



DRAFT TANZANIA STANDARD

Biofortified maize (corn) grains - Specification

draft for stakeholders comment

TANZANIA BUREAU OF STANDARDS



0. Forward

Bio fortification is one among the interventions strategy proposed to combat micronutrient deficiencies among the society. It is a process of increasing the density of vitamins and minerals in a crop through conventional plant breeding, modern biotechnology, or agronomic practices. The identified staple crops include maize, beans, sweet potatoes, cassava, wheat, rice and pearl millet. Thus when bio fortified products are consumed regularly, will improve human health and nutrition significantly.

This standard has been developed to keep up with advancements of the bio fortification food crops and to ensure the safety and quality of the product traded in the markets in order to safeguard the health of the consumers.

In reporting the result of a test or analysis made in accordance with the Tanzania standard, if the final value observed or calculated is to be rounded off, it shall be done in accordance with TZS 4

1 Scope

This draft Tanzania Standard specifies requirements, sampling and test methods for biofortified maize grains of varieties grown from common maize grains, *Zea mays indentata* L. and/or *Zea mays indurata* L. or their hybrids through conventional plant breeding intended for human consumption.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

CAC RCP 1, *General principles of food hygiene*

CODEX STAN 193, *General standard for contaminants and toxins in food and feed*

TZS 538/ EAS 38, *Labelling of pre-packaged foods — Requirements*

TZS 330/ EAS 900, *Cereals and pulses — Sampling*

TZS 331/ EAS 901, *Cereals and pulses — Test methods*

TZS 438/ EAS 44, *Maize grain — Specification*

TZS 4 Rounding of numerical values

3 Terms and definitions

For the purposes of this standard, the following terms and definitions shall apply.



3.1

biofortification

is a process that enhances the nutritional value of staple food crops by increasing the density selected micronutrients in a crop through either conventional plant breeding, modern biotechnology, or agronomic practices.

3.2 Biotechnology

the exploitation of biological processes for industrial and other purposes, especially the genetic manipulation of microorganisms for the production of antibiotics, hormones, etc.

3.3

conventional plant breeding

is the process of crop development that entails screening germplasm for available genetic diversity, pre-breeding parental genotypes, developing and testing micronutrient dense germplasm, conducting genetic studies, and developing molecular markers to lower the costs and quicken the pace of breeding.

3.4

biofortified maize (corn) grain

shelled grain or kernel of the species *Zea mays indentata* L. (dent maize) and/or *Zea mays indurata* L. (flint maize) or their hybrids enriched with beta-carotenes.

3.5

beta- carotene

an organic, strongly coloured red-orange pigment abundant in plants and fruits; that gives biofortified maize deep yellow to deep orange colour.

3.6

pro-vitamin A

is a form of beta-carotene that can be converted within the body into a vitamin A

3.7

defective/damaged grain

pest damaged, discoloured, stained, rotten and diseased, immature and shrivelled grains and broken grain

3.8

pest damaged grain

biofortified maize grain which shows damage or owing attack by rodents, insects, mites or other pests

3.9

stained grain

bio fortified grain/kernel whose natural colour has been altered by external factors, such as ground, soil or weather. This may include grain which has dark stains or discolouration with a rough external appearance.

**3.10****rotten and diseased grain**

bio fortified maize grain affected by mould growth or bacterial decomposition or other causes that may be noticed without having to cut the grains to examine it and renders it unsafe for human consumption

3.11**discoloured grain**

bio fortified maize kernel whose colour has been altered due to heat, frost or water

3.12**Mouldy grain**

bio fortified maize grain with visible mycelial growth on its tip or surface

3.13**immature and shrivelled grain**

bio fortified maize grain which is underdeveloped, thin and papery in appearance

3.14**broken kernels**

pieces of biofortified maize which pass through a 4.50mm round hole metal sieve.

3.15**other grains**

edible grains, whole or broken, other than biofortified maize, that is, cereals, pulses and other edible legumes

3.16**foreign matter**

all organic and inorganic material other than maize grain, broken kernels and other grains

3.16.1**inorganic matter**

stones, glass, pieces of soil and other mineral matter

3.16.2**organic matter**

any animal or plant matter (seed coats, straws, weeds) other than grain of maize, damaged maize grain, other grains, inorganic extraneous matter and harmful/toxic seeds

3.17**harmful/noxious seeds**

seeds such as *Crotalaria* (*Crotalaria spp.*), Corn cockle (*Agrostemma githago L.*), Castor bean (*Ricinus communis L.*), Jimson weed (*Datura spp.*) which can have a damaging or dangerous effect on health, sensory properties or technological performance

3.18**filth**

impurities of animal origin

**3.19****food grade packaging material**

material, made of substances which are safe and suitable for their intended use and which will not impart any toxic substance or undesirable odour or flavour to the product

3.20**flint maize (corn)**

form of biofortified corn whose mature kernel has a smooth, vitreous, appearance and a rather round shape

3.21**dent maize (corn)**

form of biofortified corn whose mature kernel has the shape of a horse's tooth with a depression in the crown

4 Classification**4.1 Color**

Biofortified maize shall be classified as yellow or orange colors as follows;

- (a) yellow biofortified maize grain shall contain not more than 5 % by weight of biofortified maize of other colours.
- (b) orange biofortified maize grain shall contain not more than 5 % by weight of biofortified maize of other colours

4.2 Shape

Biofortified maize grain may be classified as flint or dent or their hybrids or mixtures thereof as follows:

- a) Biofortified flint maize includes maize of any colour which consists of 95 % or more by weight of grains of flint maize;
- b) Biofortified dent maize includes maize of any colour which consists of 95 % or more by weight of grains of dent maize; and
- c) a mixture of biofortified flint and dent maize includes maize of any colour which consists of more than 5 % but less than 95 % of biofortified flint maize.

5 Quality requirements**5.1 General requirements**

Biofortified maize grain shall be;

practically free from foreign odours, moulds, live pests, toxic or noxious weed seeds, other edible grains and other injurious contaminants as determined from samples representative of the lot.

Free from genetic modified maize



5.2.1 Specific requirements

biofortified maize grain shall comply with maximum limits given in Table 1 when tested in accordance with the test methods specified therein.

Table 1 — Specific requirements for biofortified maize grain

S/N	Characteristic	Maximum limit			Test method (TZS 331/EAS 901)
		Grade 1	Grade 2	Grade 3	
i.	Foreign matter, %, m/m	0.5	1.0	1.5	Clause 4
ii.	Inorganic matter, %, m/m	0.25	0.5	0.75	
iii.	Pest damaged grains, %, m/m	1.0	3.0	5.0	
iv.	Rotten and diseased grains, %, m/m	1	2	3	
v.	Discoloured grains, %, m/m	1.5	2.0	2.5	
vi.	Immature and shrivelled grains, %, m/m	1.0	2.0	3.0	
vii.	Filth, %, m/m	0.1			
viii.	Total defective grains, %, m/m	5	9	14	
ix.	Broken kernels, %, m/m	2.0	4.0	6.0	
x.	Moisture, %, m/m	13.5			Clause 5
NOTE 1 The parameter, Total defective grains is not the sum total of the individual defects. It is limited to 70 % of the sum total of individual defects.					
NOTE 2 The parameter, Discoloured grains is limited to at least 25 % discolouration on both sides of the kernel.					

5.2.2 Requirements for biofortified maize grains

biofortified maize grains shall comply with given limits in Table 2 when tested in accordance with the test methods specified therein.

Table 2 — Requirements for biofortified maize grains

S/N	Characteristic	Minimum Limit (ppm)	Test Method
1	Pro-vitamin A (as	8	AOAC 2001.13



beta-carotene)		
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6 Contaminants

6.1 Pesticide residues

Biofortified maize grain shall comply with those pesticide residue limits established by the Codex Alimentarius Commission for this commodity.

6.2 Other contaminants

6.2.1 biofortified maize grain shall comply with those limits for heavy metals specified in CODEX STAN 193 established by the Codex Alimentarius Commission.

6.2.2 biofortified maize grain shall comply with the maximum limits for mycotoxins given in Table 3 when tested in accordance with the test methods prescribed therein.

Table 3 — Mycotoxin limits for bio fortified maize grain

S/N	Mycotoxin	Maximum limit	Test method (TZS 331/EAS901)
i.	Total aflatoxins (AFB ₁ +AFB ₂ +AFG ₁ +AFG ₂), µg/kg	10	Clause 9 or 10
ii.	Aflatoxin B ₁ , µg/kg	5	
iii.	Fumonisin (B ₁ +B ₂), mg/kg	2	Clause 11 or 12

7 Hygiene

Biofortified maize grains shall be produced, prepared and handled in accordance with Refer TZS.

8 Weights and measures

Biofortified maize grains shall be packaged in accordance with the weights and measures regulations of the destination country.

9 Packaging

9.1 Biofortified maize grains shall be packed in food grade packaging material which will safeguard the hygienic, nutritional and organoleptic qualities of the products.

9.2 Each package shall be securely closed and sealed.



10 Labelling

10.1 Labelling of retail containers

In addition to the requirements in TZS 538/EAS 38, each package shall be legibly and indelibly labelled with the following:

- a) product name as “pro-vitamin A maize grains”,
- b) grade;
- c) name, address and physical location of the producer/packer/importer;
- d) lot/batch/code number;
- e) net weight, in kilograms;
- f) the declaration “Food for Human Consumption”;
- g) storage instruction as “Store in a cool dry place away from any contaminants”;
- h) crop year;
- i) packing date;
- j) instructions on disposal of used package;
- k) country of origin; and
- l) declaration that biofortified maize is not genetically modified.

10.2 Labelling of non-retail containers

Information detailed in 10.1 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 processor or packer as well as storage instructions, shall appear on the container.

However, lot identification and the name and address of the processor or packer may be replaced by an identification mark provided that such a mark is clearly identifiable with the accompanying documents.

Certification mark (tbs mark of quality statement)



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