint Food Safety and Standards Group, Ministry of Agriculture, Fisheries and Food, Room 322, Ergon House, 17, Smith Square, London SW1P 3JR, United Kingdom (Fax: +44 171 238 6763; E-mail: g.meekings@fssg.maff.gov.uk, with a copy to the Chief, Joint FAO/WHO Food Standards Programme, FAO, Via delle Terme di Caracalla, 00100 Rome, Italy.

INTRODUCTION

1. The 21st Session of the Codex Alimentarius Commission decided that the draft Revised Standard for Honey should be elaborated through correspondence by the Government of the United Kingdom, Host Government of the Codex Committee on Sugars (CCS) which had been adjourned sine die since 1974. The draft Revised Standard for Honey was submitted to the Codex Alimentarius Commission at its 22nd Session at Step 8. The Commission agreed that the draft revised Standard issued as ALINORM 97/27 should be returned to Step 6 for further consideration.

2. In response to a circular letter (CL 1998/12-S) interested governments and organizations submitted comments at Step 6 which contained proposals for substantial changes. The 23rd Session of the Codex Alimentarius Commission noted with approval that a meeting of the Codex Committee on Sugars would be convened to discuss the completion of the Revised Standard for Honey. The Committee is invited to establish, on the basis of the new Draft Revised Standard for Honey (Appendix 1) prepared by the Host Government an agreed text for adoption by the Codex Alimentarius Commission.
3. The Draft Revised Standard on Honey has taken note of comments made in response to CL 1998/12-S. Comments were received from Argentina, Brazil, Cuba, Canada, France, Italy, Mexico, Norway, Poland, Portugal, South Africa, Spain, Switzerland, USA and Apimondia, and are detailed in Appendix 2. The main changes in the revised standard are indicated in italics in the text.

General
4. A number of comments were received in relation to the Annex regarding the need to replace the current methods of analysis for sections 2.2.1 and 2.2.4 and hence the values of components determined by these methods in sections 1.1 and 1.3 with methods used routinely by honey producers and processors worldwide. In particular the use of chromatographic methods to determine individual sugars such as fructose, glucose and sucrose have been suggested to replace the less specific determination of apparent sucrose and apparent reducing sugar content. An alternative to the determination of the mineral ash content has also been suggested which involves the more modern and speedier approach of determining electrical conductivity. Three options are therefore available: the standard could retain the current old and unspecific methods, replace these entirely by the more modern specific methods or include both the current unspecific methods with new methods also listed as alternatives allowing those who wish, to continue using the old methods.

Scope
5. The scope has not been changed. Clarification that it does not cover industrial honey and honey used as an ingredient in compound foods has been made. This is because the decision on whether honey is used as a food ingredient may be made at the point of use rather than at the point of production, and therefore is not an issue in world trade.

Essential composition and quality factors
6. The issue of filtration of honey is a difficult one as practices vary from one country to another. The comments received on informing the consumer that honey had been fine filtered to clarify it, raised the need to specify a mesh size. This may be one way forward. However, a requirement in section 3.1 has been re-introduced to permit filtration only where it is carried out in order to ensure that the honey is free from foreign inorganic and organic matter. There is still the safeguard in section 6.1.5 that honeys of specific floral origin must have the “microscopic” properties corresponding to that origin remains and must have the pollen of that floral source present.

7. As a result of comments received, the moisture content has been reduced from 21% to 20% for all honeys except heather and clover. The moisture content for clover honey has been reduced from 23% to 21%.

Contaminants
8. The current Standard does not set levels to cover contaminants in honey. The proposed revised draft Standard contains the standard wording relating to heavy metals and pesticide residues which has been agreed for inclusion in all Codex Standards. Levels of contaminants in honey should be addressed on a horizontal basis by the Codex Committee on Food Additives and Contaminants (CCFAC), who will advise on appropriate and achievable levels in consultation with the Codex Committee on Sugars.

1 Appendix 1 of this document
Methods of Analysis and Sampling

9. Some amendments have been made to the references to analytical methods to update them in line with decisions made at the Codex Committee on Methods of Analysis and Sampling (CCMAS) in November 1998.

Hydroxymethylfurfural (HMF)

10. The advisory level for HMF continues to be a contentious issue, and opinion is still divided reflecting practices and market situations in individual countries. The level of HMF in honey is time and temperature dependent. A large number of countries have requested that the limit be changed from 80mg/kg in the existing Standard to 40mg/kg. However, equally there are also other countries who are opposed to any reduction in the HMF level arguing that this could create a technical barrier to world trade for honey produced in countries with high ambient temperatures. The level of 80 mg/kg has therefore been retained in the standard but within square brackets. However, two alternative proposals have been suggested in a footnote.
The Annex to this Standard is intended for voluntary application by commercial partners and not for application by Governments.

1. SCOPE

1.1 This Standard applies to all honeys produced by honey bees and covers all styles of honey presentations which are processed and ultimately intended for direct consumption. It does not cover industrial honey or honey used as an ingredient in other foods.

1.2 The Standard also covers honey which is packed for sale in bulk containers, which is intended for repacking into retail packs.

2. DESCRIPTION

2.1 Definition

Honey is the natural sweet substance produced by honey bees from the nectar of plants or from secretions of living parts of plants or excretions of plant sucking insects on the living parts of plants, which honey bees collect, transform by combining with specific substances of their own, deposit, dehydrate, store and leave in the honey comb to ripen and mature.

2.1.1 Blossom Honey or Nectar Honey is the honey which comes from nectars of plants.

2.1.2 Honeydew Honey is the honey which comes mainly from excretions of plant sucking insects (Hemiptera) on the living parts of plants or secretions of living parts of plants.

2.2 Description

Honey consists essentially of different sugars, predominantly fructose and glucose as well as other substances such as organic acids, enzymes and solid particles derived from honey collection. The colour of honey varies from nearly colourless to dark brown. The consistency can be fluid, viscous or partly to entirely crystallised. The flavour and aroma vary, but are derived from the plant origin.

3. ESSENTIAL COMPOSITION AND QUALITY FACTORS

3.1 Honey sold as such shall not have added to it any food ingredient, including food additives, or any other substance foreign to honey. Honey shall not have any objectionable matter, flavour, aroma, or taint absorbed from foreign matter during its processing and storage. The honey shall not have begun to ferment or effervesce. No pollen or constituent particular to honey may be removed except where this is unavoidable in ensuring freedom from foreign inorganic or organic matter.

3.2 Honey shall not be heated or processed to such an extent that its essential composition is changed and/or its quality is impaired.

3.3 Chemical or biochemical treatments shall not be used to influence honey crystallisation.

3.4 Moisture Content

(a) Honeys not listed below - not more than 20%
(b) Heather honey (Calluna) - not more than 23%
(c) Clover honey (*Trifolium*) - not more than 21%

4. CONTAMINANTS

4.1 Heavy Metals

Honey shall be free from heavy metals in amounts which may represent a hazard to human health. *The products covered by this Standard shall comply with those maximum levels for heavy metals established by the Codex Alimentarius Commission.*

4.2 Pesticide Residues

The products covered by this standard shall comply with those maximum residue limits for honey established by the Codex Alimentarius Commission.

5. HYGIENE

5.1 It is recommended that the products covered by the provisions of this standard be prepared and handled in accordance with the appropriate sections of the Recommended International Code of Practice - General Principles of Food Hygiene recommended by the Codex Alimentarius Commission (CAC/RCP 1-1969, Rev 3-1997), and other relevant Codex texts such as Codes of Hygienic Practice and Codes of Practice.

5.2 *The products should comply with any microbiological criteria established in accordance with the Principles for the Establishment and Application of Microbiological Criteria for Foods (CAC/GL 21-1997).*

5.3 To the extent possible in good manufacturing practice, the honey when sold as such shall be free from objectionable organic and inorganic matter. *Honey in bulk containers receives a further removal of objectionable matter such as insects, insect debris, brood and grains of sand before packaging in retail containers.*

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2 *These levels will be established in consultation with the CCS and CCFAC as soon as possible.*

3 *The Codex Committee on Methods of Analysis and Sampling (CMAS) requested that the CCS should provide a quantitative provision for arsenic, copper and lead rather than “free from As, Cu or Pb.”*

4 *Subject to endorsement by Codex Committee on Food Hygiene (CCFH).*
6. **LABELLING**

In addition to the provisions of the General Standard for the Labelling of Pre-packaged Foods (CODEX STAN 1-1985, *Rev 2-1999*), the following specific provisions apply:

**6.1 The Name of the Food**

6.1.1 Products conforming to the standard shall be designated 'honey'.

6.1.2 For products described in 2.1.1 the name of the food may be supplemented by the term “blossom” or “nectar”.

6.1.3 For products described in 2.1.2 the name of the food shall be in close proximity to the word “honeydew”.

6.1.4 Honey may be designated by the name of the geographical or topographical region if the honey was produced exclusively within the area referred to in the designation.

6.1.5 Honey may be designated according to floral or plant source if it comes wholly or mainly from that particular source and has the organoleptic, physicochemical and microscopic properties corresponding with that origin.

6.1.6 Where honey has been designated according to floral or plant source (6.1.5) then the common name or the botanical name of the floral source shall be in close proximity to the word "honey".

6.1.7 Where honey has been designated according to floral, plant source, or by the name of a geographical or topological region, then the name of the country where the honey has been produced shall be declared.

6.1.8 The subsidiary designations listed in 6.1.9 may not be used unless the honey conforms to the appropriate description contained therein. The styles in 6.1.10 (b) and (c) shall be declared.

6.1.9 Honey may be designated according to the method of removal from the comb.

(a) **Extracted Honey** is honey only obtained by centrifuging decapped broodless combs with or without the application of moderate heat.

(b) **Pressed Honey** is honey obtained by pressing broodless combs with or without the application of moderate heat.

(c) **Drained Honey** is honey obtained by draining decapped broodless combs with or without the application of moderate heat.

6.1.10 Honey may be designated according to the following styles:

(a) **Honey** which is honey in liquid or crystalline state or a mixture of the two;

(b) **Comb Honey** which is honey stored by bees in the cells of freshly built broodless combs and which is sold in sealed whole combs or sections of such combs;

(c) **Cut comb in honey** which is honey containing one or more pieces of comb honey.

**6.2 Labelling of Non-Retail Containers**

6.2.1 Information on labelling as specified in The General Standard for the Labelling of Pre-packaged Foods and in Section 6.1 shall be given either on the container or in accompanying documents, except that the name of the product, lot identification and the name and address of the manufacturer or packer shall appear on the container.

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5 Subject to endorsement by Codex Committee on Food Labelling (CCFL)
7. METHODS OF SAMPLING AND ANALYSIS

The methods of sampling and analysis to be employed for the determination of the compositional and quality factors are detailed below:

7.1 Sample Preparation

Samples should be prepared in accordance with AOAC 920.180.6

7.2 Determination of Moisture Content


7.3 Determination of sugars added to honey (authenticity)

AOAC 977.20 for sugar profile8,
AOAC 979.22 for TLC (thin layer chromatography),8
AOAC 991.41 internal standard for SCIRA (stable carbon isotope ratio analysis).9

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6 Endorsed by CCMAS at 21st session.
7 Endorsed as Type I method. These methods are identical.
8 Endorsed as Type II method.
9 Endorsed as Type I method.
ANNEX

This text is intended for voluntary application by commercial partners and not for application by governments.

1. Additional Composition and Quality Factors
Honey may have the following compositional and quality factors:

1.1 Sugars Content

1.1.1 Apparent Reducing Sugar Content
Calculated as invert sugar:

(a) Honey not listed below - not less than 65 g/100g
(b) Honeydew honey, blends of honeydew honey with blossom honey - not less than 45 g/100g
(c) Grasstree (Xanthorrhoea preissii) - not less than 53 g/100g

1.1.2. Apparent Sucrose Content

(a) Honey not listed below - not more than 5 g/100g
(b) False Acacia (Robinia), Citrus, Alfalfa (Medicago), Sweet-clover (Trifolium), Red gum (Eucalyptus camaldulensis), Leatherwood (Eucryphia lucida), Menzies Banksia (Banksia menziesii).
(c) Lavender (Lavandula), Red bell (Calothamnus sanguineus), White stringy bark (Eucalyptus scabra), Grand banksia (Banksia grandis), Grasstree (Xanthorrhoea preissii).

[ALTERNATIVE SECTION 1.1]

1. Sugars Content

1.1.1 Fructose and Glucose Content (sum of both)

(a) Honey not listed below - not less than 60 g/100g
(b) Honeydew honey, blends of honeydew honey with blossom honey - not less than 45 g/100g

1.1.2. Sucrose Content

(a) Honey not listed below - not more than 5 g/100g
(b) Alfalfa (Medicago), Citrus, False Acacia (Robinia), French Honeysuckle - not more than 10 g/100g
(Hedysarum), Menzies Banksia (Banksia menziesii), Rosemary (Rosarimus).

(c) Lavender (Lavandula). - not more than 15 g/100g

1.2 Water Insoluble Solids Content

(a) Honeys other than pressed honey - not more than 0.1 g/100g
(b) Pressed honey - not more than 0.5 g/100g

1.3 Mineral Content (ash)

(a) Honey not listed below - not more than 0.6 g/100g
(b) Honeydew honey or a mixture of honeydew honey with blossom honey or chestnut honey - not more than 1.2 g/100g

[ALTERNATIVE SECTION 1.3]

1.3 Electrical Conductivity

(a) Honey not listed under (b) or (c), and blends of these honeys - not more than 0.8 mS/cm
(b) Honeydew and chestnut honey and blends of these except with those listed under (c) - not less than 1.2 mS/cm

(c) Exceptions: Arbutus, Bell Heather (Erica), Eucalyptus, Lime (Tilia), Ling Heather (Calluna), Manuka or Jelly bush (Leptospermum), Tea tree (Melaleuca).

1.4 Acidity

The acidity of honey may be not more than 50 milliequivalents acid per 1000g.

1.5 Diastase Activity

The diastase activity of honey, determined after processing and/or blending, in general not less than 8 Schade units and in the case of honeys with a low natural enzyme content not less than 3 Schade Units.

1.6 Hydroxymethylfurfural Content

The hydroxymethylfurfural content of honey after processing and/or blending shall not be more than 80 mg/kg. ¹⁰

2. Methods of Sampling and Analysis

The methods of sampling and analysis to be employed for the determination of the additional compositional and quality factors set out in Section 1 of the Annex are detailed below:

¹⁰ Other proposals: (a) [60 mg/kg]
(b) [40 mg/kg]. However, in the case of honey of declared origin from countries or regions with high mean ambient temperatures, and blends of these honeys, the HMF content shall not be more than 80 mg/kg.
2.1 Sample Preparation

The method of sample preparation is described in section 7.1 of the Standard. In the determination of diastase activity (2.2.6), samples are prepared without heating.

2.2 Methods of Analysis

2.2.1 Determination of Apparent Reducing Sugar Content

2.2.1.1 Principle of Method

The method is a modification of the Lane and Eynon procedure (1923) involving the reduction of Soxhlet's modification of Fehling's solution by titration at boiling point against a solution of reducing sugars in honey using ethylene blue as an internal indicator.

The maximum accuracy for this type of determination is attained by ensuring that the reduction of the Fehling's solution during the standardisation step and in the determination of the reducing sugars in the honey solution are carried out at constant volume. A preliminary titration is, therefore, essential to determine the volume of water to be added before the determinations are carried out.

2.2.1.2 Reagents

(a) Soxhlet's Modification of Fehling's Solution

Solution A: Dissolve 69.28 g copper sulphate pentahydrate (CuSO₄·5H₂O; MW = 249.71) with distilled water to 1 litre. Keep one day before titration.

Solution B: Dissolve 346 g sodium potassium tartrate (C₄H₄KNaO₆·4H₂O; MW = 282.23) and 100 g sodium hydroxide (NaOH) with distilled water to 1 litre, and filter.

(b) Standard Invert Sugar Solution (10 g/l)

Weigh accurately 9.5 g pure sucrose, add 5 mL hydrochloric acid (ca 36.5% w/w pure HCl) and dilute with water to about 100 mL. Store this acidified solution for several days at room temperature (ca 7 days at 12° to 15°C or 3 days at 20° to 25°C), and then dilute to 1 litre. (NB: acidified 1.0% invert sugar remains stable for several months). Neutralise a suitable volume of this solution with 1M sodium hydroxide solution (40 g/l) immediately before use and dilute to the required concentration (2 g/l) for the standardisation.

(c) Methylene Blue Solution

Dissolve 2 g in distilled water and dilute to 1 litre.

(d) Alumina Cream

Prepare cold saturated solution of alum (K₂SO₄Al₂(SO₄)₃·24H₂O) in water. Add ammonium hydroxide with constant stirring until solution is alkaline to litmus, let precipitate settle and wash by decantation with water until wash-water gives only slight test for sulphate with barium chloride solution. Pour off excess water and store residual cream in stoppered bottle.

2.2.1.3 Procedure

2.2.1.3.1 Preparation of Test Sample - First Procedure

(applicable to honeys which may contain sediment)

(a) Transfer an accurately weighed sample of approximately 25 g (W₁) from the homogenised honey to a 100 mL volumetric flask, add 5 mL alumina cream, dilute to volume with water at 20°C and filter.

(b) Dilute 10 mL of this solution to 500 mL with distilled water (diluted honey solution).

or

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11 Endorsed as Type I method.
2.2.1.3.2 Preparation of Test Sample - Second Procedure

(a) Weigh accurately a representative quantity of about 2 g \((W_2)\) of the homogeneous honey sample, dissolve in distilled water and dilute to 100 mL in a calibrated flask (honey solution).

(b) Dilute 50 mL of the honey solution to 100 mL using distilled water (diluted honey solution).

2.2.1.3.3 Standardisation of the Modified Fehling’s Solution

Standardise the modified Fehling’s solution A so that exactly 5 mL (pipette), when mixed with approximately 5 mL of Fehling’s solution B, will react completely with 0.050 g invert sugar added as 25 mL dilute invert sugar solution (2 g/l).

2.2.1.3.4 Preliminary Titration

The total volume of the added reactants at the completion of the reduction titration must be 35 mL. This is made up by the addition of a suitable volume of water before the titration commences. Since the compositional criteria specify that there should be no less than 60% reducing sugars (calculated as invert sugar) a preliminary titration is necessary to establish the volume of water to be added to a given sample to ensure the reduction is carried out at constant volume. The volume of water to be added is calculated by subtracting the volume of diluted honey solution consumed in the preliminary titration \((X\) mL) from 25 mL.

Pipette 5 mL Fehling’s solution A into a 250 mL Erlenmeyer flask and add approximately 5 mL Fehling’s solution B. Add 7 mL distilled water, a little powdered pumice or other suitable antibumping agent, followed by about 15 mL diluted honey solution from a burette. Heat the cold mixture to boiling over a wire gauze, and maintain moderate ebullition for 2 minutes. Add 1 mL 0.2% aqueous methylene blue solution whilst still boiling and complete the titration within a total boiling time of 3 minutes, by repeated small additions of diluted honey solution until the indicator is decolourized. It is the colour of the supernatant liquid that must be observed. Note the total volume of diluted honey solution consumed \((X\) mL).

2.2.1.3.5. Determination

Calculate the amount of added water necessary to bring the total volume of the reactants at the completion of the titration to 35 mL by subtracting the preliminary titration \((X\) mL) from 25 mL.

Pipette 5 mL Fehling’s solution A into a 250 mL Erlenmeyer flask and add approximately 5 mL Fehling’s solution B. Add \((25 - X)\) mL distilled water, a little powdered pumice or other suitable antibumping agent and, from a burette, all but 1.5 mL of the diluted-honey solution volume determined in the preliminary titration. Heat the cold mixture to boiling over a wire gauze and maintain moderate ebullition for 2 minutes. Add 1.0 mL 0.2% methylene blue solution whilst still boiling and complete the titration within a total boiling time of 3 minutes by repeated small additions of diluted honey solution until the indicator is decolourized. Note the total volume of diluted honey solution \((Y\) mL). Duplicate titrations should agree within 0.1 mL.

2.2.1.3.6 Calculation and Expression of Results

Where the First Procedure (2.2.1.3.1) has been used:

\[
C = \frac{25}{W_1} \times 1000 \times \frac{1}{Y_1}
\]

Where the Second Procedure (2.2.1.3.1) has been used

\[
C = \frac{2}{W_2} \times 1000 \times \frac{1}{Y_2}
\]
Where \( C = \text{g invert sugar per 100 g honey} \)

\( W_1 = \text{weight (g) of honey sample taken according to Section 2.2.1.3.1} \)

\( W_2 = \text{weight (g) of honey sample taken according to Section 2.2.1.3.2} \)

\( Y_1 = \text{volume (mL) of diluted honey solution consumed in the determination carried out according to the First Procedure (2.2.1.3.1)} \)

\( Y_2 = \text{volume (mL) of diluted honey solution consumed in the determination carried out according to the Second Procedure (2.2.1.3.2)} \)

2.2.1.3.7 Notes on the Procedure

It is essential to the accuracy and repeatability of the determination that the column of water necessary to bring the reactant mixture to a total volume of 35 mL be determined for each individual sample; the following table gives typical volumes which may be encountered at the preliminary titration stage for the incremental contents of invert sugar shown, assuming the test sample (First Procedure) weighs about 25 g or test sample (Second Procedure) weighs about 2 g.

<table>
<thead>
<tr>
<th>Invert Sugar Content (%)</th>
<th>Volume of Distilled Water to be Added (mL)</th>
</tr>
</thead>
<tbody>
<tr>
<td>60</td>
<td>8.3</td>
</tr>
<tr>
<td>65</td>
<td>9.6</td>
</tr>
<tr>
<td>70</td>
<td>10.7</td>
</tr>
<tr>
<td>75</td>
<td>11.6</td>
</tr>
</tbody>
</table>

[ALTERNATIVE METHODS IF USING CHROMATOGRAPHIC MEASUREMENTS]

2.2.1 Determination of Sugars Content

2.2.1.1 Fructose and Glucose Content (sum of both)\(^{12}\)

\[ \text{Determination of sugars by HPLC - Harmonised Methods of the European Honey Commission, Apologie – Special Issue 28, 1997, Chapter 1.7.2} \]

2.2.1.2 Sucrose content \(^{12}\)

\[ \text{Determination of sugars by HPLC - Harmonised Methods of the European Honey Commission, Apologie – Special Issue 28, 1997, Chapter 1.7.2} \]

2.2.2 Determination of Apparent Sucrose Content

Martin P, \textit{FAO Manual of Food Quality Control, Food and Nutrition Monograph} 14/3 (1979) 150\(^{13}\)

2.2.3 Determination of Water-insoluble Solids Content

J. Assoc. Public Analysts (1992) \textit{28} (4) 189-193/ MAFF Validated method V22 for water insoluble solids in honey\(^{13}\)

2.2.4 Determination of Mineral Content (ash)

J. Assoc. Public Analysts (1992) \textit{28} (4) 177-181 / MAFF validated method V20 for mineral (ash) in honey\(^{13}\)

\(^{12}\) Subject to endorsement by CMAS

\(^{13}\) Endorsed as Type I method.
2.2.4 Determination of Electrical Conductivity

Determination of electrical conductivity - Harmonised Methods of the European Honey Commission, Apologie – Special Issue 28, 1997, Chapter 1.2

2.2.5 Determination of Acidity


2.2.6 Determination of Diastase Activity

2.2.6.1 AOAC 958.09

or

Phadebas method specified in Section 2.2.6.2 or a method using other commercially available calibrated substrate preparations

2.2.6.2 Phadebas method

2.2.6.2.1 Principle

Determination of the diastatic activity of honey is by a photometric method in which an insoluble blue dyed cross-linked type of starch is used as the substrate. This is hydrolysed by the enzyme, yielding blue water-soluble fragments, determined photometrically at 620 nm. The absorbance of the solution is directly proportional to the diastatic activity of the sample. The method is based on that originally published by Siegenthaler and modified by Bogdanov.

2.2.6.2.2 Reagents

Phadebas tablets, Pharmacia Diagnostics;

Sodium hydroxide 0.5M

Acetate buffer (0.1M, pH 5.2): Dissolve 13.6 g of sodium acetate trihydrate in water. Adjust the pH of the solution to 5.2 with glacial acetic acid (1 - 2 mL) and dilute to 1L with water.

2.2.6.2.3 Equipment

Photometer

Reagent mixer

Thermostated water bath

Timer

Weigh 1.00 g of honey into a 100 mL volumetric flask, dissolve in the acetate buffer solution and fill to the mark. Complete the procedure within an hour. Transfer 5.0 mL of the solution to a test tube and place it in the water bath at 40°C.

Prepare a blank by placing a 5.0 mL aliquot of the acetate buffer in another test tube which is treated exactly as the sample solution.

To both solutions add a Phadebas tablet, using tweezers, and start the timer. Stir the solutions in the reagent mixer until the tablets disintegrate (ca. 10 seconds) and return them to the water bath. Terminate the reaction after exactly 15 minutes by adding 1 mL sodium hydroxide solution. Stir the mixture again in the reagent mixer for approximately 5 seconds. Immediately filter the solutions through filter papers and measure the absorbance in 1 cm cuvettes at 620 nm using water as reference. The absorbance of the blank is subtracted from that of the sample solution (ΔA_{620}). If the absorbance is

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14 Subject to endorsement by CCMAS.
15 Endorsed as Type I method.
16 Endorsed as Type II method.
17 Endorsed as Type III method.
higher than 1.0, dilute the sample with water. Take into consideration the dilution factor when calculating the results.

2.2.6.2.4 Calculations and expression of results

The classical method for the determination of the honey diastase activity is the method of Schade. The diastase activity is expressed as the diastase number (DN) in Schade units and is defined as follows: one diastase unit corresponds to the enzyme activity of 1 g of honey, which can hydrolyse 0.01 g of starch in one hour at 40°C.

A simultaneous measurement with the Phadebas and the Schade method of 57 different commercial honey samples covering the whole range of diastase activity was carried out. There was a very good correlation (r=0.987) between the two measurement. Linear regression of y (diastase number) against x (\(\Delta A_{620}\)) yielded the following relation:

\[
DN = 28.2 \times \Delta A_{620} + 2.64
\]

where 28.2 and 2.64 are respectively the slope and the intercept of the best straight line obtained by linear regression of \(\Delta A_{620}\) (x axis) on DN (y axis). For each measurement of \(\Delta A_{620}\) with the Phadebas method DN is calculated using the above formula.

The unit of Diastase Activity, the Gothe unit, is defined as that amount of enzyme which will convert 0.01 gram of starch to the prescribed end-point in one hour at 40°C under the conditions of test. Results are expressed in Gothe units (or Schade units) per gram of honey

2.2.6.2.5 Precision

This method was established by testing three different types of honey by three laboratories. The maximum deviation (range) of the diastatic activity determined with tablets of the same batch, between the laboratories, was found to be 3.7%.

The standard deviation of the diastatic activity determined with tablets of two different batches with the same honey, within one laboratory, was 3.7% (for n=24, n being the number of analyses per batch).

The weight range, for a sample of 20 tablets, was found to be 5%, with a standard deviation of 2%.

Trials of the European Honey Commission

An interlaboratory trial with the Phadebas method with 7 honeys having \(A_{620}\) values varying from 0.31 to 1.29 was carried out in 1992 with 14 EC and 21 Swiss laboratories. The batches of the Phadebas reagent were not specified. The following r and R values were obtained:

\[
\begin{align*}
r &= 0.02 + 0.03 \times A_{620} \\
R &= 0.04 + 0.32 \times A_{620}
\end{align*}
\]

2.2.7 Determination of hydroxymethylfurfural (HMF) content

2.2.7.1 AOAC 980.23

or

the method\(^{19}\) specified in Sections 2.2.7.2

2.2.7.2 Determination of hydroxymethylfurfural (HMF) by HPLC\(^{19}\)

2.2.7.2.1 Principle

Hydroxymethylfurfural (HMF) is determined in a clear, filtered, aqueous honey solution using reverse phase HPLC equipped with UV detection. The signal is compared with those from standards of known concentration. This method is based on the work of Jeuring and Kuppers. The result is usually expressed in milligrams per kilogram.

\(^{18}\) Endorsed as Type II method.

\(^{19}\) Endorsed as Type III method.
2.2.7.2.2 Reagents

Mobile phase: water-methanol (90+10 by volume), both HPLC quality.

Standard solutions: 5-(hydroxymethyl)-2-furancarbaldehyde (HMF), (e.g. Merck Nr. 820 678 or Fluka Nr. 55690), 1, 2, 5 and 10 mg/L aqueous solution. The solution should be prepared on the day of use.

2.2.7.2.3 Determination of standard HMF-content:

The absorbance A of the prepared standard solution is determined using an UV spectrophotometer at 285 nm in 1 cm quartz cells with water in the blank cell. The concentration of the standard solutions can be calculated from the literature values for molar absorptivity, $\epsilon = 16830$ or absorptivity, $a_{cm} = 133.57$ (White, 1979).

\[
\text{Concentration in mg/L} = \frac{A}{1x133.57} \times 1000
\]

where A is the absorbance of the standard solution.

The calculated content must correspond to the specifications given by the supplier.

The standard has to be stored at 4 - 8 °C under nitrogen. It is extremely hygroscopic.

2.2.7.2.4 Equipment

Liquid chromatograph with UV detector and integrator.

Column: any column with C18-reversed phase material.

Column: Hypersil ODS 5 μm, 125 x 4 mm or 250 x 4 mm.

Membrane filter, 0.45 μm (e.g. Dynagard).

2.2.7.2.5 Procedure

Accurately weigh about 10 g of prepared honey sample into a 50 mL beaker. Less sample may be needed if the concentration of HMF is very high. Dissolve the sample in approx. 25 mL of water and transfer quantitatively to a 50 mL volumetric flask. Dilute to 50 mL with water. Filter through a 0.45 μm membrane filter to provide a sample solution ready for chromatography.

Conditions for chromatography

- flow rate: 1.0 mL/minute
- quantity injected: 20 μL of sample or standard solution
- detection: UV 285 nm; range 0.2 AUFS

2.2.7.2.6 Calculations and results

The HMF content of the sample is calculated by the corresponding peak areas of the sample and those of the standard solutions, taking into account the dilution. There is a linear relationship between the concentration and the area of the HMF peak. Results are expressed in mg/kg, to 1 decimal place.

2.2.7.2.7 Precision

The values for repeatability (r) and the reproducibility (R) have been obtained in an interlaboratory trial of the International Honey Commission with 14 participating laboratories.

<table>
<thead>
<tr>
<th>HMF mg/kg</th>
<th>r</th>
<th>R</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.2</td>
<td>0.4</td>
<td>1.6</td>
</tr>
<tr>
<td>22.8</td>
<td>1.2</td>
<td>4.9</td>
</tr>
<tr>
<td>42.3</td>
<td>2.1</td>
<td>7.3</td>
</tr>
</tbody>
</table>

2.2.7.2.8 Comparison with the other methods
At low HMF levels (about 5 mg/kg) the values obtained with this method are comparable to those obtained with the White method, but are lower than those obtained with the p-toluidine method. At higher HMF levels (20 and 40 mg/kg) the values with all three methods are not significantly different from each other.

Note
Furfural, which is found only in very small quantities compared with HMF, can be determined by the same method. Furfural elutes about 1.5 minutes after HMF.

2.3. Literature references


DIN. Norm, Entwurf: Bestimmung des Gehaltes an Hydroxymethylfurfural: Photometrisches Verfahren nach Winkler (1990)


Figueiredo V, HMF Interlaboratory Trial, Report for the participants, Basel canton chemist laboratory, (1991)


International Honey Commission Collaborative Trial (in press).


Lane JH and Eynon L (1923) *J Soc Chem Ind* 42, 32T, 143T, 463T.


Harmonised methods of the European Honey Commission, Apidologie - special issue, **28**, 1997
APPENDIX 2

GOVERNMENT COMMENTS AT STEP 6

COMMENTS FROM:

ARGENTINA, BRAZIL, CUBA, CANADA, FRANCE, ITALY, MEXICO, NORWAY, POLAND, PORTUGAL, SOUTH AFRICA, SPAIN, SWITZERLAND, USA, APIMONDIA,

At the 22nd Codex Alimentarius Commission meeting it was agreed that the draft revised standard for honey and sugars issued as ALINORM 97/27 would be returned to step 6 for further comment. The UK secretariat prepared a further revised text issued as CL 1998/12-S (August 1998, deadline 30 October 1998). This Appendix contains the comments received in reply to that document in relation to **honey only**.

ARGENTINA

2.2 DESCRIPTION

The colour of the honey should be part of the description, and the colour of honeydew honey should read - “its colour varies from light brown to dark brown “ as in the previous Spanish version (Alinorm 97/27), even though it was not in the English version.

3 ESSENTIAL FACTORS OF COMPOSITION AND QUALITY

3.1 Linguistic comment on Spanish version

3.2 Moisture for all honeys should not be greater than 20%
There should be no distinction on the basis of botanical origin, because a higher moisture level shortens the shelf life because of the possible increase in micro-organisms and the increase possibility of fermentation

4. CONTAMINANTS

4.1 Heavy metals
The CCFAC should be requested to include honey in the list of foods for each contaminant with the respective maximum limits. Argentina recommends that a list of contaminants should be included in the Standard in order to establish their maximum limits.

4.2 Pesticides
Although a statement about pesticide levels has been added it implies that that MRLs have established for honey which is not the case. Argentina recommends that the Codex Committee on Pesticide Levels includes honey in its list of foods for the most important pesticides relevant to honey production and its corresponding limit.

4.3 Veterinary Drug Residues
Argentina proposes that these residues be introduced in the Standard. As honey is an animal based product which utilises these substances to control disease in hives, then the Codex committee on
Medical and Veterinary Residues should be requested to include honey in the list of food products for the relevant medicines to honey production and its corresponding maximum limit.

6 LABELLING

6.1 Name of the Food

6.1.4 Argentina suggests that at the end of this section the words “in accordance with the legislation established in each country” are added.

6.1.5 As above the words “in accordance with the legislation established in each country” are added at the end of this section, so that no difficulties are encountered with any of the criteria for different honeys from different countries.

6.1.7 If there is mention of “filtration to improve its clarity”, then mention should be made as in the previous version: that filtration is permitted only if sufficient pollen grains remain to characterise the honey.

6.1.8 In the three items mention should be made of moderate heat or an adequate temperature should be determined.

7. METHODS OF SAMPLING AND ANALYSIS

7.1 Preparation of samples
In this paragraph which covers the determination of diastase activity (1.6 - Appendix) and hydroxymethylfurfural HMF (1.7 Appendix): samples should be prepared without heating.

ANNEX

1. Additional factors of composition and quality

1.1 Apparent reducing sugar content
No exemptions for grass tree honey from 65g/100g rule

1.2 Apparent sucrose content
It is proposed to simplify this section into two categories Blossom honey: 5% and Honeydew honey and mixtures with blossom honey: 10%. Because the list of different levels in certain honeys would be too long given the floral diversity in different countries.

1.4 Mineral substances
Keep the figures given in the previous version

1.5 Acidity
It is proposed that the acidity level should not be more than 40 meq of acid per 1000g. because higher levels indicate a honey with moisture levels and acetic fermentation.

1.6 Diastase activity
The following text is suggested:
Diastase activity of honey, determined after processing and/or blending, should in general not be less than 8 Schade units, and in the case of honeys with a low natural content of the enzyme (e.g. citrus honey) not less than 3 Schade units, only when the HMF content does not exceed 15mg/kg.

1.7 HMF content

The following text is suggested:
The HMF content of honey determined after processing and/or blending should not be greater than 40 mg/kg. This is because a freshly extracted honey only contains around 2 to 4 mg/kg, and after processing can reach a maximum of 20 mg/kg. Therefore it is not considered necessary to raise the level of this parameter to 60mg/kg especially considering its correlation with enzymatic activity.

2 METHODS OF SAMPLING AND ANALYSIS

2.1 Preparation of samples

The following correction needs to be made:

The method of preparation of samples described in this section 7.1 of the Standard. To determine diastase activity (2.2.6) and HMF (2.2.7) the samples should be prepared without heating.

BRAZIL

We would like to inform that Brazil supports the proposal for the Scope of the Draft Revised Standards for Sugars and honey as described in the CL 1998/12-S.

SCOPE

1.1 This Standard applies to all honeys produced by honey bees and covers all styles of honey presentations which are processed and ultimately intended for direct consumption. It does not cover industrial honey or honey used as an ingredient in other foods

CUBA

5. Hygiene

5.3 Permitted limits need to be given to harmonise results

ANNEX

2.2.4 Cuba suggests that the method to determine mineral substances by electrical conductivity should be included.

( the rest of the comments are linguistic comments on the Spanish text)

CANADA

SECTION 3.1 : ESSENTIAL COMPOSITION AND QUALITY FACTORS
Canada suggests that the first sentence in Section 3.1 be modified to be more specific with respect to additions. Canada recommends that the words “food ingredients” be modified by adding “including food additives and sugars.” The sentence would then read as follows, “Honey sold as such shall not have added to it any ingredients, including food additives and sugars, or other substances foreign to honey.”

SECTION 6.1: THE NAME OF THE FOOD

Section 6.1.7 would require that honeys subjected to a fine filtration process be so labelled as to indicate this process. Canada does not support this requirement.

SECTION 7.3: DETERMINATION OF SUGARS ADDED TO HONEY

Canada recommends that AOAC method 978.17 (Stable carbon isotope analysis of honey) be withdrawn. AOAC Official Method 978.17 is not applicable to citrus honey. It has been proven that not all honeys with a carbon ratio more negative than -23.5 parts per thousand are authentic. The internal standard method (991.41) which uses the isotope ratio of the honey and of the protein is the only method which can determine addition of cane and or corn sugars. Only the inclusion of the carbon stable isotope analysis can definitively differentiate a honey from a sugar as there are commercially available sugars that would mimic a honey by more traditional tests.

FRANCE

1. SCOPE

All honeys likely to be sold - whatever their final use in foodstuffs (eating honey, industrial honey, honey used as an ingredient) must be covered by the Codex standard, even if certain derogations may prove necessary as regards certain criteria for honeys other than eating honey. A honey used for industrial processing can only be honey; the last sentence added to 1.1 should therefore be removed.

Honeys stored in containers (usually vats) and likely to be sold between members of the profession must be covered by the Codex standard just like honeys packed in retail packs (eg: pots). There should not be a requirement that honeys packed in vats for wholesale are packed in retail packs in order for the standard to apply in their case. The sentence proposed in 1.2 should therefore be replaced by “This standard also covers honey packed in containers for sale at a stage prior to retail”, supplemented if necessary by the following sentence: “This honey may be intended for retail provided it is packed beforehand in sale units appropriate to that stage”.

2. DEFINITION (ADD “AND DESCRIPTION”)

[It is proposed that] “solid particles derived from honey collection” (2.2) should be replaced by “structured components (pollen etc) incorporated naturally during production of the honey by honey bees”, and “fluid, viscous or (partly or entirely) crystallized” should be replaced by “fluid, viscous or partly or entirely crystallized (the honey should however be homogenous; the coexistence of two phases in the same honey - one crystallized with a solid aspect and the other not crystallized, but liquid - is not acceptable as it is associated in particular with too high a moisture content)”. The mention of dehydration in the definition of honey is inappropriate and causes confusion with technological processes which have nothing to do with natural modifications which, after ripening
and maturing in the combs of the hive, lead to the finished honey, product, being obtained. The last sentence (2.2) could be replaced by “The organoleptic properties of honey are characteristic of the plant from which it comes”.

3 ESSENTIAL COMPOSITION AND QUALITY FACTORS

Honey should keep its natural and original characteristics. The first sentence proposed for (3.1) should therefore be replaced by “Honey sold as such, whether as an ingredient or otherwise, shall not have added to it any product other than honey, including any ingredient whatever (additive etc) or any substance whatever. The components of honey (pollens etc) shall not be removed from it”.

The objectionable substances in honey (eg. waxes) are to be removed where necessary by means in proportion with the objective (decantation, crude filtration); these operations must not lead to the disappearance of natural components of honey such as pollens.

As honey is a product which is perfectly produced in nature, there can be no question of accepting any processing of the product sold as such, as an ingredient or otherwise.

Therefore, “processing” (3.1) should be replaced by “extraction” and the phrase “or processed” (3.2) should be removed in the absence of any details on processing carried out other than by the action of heat.

If honey is pasteurized (this can only be done to a moderate extent: 60°C, 2-3 mn) the sales description of the product should include an indication of the processing (“pasteurized”); this requirement should be introduced into the provisions relating to labelling (6).

In the absence of any appropriate justification for fixing the maximum moisture content of clover honeys at 23%, this value should be 21%.

5 HYGIENE

The proposal (5.2) should be replaced by “To the extent compatible with good extraction and preservation practice, honey sold as such, as an ingredient or otherwise, shall be free from objectionable organic or inorganic matter, eg insects, insect debris, brood or iron. The presence of matter foreign to the composition of honey (soot, sand etc) is prohibited in honey. In particular, the iron content shall not exceed 10mg/kg. Materials thus intended to enter into contact with honey (particularly extraction equipment and containers used for the preservation and sale of honey) shall comply with the standards in force; the use of rusty equipment or containers shall be prohibited”.

6 LABELLING

The proposals for 6.1.2 and 6.1.3 should be replaced as follows:

“6.1.2 For products described in 2.1.2 [sic], the name of the foodstuff may be “nectar honey”.  
6.1.3 For products described in 2.1.2, the name of the foodstuff may be “honeydew honey”.

The use of the name “blossom honey” is appropriate to 6.1.5: this name should be reserved for honey which comes from flower nectar.
To ensure satisfactory information for the consumer, it is necessary to require that the labelling of honey include an indication identifying its country of origin (it should not be excluded that this can be given in the sales name: eg “honey from Hungary”). Where honey from several countries is blended, a phrase such as “blend of honeys from several countries” should be possible for replacing this indication.

Fine filtration (6.1.7) is not acceptable as this processing leads to the disappearance of characteristic components of honey such as pollens. Only crude filtration as an addition to decantation could be accepted provided that the conditions are clearly specified (filtration limits: mesh size of sieves etc) so that no component of the honey is removed from it, especially its pollens.

Honey which is extracted or drained should be so processed without using other than moderate heat treatment so as to conserve its natural characteristics. Therefore “with or without moderate heat treatment” should be replaced by “possibly with the aid of moderate heat treatment” and its characteristics (duration and temperature) should be specified.

As the beekeeper does not manufacture honey, “manufacturer” should be replaced by “producer” or more specifically “beekeeper”.

**METHODS OF SAMPLING AND ANALYSIS**

Method AOAC 978.17 for SCIRA (determination of C13 of honey only) should be removed (7.3): it is appropriately replaced by the more recent method AOAC 991.41, which uses an internal standard (determination of C13 of honey proteins and not only C13 of honey). The reference to AOAC 978.17 in the standard could suggest that honey found in accordance using this method is not adulterated by added sugar whereas method AOAC 991.41 may reveal that it does not comply.

It should be specified that the methods for determining the sugars added to honey are not equivalent and should be used in the appropriate way.

Consideration should be given to introducing methods using optical microscopy which can reveal structured components foreign to the composition of honey.

The abbreviations CCM and CCMAS should be explained.

**ANNEX**

With regard to terminology and to prevent confusion concerning the standard in its French and English versions, “annex” should not be translated by “appendice” and “appendix” by “annexe”.

The change in the apparent sucrose content of honeydew honeys alone or blended with nectar honey is not acceptable without some justification (1.2).

The free acidity to be determined by the AOAC 962.19 method (pH and free acidity at pH 8.3) fixed at 50 meq of acid per 1000g is too high and should be reduced to 40 meq/kg.

Bearing in mind the anomalies noted in some honeys, an upper limit should be set for diastase activity: it should not exceed 60 Schade units (1.6).
The HMF content should not exceed 40mg/kg on sale to the final consumer to ensure honey keeps its quality.

The composition and quality factors and the references of the associated analytical methods should be kept in the body of the standard: these criteria are essential for preserving honey quality. Bearing in mind their detailed character, the descriptions of the methods for determining the apparent reducing sugar content, the diastase activity in accordance with the Phadebas method and the HMF by HPLC could be given in the annex to the standard.

Bearing in mind the inclusion of the HPLC technique for measuring HMF dosage in the text, it is surprising that the same does not apply for sugars (glucose, fructose, maltose, sucrose and possibly maltose [sic]).

Generally, any more effective new method (and such a method is often less dangerous, avoiding use of p-toluidine for example) should be introduced into the standard to ensure it evolves in line with progress in analytical techniques.

It would also be appropriate to introduce the following methods in parallel with and possibly in place of the methods already mentioned in the standard:

- fructose and glucose content (in parallel with apparent reducing sugar content): 60g/100g minimum apart from honeydew honey or blends of honeydew honey and nectar honey (45mg/kg minimum);

- sucrose content (in parallel with apparent sucrose content): maximum 5g/kg apart from Lavendula, Citrus, Hedysarum, Medicago (maximum 10g/kg)

- electrical conductivity (in parallel with mineral material content): maximum 0.5mS/cm for nectar honeys, between 0.5 and 0.9mS/cm for blends of honeydew honey and nectar honey and minimum 0.9mS/cm for honeydew honeys.

ITALY

ESSENTIAL COMPOSITION AND QUALITY FACTORS

3.1 Honey sold as... This article should be completed with the phrase: "No substances natural to honey should be removed".

**Explication:** pollen and other particles are necessary to determine the geographical and botanical origin of honey. If pollen is removed (through a fine filtration) it is impossible to verify the correct honey labelling according to 6.1 (the name of the food may be supplemented by terms referring to honey origin: nectar, honeydew, region of production, plant source). Moreover, consumers expect that honey as a natural product contain all of its natural components. In 6.1.7 an exception to this rule is specified for honeys which have been subjected to fine filtration for improvement of clarity.

ANNEX

1.1 Apparent reducing sugar content and 1.2 Apparent sucrose content. These articles should be changed as follows:
1.1. **Apparent reducing sugars content (calculated as invert sugar) or sum of Fructose and Glucose content** (one of two quality factors can be determined)

1.1.1 **Apparent reducing sugars** *(same limits)*

1.1.2 **Sum of Fructose and Glucose Content**

a) Honeys not listed below *not less than 60g/100g*
b) honeydew honey  
blends of honeydew honey and blossom honey *not less than 40g/100g*

1.2 **Sucrose Content** *The apparent or the true sucrose content can be determined*

1.2.1 **Apparent Sucrose Content** *(same limits)*

1.2.2 **Sucrose Content**

a) honeys not listed below *not more than 5g/100g*
b) Robinia, Lavandula, citrus, Hedysarum, Medicago *not more than 10g/100g*

( *Note: generally Latin names of the plants, printed in Italics are preferable* )

Explication: New methods should be added which allow the specific determination of the main honey sugars fructose, glucose and sucrose. The related limits should be changed accordingly. The old unspecific measurements of “apparent sugars” is very labour intensive and for some honey types the existing norms cannot be fulfilled. Most of laboratories over the world use specific chromatographic methods for measuring these sugars, which are quicker and more precise. The drawback is that the apparent sugar content of commercial honey should also be determined, which makes honey control very expensive.

1.4 **Mineral Content (ash).** These article should be changed as follows:

1.4 **Mineral Content: Ash or Electrical Conductivity** *(one of two quality factors can be determined)*

1.4.1 **Ash** *(same limits)*

1.4.2 **Electrical Conductivity, in milli Siemens/cm**

a) blossom honeys *not more than 1 mS/cm*
b) honeydew honey, blend of honeydew and blossom honey and Casranea honey  
blacks of honeydew honey and blossom honey *not more than 2.2 mS/cm*

Explication: Another new quality factor, the electrical conductivity correlates well with honey mineral content. Nowadays it is almost exclusively used for characterising honey because it is very fast and needs only inexpensive instrumentation.

Note: The methods for determining the new quality factors, both sugars and electrical conductivity have been validated and published (see last literature reference in the present Codex draft).

There are many scientific researches where the proposed limits were controlled with the above quality factors for Italian honeys (see references below).

An extensive wok for honeys from all over the world has been submitted for publication by the Apimondia Honey Commission will soon become available.
The quality factors mentioned above can be used, besides the old ones, as they refer to the same class of chemical substances. This will allow that experience on the new quality factors can be gathered world-wide, while the old quality factors can still be used by those who wish to. Thus, there is no danger that certain honey types can be disqualified because they fail to meet the new quality criteria.

1.10. Hydroxymethylfurfural Content
The hydroxymethylfurfural content after processing and/or blending may be more than 40 mg/kg. The Italian Codex Alimentarius Commission does not agree that the limit for hydroxymethylfurfural content is increased to 60 mg/kg. The limit of 40 mg/kg specified for honey after blending and processing and not on the market is realistic. An allowance of a higher limit value will lead to a decrease of honey quality.

2. METHODS OF SAMPLING AND ANALYSIS
According to the new quality factors proposed new methods for sugars and electric conductivity have to be added to this sections (see last literature reference in the present Codex draft)

MEXICO

1. SCOPE

Industrial honey should be included in the scope, because tropical countries such as Mexico produce large amounts of honey some of which is sold as lower grade and used as an ingredient in compound foods. As there is no specification in any international standard, the prices paid for this type of honey is very low.

ANNEX

1. Additional Composition and Quality Factors

It is necessary to include additional methods of analysis to determine the presence of added sugars to honey, which can be used to monitor its authenticity, because this is a an actual practice which has affected exports of honey from Mexico to Europe.

NORWAY

ANNEX

General Comment
We are aware that the Codex Alimentarius Commission has decided in principle to remove <<excess detail>> regarding quality provisions from the body of Codex standards. However, we look forward to a clarification of the status of Codex standards, especially quality provisions, in relation to the WT/TBT agreement. Such provisions, as included in the Annex, are at present mandatory within the EU/EEA area.

Specific comment

1.7 Hydroxymethylfurfural content
We maintain our previous position that HMF content should not exceed 40 mg/kg. This to avoid excessive heat treatment and impairment of quality.

In this context, the secretariat comments in paragraph 20 are somewhat confusing in relation to the definition in 2.1. of the main standard. In paragraph 20., the necessity of artificial drying is mentioned, whereas in 2.1 dehydration is part of the natural process performed by the bee.

**POLAND**

**HEAVY METALS**

According to the Polish legislation the permitted level of heavy metals should be not more than:

\[
\begin{align*}
\text{Pb} & \leq 0.3 \text{ mg/kg} ; \\
\text{Cd} & \leq 0.03 \text{ mg/kg} ; \\
\text{Hg} & \leq 0.01 \text{ mg/kg} ; \\
\text{As} & \leq 0.20 \text{ mg/kg} ; \\
\text{Zn} & \leq 20.0 \text{ mg/kg}
\end{align*}
\]

**ANNEX**

**1.7. Hydroxymethylfurfural Content**

According to the national Polish requirements the maximum 5-hydroxymethylfurfural content of honey should be no more than 30 mg/kg

**PORTUGAL**

**Annex**

Apparent sucrose content

b) We propose the following wording:

“Robinia, Lavender including *Lavandula stoechas*...”

or

“Robinia, *Lavandula spp*...”

Justification: Certain publications exclude *Lavandula stoechas*, which is quite important in Portugal.

**SOUTH AFRICA**

**Number 3.4 on Page 14- Moisture Content**

A moisture content of 21%/23% may cause yeast growth in crystallised honeys. We would like to suggest a slightly lower content of 20%.

**Number 6.1.9 on Page 16- Styles**

South Africa submits the addition of a definition for “creamed honey”

“Creamed honey” means crystallized extracted honey purposely processed to be of a uniformly creamy consistency and of a smooth spreadable texture.
Number 1.1(b) of Annexure on Page 18- Reducing Sugar

Not many honeydew honeys are produced in South Africa. However we are of the opinion that the level of minimum 45% reducing sugar for honeydew may be too low. A level of 53% is suggested.

Note: Indicate levels as 65% (g/100g). It may be confusing as indicated as present.

Number 1.2 (c) of Annexure on Page 18 - Sucrose content

The actual sucrose content (HPLC) of South African honeys is below 5%. In South Africa a level of 15% actual sucrose would be an indication of adulteration. We would like to suggest a maximum level of 10%.

Note: Indicate levels as 5% (g/100g). It may be confusing as indicated as present.

Number 1.7 of Annexure on Page 19

The hydroxymethylfurfural content of South African Honey is low. We are of the opinion that the maximum level of 60 mg/kg can still be lowered. A maximum level of 40 or 50 mg/kg is suggested.

Number 2.1 of Annexure on Page 19 - Sample preparation

Reference is made to section 8.1 of the standard. It should be section 7.1.

Number 2.2 of Annexure on Page 19 - Methods of analysis

In South Africa the HPLC method is used for sugars. Hence we cannot comment on the methods described to determine apparent sugar content.

SPAIN

2. DESCRIPTION

This section should have as its title Definition and Description, because both definition and description are covered.

6. LABELLING

6.1.8 Another part should be added
d) Pasteurised honey is honey which has been subjected to a heat process, whose time and temperature conditions prevent microbiological spoilage.

ANNEX

The section on Additional Composition and Quality Factors should form part of the Standard and not be in the Annex.

1.5 For “acidity” should be replace by “free acidity”

1.7 The level of HMF should be 40 mg/kg (after processing and blending).
Specific suggestions
The numbering of some of the quality factors referred to is new, as new quality factors are introduced. The numbers of the old quality factors are changed accordingly.

1.1 Apparent reducing sugars (old) and content of the Sum of Fructose and Glucose (new)
One of two quality factors (1.1.1 or 1.1.2) can be determined

1.1.1 Apparent reducing sugars

1.1.2 Content of the Sum of Fructose and Glucose
a) Honeys not listed below not less than 60g/100g
b) honeydew honey or blends of honeydew honey and blossom honey not less than 40g/100g

1.2 Sucrose Content
Either the apparent or the true sucrose content can be determined

1.2.1 Apparent Sucrose Content
The names of some honey types are not correct. Latin plant names are printed in main italics, while common names are printed in small letters. Full names are used for specific plants and first names are used when naming plant species. Following names are correct: *Robinia, Lavandula, Citrus*, sweet clover and alfalfa. *Acacia* should not be included in this list as this is a species, grown in tropical and subtropical regions comprising different plants that give rise to different types of honeys.
The last two lines should be typed in normal letters.

1.2.2 Sucrose Content (new)
a) honeys not listed under b) not more than 5g/100g
b) *Robinia, Lavandula, Citrus, Hedysarum, Medicago* not more than 10g/100g

1.4 Mineral Content (old) and Electrical Conductivity (new)
One of two quality factors (1.4.1 or 1.4.2) can be determined.

1.4.1 Mineral content
b) honeydew honey, blends of honeydew and blossom honey and chestnut honey not more than 1.2g/100g

Chestnut honey should be included in the group b) as these honeys have an ash content greater than 1.2 g/100g

1.4.2 Electrical Conductivity, in milli Siemens/cm (new)
a) blossom honeys excepted lime, heather strawberry tree lavender, eucalyptus and cotton honeys not more than 0.7 mS/cm
1.10 Hydroxymethylfurfural Content
The Hydroxymethylfurfural content after processing and/or blending may not be more than 40 mg/kg.

The limit of 40 mg/kg according to the present regional European Codex and EU standards has proven workable. In Switzerland this limit has been very rarely surpassed when commercial honey was controlled. Switzerland does not agree, that the limit for hydroxymethylfurfural content is increased to 60 mg/kg. The limit of 40 mg/kg, being specified for honey after blending and processing and not on the market, is realistic. If a higher limit value is allowed, then honey quality on the market will decrease.

ESSENTIAL COMPOSITION AND QUALITY FACTORS

3.1 Honey sold as ...

This article should be completed with the phrase: No components, natural to honey should be removed

If the pollen is removed from honey, then the geographical and botanical origin of honey can not be determined. The marketing of filtered honey will be allowed for all honeys, which will make the control, whether honey has been correctly labelled according to 6.1.2, 6.1.3 and 6.1.4 impossible. Moreover, consumers expect that honey, as a natural product, should contain all of its natural components. In 6.7 an exception to this rule is specified for honeys, which have been subjected to fine filtration for improvement of clarity.

3.4 Moisture Content
The % unit should be replaced by the official SI unit which is g/100g, see also Annex.

c) The exception for clover honey is not justified by measurements during the apt years. Accordingly, the maximal water content for clover honey is also 21g/100g.

ANNEX

General comment
1. The references at the end of the draft are not numbered. The references to these in the text carry numbers, but these do not correspond to the ones given at the end of the document.

2. There are some % designations, besides the g/100g units. The % unit should be replaced by the official SI unit which is g/100g.

3. Honey Sugars and Electrical Conductivity
The proposal of Switzerland to introduce these new quality factors has not been taken into consideration. Since a long time it has been recognised that the unspecific measurements of “apparent sugars” is very labour-intensive and for some honey types the existing norms cannot be fulfilled. In Switzerland these quality parameters are not measured in the past 20-30 years. Here, and also all over the world, specific chromatographic methods for characterising honey sugars have been used for a long time. These methods are quicker and more precise than the old...
unspecific methods and allow a better characterisation of honey. The “apparent reducing sugars” corresponds roughly to the sugars fructose and glucose. On the other hand, the measurement of “apparent sucrose” correlates to the specific content of sucrose. With only one determination method all three sugars can be determined, while “apparent” reducing sugars and “apparent sucrose” must be determined with two measurements. Electrical conductivity is another new quality factor. It correlates well with honey mineral content. Nowadays it is almost exclusively used for characterising honey, as it is very fast and needs only inexpensive instrumentation. The methods for determining the new quality factors have been validated and published (last reference in the presented Codex draft).

The Apimondia Honey Commission, in which Switzerland also participates, has compiled an extensive amount of data, where the specific sugars and the conductivity were measured in honeys all over the world. The Commission has prepared a publication on this topic and has submitted it for publication. The quality factors mentioned above can be used besides the old ones, as they refer to the same class of chemical substances. Thus, experience on the new quality factors can be gathered, while the old quality factors can still be used by those who wish to. In this way it can be avoided, that certain honey types can be disqualified because they fail to meet the new quality criteria.

USA

1. SCOPE
The United States of America recommends that the scope of the honey standard cover all honey. It is our understanding that a large portion of the honey trade in international commerce is ultimately used as an ingredient in another food product. In the United States, for examples, approximately 50% of the honey is used for this purpose. When a honey buyer purchases bulk honey, however, the buyer seldom knows for certain whether a particular lot of honey will be eventually sold for retail use or for ingredient use. Regardless, the honey ingredient buyer expects the product to be pure honey, just as does the retail consumer. Moreover, the draft Sugars Standard covers all sugars, whether consumed directly or used as an ingredient. Therefore, we recommend that the draft Honey Standard should apply to all honey in international trade.

If the Standard remain applicable only to retail honey for direct consumption by the consumer, Section 1.2 should be rephrased to cover all honey in bulk containers which may be sold at retail to consumers. We recommend that Section 1.2 should read as follows:

“The Standard also covers honeys which are packed for sale in bulk containers, that may contain product which may be repacked into retail packs.”

3. ESSENTIAL COMPOSITION AND QUALITY FACTORS

3.4 Moisture Content,
The draft standard continues to provide for unacceptably high moisture levels. Moisture content has been demonstrated to directly influence keeping quality, granulation and body 20. The United States of America considers the higher moisture levels o 21% and 23% unacceptably high because these levels will assure that fermentation will occur. Section 3.1 states “The honey shall not have begun to ferment of effersce”. Honey with moisture levels over 17% may ferment. Therefore, specifying a lower moisture level for honey is appropriate to discourage and prevent spoilage. Honey with moisture levels greater than 18.6% are considered substandard in the United States of America. We

20 The Hive and the Honey Bee, J.M. Grham (ed.) , Dadant & Sons, p.873.
reaffirm our recommendation that the standard include a maximum moisture level of 18.6 percent to ensure that fermentation does not occur.

6. LABELLING

6. The Name of the Food

6.1.7
Section 6.1.7 states that “Honey which has been subjected to a fine filtration process to improve its clarity shall bear a description to inform the consumer of this process.” If “fine filtration” is to be a label declaration, this term must be defined. We recommend the following:

“6.7 Honey which has been subjected to a fine filtration process, removing extraneous particles smaller than 10 microns, shall bear a description to inform the consumer of this process. The subsidiary designations listed.....”

7. METHODS OF SAMPLING AND ANALYSIS

7.3 Determination of Sugar Added to Honey
There appears to be a typographical error in the fourth line “9stable” as well as in footnote 4 “subject”

ANNEX

1. Additional Composition and Quality Factors

1.1 Additional Reducing Sugar Content
1.2 Apparent Sucrose Content
The United States of America reiterates its concerns regarding the apparent reducing sugar levels and the apparent sucrose content in the revised standard. We repeat our request to see the analytical data which demonstrates that the minimum apparent reducing sugar content and the maximum apparent sucrose content levels proposed have an appropriate scientific basis for the species indicated. The limited information we have, suggests that the proposed levels are much too high. If adopted these levels will be used to authenticate honeys. Allowing for excessive levels of sucrose and lowering the minimum reducing sugar content could have the undesirable effect of encouraging economic adulteration of honey with inexpensive sweeteners.

We also continue to have concerns about the use of the same maximum apparent sucrose content and minimum reducing sugar content for blends of honeydew honey and blossom honey, and honeydew honey alone. We recommend that the maximum apparent sucrose content of blends of honeydew honey and blossom honey should be established based on the level established for blossom honey (i.e. 5%). To do otherwise would be to encourage adulteration of blends with up to 10% of inexpensive sucrose solutions. If adopted, this approach clearly does not advance the mission of Codex to promote fair practices in the food trade internationally.

There appear to be typographical errors in .1 (b) and (c): the % is not needed. The specification should read “xg/100g”

1.6 Diastase Activity
The United States of America continue to have grave concerns about the further development of this standard in the absence of revisions to eliminate the excessively high levels of diastase activity. We restate our concern that the inclusion of diastase activity remains a significant potential for a trade barrier. Diastase activity is not a safety, freshness, or quality measure for honey. Diastase activity can be reduced by processing or over time during transportation. Diastase levels in honey are naturally highly variable and therefore should not be included an international standard because it will neither protect consumer health not promote fair trade practices.
If a diastase activity level is to be included in this standard, it is imperative that it not be higher than 3 Schade Units. Otherwise, the standard will impose arbitrary trade barriers. Therefore the United States of America recommends the following:

“1.6 The diastase activity of honey, determined after processing and/or blending, is not less than 3 Schade Units.”

1.7 Hydroxymethylfurfural Content
Lowering the specification for hydroxymethylfurfural (HMF) content from the current level of not more than 80 mg/kg (CODEX STAN 12-1987, Rev. 1) to the proposed 60 mg/kg will create a potential trade barrier to trade for honey produced in warm climates or transported over long distances.

HMF is a natural constituent of honey that forms over time and with exposure to heat. The HMF level is not a safety issue, taken alone, it is neither an indication of quality nor of freshness. A decrease in the HMF level from 80 mg/kg to 60 mg/kg will make it difficult to produce, process, package and ship honey from warm climates to distant markets without exceeding the proposed lower level for HMF resulting in a barrier to trade.

The current HMF specification for honey has served the international honey trade well. There are no convincing safety, quality or freshness arguments for lowering the HMF level that would advance the mission of Codex to protect consumer health and promote fair trade practices. Therefore the United States of America recommends that the HMF level for honey continue to be 80 mg/kg.

APIMONDIA

We think, that the present Codex draft is much better and up-to-date than the previous Codex Standard. However, there are still some points, where the Apimondia Honey Commission does not agree.

ESSENTIAL COMPOSITION AND QUALITY FACTORS

3.1 Honey sold as ...This article should be completed with the phrase : No components, natural to honey should be removed
If the pollen is removed from honey, then the geographical and botanical origin of honey can not be determined. The marketing of filtered honey will be allowed for all honeys, which will make the control of correct honey labelling according to 6.1.2, 6.1.3 and 6.1.4 impossible. Moreover, consumers expect that honey, as a natural product, should contain all of its natural components. In 6.1.7 an exception to this rule is specified for honeys, which have been subjected to fine filtration for improvement of clarity.

ANNEX

There are a few observations

GENERAL OBSERVATIONS

• The % unit should be replaced by the official SI unit which is g/100g. There are some old % designations, besides the g/100g units.
The references at the end of the draft are not numbered. The references to these in the text carry numbers, but these do not correspond to the ones given at the end of the document.

Honey Sugars and Electrical Conductivity

Our previous proposal to introduce these quality factors has not been taken into consideration. It has been recognised since a long time that the unspecific measurements of “apparent sugars” is very labour-intensive and for some honey types the existing norms cannot be fulfilled. These difficulties can be overcome by a specific determination of the main honey sugars fructose, glucose and sucrose. Thus in the last 30-40 years many laboratories over the world used specific chromatographic methods for characterising these sugars which are quicker and more precise than the old unspecific methods. The drawback is, that the apparent sugar content of commercial honey should also be determined, which makes honey control very expensive. Another new quality factor, the electrical conductivity correlates well with honey mineral content. Nowadays it is almost exclusively used for characterising honey, as it is very fast and needs only inexpensive instrumentation. The methods for determining the new quality factors have been validated and published (reference 23 in the presented Codex draft). The Apimondia Honey Commission has compiled an extensive amount of data, where the proposed honeys from all over the world were controlled with the above quality factors. The data has been submitted for publication which will soon become available. The quality factors mentioned above, can be used besides the old ones, and they refer to the same class of chemical substances. This will allow that experience on the new quality factors can be gathered world-wide, while the old quality factors can still be retained by those who wish to. Thus, there is no danger, that certain honey types can be disqualified because they fail to meet the new quality criteria.

SPECIFIC SUGGESTIONS

The numbering of some of the quality factors referred to is new, as new quality factors are introduced. The numbers of the old quality factors are changed accordingly.

1.1 Apparent reducing sugars (old) and Content of the Sum of Fructose and Glucose (new)

One of two quality factors to be determined

1.1.1 Apparent reducing sugars

1.1.2 Content of the Sum of Fructose and Glucose
   a) Honeys not listed below not less than 60g/100g
   b) honeydew honey or blends of
      honeydew honey and blossom honey not less than 40g/100g

1.2 Sucrose Content

The apparent or the true sucrose content can be determined

1.2.1 Apparent Sucrose Content

The names of some honey types are not correct. Generally, Latin plant names are printed in main italics, while common names are printed in small letters. Full names are used for specific plants and first names are used when naming plant species. Following names are correct: Robinia, Lavendula, Citrus, sweet clover and alfalfa. Acacia should not be included in this list as this is a species, grown in tropical and subtropical regions comprising different plants that give rise to different types of honeys.

The last two lines should be typed in normal letters.

1.2.2 Sucrose Content (new)
a) honeys not listed under b) not more than 5g/100g
b) *Robinia, Lavandula, citrus, Hedysarum, Medicago* not more than 10g/100g

1.4 **Mineral Content and Electrical Conductivity** (new)
One of two quality factors can be determined.

1.4.1 **Mineral content**
b) honeydew honey, blends of honeydew and blossom honey and chestnut honey not more than 1.2g/100g

1.4.2 **Electrical Conductivity**, in milli Siemens/cm (new)
a) blossom honeys excepted lime, heather strawberry tree lavender, eucalyptus and cotton honeys not more than 0.7 mS/cm
b) honeydew, blends of honeydew and blossom honey and Chestnut honey not more than 0.7 mS/cm

1.10. **Hydroxymethylfurfural Content**
The Hydroxymethylfurfural content after processing and/or blending may not be more than 40 mg/kg

The Apimondia Honey Commission does not agree, that the limit for hydroxymethylfurfural content is increased to 60 mg/kg. The limit of 40 mg/kg, specified for honey after blending and processing and not on the market, is realistic. An allowance of a higher limit will lead to a decrease of honey quality.