Analysis of Dietary Fibre

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HK Regulation

- *Dietary fibre* means any fibre analyzed by means of any official methods adopted by AOAC International.

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AOAC Official Methods

AOAC 985.29	Total Dietary Fibre in Foods	Enzymatic-Gravimetric Method
AOAC 993.19	Soluble Dietary Fibre in Food and Food Products	Enzymatic-Gravimetric Method
AOAC 991.42	Insoluble Dietary Fibre in Foods and Food Products	Enzymatic-Gravimetric Method
AOAC 991.43	Total, Soluble, and Insoluble Deitary Fibre in Foods	Enzymatic-Gravimetric Method
AOAC 992.16 etc	Total Dietary Fibre (Applicable to determination of total fibre in cereals, beans, vegetables and fruits)	Enzymatic-Gravimetric Method

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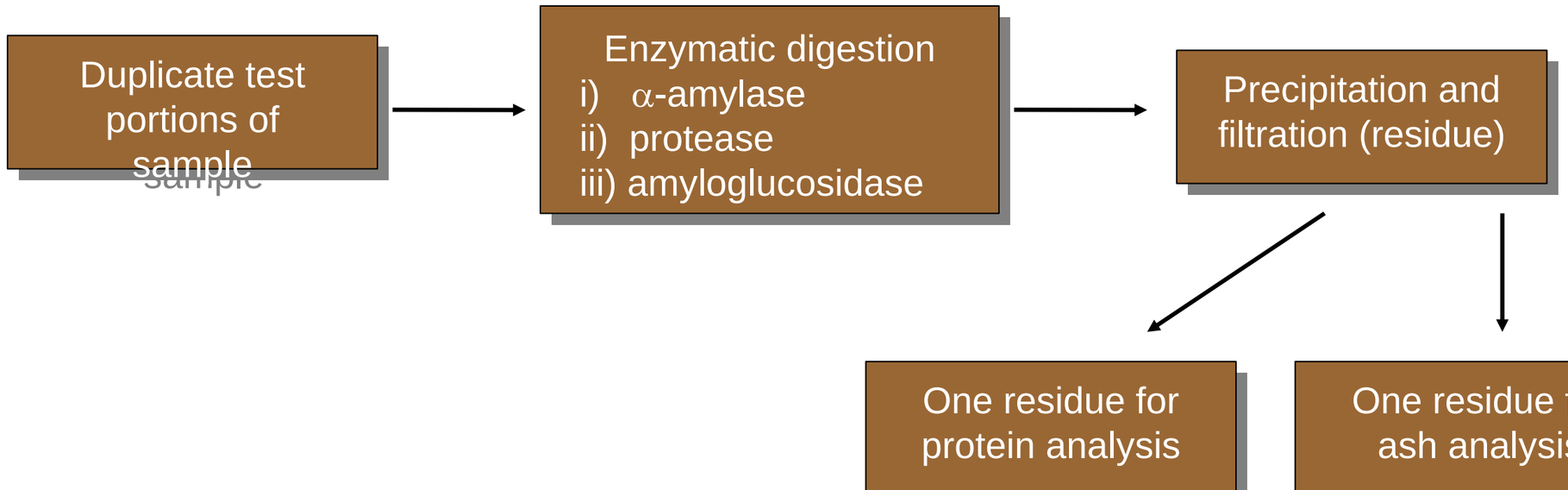

Total dietary fibre = weight (residue) – weight (ash + protein)

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- Homogenize and dry sample (freeze-dry is recommended).

- Defat with petroleum ether if >10% fat content, otherwise false high results.

- Weigh duplicate test portions (difference in weight should not >20 mg).

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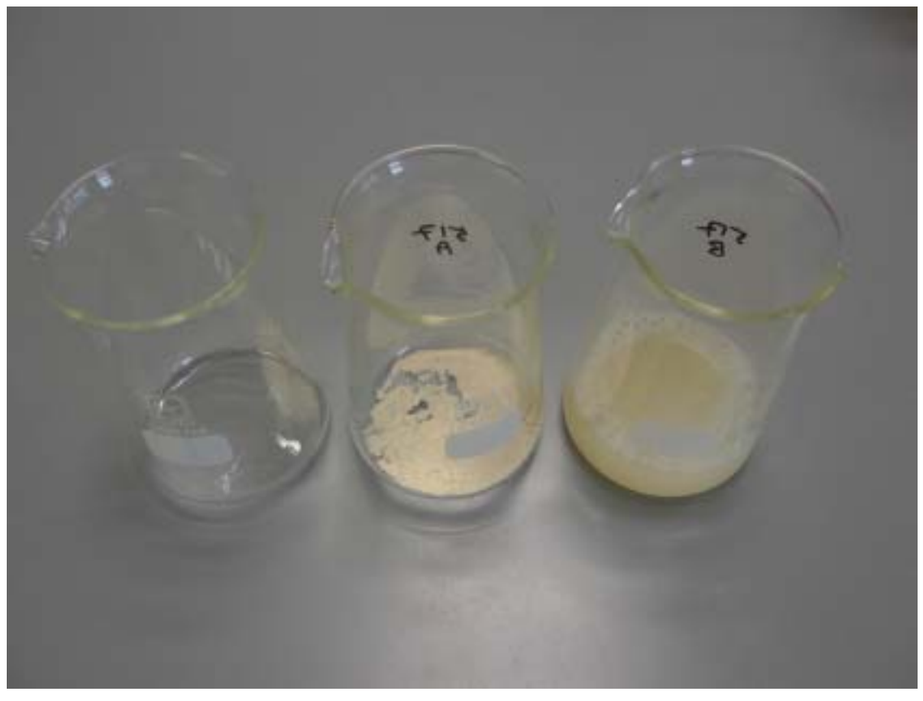
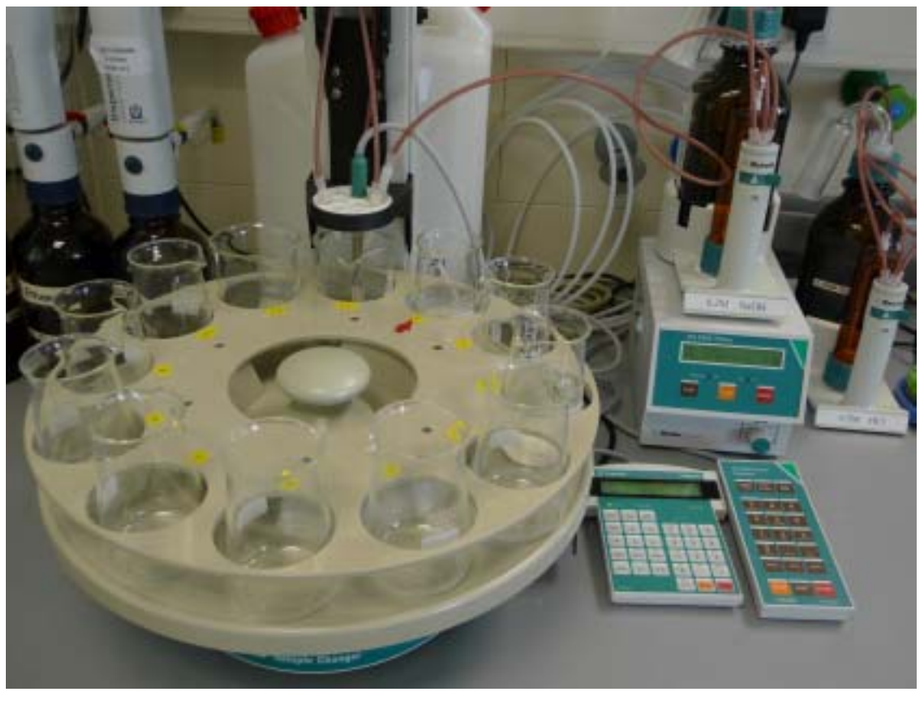
Preparing for digestion





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Preparing for digestion

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α-Amylase: gelatinize

- Add phosphate buffer (pH 6.0, 50 mL) to sample.
- Adjust to pH 6.0 $\pm$ 0.2.
- Add enzyme, incubate at 95 – 100 °C.
- 30 minutes in water bath.

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Protease: remove protein

- Cool to room temperature.
- Adjust to pH 7.5 ± 0.2.
- Add enzyme, incubate at 60 °C for 30 minutes.

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Amyloglucosidase: remove starch

- Cool.
- Adjust to pH 4.0 – 4.6.
- Add enzyme, incubate at 60 °C for 30 minutes.

Note: final solution volume is about 70 mL.

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Summary

- pH 6.0 ± 0.2, α-amylase, 95 – 100 °C, 15 - 30 min.
- pH 7.5 ± 0.2, protease, 60 °C, 30 min.
- pH 4.0 – 4.6, amyloglucosidase, 60 °C, 30 min.

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- Add 280 mL 95 % ethyl alcohol (60 ºC).
- Let precipitate form at room temperature for 60 minutes.
- Collect the residues (soluble fibre + insoluble fibre) in pre-weight crucibles.

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Precipitation

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Filtration

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- One test portion for protein, using N x 6.25 as conversion factor.

- Incinerate second test portion at 525 ^{o}C for 5 hours.

Total dietary fibre = [weight residue – protein – ash – blank] / weight test portion

Weight residue = average of duplicate
Weight test portion = average of duplicate

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Test for enzyme purity every half yearly

Test sample	Activity tested	Test portion (g)	Expected recovery (%)
Citrus pectin	Pectinase	0.1	95-100
Stractan (larch gum)	Hemicellulase	0.1	95-100
Wheat Starch	Amylase	1.0	0-1
Corn Starch	Amylase	1.0	0-2
Casein	Protease	0.3	0-2
β-Glucan (barley gum)	β-Glucanase	0.1	95-100

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AOAC Method for functional fibre

Functional fibre	Commercial name	Test Method
Beta-glucan	Imprime PGG®	AOAC 995.16
Oligofructose	Raftilose®, OliggoFiber™	AOAC 997.08 or 999.03
Fructooligosaccharides	Neosugar, Actilght®	AOAC 997.08 or 999.03
Polydextrose	Litesse®	AOAC 2000.11
Galactooligosaccharides	Yacult, Borculo Whey Products	AOAC 2001.02
Resistant maltodextrin	Fibersol-2	**AOAC 2001.03**
Resistant starch	C*Actistar	AOAC 2002.02

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AOAC 2001.03

Dietary Fiber Containing Supplemented Resistant Maltodextrin (RMD)

High MW RMD by Method 985.29 and
Low MW RMD by HPLC

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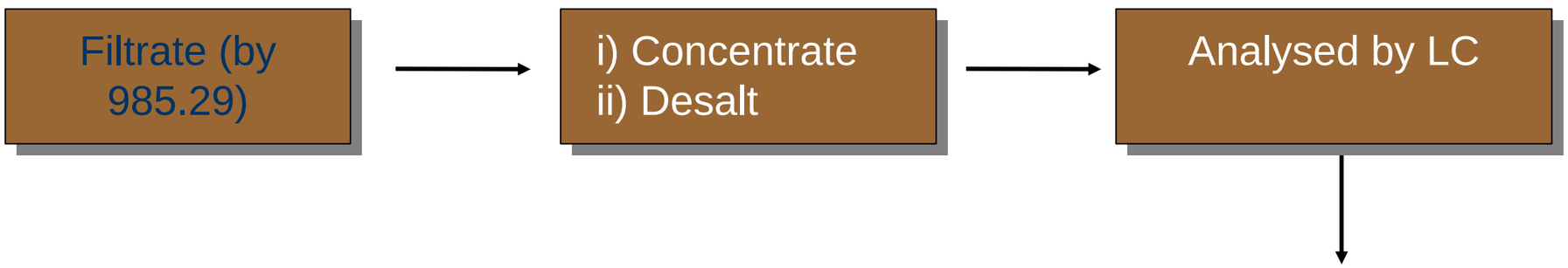

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- Only a portion of the resistant maltodextrin is precipitated in the aqueous ethanol when *Method 985.29* is applied to foods containing resistant maltodextrin.

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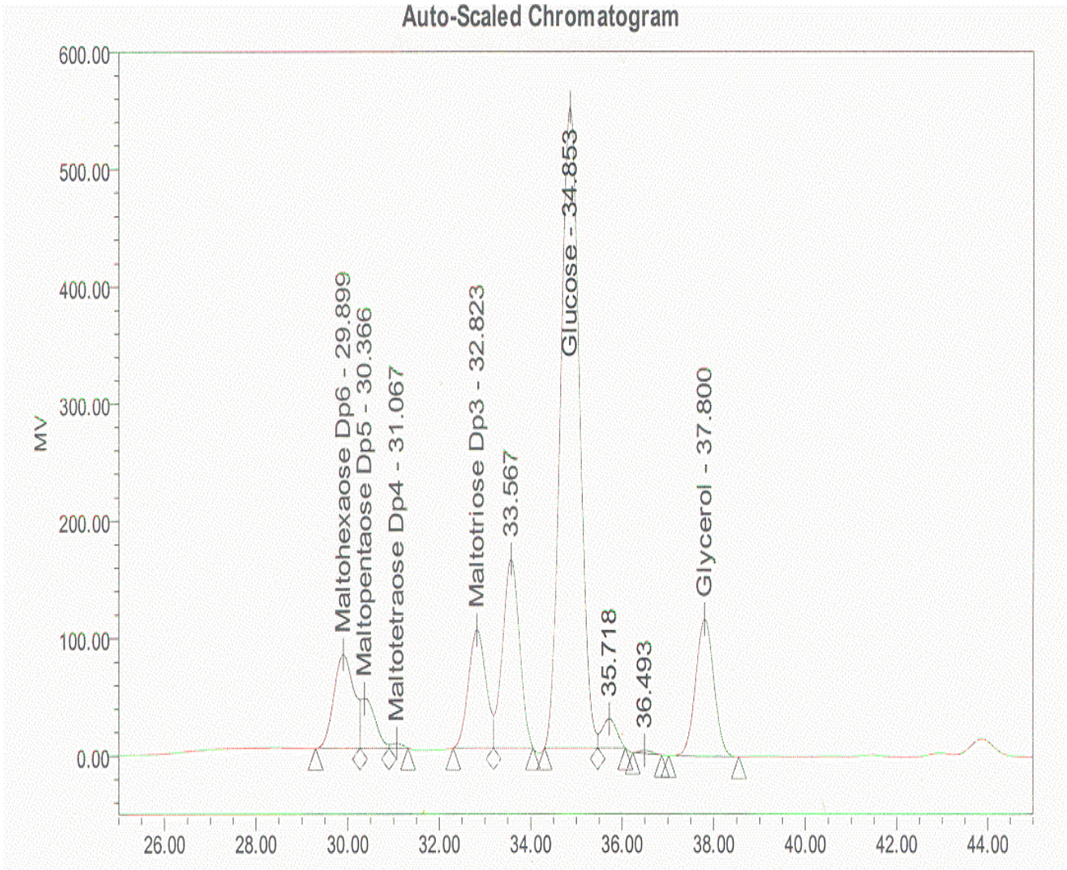
- In *Method 2001.03*, resistant maltodextrin that are soluble in aqueous ethanol are desalted, concentrated and measured by liquid chromatography.



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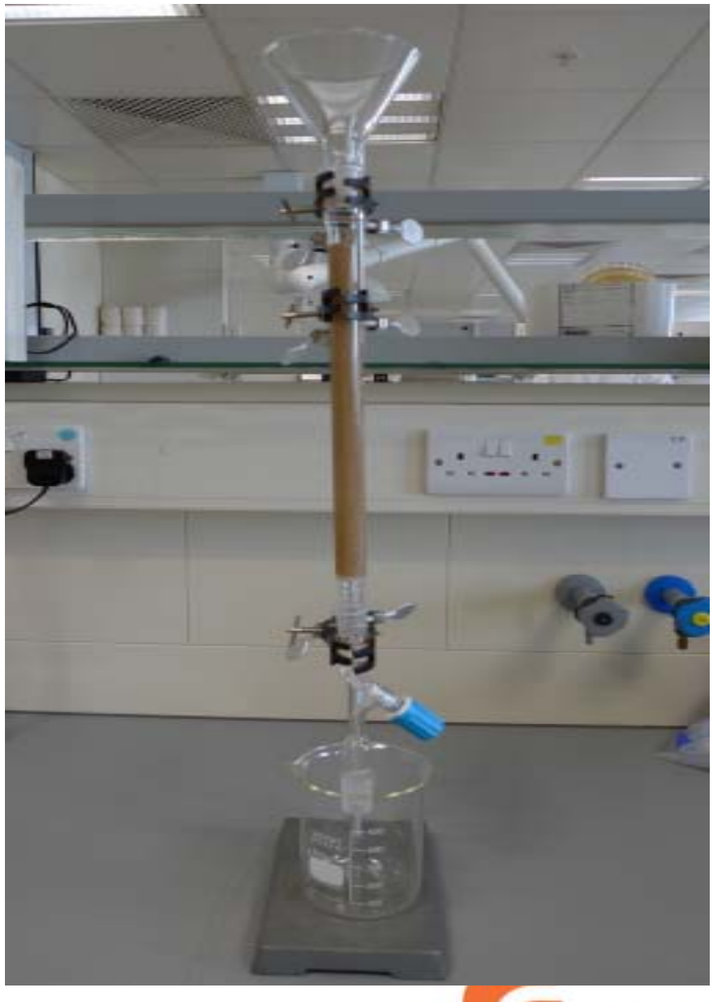
Desalting

- Ion exchange column (OH-type and H-type)



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Total dietary fibre =

fibre as measured by *Method 985.29* plus
low molecular weight resistant maltodextrin

Note: low molecular weight resistant maltodextrin refers to resistant maltodextrin that are soluble in the aqueous ethanol in Method 985.29.

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Calculation of available carbohydrate when method 2001.03 is used

- Available carbohydrate = 100 – [moisture + ash + protein + fat + alcohol + (soluble dietary fibre + insoluble dietary fibre) + low molecular weight resistant maltodextrin]

Note: low molecular weight resistant maltodextrin refers to resistant maltodextrin that is measured by AOAC 2001.03.

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Recoveries for other functional fibres when tested by AOAC 2001.03

Functional fibre	Recovery (%)
β-Glucan	101*
Fructooligosaccharides	98
Polydextrose	117
Galactooligosaccharides	111
Glucooligosaccharides	46
Resistant maltodextrin	88

* Recovery of insoluble dietary fibre and soluble dietary fibre is particular high.

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Points to note

- Definition of “0”: ≤1 g/100 g.
- Results are method dependent.

- Functional fibre should be included in the calculation of available carbohydrate.

- AOAC 2001.03 may give higher TDF results but with higher testing cost.

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Available proficiency test

- FAPAS
- AOAC
- LGC

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Thank You

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