

**1 Scope**

This standard applies to commercial varieties of spinach grown from *Spinacia oleracea* L. of the Amaranthaceae family, to be supplied fresh to the consumer. Spinach for industrial processing are excluded.

**2 Normative References**

The following documents are referred to in the text in such a way that some or all their contents constitute the requirements of this document. The latest edition of the referenced documents (including any amendments) applies.

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### 3 Terms and Definitions

For the purpose of this Standard, the following definitions apply:

#### 3.1

##### **flower stem**

flower bearing portion of the spinach plant (CAC, 2015)

#### 3.2

##### **foreign matter**

vegetal and non-vegetal matter not associated with spinach. It includes stones, sticks, bark, soil, metal, plastic, debris, and glass among others (CAC, 2022, *modified*)

#### 3.3

##### **foreign smell and/or taste**

smell or taste not associated with spinach due to inappropriate postharvest practices/conditions and transportation (CAC, 2022, *modified*)

#### 3.4

##### **intact**

spinach as it was harvested having no physical parts/pieces missing (CAC, 2022, *modified*)

#### 3.5

##### **spinach**

low-heat tolerant annual crop, propagated commercially via seeds that are sown either through broadcasting or in hills using dry soils (El-Saady, 2016, *modified*)

#### 3.6

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85 **tolerances**  
86 maximum percentage of all the allowances/deviations that are permitted within a  
87 lot of spinach or a class, from the requirements of the standard (CAC, 2022,  
88 *modified*)

89  
90 **3.7**

91 **well-trimmed**

92 leaf stems or petioles of the spinach that are left intact in relation to the market  
93 requirements after removal of undesirable parts (Tanzania Bureau of Standard  
94 [TZS], 2024, *modified*)

95

96

97 **4 Provisions Concerning Quality**

98

99 **4.1 Minimum requirements**

100

101 In all classes, subject to the special provisions for each class and the tolerances  
102 allowed, the spinach shall be:

103

104 a. intact;

105 b. sound; produce affected by rotting or deterioration such as to make it unfit for  
106 consumption is excluded;

107 c. firm;

108 d. clean, practically free of any visible foreign matter;

109 e. practically free of pests and damaged caused by them affecting the general  
110 appearance of the produce;

111 f. free of abnormal external moisture excluding condensation following removal  
112 from cold storage;

113 g. free of any foreign smell and/or taste;

114 h. fresh in appearance;

115 i. free from flower stem;

116 j. well-trimmed;

117 k. free from root tufts; and

118 l. practically free from mechanical and physiological damage caused by low  
119 and/or high temperature.

120

121 **4.2** Spinach shall be harvested and have reached an appropriate degree of  
122 development in accordance with criteria proper to the variety and the area in  
123 which they are grown.

124

125 **4.3** The development and condition of the spinach shall be such as to enable them:

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- 127 a. to withstand transport and handling; and  
128 b. to arrive in satisfactory condition at the place of destination.

129

130

## 131 **5 Classification**

132

133 Spinach of any variety and/or commercial type shall be classified in three classes  
134 defined below:

135

### 136 **5.1 Extra class**

137

138 Spinach in this class shall be of superior quality. They shall be free from defects  
139 with the exception of very slight superficial defects, provided these do not affect  
140 the general appearance of the produce, the quality, the keeping quality and  
141 presentation in the package.

142

### 143 **5.2 Class I**

144

145 Spinach in this class shall be of good quality. The following slight defects,  
146 however, may be allowed, provided these do not affect the general appearance  
147 of the produce, the quality, the keeping quality and presentation in the package:

148

- 149 a. slight damage in leaves, such as cracks, holes, or tears;  
150 b. slight defect in shape; and  
151 c. slight defects in coloring.

152

### 153 **5.3 Class II**

154

155 This class includes Spinach that do not qualify for inclusion in the higher classes  
156 but satisfy the minimum requirements in Clause 4.1 above. The following defects  
157 shall be allowed, provided the spinach retain their essential characteristics as  
158 regards the quality, the keeping quality, and presentation:

159

- 160 a. damage in leaves, such as cracks, holes, or tears;  
161 b. defects in shape; and  
162 c. defects in coloring.

163

164

## 165 **6 Provisions Concerning Tolerances**

166

167 **6.1** At all marketing stages, tolerances with respect to quality shall be allowed in each  
168 lot for produce not satisfying the requirements of the class indicated. Conformity

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169 assessment for the produce shall be conducted in accordance with the relevant  
170 provisions in the PNS/BAFS 293:2020 (Principles and guidelines for national  
171 food control systems), (ASEAN Principles for food import and export inspection  
172 and certification, MOD), the CXG 47-2003 (Guidelines for food import control  
173 systems), and/or their latest issuances.  
174

## 175 **6.1.1 Quality tolerances**

### 176 177 **6.1.1.1 Extra class**

178  
179 Five percent (5%) by number or weight of spinach not satisfying the requirements  
180 of the class, but meeting those of Class I or, exceptionally, coming within the  
181 tolerances of that class.  
182

### 183 **6.1.1.2 Class I**

184  
185 Ten percent (10%) by number or weight of spinach not satisfying the  
186 requirements of the class, but meeting those of Class II or, exceptionally, coming  
187 within the tolerances of that class.  
188

### 189 **6.1.1.3 Class II**

190  
191 Fifteen percent (15%) by number or weight of spinach satisfying neither the  
192 requirements of the class nor the minimum requirements, with the exception of  
193 produce affected by rotting or any other deterioration rendering it unfit for  
194 consumption.  
195

## 196 197 **7 Provision Concerning Presentation**

### 198 199 **7.1 Uniformity**

200  
201 The contents of each package (or lot for produce presented in bulk) shall be  
202 uniform and contain only spinach of the same origin, and quality. The visible part  
203 of the contents of the package (or lot for produce presented in bulk) shall be  
204 representative of the entire contents.  
205

### 206 **7.2 Packaging**

207  
208 **7.2.1** Spinach shall be packed in such a way as to protect the produce properly. The  
209 materials used inside the package shall be of food-grade quality, clean, and of  
210 quality such as to avoid causing any external or internal damage to the produce.

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211 The use of materials, particularly of paper or stamps bearing trade specifications  
212 is allowed, provided the printing or labelling has been done with non-toxic ink or  
213 glue.  
214

215 **7.2.2** Spinach shall be packed in each container in compliance with the PNS/BAFS  
216 49:2021 (GAP for fruits and vegetable farming), PNS/BAFS 198:2017 (COP for  
217 packaging and transport of fresh fruits and vegetables), and/or their latest  
218 issuances.  
219

220 **7.2.2.1 Description of containers**  
221

222 The containers shall meet the quality, hygiene, ventilation, and resistance  
223 characteristics to ensure suitable handling, shipping and preserving of the  
224 spinach. Packages (or lot for produce presented in bulk) shall be free of all  
225 foreign matter and smell.  
226  
227

228 **8 Provisions Concerning Marking or Labelling**  
229

230 **8.1** Labelling of spinach for retail and non-retail containers shall conform with  
231 relevant provisions of Clause 6 Mandatory information requirements on the label  
232 of the PNS/BAFS 384:2024 (General standard for labelling of primary and  
233 postharvest foods — Product standard) and/or its latest issuances.  
234  
235

236 **9 Food Additives**  
237

238 **9.1** The use of food additives shall not be allowed in spinach intended to be supplied  
239 fresh to consumers.  
240  
241

242 **10 Contaminants**  
243

244 **10.1** Spinach shall comply with the Maximum Residue Limits (MRL) of pesticides  
245 established by the national competent authority, CAC, and/or ASEAN  
246 Harmonized MRL of Pesticides.  
247

248 **10.2** Spinach shall comply with the Maximum Levels (ML) of the PNS/BAFS 194:2022  
249 (GSCTFF — Product standard) and/or its latest issuances.  
250  
251

252 **11 Hygiene**

253  
254 **11.1** It is recommended that the produce covered by the provisions of this Standard  
255 be prepared and handled in accordance with the appropriate sections of the  
256 PNS/BAFS 49:2021 (GAP for fruits and vegetable farming), PNS/BAFS  
257 233:2018 (COHP for fresh fruits and vegetables), CXC 1-1969, Rev. 2022  
258 (General principles of food hygiene), and other relevant codes of practice.

259  
260 **11.2** Spinach shall comply with microbiological criteria established in accordance with  
261 the PNS/BAFS 307:2020 (Establishment of microbiological criteria for food),  
262 PNS/BAFS 372:2023 (Primary and postharvest food and feed — Product  
263 standard — Microbiological criteria), and/or their latest issuances.

264  
265  
266 **12 Methods of Analysis and Sampling**

267  
268 Analytical and sampling methods to be used for ascertaining conformance to the  
269 requirements of this specification shall be in accordance with relevant text in  
270 PNS/BAFS 351:2022 (General methods of analysis for contaminants in food and  
271 feed — Guidelines) and CXS 234-1999 (Recommended methods of analysis and  
272 sampling) and/or their latest issuances.

273  
274  
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276 **13 Nutritional Composition**

277  
278 Information on the nutritional composition is shown in Annex A (Nutritional  
279 composition of Spinach) based on the FoodData Central of 2019 (Agriculture  
280 Research Service [ARS]-United States Department of Agriculture [USDA], 2019).

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**Annex A**  
(Informative)

**Nutritional composition of spinach (ARS-USDA, 2019)**

Nutrients	Values
<b>Proximate</b>	
Water (g)	9.14
Energy (kcal)	23
Energy (kJ)	97
Protein (g)	2.86
Total lipid [fat] (g)	0.39
Ash (g)	1.72
Carbohydrate, by difference (g)	3.36
<b>Other Carbohydrate</b>	
Fiber, total dietary (g)	2.2
Total Sugars (g)	0.42
Sucrose (g)	0.07
Glucose (g)	0.11
Fructose (g)	0.15
Lactose (g)	0
Maltose (g)	0
Galactose (g)	0.1
<b>Minerals</b>	
Calcium, Ca (mg)	99
Iron, Fe (mg)	2.71
Magnesium, Mg (mg)	79
Phosphorus, P (mg)	49
Potassium, K (mg)	558
Sodium, Na (mg)	79
Zinc, Zn (mg)	0.53
Copper, Cu (mg)	0.13
Manganese, Mn (mg)	0.897
Selenium, Se (µg)	1
<b>Vitamins</b>	
Vitamin C, total ascorbic acid (mg)	28.1
Thiamin (mg)	0.078
Riboflavin (mg)	0.189
Niacin (mg)	0.724

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Pantothenic acid (mg)	0.065
Vitamin B-6 (mg)	0.195
Folate, total (µg)	194
Folic acid (µg)	0
Folate, food (µg)	194
Folate, DFE (µg)	194
Choline, total (mg)	19.3
Betaine (mg)	103
Vitamin B-12 (µg)	0
Vitamin B-12, added (µg)	0
Vitamin A, RAE (µg)	469
Retinol (µg)	0
Carotene, beta (µg)	5630
Carotene, alpha (µg)	0
Cryptoxanthin, beta (µg)	0
Vitamin A, (IU)	9380
Lycopene (µg)	0
Lutein + zeaxanthin (µg)	12200
Vitamin E [alpha-tocopherol] (mg)	2.03
Vitamin E, added (mg)	0
Tocopherol, beta (mg)	0
Tocopherol, gamma (mg)	0.18
Tocopherol, delta (mg)	0
Tocotrienol, alpha (mg)	0
Tocotrienol, beta (mg)	0
Tocotrienol, gamma (mg)	0
Tocotrienol, delta (mg)	0
Vitamin D [D2 + D3], International Units (IU)	0
Vitamin D [D2 + D3] (µg)	0
Vitamin K [phylloquinone] (µg)	483
<b>Lipids</b>	
Fatty acids, total saturated (g)	0.063
Fatty acids, total monounsaturated (g)	0.01
Fatty acids, total polyunsaturated (g)	0.165
<b>Amino acids</b>	
Tryptophan (g)	0.039
Threonine (g)	0.122
Isoleucine (g)	0.147

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Nutrients	Values
Leucine (g)	0.223
Lysine (g)	0.174
Methionine (g)	0.053
Cystine (g)	0.035
Phenylalanine (g)	0.129
Tyrosine (g)	0.108
Valine (g)	0.161
Arginine (g)	0.162
Histidine (g)	0.064
Alanine (g)	0.142
Aspartic acid (g)	0.24
Glutamic acid (g)	0.343
Glycine (g)	0.134
Proline (g)	0.112
Serine (g)	0.104
<b>NOTE</b> The reported values indicated were computed per 100g of spinach	

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