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RICE – SPECIFICATION

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FOREWORD

The South Asian Regional Standards Organization (SARSO) is a Specialized Body of South Asian Association for Regional Cooperation (SAARC) aimed to achieve and enhance coordination and cooperation among SAARC Member States in the fields of Standardization and conformity assessment and to develop harmonized Standards for the South Asian region to facilitate intra-regional trade and to have access in the global market. The Member States of SAARC are Afghanistan, Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan and Sri Lanka. The Agreement on the establishment of SARSO entered into force with effect from 25 August 2011 after ratification by all Member States of SAARC.

The National Standards Bodies of the SAARC Member States participate in the development of SAARC Standards (SARS) through the Sectoral Technical Committees (STCs). The SARS are developed through consensus and are drafted in accordance with the editorial rules of the SARSO Directives, Part 2.

The SARSO Secretariat is the guardian of the authoritative versions of the SAARC Standards and is responsible for keeping master texts of SAARC Standards, both in hard and soft form. The Member States are responsible for making SAARC Standards available for sale, distribution, etc., at the national level. In accordance with the 'SAARC Agreement on Implementation of Standards', the approval of a SAARC Standard implies that Member States have an obligation to give it the status of a National Standard.

This SAARC Standard was considered by the Technical Management Board and approved by the Governing Board of SARSO on the recommendation of the STC - 01: Food and Agricultural Products.

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INTRODUCTION

Rice is a major food staple and a mainstay for the rural population and for household food security. There are only two major species of cultivated rice: *Oryza sativa*, or Asian rice, and *Oryza glaberrima*, or African rice. The rice varieties grown across the world belong overwhelmingly to the *O. Sativa* (O.S) species, while cultivation of the O.G is confined to Africa.

Rice also plays an important role as a “wage” commodity for workers in the cash crop or non-agricultural sectors. Rice is of special importance for the nutrition of large reaches of the population in Asia parts of Latin America and the Caribbean and, increasingly so, in Africa. As a result, it plays a pivotal role for the food security of over half the world population. It is also a central component of the culture of a number of communities. For those reasons, rice is considered as a “strategic” commodity in many countries, both developed and developing, and has consequently remained subject to a wide range of government controls and interventions.

Rice is one of the items of the mass consumption in the South Asian countries. Therefore, it is desirable that proper quality control is exercised in its processing in order to provide wholesome and safe product. It is an important commodity in the International trade and SAARC Countries are major producer and exporter in the world.

163 SAARC Standard

164 RICE – SPECIFICATION

165 1 SCOPE

166 This SAARC Standard specifies minimum specifications for rice (*Oryza sativa* L.) which is subject to the trade
167 in SAAR countries. It is applicable to the following types: husked rice (brown rice) and milled rice, husked
168 parboiled rice and milled parboiled rice intended for direct human consumption. It is neither applicable to other
169 products derived from rice, nor to waxyrice (glutinous rice).

170 2 NORMATIVE REFERENCE

171 The following documents in whole or in part, are normatively referenced in this document and are
172 indispensable for its application. For dated references, only the edition cited applies. For undated references,
173 the latest edition of the referenced document (including any amendments) applies.

174 *ISO 712 Cereals and cereal products -- Determination of moisture content -- Reference method*

175 *ISO 605 Pulses -- Determination of impurities, size, foreign odours, insects, and species and variety -- Test*
176 *methods*

177 *ISO 16050 Foodstuffs -- Determination of aflatoxin B1, and the total content of aflatoxins B1, B2, G1 and G2 in*
178 *cereals, nuts and derived products -- High-performance liquid chromatographic method*

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

180 *ISO 21527-2 Microbiology of food and animal feedingstuffs — Horizontal method for the enumeration of yeasts*
181 *and moulds*

182 *ISO 7251 Microbiology of food and animal feeding stuffs - Horizontal method for the detection and*
183 *enumeration of presumptive Escherichia coli (MPN)*

184 *ISO 6579 Microbiology of the food chain -- Horizontal method for the detection, enumeration and serotyping of*
185 *Salmonella -- Part 1: Detection of Salmonella spp.*

186 *ISO 24333-2009 Cereal and cereal products-Sampling*

187 *ISO 17301-1:2016 Cereals and pulses — Specification and test methods — Part 1: Rice*

188 *SARSO 0014 Final Draft SAARC Standards on Food Hygiene – General Principles – Code of Practice (under*
189 *development)*

190 3. TERMS AND DEFINITIONS

191 3.1 Paddy (rough rice)

192 Rice which has retained its husk after threshing is referred to as paddy or rough rice. This means that the rice
193 grains are still tightly enveloped by the husk.

194 3.2 Rice

195 Rice includes cargo rice, white rice, glutinous rice, and boiled rice, whether it is whole grain, head rice, big
196 broken, broken or small broken.

197 3.3 Husked Rice (cargo rice or brown rice)

198 Husked (brown/cargo) rice from which only the husk has been removed. Brown rice is unpolished rice, which
199 has been milled to remove the hull from the kernel but retain the rice bran layer and the germ,

200 *NOTE: The processes of husking and handling may result in some loss of bran.*

201 **3.4 Milled Rice (white rice)**

202 Husked (brown/cargo) rice from which almost all of the bran and embryo have been removed by milling

203 **3.4.1 Under-milled Rice**

204 Milled rice obtained by milling the husked (brown/cargo) rice, but not to the degree necessary to meet the
205 requirements of well-milled rice

206 **3.4.2 Well-milled Rice**

207 Milled rice obtained by milling husked (brown/cargo) rice in such a way that most of the bran and part of the
208 embryo have been removed

209 **3.4.3 Extra-well Milled Rice**

210 Milled rice obtained by milling husked (brown/cargo) rice in such a way that almost all of the bran and the
211 embryo have been removed

212 **3.5 Parboiled Rice**

213 Husked (brown/cargo) or milled (white) rice processed from paddy or husked rice that has been soaked in
214 water and subjected to a heat treatment so that the starch is fully gelatinized, followed by a drying process

215 **3.6 Waxy Rice**

216 Glutinous rice varieties of rice whose kernels have a white and opaque appearance

217 *NOTE: The starch of waxy rice consists almost entirely of amylopectin. The kernels have a tendency to stick together after*
218 *cooking.*

219 **3.7 Moisture**

220 Means condensed vapour in the rice which is measurable.

221 **3.8 Extraneous Matter**

222 Inorganic and organic components other than whole or broken kernels of rice

223 **3.9 Inorganic Extraneous Matter**

224 Inorganic components, such as stone, sand and dust

225 **3.10 Organic Extraneous Matter**

226 Extraneous matter including edible and non-edible

227 **3.11 Edible organic extraneous matter**

228 Extraneous matter, such as bran, non-toxic foreign seeds, flour lumps, and other food

229 **3.12 Non-edible organic extraneous matter**

230 Extraneous matter, including husks, pieces of straw, and impurities of animal origin, such as dead insects and
231 their fragments

232 **3.13 Foreign Grains**

233 Means seeds other than rice such as wheat, pulses etc.

234 **3.14 Heat-damaged kernel**

235 Head rice or broken kernel that has changed its normal colour as a result of microbiological heating

236 *NOTE: This category includes kernel that is yellow to dark yellow in the case of non-parboiled rice and orange to dark*
237 *orange in the case of parboiled rice, due to a microbiological alteration.*

238 **3.15 Damaged kernel**

239 Head rice or broken kernel showing evident deterioration due to moisture, pests, disease or other causes, but
240 excluding heat-damaged kernels (3.14)

241 **3.16 Yellow Kernel**

242 Means the kernel of which 25% or more of the surface area has turned yellow in colour.

243 **3.17 Chalky Kernel**

244 Means the kernel of which 50% or more of the surface area is white like the colour of chalk. The core
245 whiteness of Basmati-385 variety shall not be considered as chalky grain while completely chalk like grains of
246 this variety shall be considered chalky kernels.

247 **3.18 Red Striped Kernel**

248 Means the kernel of which 25% or more of the surface area is covered with outer red bran layer.

249 **3.19 Shriveled Kernel**

250 Means the kernel which is spear like in shape and whose width is distinctly thinner than normal.

251 **3.20 Green Rice**

252 Means the kernel of green colour in Cargo (Brown) rice which when broken is also green in colour from inside
253 or in the endosperm.

254 **3.21 Under-milled Rice**

255 Means milled rice which is not equal to the milling requirements for "Extra Well Milled", "Well Milled",
256 "Reasonably Well Milled" and "Ordinary Milled" as defined under Grades of Milled Rice for milling degree.

257 **3.22 Un-gelatinized Grains**

258 Whole or broken grains of parboiled rice with distinct white or chalky areas due to incomplete gelatinization of
259 the starch.

260 **3.23 Contrasting Variety**

261 All varieties other than designated/defined variety of rice shall be considered as contrasting variety whether
262 Brown rice, Milled White Rice or Parboiled (Sela) rice.

263 **3.24 Immature Kernel**

264 Malformed kernel head rice or broken kernel which is unripe or badly developed

265 **3.25 Chalky kernel**

266 Head rice or broken kernel of non-parboiled rice, except waxy rice (3.5), whose whole surface has an opaque
267 and floury appearance

268 **3.26 Red kernel**

269 Head rice or broken kernel having a red bran covering more than one-quarter of its surface

270 **3.27 Red-streaked kernel**

271 Head rice or broken kernel with red bran streaks of length greater than or equal to one-half of the average
272 Length (3.12), but where the surface covered by these red streaks is less than one-quarter of the total surface

273 **3.28 Partly gelatinized kernel**

274 Head rice or broken kernel of parboiled rice which is not fully gelatinized and shows a distinct white opaque
275 area

276 **3.29 Peck**

277 Head rice or broken kernel of parboiled rice of which more than one-quarter of the surface is dark brown or
278 black in colour due to the parboiling process

279 **3.30 Whole Kernel**

280 Husked or milled kernel without any broken part, or part of kernel with a length greater than or equal to nine-
281 tenths of the average length (3.12) of the test sample kernels

282 *NOTE: See Figure 1.*

283 **3.31 Head Rice**

284 Whole kernel (3.6) or part of kernel with a length greater than or equal to three-quarters of the average length
285 of the test sample kernels

286 *NOTE: See Figure 1.*

287 **3.32 Large Broken Kernel**

288 Part of kernel with a length less than three-quarters but greater than one-half of the average length of the test
289 sample kernels

290 *NOTE: See Figure 1.*

291 **3.33 Medium Broken Kernel**

292 Part of kernel with a length less than or equal to one-half but greater than one-quarter of the average length of
293 the test sample kernels

294 *NOTE: See Figure 1.*

295 **3.34 Small Broken Kernel**

296 Part of kernel with a length less than or equal to one-quarter of the average length of the test sample kernels
297 but which does not pass through test sieve with round apertures having diameter 1,4 mm

298 *NOTE: See Figure 1.*

299 **3.35 Chip**

300 Part of the kernel which passes through a metal sieve with round perforation 1.4 mm in diameter

301 **3.36 Grain classification**

302 Means the proportional mixture of rice of different classes to form up a grade. / Rice kernel is divided into four
303 classes, namely:

304 **3.36.1 Extra Long Grain**

305 Shall be the head rice/whole grain having the average grain length of 7.00 mm or more.

306 **3.36.2 Long Grain**

307 Shall be the head rice/whole grain having the average grain length of more than 6.0 mm but not more than 6.9
308 mm.

309 **3.36.3 Medium Grain**

310 Shall be the head rice/whole grain having the average grain length of more than 5.0 mm but not more than 5.9
311 mm.

312 **3.36.4 Short Grain**

313 Shall be the head rice/whole grain having the average grain length of 5.0 mm or less.

314 **3.37 Grades of Milled Rice**

315 Rice based on milling degree is divided into four, namely.

316 **3.37.1 Extra Well Milled Rice** means rice obtained by the milling of paddy from which the husk, the
317 germ, and both of its outer and inner bran layers (cargo and white meal) have been completely removed (to
318 the extent that the appearance of the kernel is translucent).

319 **3.37.2 Well Milled Rice** means rice obtained by the milling of paddy from which the husk, the germs, and
320 both of its outer and inner bran layers (cargo and white meal) have been removed to a degree that the
321 translucence of the kernel is slightly less than that of extra well milled rice.

322 **3.37.3 Reasonably Well Milled Rice** means rice obtained by the miffing of paddy from which the husk,
323 the greater parts of the germ and both of its outer and inner bran layers (cargo and white meal) have been
324 removed to a certain extent that the kernel presents its moderate translucence in a degree less than that of
325 well milled rice.

326 **3.37.4 Ordinarily Milled Rice** means rice obtained by the miffing of paddy from which the husk and
327 certain parts of the germ and the whole part of its outer bran layers (cargo meal) have been removed with
328 some part of its inner bran layers (white meal) remain intact. The degree of its translucence is moderate and
329 being less than that of reasonably well milled rice.

330 **3.38 Sieves**

331 Shall be the thick metal sheet perforated with round holes of different length of diameter as follows:

332 **3.38.1 Sieve No. 8½**

333 Is the metal sheet of 0.031" (inch) thick with round perforation of 0.092" (inch) in diameter.

334 **3.38.2 Sieve No. 8**

335 Is the metal sheet of 0.031" (inch) thick with round perforation of 0.085 inch in diameter.

336 **3.38.3 Sieve No. 7**

337 Is the metal sheet of 0.031" (inch) thick with round perforation of 0.069" (inch) in diameter.

338 **4 REQUIREMENTS**

339 **4.1 CONTAMINANTS**

340 **4.1.1 Heavy Metals**

341 Rice shall comply with those maximum residue limits as established by the Codex Alimentarius for this
342 commodity. (CODEX STAN 193-1995)

343 **4.1.2 Pesticide Residues**

344 Rice shall comply with those maximum residue limits established by the Codex Alimentarius Commission for
345 this commodity.

346 **4.2 HYGIENIC REQUIREMENT**

347 Rice whether it is husked (cargo/brown) rice, milled rice, husked parboiled rice and or milled parboiled rice
348 shall be processed and packed as per SARS 0014 food hygiene-general principles-code of practices (final
349 draft) in order to ensure quality and safe product to the consumers.

350 When tested by appropriate methods of sampling and examination, the product shall conform to
351 the requirements outlined in Table-1

352

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Table 1: Microbiological requirements for Rice

S/N	Parameters	Maximum Residual Limits	Reference for Proposed Limits	Test Methods
		Proposed		
1	Yeasts and moulds, per g max	10 ⁴	GMP Manual for Rice Production by TBT Program	ISO 21527-2
2	S. aureus per 25 g max	10 ³	GMP Manual for Rice Production by TBT Program	ISO 6888
3	E. coli	Absent	GMP Manual for Rice Production by TBT Program	ISO 7251
4	Salmonella,	Absent	GMP Manual for Rice Production by TBT Program	ISO 6579
5	Aflatoxin B1 mg/kg	0.002 for Milled Rice 0.005 for Cargo Rice	(EUCR) No 165/2010	ISO 16050
6	Total Aflatoxin (B1+B2+G1+G2) mg/kg	0.004 For Milled Rice 0.010 for Cargo Rice	(EUCR) No 165/2010	
7	Ochratoxin mg/kg	0.003	(EUCR) No 165/2010	

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357 4.3 ESSENTIAL COMPOSITION AND QUALITY FACTORS

358 4.3.1 Quality factors – General

359 Kernels of rice, whether or not-parboiled, husked or milled, and whether or not whole or broken, shall be
360 sound, clean and free from foreign odours, abnormal flavors, insects; and shall be safe and suitable for
361 human consumption.

362 4.3.2 Quality factors – Specific

363 4.3.2.1 Moisture content shall not be greater than 14 % (m/m).

364 4.3.2.2 The defects tolerance for the categories considered and determined in accordance with the
365 prescribed method shall not exceed the limits given in Tables 2 to 5.

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Table 2: Specification of husked (cargo/brown) rice

S/N	Characteristics	Requirements		
		G-1	G-2	G-3
1	Broken, %, max mass fraction	3	7	10
2	Damaged rice, %, max mass fraction	1	1.5	2
3	Heat damaged rice, %, max mass fraction	0.5	1	1.5
4	Chalky %, max mass fraction	4	6	8
5	Red or red streaked, %, max.	1	2	4
6	Other contrasting varieties, % max. mass fraction	5	7	15
7	Extraneous /Foreign Matter Organic / Inorganic, % max mass fraction	0.2	0.4	0.8
8	Foreign Grain, % max. mass fraction	0.2	0.4	1
9	Paddy grains, No./kg (max)	15	25	35
10	Green Grains, % max. mass fraction	3	5	10
11	Live weevils/kg, max. mass fraction	Nil	Nil	Nil
12	Filth, (impurities of animal origin including dead insects) %, max. mass fraction	0.1	0.1	0.1
13	Immature grains, %, max. mass fraction	to be covered in chalky grains		
14	Moisture content, %, max. mass fraction	14		

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Table 3: Specification of milled (white) Rice

S/N	Characteristics	Requirements		
		G-1	G-2	G-3
1	Broken, %, max mass fraction	7	10	15
2	Damaged rice, %, max mass fraction	0.5	1	1.5
3	Heat damaged rice, %, max mass fraction	0.5	0.5	1
4	Chalky %, max mass fraction	3	5	7
5	Red or red streaked, %, max.	1	1.5	3
6	Other contrasting varieties, % max. mass fraction	5	7	10
7	Extraneous /Foreing Matter Organic / Inorganic %, max. mass fraction	0.2	0.4	0.8
8	Foreign Grain, % max. mass fraction	0.2	0.4	0.8
9	Paddy grains, No./kg (max)	10	20	30
10	Green grains % max. mass fraction	Nil	Nil	Nil
11	Undermilled, % max. mass fraction	1.5	3	5
12	Live weevils/kg, max. mass fraction	Nil	Nil	Nil
13	Filth, (impurities of animal origin including dead insects) %, max. mass fraction	0.1	0.1	0.1
14	immature grains, %, max. mass fraction	To be covered in chalky rice		
15	Moisture content, %, max. mass fraction	14		

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Table 4: Specification of husked (cargo) parboiled Rice

S/N	Characteristics	Requirements		
		G-1	G-2	G-3
1	Broken, %, max mass fraction	3	7	10
2	Damaged rice, %, max mass fraction	0.5	1.5	2
3	Heat damaged rice, %, max mass fraction	0.5	0.5	1
4	Chalky %, max mass fraction	4	6	8
5	Ungelatinized Kernels %, max mass fraction	5	7	10
6	Other contrasting varieties, % max. mass fraction	5	7	15
7	Extraneous /Foreing Matter Organic / Inorganic, %, max. mass fraction	0.2	0.4	0.8
8	Foreign Grain, % max. mass fraction	0.2	0.4	1
9	Paddy grains, %, max. mass fraction	15	25	35
10	Green Grains, % max. mass fraction	3	5	10
11	Live weevils/kg, max. mass fraction	Nil	Nil	Nil
12	Filth, (impurities of animal origin including dead insects) %, max. mass fraction	0.1	0.1	0.1
13	Non parboiled rice, % max mass fraction	0.1	0.2	0.3
14	Un-gelatinized rice, % max. mass fraction	10	10	10
15	immature grains, %, max. mass fraction	to be covered in chalky grains		
16	Moisture content, %, max. mass fraction	14		

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Table 5: Specification of milled (white) parboiled Rice

S/N	Characteristics	Requirements		
		G-1	G-2	G-3
1	Broken, %, max mass fraction	4	6	8
2	Damaged rice, %, max mass fraction	1	2	3
3	Ungelatinized Kernels %, max mass fraction	5	7	10
4	Red or red streaked, %, max.	1	2	3
5	Other contrasting varieties, % max. mass fraction	5	7	10
6	Extraneous /Foreing Matter Organic / Inorganic, % max mass fraction	0.2	0.4	0.8
7	Foreign Grain, % max. mass fraction	0.2	0.4	1
8	Paddy grains, No./kg (max)	10	20	30
9	Green grains % max. mass fraction	10	20	30
10	Undermilled, % max. mass fraction	3	5	7
11	Live weevils/kg, max. mass fraction	Nil	Nil	Nil
12	Filth, (impurities of animal origin including dead insects) %, max. mass fraction	0.1	0.1	0.1
13	Non parboiled rice, % max. mass fraction	0.1	0.2	0.3
14	Un-gelatinized rice, % max. mass fraction	10	10	10
15	Moisture content, %, max. mass fraction	14		

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384 **5 METHODS OF SAMPLING AND ANALYSIS**

385 **5.1 Sampling**

386 Sampling shall be carried out in accordance with ISO 24333-2009

387 **5.2 Impurities**

388 Impurities shall be determine in accordance with ISO 605 Pulses

389 **5.3 Moisture Content**

390 Determine the mass fraction of moisture in accordance with the method specified in ISO 712.

391 **5.4 Defects**

392 Determine the defects in specific category with the method Annex-A

393 **5.5 Waxy rice content**

394 Determine the mass fraction of waxy rice. Annex B gives an example of a suitable method.

395 **5.6 Gelatinization time**

396 Determine the mass fraction of waxy rice. Annex B gives an example of a suitable method.

397 **6 TEST REPORT**

398 6.1 The test report shall show the method used and the result obtained. It shall also mention all operating
399 details not specified in this Pakistan Standard, or regarded as optional, as well as any incidents which may
400 have influenced the result.

401 The report shall include all details required for the complete identification of the sample, and in particular the
402 date on which the analysis was carried out.

403 **7 PACKING, TRANSPORTATION AND STORAGE**

404 The following shall be met in packaging, transportation and storage.

405 **7.1 Packaging**

406 7.1.1 The product shall be packed In hygienic, sound and/strong packaging not previously used and
407 have no contaminating effect on the product.

408 7.1.2 Packages shall be made from materials which are not harmful to human being.

409 **7.2 Transportation**

410 Packages shall be carried out in such a way as to protect them from mechanical damage and contamination.

411 **7.3 Storage**

412 Packages shall be stored in warehouses constructed and used in such a way as to keep their moisture
413 content sufficiently low, consistent with local conditions, and prevent its exposure to insects, rodents, birds
414 and epidemic animals.

415

416 **8 MARKING AND LABELLING**

417 8.1 Each bag shall be marked legibly and indelibly or a label shall be attached to the bag, with the following
418 information:

- 419 a) Name of the product as husked (cargo/brown) rice, milled (white) rice, husked parboiled rice, milled
420 parboiled rice
- 421 b) Trade mark, if any;
- 422 c) Net mas in g or in kg;
- 423 d) Grade;
- 424 e) Name and address of the producer or trader; and
- 425 f) Month and year of harvest (in case of bulk packages only).

426 And or the packages shall be marked or labelled as required by the country of destination.

427 **8.2 Labeling of non-retail**

428 Information on non-retail containers shall be either on the container or in accompanying documents, except
429 that the name of the product, lot identification and the name and address of the manufacturer or packer shall
430 appear on the container. However, lot identification and the name and address of the manufacturer or packer
431 may be replaced by an identification mark, provided that such a mark is clearly identifiable with the
432 accompanying documents.

433

434

Annex A
(Normative)
(Clause 6.2)

DETERMINATION OF DEFECTS

A-1 Principle

Extraneous matter, broken kernels, damaged kernels and other kinds of rice are separated manually according to the following types: husked rice, milled rice, husked parboiled rice and milled parboiled rice. Each type is then weighed.

A-2 Apparatus

The usual laboratory apparatus and, in particular, the following.

A-2.1 Sample divider, consisting of a conical sample divider or multiple-slot sample divider with a distribution system, e.g. “Split-it-right” sample divider, such as that shown in Figure A-1.

A-2.2 Sieve, with round perforations of diameter 1.4 mm.

A-2.3 Tweezers.

A-2.4 Scalpel.

A-2.5 Paintbrush.

A-2.6 Steel bowls, of diameter 100 mm ± 5 mm; seven per test sample.

A-2.7 Balance, which can be read to the nearest 0.01g.

A-3 Sampling

See Clause 5.

A-4 Procedure

A-4.1 Preparation of test sample

Carefully mix the laboratory sample to make it as uniform as possible, then proceed to reduce it, using a divider (A-2.1), until a quantity of about 30 g is obtained.

All parts of kernels which get stuck in the perforations of a sieve should be considered to be retained by the sieve.

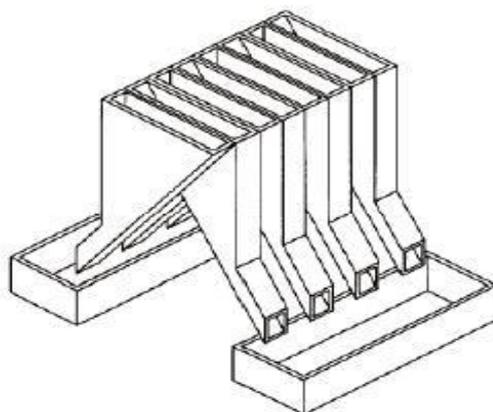


Figure A-1 — “Split-it-right” sample divider

469 **A.5 Determination**

470 Weigh, to the nearest 0.1 g, one of the test samples obtained in accordance with A-4.1 and separate the
471 different defects into the bowls (A-2.6). When a kernel has several defects, classify it in the defect category for
472 which the maximum permissible value is the lowest (see Table 1).

473 Weigh, to the nearest 0.01g, the fractions so obtained.

474 **A-6 Calculation**

475 Express the mass fraction of each defect using Formula:

476
$$W = \frac{m_D}{m_S}$$

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480 Where

481 w is the mass fraction of grains with a particular defect in the test sample;
482 m_D is the mass, in grams, of grains with that defect;
483 m_S is the mass, in grams, of the test sample.
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485 **A-7 Test report**

486 Report the results as specified in Clause 7.

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Annex B
(Normative)
(Clause 6.3)

DETERMINATION OF THE WAXY RICE CONTENT OF PARBOILED RICE

B-1 Principle

Waxy rice kernels have a reddish brown colour when stained in an iodine solution, while non-waxy rice kernels show a dark blue colour.

B-2 Apparatus

The usual laboratory apparatus and, in particular, the following.

B-2.1 Balance, capable of weighing to the nearest 0.01 g.

B-2.2 Glass beaker, of capacity 250 ml.

B-2.3 Small white colour bowls, or any white colour container of a suitable size.

Wire sieve, with long rounded apertures of $(1 \text{ mm}^{+0.02} \text{ mm}) \times (20 \text{ mm}^{+2} \text{ mm})$.0 -1

B-2.4 Tweezers or forceps.

B-2.5 Tissue paper.

B-3 Reagents

WARNING — Direct contact of iodine with skin can cause lesions so care should be taken in handling iodine. Iodine vapour is very irritating to eyes and mucous membranes.

B-3.1 Deionized water, Grade 3 quality as specified in ISO 3696.

B-3.2 Iodine stock solution, containing a mass fraction of 4.1 % iodine and 6.3 % potassium iodide in deionized water.

B-3.3 Iodine working solution, obtained by diluting the stock solution (B-3.2) two times (by volume) with deionized water (B-3.1). Prepare fresh daily.

B-4 Sampling

Sampling shall be carried out in accordance with Clause 5.

B-5 Determination

B-5.1 Weigh a portion of about 100 g of milled rice and put it into a glass beaker (B-2.2).

B-5.2 Add enough iodine working solution (B-3.3) to soak the kernels, and stir (B-2.5) until all the kernels are submerged under the solution. Let the kernels soak in the solution for 30s.

B-5.3 Pour the rice and solution into a wire sieve (B-2.4), and shake the basket slightly in order to drain out the solution. Then place the wire sieve on a piece of tissue paper (B-2.7) to absorb the excess liquid.

B-5.4 Pour the stained kernels into a bowl (B-2.3). Using tweezers or forceps (B-2.6), separate the reddish brown kernels of waxy rice from the dark blue kernels of non-waxy rice.

B-5.5 Weigh the waxy rice portion (m_1) and the non-waxy rice portion (m_2) to the nearest 0.1 g.

523 **B-6 Calculation**

524 Calculate the mass fraction, expressed as a percentage, of the waxy rice, w_{wax} , using Formula:

525
$$W_{wax} = \frac{m_1}{m_1 + m_2} \times 100$$

526

527

528
529 Where

530 m_1 is the mass, expressed in grams, of the waxy rice portion;
531 m_2 is the mass, expressed in grams, of the non-waxy rice portion.

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533 **B-7 Test report**

534 Report the results as specified in Clause 7, giving the results calculated using Formula.

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Annex C (Normative)

Gelatinization

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Figure C.1 gives an example of a typical gelatinization curve. Figure C.2 shows the three stages of gelatinization.

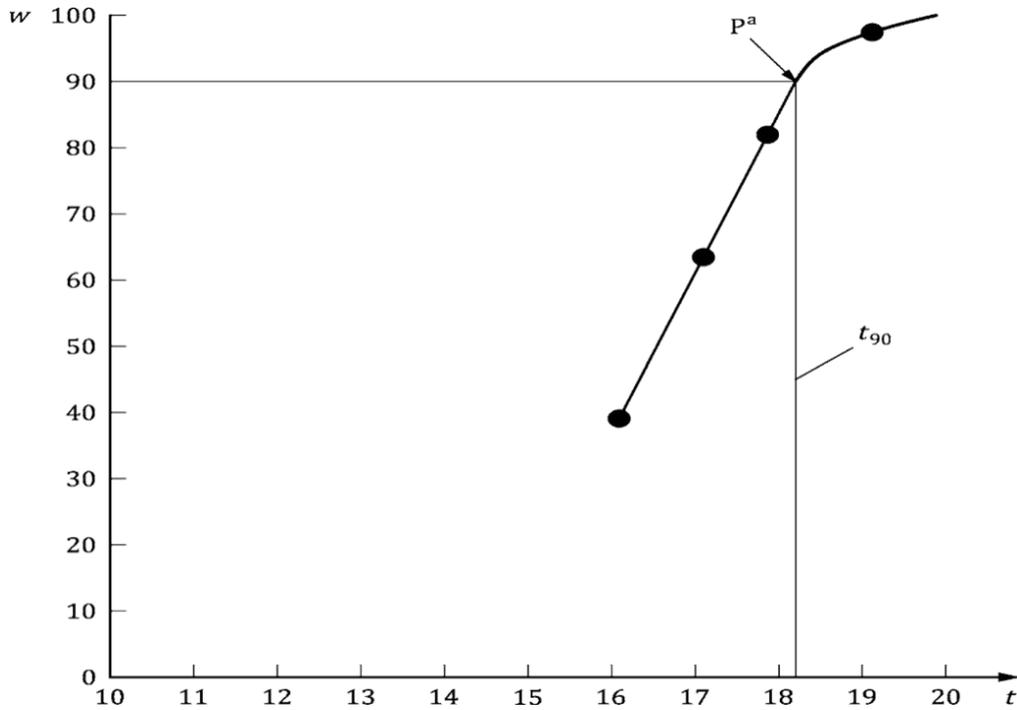


Figure C.1-Typical gelatinization curve

614 Key

615 w mass fraction of gelatinized kernels, expressed in per cent

616 t cooking time, expressed in minutes

617 t₉₀ time required to gelatinize 90 % of the kernels

618 P point of the curve corresponding to a cooking time of t₉₀

619 a The time t₉₀ was estimated to be 18,2 min for this example.

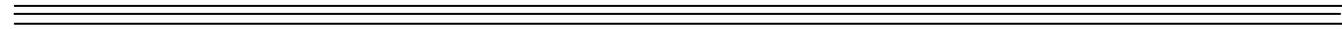
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621 NOTE These results are based on a study carried out on three different types of kernel.

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