ICS 67.060

DMS 1694:2020
First edition

DRAFT MALAWI STANDARD

Ready to eat extruded snacks – Specification

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FOREWORD

Production of ready to eat extruded snacks, both sweet and savoury, have recently increased. To safeguard the health of the consumers which are mainly children, and at the same time, to provide guidelines for manufacture of such foods, it has been felt necessary to prescribe requirements for them.

This standard does not define any particular composition of the 'ready-to-eat' extruded snack but leaves to option of using different types of raw materials in optional proportions to the manufacturers.

In preparing this standard, reference was made to the following Indian standard, and other publications:

IS 12566:1989, amended 1990, *Ready to eat extruded snacks – Specification;*

M.Kavya Reddy et el. (2014) *Development of extruded ready to eat (RTE) snacks using corn, black gram, roots and tuber flour blends.* J Food Sci Technol (September 2014) 51 (9):1929-1937*;*

Amudha Senthil, Bharath Kumar S. Aparna Pathak (2014), *Comparative quality evaluation of commercial extruded snacks*. Wudpecker Journal of Food Technology vol 3(1) pp 001-011, April 2015:

Acknowledgement is made for the use of the information.

TECHNICAL COMMITTEE

This draft proposal was prepared by the Technical Committee MBS/TC 16, *Cereals, pulses, legumes and their products,* and the following companies, organizations and institutions were consulted:
Agricultural Development and Marketing Corporation (ADMARC)
University of Malawi – Chancellor College
F&F Industries Limited
HMS Foods and Grains
Malawi Bureau of Standards
Ministry of Agriculture – Bvumbwe Agricultural Research Services
Ministry of Health
Ministry of Industry
Moon Puffs
Unity Super Meal

NOTICE

This standard shall be reviewed every five years, or earlier when it is necessary, in order to keep abreast of progress. Comments are welcome and shall be considered when the standard is being reviewed.

DRAFT MALAWI STANDARD

Ready to eat extruded snacks – Specification

1 SCOPE

This draft standard prescribes the requirements and methods of sampling and test for 'ready-to-eat' extruded snacks.

2 NORMATIVE REFERENCES

The following standards contain provisions, which through reference in this text, constitute provisions of this draft standard. All standards are subject to revision and, since any reference to a standard is deemed to be a reference to the latest edition of that standard, parties to agreements based on this draft standard are encouraged to take steps to ensure the use of the most recent edition of the standard indicated below. Information on current valid national and international standards can be obtained from the Malawi Bureau of Standards.

MS 19: *Labelling of pre-packed foods – General standard;*

MS 21: *Food and food processing units – Code of hygienic conditions;*

MS 30: Fortified wheat flour – Specification;

MS 51: Fortified edible oils – Specification;

MS 63: *Vegetable ghee – Specification;*

MS 63: *Mixed animal and vegetable ghee – Specification;*

MS 188: *Edible salt – Specification;*

MS 302: *Contaminants and toxins in foods – General standard;*

MS 633: *Milk powders – Specification*;

MS 1006: *Milk fat products – Specification;*

ISO 6579: *Methods for the microbiological examination of foods, Part 6: Examination for Salmonella Spp.;*

ISO 6888: *Microbiology of food and animal feeding stuffs – Horizontal method for the enumeration of coagulase-positive staphylococci (Staphylococcus aureus and other species);*

ISO 7251: *Microbiology of food and animal feeding stuffs – Horizontal method for the detection and enumeration of presumptive Escherichia coli – Most probable number technique;*

ISO 16050: *Foodstuffs – Determination of aflatoxin B*1*, and the total content of aflatoxin B*1*, B*2*, G*1 *and G2 in cereals, nuts and derived products – High performance liquid chromatographic method;*

ISO 21527-2: *Microbiology of food and animal feeding stuffs – Horizontal method for the enumeration of yeasts and moulds – Part 2: Colony count technique in products with water activity less than or equal to 0.95; and*

3 TERMS AND DEFINITIONS

For the purpose of this draft standard, the following terms and definitions shall apply:

3.1
'Ready-to-Eat' extruded snacks
ready to eat extruded snacks are made by a process known as 'extrusion cooking'

3.2
extrusion
is a process by which pre-conditioned raw food material is subjected to high-temperature short-time cooking which results in the material becoming of plastic consistency. This material is then extruded through specially tapered dies. As it emerges from the dies, it passes from a high pressure to a low pressure zone and this results in puffing of the product. The cooked dough is cut to the desired size; after which it is dried to the desired moisture. Finally, the product is coated with oil, flavours, salt, spices or sweetening agent, etc., and packed. These ingredients may also be added before extrusion

Note: The cooker extruder configuration used for the purpose of extrusion cooking shall ensure adequate cooking of raw ingredients. The: shape and size of the extruded product shall be reasonably uniform. being governed by the nature of die used for extrusion-cooking. The product shall be fully cooked. It shall also be free from insects, insect residues. rodent hair and excreta, fungal infection and any other extraneous and harmful material. The product shall be crisp, and free from grits or uncooked particles.

4 ESSENTIAL COMPOSITION AND QUALITY REQUIREMENTS

4.1 Raw materials

The following raw materials may be used for the production of ready-to-eat extruded snacks:

4.1.1 Dehusked and/or degermed cereals and pulses;

4.1.2 Wheat flour/semolina complying with MS 30;

4.1.3 Edible tubers and starches;

4.1.5 Edible oils complying with MS 51;

4.1.6 Ghee singly or in combination complying with MS 63, MS 64 and MS 1006;

4.1.7 Salt complying with MS 188.

4.1.8 Spices, spice extracts and condiments;

4.1.9 Tomato, onion and garlic powder;

4.10 Powder of other edible vegetables and fruits;

4.11 Cheese powder**;**

4.12 Skimmed milk powder complying with MS 633;

4.13 Dextrins;

4.14 High protein flours; and

4.14 Sugar and sugar products.

4.2 Quality requirements

4.2.1 The 'ready-to-eat' extruded snacks shall be of pleasant taste and smell, and free from rancid, soap, bitter or burnt taste and smell. They shall have an aroma and taste characteristic of the flavours and spices used.

4.2.2 Ready-to-eat extruded snacks shall conform to the composition requirements indicated in **Table 1**.

Table 1: Specific requirements for ready-to-eat extruded snacks

1	2	3	4
S/No.	**Characteristic**	**Maximum limits**	**Methods of test**
1	Moisture content, %(m/m), max	6.0	Annex B
2	Fat on dry basis, % m/m, max	25	Annex c
3	Peroxide value, max	10	AOAC
4	Total aflatoxin (AFB1+AFB2+AFG1 +AFG2), ppb, max	10	ISO 16050
5	Aflatoxin B1 only, ppb, max	5	
6	Total fumonisin (FB1+FB 2+FB3), ppm, max	2	AOAC

4.2.3 The product shall comply with the microbiological limits given in **Table 2.**

Table 2 – Microbiological limits for ready-to-eat extruded snacks

1	2	3	4
S/No.	**Type of microorganism**	**Maximum limit**	**Method of test**
(i)	Total viable count, cfu/g, max	$<10^4$	ISO 4833
(ii)	*Salmonella* in 25 g, max	Absent	ISO 6579
(iii)	*E. coli* per g, max	Absent	ISO 7251
(iv)	*Shigella* per g, max	Absent	ISO 21567
(v)	Coliforms g (per 100 g), cfu/g, max	Absent	ISO 4832
(vi)	*Staphylococcus aureus* per 10 g, max	Absent	ISO 6888
(vii)	*Moulds and yeast, per g, max*	< 50	ISO 21527-2

5 HYGIENE

5.1 The product covered by the provisions of this draft standard shall be prepared and handled in accordance with MS 21.

6 FOOD ADDITIVES

Only those food additives listed under this product in MS 237 shall be used and only within the limits specified.

7 CONTAMINANTS

7.1 Heavy metals

Ready to eat extruded snacks shall comply with maximum limits of heavy metals in accordance with MS 302.

7.2 Mycotoxin limits

Ready to eat extruded snacks shall comply with those maximum mycotoxin limits set in **Table 1** above, and those established by the Codex Alimentarius Commission for this commodity when tested according to ISO 16050.

8 PACKAGING AND LABELLING

8.1 Packaging

8.1.1 Ready to eat extruded snacks shall be packed in suitable containers or packages which will safeguard the hygienic, nutritional, technological and organoleptic qualities of the products. They shall be clean, free and of food grade quality.

8.1.2 The containers, including packaging material, shall be made of food grade material. They shall not impart any toxic substance or undesirable odour or flavour to the product.

8.1.3 Each package shall be securely closed and sealed. The sealing shall be done hermetically with or without nitrogen flushing to retain the contents in a fresh condition.

8.2 Labelling

8.2.1 In addition to the requirements in MS 19, each package shall be legibly and indelibly marked with the following:

8.2.1.1 Name of the material and trade-mark, if any;

8.2.1.2 Name and address of the manufacturer;

8.2.1.3 Batch or code number;

8.2.1.4 Net mass in grams or kilograms:

8.2.2.5 Date of manufacture;

8.2.2.6 List of ingredients; and

8.2.2.7 Expiry date.

9 METHODS OF SAMPLING AND TESTS OF 'READY-TO-EAT' EXTRUDED SNACKS

9.1 Representative samples of the product shall be drawn and criteria for ascertaining conformity to the requirements shall be as prescribed in **Annex A.**

9.2 Testing shall be done in accordance with the methods indicated against each requirement in **Tables 1** and **2** or other equivalent methods.

ANNEX A
(Normative)

SAMPLING OF READY-TO-EAT EXTRUDED SNACKS

A.1 GENERAL REQUIREMENTS OF SAMPLING

A.1.1 In drawing, preparing. storing and handling samples, the following precautions and directions shall be observed.

A.1.2 The sampling instrument shall be clean and dry when used. When talking samples for bacteriological examination, it shall be sterile.

A.1.3 Precautions shall be taken to protect the samples, the material being sampled, the sampling instrument and the containers for samples from adventitious contamination.

A.1.4 The samples shall be placed in clean and dry containers. The sample containers shall be of such a size that they are almost completely filled with the sample. The sample containers shall, in addition, be sterile when they are used for samples for bacteriological examination.

A.1.5 Each container shall be sealed air-tight after filling and marked with full details of sampling, such as, date' of sampling, date of manufacture and batch number or code number, if any.

A.1.6 Samples shall be stored in such a manner that the temperature of the material does not vary unduly from the normal temperature.

A.2 SCALE OF SAMPLING

A.2.1 **Lot.** In any consignment all the containers of the same size and belonging to the same batch of manufacture shall be grouped together to constitute a lot.

A.2.2 Samples shall be tested from each lot for ascertaining conformity of material to the requirements of the specification.

A.2.3 The number of containers to be tested from a lot shall depend upon the size of the lot and shall be in accordance with Table 2.

Table 2: Scale of sampling

1	2	3	4
S/No	**Number of containers in the lot**	**Sample size for tests other than microbiological**	**Sub-sample size for microbiological tests**
1	Up to 25	2	1
2	26 to 50	3	2
3	51 to 100	5	3
4	101 to 150	6	4
6	151 and above	8	

A.2.4 The containers shall be chosen at random from the lot.

A.3 TEST SAMPLES AND REFEREE SAMPLES

A.3.1 Empty the contents of the container on a sheet of paper and mix thoroughly. Take equal quantities of the material from each selected container and mix thoroughly as to form a composite sample weighing about 500 g. This composite sample shall be divided into three. equal parts, one for the purchaser another for the supplier and the third for the referee.

A.3.2 From the remaining portion of the material from each container, draw three samples each weighing not less than 100 g. These will constitute individual test samples for the container. These individual samples shall be separated into three identical size of samples in such a way that each set has an individual test sample

representing each container selected. One of these three sets shall be for the purchaser. another for the supplier and the third to be used as the referee sample.

A.3.3 From the containers selected according to Table 2, the number of containers given in Table 2 shall be randomly selected. Drawn with a suitable sampling instrument which is sterile, the representative quantity of material under aseptic conditions to form a sample of container for microbiological examination. Divide the sample (taking care not to bring in microbiological combination in the material) into three equal parts, each part so obtained shall constitute a test sample representing the container and shall be transferred to sterile containers sealed air-tight and labelled with full identification particulars given in **A.1.5**. These shall be marked, in addition, with the words. 'For microbiological examination' The sample so obtained shall be divided into three sets in such a way that each set has a sample representing each selected container. One of these sets shall be marked for the purchaser. another for the vendor and third for the referee.

A.3.4 Referee samples shall consist of a set of individual sample, the composite sample and a set of samples for microbiological examination marked for this purpose and shall bear the seals of the purchaser and the vendor. These shall be kept at a place agreed to between the purchaser and the vendor to be used in case of dispute between the two.

A.4 NUMBER OF TESTS

A.4.1 Tests for determination of moisture, fat and peroxide value shall be conducted on each of the samples constituting a set of individual samples.

A.4.2 Tests for description and flavour shall be conducted on the composite sample,

A.4.3 Tests for bacterial count. coliform count, Salmonella, Shigella and E Coli shall be conducted on each of the samples constituting a set of test samples labelled with the words "For microbiological examination".

A.5 CRITERIA FOR CONFORMITY

A.5.1 For individual samples, the lot shall be declared to satisfy the requirements of moisture, fat and peroxide value. jf each of the test results satisfies the corresponding requirements given in Table 1**.**

A.5.2 For samples for microbiological examination, the test results on the sample for microbiological examination shall meet the corresponding requirements specified in Table 2.

ANNEX B
(informative)
DETERMINATION OF MOISTURE CONTENT

B.1. PROCEDURE

Weigh about 5 g of the material in a dish made of porcelain, silica or platinum, previously dried in an electric oven maintained at 105 ± 1°C, for 5 hours. Cool the dish in a desiccator and weigh with the lid on. Repeat the process of heating, cooling and weighing at half-hour intervals until the loss in weight between two successive weighings is less than one milligram. Record the lowest weight obtained.

B.2. CALCULATION

Moisture, per cent by mass $\frac{100\,(M_1 - M_2)}{M_1 - M}$

Where,

M_1 = mass in g, of the dish with the material before drying;

M_2 = mass in g, of the dish with the material after drying; and

M = mass in g, of the empty dish.

ANNEX C
(informative)
DETERMINATION OF TOTAL FAT CONTENT

C.1 DEFINITION

C.1.1 Total fat content – The whole of the substances extracted by hexane under the operating conditions specified in this standard, and expressed as a percentage by mass of the product as received.

C.2 PRINCIPLE

After any grinding required, hydrolysis of a test portion by hydrochloric acid in the presence of ethanol and formic acid, thus releasing lipids bound to proteins and sugars and producing *in situ* ethyl formate which is a lipid solvent. Extraction of the fat by hexane in a special flask, removal of the solvent and weighing the residue thus obtained.

C.3 REAGENTS

The reagents used shall be of recognized analytical purity and the water used shall be distilled water of at least equivalent quality.

C.3.1 *n*-Hexane, boiling between 68 °C and 70 °C and having a residue on evaporation of less than 0.001 g per 100 ml, or failing this, n-hexane boiling between 67 °C and 70 °C and having a residue on evaporation of less than 0.002 g per 100 ml (if necessary, the residue on evaporation should be taken into account in the expression of results).

C.3.2 Ethanol, 95 per cent (v/v).

C.3.3 Formic Acid, 99 per cent (v/v).

C.3.4 Hydrochloric acid solution, dilute 7 volumes of concentrated hydrochloric acid ρ_{20} = 1.19 g/ml, with 3 volumes of water.

C.3.5 Nitrogen.

C.4 APPARATUS

Usual laboratory apparatus and in particular:

C.4.1 Mechanical grinder

C.4.2 Sieve of aperture size 500 µm.

C.4.3 Water bath capable of being thermostatically controlled at 75 ± 1°C.

C.4.4 Analytical balance.

C.4.5 Distillation apparatus, preferably a reduced pressure rotary evaporator.

C.4.6 Magnetic stirrer, with PTFE coated bar magnet approximately 0.9 cm in diameter and 4.5 cm long.

C.4.7 Flask for hydrolysis and extraction, with a ground neck and a side tube of sufficient capacity to retain the aqueous phase and a small portion of the hexane phase, and of dimensions and shape similar to that shown in Figure 1. The flask shown in Figure 1 is suitable and has a capacity of 317 ml, the capacity of the side tube being 51 ml.

C.4.8 Reflux condenser, to fit the flask (see **C.4.7**) (ground joint 29/32).

C.4.9 Round-bottomed flask of capacity 250 ml, to fit the distillation apparatus (see **C.4.5**)

All dimensions in millimetres

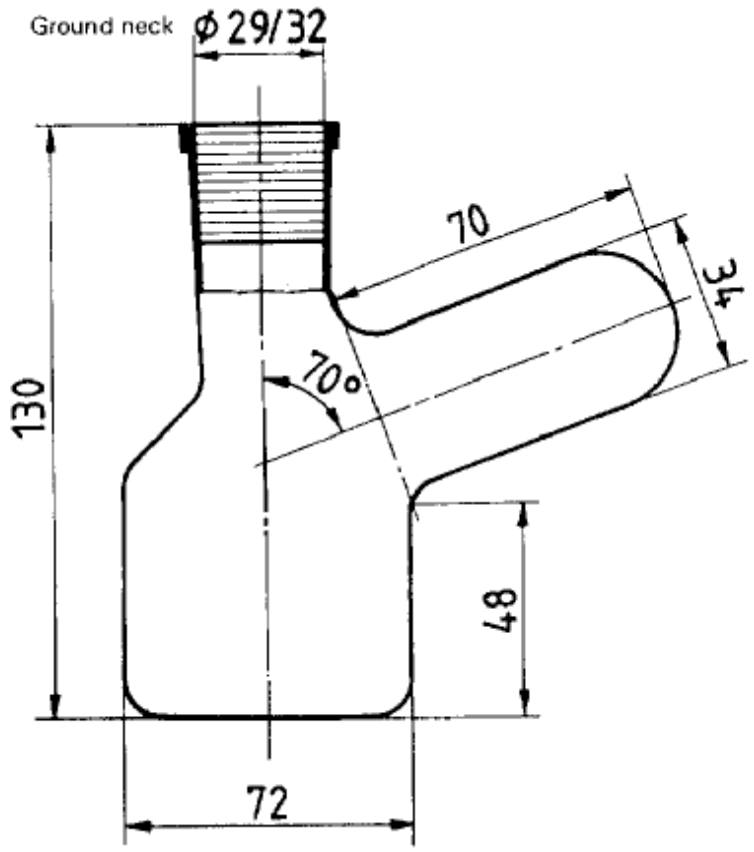

Figure 1: Flask for hydrolysis and extraction (for information only)

C.5 PROCEDURE

C.5.1 Preparation of the test sample

If necessary, grind the laboratory sample in the previously well cleaned mechanical grinder (see **C.4.7**) to produce particles such that 95 per cent shall pass through the sieve (see **C.4.2**). Mix well before the test portion.

C.5.2 Preparation of the flask

Dry the flask (see **C.4.9**) in an oven and allow it to cool to room temperature in the laboratory atmosphere. Then weigh it to the nearest 0.1 mg.

C.5.3 Test portion

Weigh, to the nearest 0.01 g, about 8 g of the test sample and transfer it to the flask for hydrolysis and extraction (see **C.4.7**) containing the bar magnet of the magnetic stirrer (see **C.4.6**).

C.5.4 Hydrolysis

Spread the test portion in the bottom of the flask. Add 10 ml of ethanol (see **C.3.2**), place the flask on the magnetic stirrer (see **C.4.6**), and operate the stirrer until as homogenous a paste as possible is obtained.

Add 8 ml of the formic acid (see **C.3.3**) and 12 ml of the hydrochloric acid solution (see **C.3.4**) and continue stirring to homogenize (see **C.7**). Fit the reflux condenser (see **C.4.8**) controlled at 75 ± 1 °C, for 20 minutes. Remove the reflux condenser, cool the flask and replace it on magnetic stirrer.

C.5.5 Extraction

Place 18 ml of the ethanol (see **C.3.2**) and 50 ml of the hexane (see **C.3.1**) in the flask, and stir the mixture for 5 minutes at the maximum frequency of rotation of the bar magnet that can be used without risk of ejection of material from the flask. Allow the mixture to stand until the phases are completely separated.

If necessary, accelerate the separation by heating the flask for 20 seconds on the water (see **C.7**). Transfer the hexane phase into the prepared flask (see **C.5.2**) retaining the aqueous phase in the lateral tube of the flask. Rinse the neck of the flask with several drops of hexane. Place 30 ml of hexane in the flask, stir the mixture for 5 minutes, allow the phases to separate, then transfer the hexane phase into the flask containing the first extract. Repeat the extraction once more, using 30 ml of hexane each time.

C.5.6 Removal of solvent and weighing the residue

Evaporate the solvent contained in the flask, preferably under reduced pressure; by means of the distillation apparatus (see **C.4.5**).

Immediately after evaporation, pass a stream of nitrogen (see **C.3.5**) through the flask for 10 minutes. Carefully wipe the outside of the flask and allow it to cool to room temperature in the laboratory atmosphere. Then weigh it to the nearest 0.1 mg.

C.6. EXPRESSION OF RESULTS

Total fat content: expressed as a percentage by mass of the product as received, = $\frac{M_2 - M_1 \times 100}{M_o}$

Where,

M_o = mass, in g of the test portion (see **C.5.3**);

M_1 = mass, in g of the flask; and

M_2 = mass, in g of the flask and residue (see **C.5.6**).

Express the results to the nearest 0.01 per cent.

C.7. NOTES ON PROCEDURE

If dispersion of the product in the reagents before hydrolysis (see **C.5.4**) is not possible, or if the decantation of the upper phase after extraction by hexane (see **C.5.5**) is difficult, it is recommended to carry out the determination on a test portion of mass less than 8 g, while maintaining the same quantity of reagents.

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