JOINT FAO/WHO FOOD STANDARDS PROGRAMME

CODEX COMMITTEE ON NUTRITION AND FOODS FOR SPECIAL DIETARY USES
Twenty-sixth Session

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PROPOSALS FOR A DEFINITION AND METHODS OF ANALYSIS FOR DIETARY FIBRE CONTENT

Prepared by a drafting group led by France and Sweden

BACKGROUND

During the 24th session of the Codex Committee on Nutrition and Foods for Special Dietary Uses (CCNFSDU) Berlin 4-8 November 2002, the delegation of France, with participation of Cuba, Japan, Netherlands, New Zealand, Poland, South Africa, Sweden, Switzerland, United Kingdom, United States, EC, CIAA, IBFAN, IDF, ISDI⁴, was requested to draft a working document including proposals for definition, method of analysis and conditions for nutritional claims on fibre content, in order to facilitate further discussion.

The first version of this paper was presented during the 25th session of the CCNFSDU (Bonn, 3-7 November 2003)². The committee requested the drafting group to revise the proposed definition, taking into account the written comments included in the Conference room documents and comments made orally during the meeting. The delegation of Sweden joined as co-chair of the drafting group and the delegations of Australia, Brazil, Thailand, Turkey, ESPGHAN and IFT expressed the wish to be added to the list of members of this group at the last CCNFSDU session.

The content of the first draft has been simplified to take into account all the comments³.

The existing Codex Guidelines define⁴ "Dietary fibre" as "edible plant and animal material not hydrolysed by the endogenous enzymes of the human digestive tract as determined by the agreed upon method."

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¹ ALINORM 03/26A -- para. 19, footnote 8.
² CX/NFSDU 03/3
³ CRD 5 (comments of the Philippines), CRD 15 (comments of Indonesia). The delegations of Turkey, ISDI have also provided comments during the redrafting of this document.
⁴ See paragraph 2.7 Codex Alimentarius, Codex guidelines on nutrition labelling CAC/GL 2-1985 (Rev. 1-1993). Page 34. In: Food labelling complete texts
DEFINITION OF DIETARY FIBRE

Dietary fibre consists either of:

- Edible, naturally occurring in the food as consumed, non digestible material composed of carbohydrate polymers\(^5\) with a degree of polymerisation (DP) not lower than 3, or of carbohydrate polymers (DP \(\geq 3\)), which have been obtained from food raw material by physical, enzymatic or chemical means, or of synthetic carbohydrate polymers (DP \(\geq 3\)).

Dietary fibre is neither digested nor absorbed in the small intestine and has at least one of the following properties:

- Increase stools bulk
- [Increase laxative properties]\(^6\)
- Stimulate colonic fermentation\(^7\)
- Reduce blood total and/or LDL cholesterol levels
- Reduce post-prandial blood glucose and/or insulin levels.

METHODS OF ANALYSIS FOR DIETARY FIBRE

<table>
<thead>
<tr>
<th>Name</th>
<th>Quantified compounds</th>
<th>Reference</th>
<th>Type</th>
<th>Chapter(^8)</th>
</tr>
</thead>
<tbody>
<tr>
<td>AOAC 991.43</td>
<td>Soluble + insoluble polysaccharides (including RS 3)+ lignin</td>
<td>Lee et al.</td>
<td>Enzymatic-gravimetric</td>
<td>32.1.17</td>
</tr>
<tr>
<td>AOAC 985.29</td>
<td>Soluble + insoluble polysaccharides (including RS 3)+ lignin</td>
<td>Prosky et al. 1992</td>
<td>Enzymatic-gravimetric</td>
<td>45.4.07</td>
</tr>
<tr>
<td>AOAC 994.13</td>
<td>Soluble + insoluble polysaccharides (including RS 3)+ lignin</td>
<td>Theander et al.</td>
<td>Enzymatic-chemical</td>
<td>45.4.11</td>
</tr>
<tr>
<td>AOAC 995.16</td>
<td>beta-glucans</td>
<td>McCleary &amp; Codd, 1991</td>
<td>Enzymatic</td>
<td>32</td>
</tr>
<tr>
<td>AOAC 2002.02</td>
<td>Resistant starch and algal fibre</td>
<td>McCleary &amp; Monaghan, 2002</td>
<td>Enzymatic</td>
<td>45.4.15</td>
</tr>
</tbody>
</table>

\(^5\) When derived from a plant origin, dietary fibre may include fractions of lignin and/or other compounds when associated with polysaccharides in the plant cell walls and if these compounds are quantified by the AOAC gravimetric analytical method for dietary fibre analysis: Fractions of lignin and the other compounds (proteic fractions, phenolic compounds, waxes, saponins, phytates, cutin, phytosterols, etc.) intimately "associated" with plant polysaccharides are often extracted with the polysaccharides in the AOAC 991.43 method. These substances are included in the definition of fibre insofar as they are actually associated with the poly- or oligo-saccharidic fraction of fibre. However, when extracted or even re-introduced into a food containing non digestible polysaccharides, they cannot be defined as dietary fibre. When combined with polysaccharides, these associated substances may provide additional beneficial effects.

\(^6\) As suggested by Turkey, in its written comments; the Committee may wish to consider whether the relevant physiological effect is sufficiently covered by the 1st bullet point and whether this new bullet point is required.

\(^7\) The statement "Stimulation of colonic fermentation" is added to take into account the effects resulting from the fermentation of fibre (production of metabolites, modification of the flora, effects associated with acidification of the lumen contents, with modification of certain enzymatic activities (e.g. effect on glyco-conjugated estrogens) or the production of a large quantity of short chain fatty acids and in particular butyrate which is thought to contribute to the proper functioning of the colonic mucosa and which might be beneficial in the prevention of several types of colon disease, including colon cancer. The physiological effects of fibre cannot be restricted to the colon. Epidemiological and interventional studies have demonstrated that protective properties of fibre are –above all- observed on cardiovascular diseases.

\(^8\) Official Methods of Analysis of AOAC International. 17th edition. Volume II. Horwitz, editor
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<tbody>
<tr>
<td>AOAC 999.03</td>
<td>Fructans (oligofructans, inulin derivatives, fructooligosaccharides)</td>
<td>McCleary &amp; Blakeney, 1999 McCleary <em>et al</em>., 2000</td>
<td>Enzymatic &amp; colorimetric</td>
<td>45.4.06B</td>
</tr>
<tr>
<td>AOAC 997.08</td>
<td>Fructans (oligofructans, inulin derivatives, fructooligosaccharides)</td>
<td>Hoebregs, 1997</td>
<td>Enzymatic &amp; HPAEC</td>
<td>45.4.06A</td>
</tr>
<tr>
<td>AOAC 2001.02</td>
<td>Trans-galactooligosaccharides</td>
<td>De Slegte</td>
<td>HPAEC-PAD</td>
<td>45.4.12</td>
</tr>
<tr>
<td>AOAC 2001.03</td>
<td>Total dietary fibre in foods containing resistant maltodextrin</td>
<td></td>
<td>Enzymatic gravimetric and Liquid chromatography</td>
<td>45.4.13</td>
</tr>
<tr>
<td>AOAC 2000.11</td>
<td>Polydextrose</td>
<td>Craig <em>et al</em>., 2001</td>
<td>HPAEC</td>
<td>45.6.06C</td>
</tr>
</tbody>
</table>

All the above methods are approved AOAC techniques. These methods have the advantage of being used world-wide as well as being easily used in routine analysis.

The AOAC 985.29 and 991.43 are the general methods for measuring ‘total dietary fibre’ in most foods. The other methods can be used for complementary assessment of other fibre components/fractions not measured by the general methods due to their solubility in aqueous alcohol or for analysis of certain foods or raw materials for which the standard methods may be less suitable. The methods for total or soluble+insoluble dietary fibre give satisfactory results for foods that contain neither added non-digestible oligosaccharides (e.g. FOS) nor resistant starch\(^9\) fractions RS1 and RS2 which are not measured by these AOAC method.

The AOAC 991.43 includes part of the resistant starch fractions (retrograded starches, RS3). Therefore, in order to include total RS, it is necessary to analyse RS independently and correct for the RS in the fibre residue.

The Englyst method, which is not used world-wide, is complicated and may therefore be less suitable for routine analysis. However, this or similar methods may be necessary in some foods difficult to analyse with the routine methods, e.g. infant formula.

**RECOMMENDATIONS TO CODEX COMMITTEES USING THIS DEFINITION OF DIETARY FIBRES**

Codex Committees, when making use of this definition, may wish to consider that:

- Food safety requirements should be met by the substances purporting to be presented as source of dietary fibres;
- The physiological effects listed in the definition may vary with the substances present in the foods and the justification for the use of the nutrition and health claims must accommodate this diversity;
- If the dietary fibre does not derive from plants, it may be appropriate to consider, when establishing labelling provisions, that consumers in many countries generally regard foods designated as sources of dietary fibre as having a plant origin.

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\(^9\) Resistant starch (RS) is defined as the fraction of starch not absorbed in the small intestine. It consists of physically enclosed starch (RS1), certain types of raw starch granules (RS2) and retrograded amylose (RS3). Modified starches used as food additives may also be partially resistant (RS4).
Annex 1

References


References to methods in the table.

985.29

991.43

994.13