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EAST AFRICAN STANDARD

Chickpeas — Specification and grading



EAST AFRICAN COMMUNITY

HS 0713.20.00

Foreword

Development of the East African Standards has been necessitated by the need for harmonizing requirements governing quality of products and services in East Africa. It is envisaged that through harmonized standardization, trade barriers which are encountered when goods and services are exchanged within the Community will be removed.

In order to meet the above objectives, the EAC Partner States have enacted an East African Standardization, Quality Assurance, Metrology and Test Act, 2006 (EAC SQMT Act, 2006) to make provisions for ensuring standardization, quality assurance, metrology and testing of products produced or originating in a third country and traded in the Community in order to facilitate industrial development and trade as well as helping to protect the health and safety of society and the environment in the Community.

East African Standards are formulated in accordance with the procedures established by the East African Standards Committee. The East African Standards Committee is established under the provisions of Article 4 of the EAC SQMT Act, 2006. The Committee is composed of representatives of the National Standards Bodies in Partner States, together with the representatives from the private sectors and consumer organizations. Draft East African Standards are circulated to stakeholders through the National Standards Bodies in the Partner States. The comments received are discussed and incorporated before finalization of standards, in accordance with the procedures of the Community.

Article 15(1) of the EAC SQMT Act, 2006 provides that "Within six months of the declaration of an East African Standard, the Partner States shall adopt, without deviation from the approved text of the standard, the East African Standard as a national standard and withdraw any existing national standard with similar scope and purpose".

East African Standards are subject to review, to keep pace with technological advances. Users of the East African Standards are therefore expected to ensure that they always have the latest versions of the standards they are implementing.

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Introduction

In the preparation of this East African Standard, the following sources were consulted extensively:

Chickpeas Official Grain Grading Guide, August 1, 2009, Canadian Grain Commission

Pulses Grading and Marking Rules, 2003, Schedule XII, *Grade designation and definition of quality of Kabuli Chana*, Ministry of Agriculture, India, 7th April 2004

Ethiopian Standards, ES 18:2001, *Pulses — Grading of chickpeas*

CODEX STAN 171:1989 (Rev. 1:1995), *Standard for Certain Pulses*

CODEX STAN 193:1995 (Rev.4:2009), *General Standard for Contaminants and Toxins in Foods*

CODEX STAN 228:2001 (Rev.1:2004), *General methods of analysis for contaminants*

Codex Alimentarius website: http://www.codexalimentarius.net/mrls/pestdes/jsp/pest_q-e.jsp

USDA Foreign Agricultural Service website: <http://www.mrldatabase.com>

USDA Agricultural Marketing Service website: <http://www.ams.usda.gov/AMSV1.0/Standards>

USDA Plant Inspectorate Service website: http://www.aphis.usda.gov/import_export/plants

European Union: http://ec.europa.eu/sanco_pesticides/public

Assistance derived from these sources and others inadvertently not mentioned is hereby acknowledged.

This standard has been developed to take into account:

- the needs of the market for the product;
- the need to facilitate fair domestic, regional and international trade and prevent technical barriers to trade by establishing a common trading language for buyers and sellers.
- the structure of the CODEX, UNECE, USA, ISO and other internationally significant standards;
- the needs of the producers in gaining knowledge of market standards, conformity assessment, commercial cultivars and crop production process;
- the need to transport the product in a manner that ensures keeping of quality until it reaches the consumer;
- the need for the plant protection authority to certify, through a simplified form, that the product is fit for crossborder and international trade without carrying plant disease vectors;
- the need to promote good agricultural practices that will enhance wider market access, involvement of small-scale traders and hence farming a viable means of wealth creation; and
- the need to ensure a reliable production base of consistent and safe crops that meet customer requirements.

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Draft for comments only — Not to be cited as East African Standard

Chickpeas — Specification and grading

1 Scope

This East African Standard specifies the quality and grading requirements and methods of analysis for dry chickpeas of the varieties (cultivars) grown from *Cicer arietinum* Linn. 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, *Recommended international code of practice — General principles of food hygiene*

EAS 38, *Labelling of prepackaged foods — Specification*

EAS 79, *Cereals and pulses as grain — Methods of sampling*

EAS 217, *Methods for the microbiological examination of foods*

ISO 520, *Cereals and pulses — Determination of the mass of 1000 grains*

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

ISO 2164, *Pulses — Determination of glycosidic hydrocyanic acid*

ISO 2171, *Cereals, pulses and by-products — Determination of ash yield by incineration*

ISO 4112, *Cereals and pulses — Guidance on measurement of the temperature of grain stored in bulk*

ISO 4174, *Cereals, oilseeds and pulses — Measurement of unit pressure loss in one-dimensional air flow through bulk grain*

ISO 5223, *Test sieves for cereals*

ISO 5526, *Cereals, pulses and other food grains — Nomenclature*

ISO 5527, *Cereals — Vocabulary*

ISO 6322-1, *Storage of cereals and pulses — Part 1: General recommendations for the keeping of cereals*

ISO 6322-2, *Storage of cereals and pulses — Part 2: Practical recommendations*

ISO 6322-3, *Storage of cereals and pulses — Part 3: Control of attack by pests*

ISO 6639-1, *Cereals and pulses — Determination of hidden insect infestation — Part 1: General principles*

ISO 6639-2, *Cereals and pulses — Determination of hidden insect infestation — Part 2: Sampling*

ISO 6639-3, *Cereals and pulses — Determination of hidden insect infestation — Part 3: Reference method*

ISO 6639-4, *Cereals and pulses — Determination of hidden insect infestation — Part 4: Rapid methods*

ISO 13690, *Cereals, pulses and milled products — Sampling of static batches*

ISO 16002:2004, *Stored cereal grains and pulses — Guidance on the detection of infestation by live invertebrates by trapping*

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

ISO/TS 16634-2, *Food products — Determination of the total nitrogen content by combustion according to the Dumas principle and calculation of the crude protein content — Part 2: Cereals, pulses and milled cereal products*

ISO 20483, *Cereals and pulses — Determination of the nitrogen content and calculation of the crude protein content — Kjeldahl method*

ISO 22000, *Food safety management systems — Requirements for any organization in the food chain*

ISO 24557, *Pulses — Determination of moisture content — Air-oven method*

OIML R87, *Quantity of product in prepackages*

3 Definitions and grading factors

For the purpose of this standard the following definitions and grading factors shall apply:

3.1

chickpeas

dry mature seeds of *Cicer arietinum* L.

3.2

broken chickpeas

pieces of chickpeas that are less than three-quarters the size of a whole seed

3.3

cleaning for grade improvement

if the grade of a delivery can be improved by additional cleaning, perform the cleaning and add the additional material to dockage. Cleaning for grade improvement can be done at any time.

3.4

contaminated grain

grain containing any substance in sufficient quantity that the grain is unfit for consumption by persons or animals or is adulterated within the meaning of the regulations on food safety

3.5

dockage

any material intermixed with a parcel of grain, other than kernels of grain of a standard of quality established for a grade of that grain, that must and can be separated from the parcel of grain before that grade can be assigned to the grain. Dockage in chickpeas includes

- material handpicked from the sieved sample, including all coarse foreign vegetable matter such as pods, stems, straw, and thistle tops
- all material removed by sieving
- soft earth pellets, if they are 10.0% or less of the uncleaned sample by weight

IMPORTANT! Do not handpick mineral matter, ergot, sclerotinia, or large-seeded grains other than chickpeas from the sieved sample.

3.7

net weight of sample

the sample after cleaning and removal of dockage is referred to as the cleaned sample. Its weight is the net weight of the sample. Percentages by weight for grading refer to percentages of net weight.

3.8**kernel counts**

- to do kernel counts you must have 500 grams of cleaned sample.
- all grading is done on representative portions divided down from the cleaned sample using a Boerner-type divider.

3.9**gross weight sample**

the sample as it arrives is referred to as the uncleaned sample. Its weight is the gross weight of the sample.

3.10**hazardous substances in samples**

any pesticide, herbicide or desiccant

3.11**classes**

there are two classes of chickpeas, Kabuli and Desi. The class forms part of the grade name.

3.12**colour**

colour is a grade determinant only in the Kabuli class. Colour is assessed after the removal of damaged chickpeas and chickpeas assessed as green. See *Damaged* and *Green*.

If chickpeas are . . .	Colour is . . .
Sound, well matured and have a uniform normal colour	Good
Immature, but not green, have moderate amounts of adhered soil, are lightly stained but otherwise moderately discoloured from natural causes	Fair
Do not meet the definition of fair colour	Poor

3.13**damage**

damaged chickpeas include

- whole or broken chickpeas that are sprouted, frost damaged, heated, damaged by insects, distinctly deteriorated or discoloured by weather or by disease, or that are otherwise damaged in a way that seriously affects their quality
- in Kabuli chickpeas, white and shrivelled chickpeas and yellow or water stained chickpeas should be cut and examined for damage. If the cotyledons show
 - any signs of visible damage, they are considered damaged
 - no signs of visible damage, they are considered in the evaluation of colour

3.14**defective chickpeas**

shall mean the following:

3.14.1**insect damaged**

chickpeas which have been damaged by insects

3.14.2**discoloured chickpeas**

chickpeas that have been discoloured by heat, fermentation, moulds, weathering soil or disease

3.14.3**diseased chickpeas**

chickpeas which have been decayed by fungi, bacteria or other organisms of decay

3.14.4

germinated chick peas

chick peas which have sprouted

3.14.5

mouldy chickpeas

chickpeas with visible mycelial growth on their surface

3.14.6

shrivelled chickpeas

chickpeas which are under-developed and wrinkled over their entire surface excluding wrinkled chickpeas

3.14.7

heat damaged

chickpeas that have dull seed coats and discoloured cotyledons ranging from light tan to dark brown are considered heated. See *Damage*.

3.14.8

split

the cotyledons that have been separated

3.14.9

other coloured chickpeas

chickpeas, which are of different colour from the dominant variety

3.14.10

total defective chickpeas

total number of insect damaged and other defective grains

3.15

earth pellets

- hard earth pellets are pellets that do not crumble under light pressure. See *Stones*.
- soft earth pellets are pellets that crumble under light pressure. See *Soft earth pellets*.

3.16

ergot

sclerotia (sclerotium, in singular) of the fungus, *Claviceps* species, which are associated with some seeds where the fungal organism has replaced the seed. A plant disease producing elongated fungal bodies that have a purplish-black exterior, a purplish-white to off white interior, and a relatively smooth surface texture.

3.17

fertilizer pellets

fertilizer pellets are typically either small, round and white or irregular shaped and pink or red. Fertilizer pellets are not considered a hazardous substance however there is no visible means of assuring that material resembling fertilizer pellets is not some other contaminant.

3.18

fireburnt

samples that show any evidence of being charred or scorched by fire are considered fireburnt. Evidence includes odour, pieces of charred wood, and so on. Fireburnt seeds crumble easily under pressure. No fireburnt seeds are allowed in chickpeas.

3.19

foreign matter

foreign in chickpeas material includes

- other classes of chickpeas
- other grains and seeds
- ergot and sclerotinia

- mineral matter, stones and earth pellets
- excreta
- any other material not removed by normal cleaning procedures

3.20**green**

chickpeas may be considered green regardless of the cause. Frost-damaged chickpeas which are green are considered under the grade determinant for *Green*. Frost-damaged chickpeas with no green colour are considered under the grade determinant for *Damage*.

- **Kabuli** chickpeas are considered green if they show any green colour of any size area anywhere on the seeds or seed coats.
- **Desi** chickpeas are considered green if they show distinctly green colour throughout the seed when cut to expose the cotyledons.

3.21**insect parts**

insect parts refers to pieces of insects such as grasshoppers and lady bugs that remain in the sample after cleaning or processing. Samples are analyzed for the percentage of insect fragments and graded according to established tolerances. If pulse crops come into contact with insects during the harvesting process, it may result in seed staining and earth adhering to the seed and may result in samples having an objectionable odour. Samples containing staining of this nature will be considered to be earth tagged and graded according to colour definitions.

3.22**mechanical damage including splits**

in chickpeas, mechanical damage including splits includes

- whole chickpeas with more than 10% of the chick pea broken off
- split chickpeas

IMPORTANT! Seeds with hairline cracks and chipped seed coats are not considered mechanical damage.

3.23**odour**

there is no numeric tolerance for odour. Consider

- the basic quality of the sample
- the type and degree of the odour
- the presence of visible residue causing the odour

3.24**poisonous, toxic and/or harmful seeds**

any seed which if present in quantities above permissible limit may have damaging or dangerous effect on health, organoleptic properties or technological performance such as Jimson weed — datura (*D. fastuosa* Linn and *D. stramonium* Linn.) corn coker (*Agrostemma githago* L., *Machai Lallium remulenum* Linn.) Akra (*Vicia* species), *Argemone mexicana*, Khesari and other seeds that are commonly recognized as harmful to health

3.25**rotted**

see *heated*

3.26**Sclerotia (sclerotium, singular)**

dark colored or black resting bodies of the fungi *Sclerotinia* and *Claviceps*

3.27**Sclerotinia**

genus name which includes the fungus *Sclerotinia sclerotiorum* which produces sclerotia. *Sclerotinia sclerotiorum* is a fungus producing hard masses of fungal tissue, called *sclerotia*. The sclerotia vary in

size and shape, have a coarse surface texture, vary in exterior color from dark black to gray to white and have a pure white interior.

3.28

soft earth pellets

soft earth pellets are pellets that crumble under light pressure—if they do not crumble, they are considered stones. These pellets can be

- earth and fertilizer pellets
- any non-toxic material of similar consistency

3.29

splits

splits include

- halves or smaller pieces of chickpeas
- halves that are loosely held together by cracked seed coats
- chickpeas with cracked cotyledons, such as from artificial drying

Splits do not include chickpeas that are otherwise damaged.

3.30

sprouted

chickpeas in which the hull is parted over the area of the germ as a result of sprouting are considered damaged. See *Damage*.

3.31

stones

hard shale, coal, hard earth pellets, and any other non toxic materials of similar consistency. Fertilizer pellets are assessed as stones when constituting 1.0% or less of the net sample weight.

3.32

treated seed and other chemical substances

- (a) Treated seed is grain that has been coated with an agricultural chemical for agronomic purposes. These seed dressings contain a dye to render the treated seed visually conspicuous. The colour of the dye varies depending upon the type of treatment and the type of grain. The coatings or stains may appear greasy or powdery and surface area distribution ranges from tiny flecks to complete coverage.
- (b) Other chemical substances refers to any chemical residues either adhering to the kernel or remaining in the sample and to samples having a chemical odour of any kind.

3.33

varieties

chickpeas are graded with reference to Desi or Kabuli varieties

4 Requirements

4.1 Basis of determination

Each determination of class, damaged kernels, mechanical damage, insect parts, splits, and moulds is made on the basis of the grain when free from foreign material. Other determinations not specifically provided for under the general provisions are made on the basis of the grain when free from dockage, except the determination of odour is made on either the basis of the grain as a whole or the grain when free from dockage.

4.2 Representative portion of chickpeas for grading, grams

All grading is done on representative portions divided down from the cleaned sample, using a Boerner-type divider. Values in Table 1 represent a range of recommended portions of samples for grading.

Table 1 — Representative portion of chickpeas for grading, grams

Grading factor	Minimum	Optimum	Export
Colour	working sample	working sample	working sample
Damage	100	250	250
Foreign material	100	250	500
Green	100	250	250
Insect parts	working sample	working sample	working sample
Mechanical damage including splits	100	250	250
Odour	working sample	working sample	working sample

4.3 General requirements

4.3.1 Chickpeas shall meet the following general requirements/limits as determined using the relevant standards listed in Clause 2. Chickpeas

- a) shall be the dried mature grains of *Cicer arietinum* Linn;
- b) shall be sweet, well-filled, clean, wholesome, uniform in size, shape, colour and in sound merchantable conditions;
- c) shall be free from a substance which renders them unfit for human or animal consumption or processing into or utilisation thereof as food or feed;
- d) shall be free from glass, metal, coal or dung;
- e) shall be free of pests, live animals, animal carcasses, animal droppings, fungus infestation, added colouring matter, moulds and must meet any other phytosanitary requirements specified by the importing country authority;
- f) shall be free from filth (impurities of plant and animal origin including insects, rodent hair and excreta) in amounts that represent a hazard to human health;
- g) shall be free from toxic or noxious seeds that are commonly recognized as harmful to health;
- h) shall be free from abnormal flavours, musty, sour or other undesirable odour, obnoxious smell and discolouration;
- i) shall be free from micro-organisms and substances originating from micro-organisms, fungi or other poisonous or deleterious substances in amounts that may constitute a hazard to human health.
- j) shall contain no chemical residues which exceed the prescribed maximum residue limit: Provided that:
 - (i) if the prescribed maximum residue limit of an importing country is lower than is permissible, the prescribed maximum residue limit of the importing country shall be complied with; and
 - (ii) the Food Safety Authority may grant permission for chickpeas with a higher maximum residue limit, to be exported to countries where this higher residue limit is permissible: Provided that the export documents are accordingly endorsed with the name of the importing country;
- k) shall contain not more than 10 microgram per kilogram aflatoxin of which not more than 5 microgram per kilogram may be aflatoxin B1: Provided that:

- (i) if the prescribed maximum aflatoxin limit of an importing country is lower than is permissible, the prescribed maximum aflatoxin limit of the importing country shall be complied with;
 - (ii) the Food Safety Authority may grant permission for chickpeas with a higher maximum aflatoxin content to be exported to countries where this higher aflatoxin limit is permissible: Provided that the export documents are accordingly endorsed with the name of the importing country; and
 - (iii) an inspector shall verify compliance to the levels of aflatoxin by sampling and submitting samples for analysis of only certain consignments according to a risk-based plan.
- l) shall comply with the requirements for declared plant injurious organisms of phytosanitary importance as determined by the plant health protection agency.

4.3.2 Chickpeas shall have even cooking properties.

4.3.3 If chickpeas are presented in bags, the bags shall also be free of pests and contaminants. In addition the chickpeas shall comply with any conditions set by the importing country authority.

4.3.4 If chickpeas are rejected because pests or contaminants are found in inspected samples, the chickpeas are not to be re-presented for inspection unless they have been treated or cleaned.

4.3.5 Blending of rejected chickpeas is not permitted as a treatment for insect infestation or as a method of cleaning for contaminants for which there is a nil tolerance

4.3.6 Brushing the outside of bags is not permitted as a remedy to remove pests or contaminants.

4.3 Classification

Chickpeas shall be classified into three grades on the basis of the tolerable limits established in Tables 2, 3 and 4 which shall be additional to the general requirements set out in this standard.

4.4 Unclassified chickpeas

Shall be chickpeas which do not fall within the requirements of Grades 1, 2 and 3 of this standard but are not rejected chickpeas.

4.5 Reject grade chickpeas

This comprises dry chick peas, which have objectionable odour, off flavour, living insects or which do not possess the quality characteristics specified in Tables 2, 3 and 4. They cannot satisfy the conditions of under grade chick peas and shall be classified as reject chick peas and shall be regarded as unfit for human consumption.

Table 2 — Specific requirements for large Kabuli chickpeas

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Parameter	Requirements			Method of test	
	Grade 1	Grade 2	Grade 3		
Physical characteristics	The Kabuli type Chickpeas (<i>Cicer arietinum</i> Linn.) shall be sound, dry, fresh and cream to light brown in colour. Dark brown to black is excluded as the predominating class. Shall be sweet, clean, wholesome, uniform in size, shape, colour and in sound merchantable conditions			ISO 605	
Purity , % min by wt Whole Kabuli type Chickpeas, defective Kabuli type Chickpeas and seed coats.	99.5	97.0	97.0	ISO 605	
Moisture , % max by wt	10.0	12.0	13.5	ISO 711/712	
Degree of soundness — Colour	Reasonably well matured, reasonably good natural colour	Fairly well matured, fair colour	Cool and sweet, excluded from higher grades due to immaturity, poor colour or damage		
Damage, % by mass, <i>max</i> , unless otherwise stated	Heated or rotted	Nil	3K 1.0		
	Mouldy	Nil	6K 2.0		
	Mechanical damage including splits	1.0	2.0	3.0	
	Insect damage, No. Per 100 g	31	31	31	
	Immature seeds	1.0	2.0	3.0	
Green	0.50	1.0	2.0		
Defective Kabuli type chickpeas not of the specified variety and Kabuli type chickpeas that are bin burnt, broken, caked, chipped, frost damaged, heat damaged, insect damaged, sappy, shrivelled, split, sprouted, weather damaged, wrinkled and affected by mould (field or storage). Includes whole pods containing seed and screenings.	1.5% max by weight	3.0% Max by weight, includes 2% Max by weight Poor Colour and nil mould (field or storage)	6.0% Max by weight,		
Screenings Chickpea material falling through the screen is Defective. Use "Forty Shakes" screening method	6.00 mm round hole	6.00 mm round hole	6.00 mm round hole	See 4.2.2	
Poor colour Kernel is distinctly blemished and / or off colour from the characteristic yellow colour of the predominating class.	2% max by wt, includes 1% Max by wt Ascochyta	2% max by wt, includes 1% max by wt Ascochyta	2% Max by wt, includes max 1% by wt Ascochyta		
Ascochyta Ascochyta affected means that an Ascochyta lesion is visible on the kernel. Classifiers are required to break the seed coat if they are not confident that the lesion has penetrated to the kernel.	1 % Max by weight	1 % Max by weight	1 % Max by weight		
Broken and kibbled (Damaged grains) Chickpea material which passes through a 3.57 mm round hole screen. Use "Forty Shakes" screening method	0.5 % max by weight, 3.57 mm round hole	2.0 % max by weight, 3.57 mm round hole	5.0 % max by weight, 3.57 mm round hole	See 4.2.2	
Weevilled grains (incl. Clean-bored) , % by count	2.0	3.0	5.0		
Foreign matter , % by mass, <i>max</i> .	Excreta	0.01	0.01	0.01	
	Ergot	Nil	0.05	0.05	
	Insect parts	0.02	0.02	0.02	
	Sclerotinia	0.05	0.05	0.05	
	Stones or shale	0.10	0.20	0.50	
Foreign material (Total) Unmillable material and all vegetable matter other than Kabuli type chickpeas seed material.	0.5 % max by weight, includes 0.1 % max by weight unmillable material	1.0% max by weight, includes max 0.5% max by weight unmillable material	2.0% max by wt, includes 1% max by wt field peas and 0.7% max by wt unmillable material		
Other edible grains Any edible grains (including oilseeds) other than the one which is under consideration	0.5 % max by weight	2.0 % Max by weight	4.0 % Max by weight		
Unmillable material Soil, stones, metals and non-vegetable matter. See 4.2.3	0.1% max by wt (of which nil % soil)	0.5% max by wt (of which 0.2% max by wt soil)	0.7% max by wt (of which Max 0.3% soil)	See 4.2.3	
Snails Dead or alive. Whole or substantially whole (more than half) including bodies per 400g sample.	Nil tolerance	Two (2) Max	Two (2) Max		
Field Insects Dead or alive per 400g sample. See Annex C.	Two (2) max Dead	Thirty (30) Max	Thirty (30) Max		
Foreign Seeds See Appendix B.	—	—	—		
Objectionable Material Includes Objectionable Odour, see Annex A.	Nil tolerance	Nil tolerance	Nil tolerance		
Ryegrass Ergot Pieces laid end to end per 400g sample.	Nil tolerance	Four (4) cms Max	Four (4) cms Max		
Uric acid Maximum per kg sample	100 ml	100 ml	100 ml		
Aflatoxin – Total ppb (Total Aflatoxin including (AFB1+AFB2+AFG1 +AFG2))	10	10	10	ISO 16050	
Fumonisin – Total ppb (Total Fumonisin including (FB1 + FB2 + FB3))	5	5	5	ISO 16050	
K Number of kernel sized pieces in 500 g.					

Table 3 — Grades and requirements for small Kabuli chickpeas (Kabuli chana)

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Parameter	Requirements			Method of test
	Grade 1	Grade 2	Grade 3	
Physical characteristics	The Kabuli type Chickpeas (<i>Cicer arietinum</i> Linn.) shall be sound, dry, fresh and cream to light brown in colour. Dark brown to black is excluded as the predominating class. Shall be sweet, clean, wholesome, uniform in size, shape, colour and in sound merchantable conditions			ISO 605
Purity , % min by wt Whole Kabuli type Chickpeas, defective Kabuli type Chickpeas and seed coats.	99.5	97.0	97.0	ISO 605
Moisture , % max by wt	10.0	12.0	13.5	ISO 711/712
Degree of soundness — Colour	Reasonably well matured, reasonably good natural colour	Fairly well matured, fair colour	Cool and sweet, excluded from higher grades due to immaturity, poor colour or damage	
Damage, % by mass, <i>max, unless otherwise stated</i>	Heated or rotted	Nil	3K	1.0
	Mouldy	Nil	6K	2.0
	Mechanical damage including splits	1.0	2.0	3.0
	Insect damage, No. per 100 g	31	31	31
	Immature seeds	1.0	2.0	3.0
	Green	0.50	1.0	2.0
Defective Kabuli type chickpeas not of the specified variety and Kabuli type chickpeas that are bin burnt, broken, caked, chipped, frost damaged, heat damaged, insect damaged, sappy, shrivelled, split, sprouted, weather damaged, wrinkled and affected by mould (field or storage). Includes whole pods containing seed and screenings.	2.0% Max by weight, includes 2.0% max by weight poor colour	3.0% Max by weight, includes 2% Max by weight Poor Colour and nil mould (field or storage)	4.0% max by wt, includes 1% max by wt field peas and 0.7% max by wt unmillable material	
Screenings Chickpea material falling through the screen is Defective. Use "Forty Shakes" screening method	5.00 mm round hole	5.00 mm round hole	5.00 mm round hole	See 4.2.2
Poor colour Kernel is distinctly blemished and / or off colour from the characteristic yellow colour of the predominating class.	2% Max by weight, includes 1% Max by weight Ascochyta	2% Max by wt, includes 1% Max by wt Ascochyta	2% Max by wt, includes 1% Max by wt Ascochyta	
Ascochyta Ascochyta affected means that an Ascochyta lesion is visible on the kernel. Classifiers are required to break the seed coat if they are not confident that the lesion has penetrated to the kernel.	1 % Max by weight	1 % Max by weight	1 % Max by weight	
Broken and kibbled (Damaged grains) Chickpea material which passes through a 3.57 mm round hole screen. Use "Forty Shakes" screening method	0.5 % max by weight, 3.57 mm round hole	2.0 % max by weight, 3.57 mm round hole	5.0 % max by weight, 3.57 mm round hole	See 4.2.2
Weevilled grains, % by count	2.0	3.0	5.0	
Foreign matter, % by mass, <i>max.</i>	Excreta	0.01	0.01	0.01
	Ergot	Nil	0.05	0.05
	Insect parts	0.02	0.02	0.02
	Sclerotinia	0.05	0.05	0.05
	Stones or shale	0.10	0.20	0.50
Foreign material (Total) Unmillable material and all vegetable matter other than Kabuli type Chickpeas seed material.	0.5 % Max by weight, includes 0.1 % Max by weight unmillable material	3% Max by weight, includes 2% Max by weight unmillable material	3% Max by wt, includes 2% Max by wt field peas and 0.7% max by wt unmillable material	
Other edible grains Any edible grains (including oilseeds) other than the one which is under consideration	0.5 % max by weight	2.0 % Max by weight	4.0 % Max by weight	
Unmillable material Soil, stones, metals and non-vegetable matter.	0.1% max by wt (of which nil % soil)	0.5% max by wt (of which 0.2% max by wt soil)	0.7% max by wt (of which Max 0.25% soil)	See 4.2.3
Snails Dead or alive. Whole or substantially whole (more than half) including bodies per 200g sample.	Nil tolerance	One (1) Max	One (1) Max	
Field Insects Dead or alive per 200g sample.	One (1) max Dead	Fifteen (15) Max	Fifteen (15) Max Dead	Annex C
Foreign Seeds	—	—	—	Annex B
Objectionable Material Includes objectionable odour	Nil tolerance	Nil tolerance	Nil tolerance	Annex A
Ryegrass Ergot Pieces laid end to end per 200g sample.	Nil tolerance	Two (2) cms Max	Two (2) cms Max	
Uric acid Maximum per kg sample	100 ml	100 ml	100 ml	
Aflatoxin – Total ppb (Total Aflatoxin including (AFB1+AFB2+AFG1 +AFG2))	10	10	10	ISO 16050
Fumonison – Total ppb (Total Fumonisin including (FB1 + FB2 + FB3))	5	5	5	ISO 16050
K	Number of kernel sized pieces in 500 g.			

Table 4 — Specific requirements for Desi chickpeas

HS 0713.20.00

Parameter	Requirements			Method of test
	Grade 1	Grade 2	Grade 3	
Physical characteristics	The Desi type chickpeas (<i>Cicer arietinum</i> Linn.) should be sound, dry, fresh and light to medium brown in colour (a slight greenish tinge is allowed). Black is excluded as the predominating class. Shall be sweet, clean, wholesome, uniform in size, shape, colour and in sound merchantable conditions			ISO 605
Purity , % min by wt Includes whole Desi type chickpeas, defective Desi type chickpeas and seed coats.	99.0	97.0	97.0	ISO 711/712
Moisture , % max by wt	10.0	12.0	13.5	
Degree of soundness — Colour	Reasonably well matured, reasonably good natural colour	Fairly well matured, fair colour	Cool and sweet, excluded from higher grades on account of immaturity, poor colour or damage	
Damage , % by mass, max, unless otherwise stated	Heated or rotted	Nil	3K	1.0
	Mouldy	Nil	6K	2.0
	Mechanical damage incl. splits	1.0	2.0	3.0
	Insect damage, No. per 100 g	31	31	31
	Immature seeds	1.0	2.0	3.0
Green	0.50	1.0	2.0	
Defective , % max by wt Desi type chickpeas that are bin burnt, broken, chipped, frost damaged, fully green, hail damaged, heat damaged, insect damaged, sappy, shrivelled, split, sprouted, weather damaged, wrinkled and affected by mould (field or storage). Includes pods that contain Desi type chickpeas, whether broken or unbroken, loose seed coats and screenings.	4.0% Max by weight	6.0% Max by weight	8.0% Max by weight, includes 2% Max by weight Poor Colour and nil mould (field or storage)	
Screenings Chickpea material falling through the screen is defective. Use "Forty Shakes" screening method	3.97 mm slotted hole	3.97 mm slotted hole	3.97 mm slotted hole	See 4.2.2
Poor colour Kernel is distinctly blemished and / or off colour from the characteristic yellow colour of the predominating class. Must comply with the 1 % Ascochyta detailed below.	2% Max by weight, includes max 1% by wt Ascochyta	2% Max by wt, includes max 1% by wt Ascochyta	2% Max by wt, includes max 1% by wt Ascochyta	
Ascochyta Ascochyta affected means that an Ascochyta lesion is visible on the kernel. Classifiers are required to break the seed coat if they are not confident that the lesion has penetrated to the kernel.	1 % Max by weight	1 % Max by weight	1 % Max by weight	
Foreign matter, % by mass, max.	Excreta	0.01	0.01	0.01
	Ergot	Nil	0.05	0.05
	Insect parts	0.02	0.02	0.02
	Sclerotinia	0.05	0.05	0.05
	Stones, glass, soil or shale	Nil	0.20	0.50
Foreign material (Total) Includes unmillable material and all vegetable matter other than Desi type chickpea seed material.	1 % Max by weight, includes 0.1 % Max by weight unmillable material	3% max by wt, includes 2% max by wt field peas and 0.5% max by wt unmillable material	3% max by wt, includes 2% max by wt field peas and 0.7% max by wt unmillable material	
Other edible grains Any edible grains (including oilseeds) other than the one which is under consideration	0.5 % Max by weight	2.0 % Max by weight	4.0 % Max by weight	
Unmillable material Soil, stones, metals and non-vegetable matter. See 4.2.3	0.1% Max by weight (of which nil % soil)	0.5% Max by weight (of which Max 0.2% soil)	0.7% Max by weight (of which Max 0.3% soil)	See 4.2.3
Snails Dead or alive. Whole or substantially whole (more than half) including bodies per 200g sample.	Nil tolerance	One (1) Max Dead	One (1) Max Dead or alive	
Field insects Dead or alive per 200g sample.	One (1) Max Dead	Fifteen (15) Max Dead	Fifteen (15) Max Dead or alive	See Annex C
Foreign seeds	—	—	—	See Annex B
Objectionable material Includes objectionable odour, flavour/taste.	Nil tolerance	Nil tolerance	Nil tolerance	See Annex A
Ryegrass ergot Pieces laid end to end per 200g sample.	Two (2) cms Max	Two (2) cms Max	Two (2) cms Max	
Uric acid Maximum per kg sample	100 ml	100 ml	100 ml	
Aflatoxin – Total ppb (Total Aflatoxin including (AFB1+AFB2+AFG1 +AFG2))	10	10	10	ISO 16050
Fumonison – Total ppb (Total Fumonisin including (FB1 + FB2 + FB3))	5	5	5	ISO 16050
K Number of kernel sized pieces in 500 g.				

5 Contaminants

5.1 Heavy metals

Pulses shall be free from heavy metals in amounts which may represent a hazard to health. If present, they shall not exceed the limits established in Table 4.

Table 4 — Heavy metal contaminant limits

	Parameter	Limit	Test method
i)	Arsenic (As), ppm max.	0.10	EAS 41
ii)	Copper (Cu), ppm max.	5.0	
iii)	Lead (Pb), ppm max.	0.10	
iv)	Cadmium (Cd), ppm max.	0.02	
v)	Mercury (Hg), ppm max.	0.01	

5.2 Pesticide residues

Chickpeas shall comply with those maximum pesticide residue limits established by the Codex Alimentarius Commission for this commodity. The table below provides current MRLs while Annex E provides current MRLs for the USA, EU and Codex markets.

Table 5 — Maximum pesticide residue limits and extraneous maximum residue limits in chickpeas (current as at 2009-06-09)

Type	Unit symbol	Limit	Method of test	Notes
DIQUAT	mg/kg	0.2		
FLUDIOXONIL	undef	0.07		
GLUFOSINATE-AMMONIUM	mg/kg	3		
GLYPHOSATE	undef	5		
METHIDATHION	mg/kg	0.1		
METHIOCARB	mg/kg	0.1		
PARATHION-METHYL	mg/kg	0.3		
PYRACLOSTROBIN	undef	0.3		
QUINTOZENE	mg/kg	0.01		

5.3 Mycotoxin and chemical limits

Chickpeas shall comply with those maximum mycotoxin limits established by the Codex Alimentarius Commission for this commodity.

5.3.1 Uric acid shall not exceed 100 milligrams per kilogram.

5.3.2 Total aflatoxin levels in beans for human consumption shall not exceed 10 ppb with B₁ not exceeding 5 ppb when tested according to ISO 16050.

5.4 Environment

Chickpeas shall be produced, processed and handled under conditions complying with the stipulations of relevant environmental regulations and therefore conform to cleaner production technological practices.

6 Hygiene

6.1 It is recommended that the produce covered by the provisions of this Standard be prepared and handled in accordance with the appropriate sections of CAC/RCP 1, ISO 22000, and other relevant Codex texts such as Codes of Hygienic Practice and Codes of Practice.

6.2 The produce should comply with any microbiological criteria established in accordance with CAC/GL 21.

6.3 To the extent possible in good manufacturing practice, the products shall be free from objectionable mater.

6.4 When tested by appropriate standards of sampling and examination listed in Clause 2, the products:

- shall be free from microorganisms in amounts which may represent a hazard to health and shall not exceed the limits stipulated in Table 6;
- shall be free from parasites which may represent a hazard to health; and
- shall not contain any substance originating from microorganisms in amounts which may represent a hazard to health.

Table 6 — Microbiological limits for chickpeas

	Type of micro-organism	Limits	Test method
i)	Yeasts and moulds, max. per g	10 ²	EAS 217
ii)	<i>S.aureus</i> per 25 g	Nil	
iii)	<i>E. Coli</i> , max. per g	Nil	
iv)	<i>Salmonella</i> , max. per 25 g	Nil	

7 Packaging

7.1 Chickpeas shall be packed in gunny bags/jute bags, poly woven bags, poly pouches, cloth bags or other suitable packages which shall be clean, sound, free from insect, fungal infestation and the packing material shall be of food grade quality.

7.2 Chickpeas shall be packed in containers which will safeguard the hygienic, nutritional, technological and organoleptic qualities of the products.

7.3 The containers, including packaging material, shall be made of substances which are safe and suitable for their intended use. They shall not impart any toxic substance or undesirable odour or flavour to the product.

7.4 The net weight of the chickpeas in a package shall comply with OIML R87.

7.5 Each package shall contain chickpeas of the same type and of the same grade designation.

7.6 Each package shall be securely closed and sealed.

8 Marking or labelling

8.1 In addition to the requirements in EAS 38, each package shall be legibly and indelibly marked with the following:

- i) product name as “Dry Chickpeas”, “Dry Split Chickpeas”;
- ii) variety;
- iii) grade;

- iv) name, address and physical location of the manufacturer/ packer/importer;
- v) lot/batch/code number;
- vi) net weight, in g/kg;
- vii) the declaration “Food for Human Consumption”;
- viii) storage instruction as “Store in a cool dry place away from any contaminants”;
- ix) crop year;
- x) packing date;
- xi) expiry date or best before _____ month _____ year;
- xii) a declaration of the product lifespan;
- xiii) instructions on disposal of used package;
- xiv) country of origin;
- xv) a declaration on whether the dry chickpeas was genetically modified or not.

8.2 A declaration of any inaccurate information in marking/labelling is prohibited and shall be punishable by law under the statutes of the Partner States.

8.3 The authorized packer shall observe all instructions regarding testing, grading, packing, marking, sealing and maintenance of records applicable to the product.

9 Sampling

Sampling shall be done in accordance with the EAS 79/ISO 13690.



Chickpea plant (Kabuli)



Chickpea pods



Kabuli chickpeas (various colours)

Fresh green chickpeas



Ethiopian chickpeas — Desi type, Grade 3



Kabuli chickpeas

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Annex A
(normative)**Determination of uric acid****A.1 Principle**

The method is based on the precipitation of proteins and treatment of protein free filtrate with uric acid and sodium cyanide and measuring the resultant blue colour colorimetrically.

A.2 Apparatus

- (a) **Photo electric colorimeter/spectrophotometer**
- (b) **Volumetric flask** — 50 ml capacity

A.3 Reagents

- (a) **Sodium Tungstate solution** — 10 % (w/v)
- (b) **Standard Sulphuric Acid solution** — 0.667 N
- (c) **Benedicts Uric acid reagent** — Dissolve 100 gm of pure Sodium Tungstate in 600 ml water. Add 5 gm of Arsenic acid (As_2O_3) followed by 25 ml of 85% phosphoric acid and 20 ml of conc HCl. Boil the mixture for 20 minutes, cool and make volume upto 1 litre.
- (d) **Sodium Cyanide solution** — 5 percent containing 2 ml of ammonia per litre. This solution requires to be prepared fresh after about six weeks.
- (e) **Standard Uric acid solution (Benedicts) stock solution** — Dissolve 9 gm of Sodium dihydrogen phosphate in about 200 – 300 ml water. If the solution is not clear, filter and make upto 500 ml with hot water. Weigh 200 mg of pure uric acid in 1 litre volumetric flask and add a few mls of water to suspend the uric acid. Now add the solution made earlier and shake till the uric acid dissolves completely. Cool, add 1.4 ml of glacial acetic acid, dilute to mark and mix. Add 5 ml chloroform to prevent bacterial growth. 5 ml of stock solution contains 1 mg uric acid.
- (f) **Working Standard uric acid solution** — Dilute 50 ml of stock solution containing 10 mg of uric acid with 400 ml distilled water in a 500 ml volumetric flask. Add 25 ml dilute HCl (1+ 9). Make the solution upto mark and mix. The working solution should be prepared from stock solution which is more than 10 days old.

A.4 Procedure

Weigh 50 gm sample and grind it finely. Take between 4 - 20 gm powder expected to contain 1 mg to 5 mg uric acid and suspend in 200 ml water. Allow the mixture to stand for 2 hours and then mix in a Waring blender for 10 minutes and centrifuge at about 2000 r.p.m for 10 minutes. To 100 ml of clear centrifugate add 10 ml Sodium tungstate solution and mix. Then add 10 ml standard sulphuric acid solution to precipitate the proteins present in the extract.

Mix and allow to stand for 5 minutes and filter. Take an aliquot of the filtrate containing between 0.15-0.3 mg uric acid per 10 ml filtrate in the 50 ml volumetric flask and add 5 ml of sodium cyanide solution followed by 1 ml of Benedicts uric acid reagent. Shake gently and make upto mark with distilled water.

Take 10 ml of standard uric acid solution containing 0.2 mg of uric acid in a 50 ml flask, add 5 ml of sodium cyanide followed by 1 ml of Benedicts uric acid reagent. Dilute to mark after 5 minutes and determine the intensity of colour in a photoelectric colorimeter using a 520 nm filter.

A parallel test using the same quantity of good uninfested sample as the sample under test should be run as a control.

Annex B
(normative)**Test for presence of ergot in food grains****B.1 Reagents**

- (a) **Petroleum ether** — 40 – 60 °C
- (b) **Solvent ether**
- (c) **Dilute Ammonia** 10 % (v/v)
- (d) **Tartaric acid solution** — 1 % (freshly prepared)
- (e) **p-dimethyl amino benzaldehyde (PDAB)** — Dissolve 0.125 gm of PDAB in a cold mixture of 65 ml of conc Sulphuric acid and 35 ml of distilled water.

Add 0.1 ml of 5 % Ferric chloride solution and let it stand for 24 hours before use.

B.2 Apparatus

- (a) Grinding mill
- (b) Electric shaker

B.3 Procedure


Grind about 50 gm of sample in the grinding mill to a fine powder. Take 10 gm of powdered sample in a stoppered conical flask. Add sufficient petroleum ether and shake for half an hour in the electric shaker. Allow to settle and decant off the petroleum ether. Dry the material in air. Add to the material 8 ml of dilute ammonia and sufficient quantity of solvent ether. Again shake for ½ hour. Filter ether portion in a beaker and concentrate to a small volume. Add 2 ml of tartaric acid solution to the beaker and shake thoroughly. Mix 1 ml of this tartaric acid – sample solution with 1 or 2 ml of p-dimethyl benzaldehyde solution.

The appearance of blue colour indicates presence of Ergot.

Annex C
(informative)

Model certificate of conformity with standards for farm produce

Standard

1. Trader:	Certificate of conformity with the Community marketing standards applicable to fresh fruits and vegetables No. (This certificate is exclusively for the use of inspection bodies)		
2. Packer identified on packaging (if other than trader)	3. Inspection body		
	4. Place of inspection/country of origin ⁽¹⁾	5. Region or country of destination	
6. Identifier of means of transport	7. <input type="checkbox"/> Internal <input type="checkbox"/> Import <input type="checkbox"/> Export		
8. Packages (number and type)	9. Type of product (variety if the standards specifies)	10. Quality Class	11. Total net weight in kg
12. The consignment referred to above conforms, at the time of issue, with the Community standards in force, vide: <u>CD/K/452:2010, Chickpeas — Specification and grading</u> <hr style="width: 50%; margin-left: 0;"/> Customs office foreseen Place and date of issue Valid until (date): Signatory (name in block letters): <div style="display: flex; justify-content: space-around; width: 100%;"> Signature Seal of competent authority </div>			
13. Observations:			
(1) Where the goods are being re-exported, indicate the origin in box 9.			

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Annex D
(normative)

Chickpeas (*Cicer arietinum* L) — Fact sheet



Authority	L.
Family	Magnoliopsida:Rosidae:Fabales:Leguminosae
Synonyms	
Common names	Chick Pea, Bengal Gram, Gram, Indian Gram, Cafe Francaise, Garbanzo bean, Ceseron, Cicerole, Ciche, Gairrance, Gairoutte, Pois Becu, Pois Cafe, Pois Chabot, Pois de Brebis, Pois Pointu, Pois chiche, Gravancos, Sigro, Chicher, Cicererbis, Echte Kicher, Fontanellerbse, Kicherbse, Ziersererbsen, Ziserbohne, Adas, Buthalai, Chala, Chota But, Chunna, Harimandha-kam, Kadala, Karikadale, Korkadala, Sangalu, Sanikalu, Sundal Kadalai, Kachang Kuda, Kachang Arab, Kala-pe, Kulapia, Sin-gaung-kala-pe, Konda Kadala, Hanaz, Djelbane, Ikiker, Lablabi, Omnos, Alhamos, Beiqa, Blabi, Chemps, Hamica, Hammes, Himmos, jumes, Adungare, ater Cajeh, Atir Saho, Chimbera, Sembera, Shimbrah, Shumbra, Hummous, Kabkaza, Kebkabeik, Ndengu, Yellow Gram, Garbanza, Gravancos, Thua hua chang.

Editor	
Ecocrop code	2479

Description

A branched, hairy, herbaceous legume reaching 20-100 cm in height with straight or bent stems and roots reaching 1-2 m deep. The leaves have 11-15 leaflets, the flowers are white, pink to purplish or blue and the pods are 14-29 mm long.

Uses

It is mainly consumed as a dry pulse. The whole dried seeds are eaten cooked, boiled or made into dhal. Seeds are ground to flour and used in confectionery. Young shoots or green pods, shelled for the peas and eaten as a snack or vegetable. Pod hairs have medicinal properties. The seed husks are used as feed for livestock and poultry.

Growing period

Annual. Pods may be harvested 90-120 days or 130-180 days from sowing.

Further information

Chickpea originated in south-eastern Anatolia, Turkey. Elevation of up to 1200 m are suitable for the cultivation of most forms of chickpea but in Ethiopian and East Africa cultivation can be found up to 2300 m. Photoperiod 9-16 hours. Optimum seed setting is normally achieved when the relative humidity varies from 20-40% and mild winter or spring rains during the vegetative stage are advantageous. Excessive humidity, heavy rain or hailstorms, especially during the flowering stage

may have detrimental effect on seed-setting. Chickpea is adapted to moderate temperatures during the growing period, but tolerates considerable heat during the fruiting and ripening period. Photosynthesis pathway C 3. In Africa average yield of rain-fed chickpea ranges from 350-1170 kg/ha. Experimental yields of up to 4 t/ha have been reported.

D.1 Introduction

Common Names

Bengal gram, Calvance Pea, *Ceci*, Chestnut Bean, Chich, Chich-pea, Chickpea, Dwarf Pea, Garavance, Garbanza, *Garbanzo*, Gram, Gram Pea, *Grão do bico*, Hommes, Hamaz, Nohud, Lablabi, Pulse, Shimbira, Yellow Gram

Scientific Names

Species: *Cicer arietinum* L.

Family: Leguminosae

D.2 Uses

Chickpea is grown in tropical, sub-tropical and temperate regions. Kabuli type is grown in temperate regions while the desi type chickpea is grown in the semi-arid tropics. Chickpea is consumed as a dry pulse crop or as a green vegetable with the former use being most common. Seeds average about 20% protein, 5% fat and 55% carbohydrate. Seeds are sold in markets either dry or canned. Chickpea seeds are eaten fresh as green vegetables, parched, fried, roasted, and boiled; as snack food, sweet and condiments; seeds are ground and the flour can be used as soup, dhal, and to make bread; prepared with pepper, salt and lemon it is served as a side dish. Dhal is the split chickpea without its seedcoat, dried and cooked into a thick soup or ground into flour for snacks and sweetmeats. Sprouted seeds are eaten as a vegetable or added to salads. Young plants and green pods are eaten like spinach. A small proportion of canned chickpea is also used in Turkey and Latin America, and to produce fermented food. Animal feed is another use of chickpea in many countries. An adhesive may also be prepared; although not water-resistant, it is suitable for plywood. Gram husks, and green or dried stems and leaves are used for stock feed; whole seeds may be milled directly for feed. Leaves are said to yield an indigo-like dye. Acid exudates from the leaves can be applied medicinally or used as vinegar. In Chile, a cooked chickpea-milk (4:1) mixture was good for feeding infants, effectively controlling diarrhoea. Chickpeas yield 21% starch suitable for textile sizing, giving a light finish to silk, wool, and cotton cloth.

D.3 Chemistry

Chickpea seed has 38-59% carbohydrate, 3% fibre, 4.8-5.5% oil, 3% ash, 0.2% calcium, and 0.3% phosphorus. Digestibility of protein varies from 76-78% and its carbohydrate from 57-60%. Raw whole seeds contain per 100 g: 357 calories, 4.5-15.69% moisture, 14.9-24.6 g protein, 0.8-6.4 % fat, 2.1-11.7 g fibre, 2-4.8 g ash, 140-440 mg Ca, 190-382 mg P, 5.0-23, 9 mg Fe, 0-225 µg β-carotene equivalent, 0.21-1.1 mg thiamin, 0.12-0.33 mg riboflavin, and 1.3-2.9 mg niacin. Boiled and roasted seeds contain similar amounts. Sprouting is said to increase the proportionate amounts of ascorbic acid, niacin, available iron, choline, tocopherol, pantothenic acid, biotin, pyridoxine, inositol, and vitamin K. Malic and oxalic acid exudation from the leaves of the plant may soil and damage trousers and shoes. Wild species often have similar glandular secretions. The limiting amino acid concentrations are 0.52 for methionine, 1.45 for lysine and cystine, 0.71 for threonine and 0.16 for tryptophan. The amino acid composition of seeds with 19.5% protein, 5.5% oil is (per 16 g N): 7.2 g lysine, 1.4 g methionine, 8.8 g arginine, 4.0 g glycine, 2.3 g histidine, 4.4 g isoleucine, 7.6 g leucine, 6.6 g phenylalanine, 3.3 g tyrosine, 3.5 g threonine, 4.6 g valine, 4.1 g alanine, 11.7 g aspartic acid, 16.0 g glutamic acid, 0.0 g hydroxyproline, 4.3 g proline, and 5.2 g serine. Percent fatty acid compositions are: 'Desi': oleic 52.1, linoleic 38.0, myristic 2.74, pactic 5.11, and stearic 2.05; 'Kabuli': oleic 50.3, linoleic 40.0, myristic 2.28, palmitic 5.74, stearic 1.61, and arachidic 0.07%. The leaves contain 4-8% protein.

D.4 Traditional medicinal uses

Among the food legumes, chickpea is the most hypocholesteremic agent; germinated chickpea was reported to be effective in controlling cholesterol level in rats. Glandular secretion of the leaves, stems, and pods consists of malic and oxalic acids, giving a sour taste. In India these acids used to be harvested by spreading thin muslin over the crop during the night. In the morning the soaked cloth

is wrung out, and the acids are collected in bottles. Medicinal applications include use for aphrodisiac, bronchitis, catarrh, cutamenia, cholera, constipation, diarrhoea, dyspepsia, flatulence, snakebite, sunstroke, and warts. Acids are supposed to lower the blood cholesterol levels. Seeds are considered antibilious.

D.5 Origin and description

Chickpea (*Cicer arietinum* L.) is an ancient crop that has been grown in India, the Middle East and parts of Africa for many years. It may have been grown in Turkey nearly 7,400 years ago. It is believed that the species originated in the southern Caucasus and northern Persia. Studies have indicated the centre of origin to be south-eastern part of Turkey adjoining Syria based on the presence of the closely related annual species, *C. reticulatum* Ladizinsky and *C. echinospermum* P.H. Davis. Wild *C. reticulatum* is interfertile with the cultivated pulse and morphologically closely resembles cultivated *C. arietinum*. It is regarded as the wild progenitor of chickpea. Botanical and archeological evidence show that chickpeas were first domesticated in the Middle East and were widely cultivated in India, Mediterranean area, the Middle East, and Ethiopia since antiquity. Brought to the New World, it is now important in Mexico, Argentina, Chile, Peru, the U.S and Australia. Wild species are most abundant in Turkey, Iran, Afghanistan, and Central Asia.

Chickpeas are classified as either *desi* or *kabuli* types. The *desi* types are characterized by smaller, angular, and pigmented seeds; whereas the *kabuli* types are characterized by larger seeds that are more rounded and lack pigmentation. The *desi* types predominate in the Indian subcontinent while the *kabuli* types predominate elsewhere.

D.6 Botany — Taxonomy, morphology and floral biology

Cicer, which was classified under Viciae Alef., was later reported to belong to the monogeneric tribe, Cicereae. The Genus includes 9 annuals and 34 perennial herbs. Crossability and fertility of hybrids in interspecific crosses have been used as a basis to classify the annuals into 4 crossability groups. The first group includes the cultivated chickpea (*Cicer arietinum* L.) and *C. reticulatum*. Chickpea plants can be described as stems are branched, erect or spreading, sometimes shrubby much branched, 0.2-1 m tall, glandular pubescent, olive, dark green or bluish green in color. Root system is robust, up to 2 m deep, but major portion up to 60 cm. Leaves imparipinnate, glandular-pubescent with 3-8 pairs of leaflets and a top leaflet (rachis ending in a leaflet); leaflets ovate to elliptic, 0.6-2.0 cm long, 0.3-1.4 cm wide; margin serrate, apex acuminate to aristate, base cuneate; stipules 2-5 toothed, stipules absent. Flowers solitary, sometimes 2 per inflorescence, axillary; peduncles 0.6-3 cm long, pedicels 0.5-1.3 cm long, bracts triangular or tripartite; calyx 7-10 mm long; corolla white, pink, purplish (fading to blue), or blue, 0.8-1.2 cm long. The staminal column is diadelphous (9-1) and the ovary is sessile, inflated and pubescent. Pod rhomboid ellipsoid, 1-2 with three seeds as a maximum, and inflated, glandular-pubescent. Seed colour cream, yellow, brown, black, or green, rounded to angular, seedcoat smooth or wrinkled, or tuberculate, laterally compressed with a median groove around two-thirds of the seed, anterior beaked; germination cryptocotylar.

D.7 Ecology

Chickpea is a self-pollinated crop. Cross-pollination is rare; only 0-1 % is reported. Grown usually as a rainfed cool-weather crop or as a dry climate crop in semi-arid regions. Optimum conditions include 18-26°C night and 21-29°C day temperatures and annual rainfall of 600-1000 mm. They produce good yields in drier conditions because of their deep tap root. Heavier rainfall seasons (over 76.2 cm annually) show reduced yields due to disease outbreaks and stem lodging problems from the excessive vegetative growth. Areas with lighter, well distributed rainfall patterns have produced the highest yield and quality chickpea seed. Chickpea thrives on a sunny site in a cool, dry climate on well-drained soils and grows on a residual moisture in the post-rainy seasons. Generally grown on heavy black or red soils pH 5.5-8.6. Frost, hailstones, and excessive rains damage the crop. Though sensitive to cold, some cultivars can tolerate temperatures as low as -9.5°C in early stages or under snow cover. Daily temperature fluctuations are desired with cold nights with dewfall. Relative humidity of 21-41% is optimum for seed setting. In virgin sandy soils or for the first planting in heavier soils, inoculation is said to increase yield by 10-62%. Although spoken of as "day-neutral," chickpea is a quantitative long-day plant, but flowers in every photoperiod.

D.8 Soils

Chickpea does best on fertile sandy, loam soils with good internal drainage. Good drainage is necessary because even short periods of flooded or waterlogged fields reduce growth and increases susceptibility to root and stem rots.

D.9 Crop culture

D.9.1 Field cultivation

Chickpeas are propagated from seeds. Seed is broadcast or (more often) drilled in rows 25-60 cm apart, spaced at 10 cm between seeds, at a depth of 2-12 cm with soil well pressed down. Soil is worked into a rough tilth, clods broken and field-levelled. Seed is sown when the ground has warmed or when the rains recede depending on the region. Seeding rates vary from 25-40 kg/ha to 80-120 kg/ha, depending on the area and seed type. Chickpea may be cultivated as a sole crop, or mixed with barley, lathyrus (grasspea), linseed, mustard, peas, corn, coffee, safflower, potato, sweet potato, sorghum, or wheat. In rotation it often follows wheat, barley, rice, or teff. In India, chickpeas are also grown as a catch crop in sugarcane fields and often as a second crop after rice. Although usually considered a dry-land crop, chickpeas develop well on rice lands.

In most areas, chickpeas are intercultivated once about 3-4 weeks after sowing; thereafter, the crop develops enough shade to smother weeds. In other areas light weeding is recommended. On poor soils, manure or compost is beneficial. Seed inoculation improves yield only for crops grown for the first time or after rice, where *Rhizobium* populations are naturally low or absent. Irrigation at 45 and 75 days after planting is useful. Fertilizers or manure have often failed to increase yields substantially because of fixation of P by soils and the accumulation of nutrients in the upper layer of the soil which are often dry.

Plants are multiple branched, spreading growth habit annuals ranging from 20 cm to 100 cm tall. Some chickpea varieties have compound leaves (8 to 20 leaflets) and some have simple leaves, which are pubescent (hairy) in appearance. Chickpea leaves exude malic and oxalic acids. Kabuli (large seeded = 800 seeds/lb) varieties are generally taller than the desi (small-seeded = 1,500 seeds/lb) varieties.

Because of its deep tap root system, chickpea can withstand drought conditions by extracting water from deeper in the soil profile.

Flowers (self-pollinated) which are borne in groups of two or three are 12 mm to 25 mm long and come in purple, white, pink or blue colour depending upon variety. Each flower produces a short, pubescent pod which is 2 cm to 5 cm long and which appears to be inflated. One or two seeds (12.7 mm to 25 mm diameter) are present in each pod. The seeds come with either rough or smooth surfaces and can be crème, yellow, brown, black or green in colour. There is a definite groove visible between the cotyledons about two-thirds of the way around the seed, with a beak-like structure present.

D.9.2 Seed preparation and germination

Good quality certified chickpea seed should always be used. This seed should be high in germination percentage (over 85%), free of damage, and free of weed seeds. Good quality seed does not need to be treated with an insecticide or fungicide, but if you have had past problems with *Pythium* or *Rhizoctonia* rots in your fields you may need to treat your seed prior to planting.

Plan to purchase the special strain of nitrogen fixing bacteria required for chickpea if you are planting this crop for the first time in a field. It can be purchased in peat or granular form, the latter type must be used if your seed is fungicide treated. Follow instructions supplied with your inoculant to ensure its proper use.

D.9.3 Seedbed preparation

A firm, smooth seedbed with most of the previous crop residue incorporated is best. This will allow proper depth of planting as well as good seed-soil contact, which is essential for rapid germination

and emergence. If moisture is short keep deep preplant tillage to a minimum to prevent excessive drying in the top 5 cm to 7.5 cm of soil.

D.9.4 Method and rate of seeding

Chickpeas can be planted at row spacing between 15 cm and 100 cm. Seeds should be planted 2.5 cm to 5 cm deep using a drill or planter which can deliver the chickpea seed without damage. Good seed soil contact should be ensured with a press wheel if possible.

D.9.5 Fertility and lime requirements

Any fertilizer application should be based on soil test level, previous crop and expected yield level. Soil should be limed to a pH of 6.0 unless a crop with a higher pH requirement is grown in the rotation.

If roots can be nodulated with the proper strain of Rhizobium, nitrogen fertilizer will not be necessary. Some growers may wish to provide 7 to 14 kg of nitrogen as a broadcast treatment to enhance early seedling development.

D.9.6 Variety selection

Growers should consider maturity, growth habit, seed size and colour pattern as well as yield when selecting a variety to grow. Currently large seeded, lighter coloured seed types are preferred for soup and salad bar uses.

D.9.7 Weed control

D.9.7.1 Mechanical

Chickpea is not very competitive with weeds so they should be planted only on fields which have few if any major weed problems, especially perennial weeds such as quackgrass and thistle.

Rotary hoeing and/or field cultivating in wider row spacings should be used as necessary to control weed populations in chickpea. Early weed competition is more damaging to yield than later emerging weeds. Avoid extensive damage to plants and cultivate when leaves and stems are dry to reduce spread of disease organisms.

D.9.7.2 Chemical

The herbicide metholachlor (Dual) can be applied as a preplant incorporated or preemergence treatment. It gives excellent annual grass and fair to good annual broadleaf control. A rotary hoe could be used in chickpea in the same manner as with soybean. Row cultivation is not practical due to the narrow row spacing.

If annual grasses or quackgrass are abundant after the crop emerges, a postemergence application of sethoxydim (Poast) should be considered. Treat when the grasses are 4 to 6 in. tall. A 1 pt/acre rate controls most annual grasses; check the label and select the rate appropriate for your weed species. Always use 1 qt/acre of Dash or a crop oil concentrate when Poast is applied.

Chickpea has been grouped on some herbicide labels with other dry pod harvested crops such as field bean or adzuki bean. This could allow use of herbicides cleared in those crops to be used on chickpea. Read labels carefully and seek clarification from the company involved before using any herbicide on your chickpea crop. Be sure to ask a company representative, your extension agent or crop consultant for the most recent information and follow the label directions exactly. Because chickpea is a lesser grown crop in Wisconsin and Minnesota, label clearance from other states may not apply.

D.9.8 Harvesting

Chickpeas mature in 3-7 months and the leaves turn brown/yellow during maturity. For dry seeds, the plants are harvested at maturity or slightly earlier by cutting them close to the ground or uprooting. The plants are stacked in the field for a few days to dry and later the crop is threshed by trampling or

beating with wooden flails. The chaff is separated from the grain by winnowing. Tall cultivars are suitable for mechanized harvesting in which case combines can be used. Chickpeas are usually stored in bags, but are more subject to insect damage than when stored in bulk. Proper cleaning, drying, and aeration are necessary to control seed beetles. A thin coating with vegetable oil can reduce storage damage. Sometimes baskets, made from twisted rice straw, are used as storage containers.

D.10 Biotic factors

Ascochyta blight, *Rhizoctonia* root rot, *Pythium* rot, *Fusarium* wilt, white mold, bacterial blight and certain viruses are possible disease problems in production fields of chickpea. These are typical diseases which affect other pulse or legume crops and they are accentuated by periods of high rainfall, high humidity and high temperatures.

These are best controlled by using good quality seed, proper crop rotations, proper tillage practices to bury diseased residue and disease resistant varieties if available.

Contact your extension agent or crop consultant for identification of disease organisms, threshold value determinations and control or management suggestions.

Among the abiotic factors, drought stands to be the number one problem in major chickpea growing regions because the crop is grown on residual moisture and the crop is eventually exposed to terminal drought. In west Asia and North African countries, low temperature causing freezing injury or death or delayed onset of podding reduces yield tremendously. Heat and salinity problems are relatively important following drought and cold stresses.

D.11 Insects and other predators and their control

Because chickpea leaves, stems and pods are heavily pubescent with glandular hairs that secrete malic and oxidic acid, they suffer little direct damage from aphids and other insects. Seedcorn maggot and wireworms might be expected to cause problems early in the season by attacking the germinating seed and destroying the growing point.

If a serious insect problem develops in a field, consult your local extension office or crop consultant for information about threshold value determinations and recommendations for control.

D.12 Drying and storage

Moisture content should be around 10 to 12% to prevent insect and or disease outbreaks in storage. Because of their relatively large seed size, chickpea can be dried slightly with ambient temperature air flow through thin layers in a regular storage bin.

Storage system should be carefully fumigated before storing chickpea and all storage areas should be monitored regularly to identify potential problems early.

D.13 Yields and economics

Greater and more stable yields are the major goals of plant breeding programs. Chickpea yields usually average 400-600 kg/ha, but can surpass 2,000 kg/ha, and in experiments have attained 5,200 kg/ha. Yields from irrigated crops are 20-28% higher than yields from rainfed crops. Two types of chickpea are recognized, desi (coloured, small seeded, angular and fibrous) and kabuli (beige, large seeded, rams-head shaped with lower fibre content) types. In a 3-cultivar trial in India, dry matter yields ranged from 9,400 to 12,000 kg/ha. In India, chickpea or gram ranks 5th among grain crops, and is the most important pulse crop. In India and Pakistan, chickpeas are consumed locally, and about 56% of the crop is retained by growers. In United States and Europe, chickpeas are marketed dried, canned, or in various vegetable mixtures. In Europe, mashed chickpeas from the Mediterranean are sold canned. Mashed chickpea mixed with oils and spices (hummus) is a popular hors d'oeuvre in the Mediterranean Middle East. In 1975 to 1994, on the average, Asia produced 5-6,000,000 MT, yields ranging from 570-766 kg/ha, led by India, which produced 4-5,000,000 MT, ranging from 500-900 kg/ha; Africa produced 250-364,000 MT, with yields ranging from 600-660 kg/ha. North and Central

America produced 180-260,000 MT, while averaging 1,600 kg/ha. Europe produced 50-118,000 MT, while averaging 750 kg/ha. The major chickpea growing countries are India, Pakistan, and Turkey in Asia, Ethiopia in Africa, California and Washington State in the U.S., Mexico and Australia. Chickpea production increased from 1980 to 1990 by about a million tons (at 1.8 % annually), and there was a 5.6 % increase in yield over the decade. Further increases in yield could be attained from the use of germplasm/wild relatives, for identification of new genes, and from new combinations of favorable genes already existing.

D.14 Germplasm

Chickpea germplasm is maintained at two International centres (ICRISAT in India and ICARDA in Syria) and at National centres including the Vavilov institute in Russia, the USDA-ARS Regional Plant Introduction Station at Pullman in the U.S. and other gene banks. Tremendous variation for economically important traits has been documented and improved cultivars have been developed and released. Variation for Flower and seed colour and size, growth duration, yield, and biomass, disease resistance, quality traits (cooking time, amino acid content, flatulence and digestibility) are recorded. 'Kabuli' type chickpeas (Mediterranean and Middle Eastern origin) generally have the largest seeds, and grow well under irrigation. Desi chickpeas (Indian distribution) have smaller seeds, and yield better in Indian subcontinent, Ethiopia and often elsewhere. Hybrids between Kabuli and Desi have produced strains with medium-size seeds and fair yields. The bulk of chickpeas grown in developing countries are from unselected land races. Germplasm with resistance to major diseases has been identified and genes for important diseases have been named.



Annex E (informative)

Chickpeas — Codex, EU and USA pesticide residue limits

Users are advised that international regulations and permissible Maximum Residue Levels (MRL) frequently change. Although this International MRL Database is updated frequently, the information in it may not be completely up-to-date or error free. Additionally, commodity nomenclature and residue definitions vary between countries, and country policies regarding deferral to international standards are not always transparent. This database is intended to be an initial reference source only, and users must verify any information obtained from it with knowledgeable parties in the market of interest prior to the sale or shipment of any products. The developers of this database are not liable for any damages, in whole or in part, caused by or arising in any way from user's use of the database.

Results Key

MRL values in *{Italics}* are more restrictive than US

--- indicates no MRL value is established.

Cod, EU, etc. indicates the source of the MRL and EXP means the market defers to the exporting market.

All numeric values listed are in parts per million (ppm), unless otherwise noted

	US	Cod	EU 1
2,4-D	---	---	0.05
	1. European Union does not maintain a specific MRL for the 2,4-D/Chickpea combination, but does maintain an MRL of 0.05 PPM for its "Pulses, Dry" group.		
	US 2	Cod	EU 3
Acetochlor	---	---	0.01
	2. MRL applies to indirect or inadvertent residues only. 3. European Union does not maintain a specific MRL for the Acetochlor/Chickpea combination, but does maintain an MRL of 0.01 PPM for its "Pulses, Dry" group.		
	US 4	Cod	EU 5
Azoxystrobin	0.5	---	<i>{0.1}</i>
	4. United States does not maintain a specific MRL for the Azoxystrobin/Chickpea combination, but does maintain an MRL of 0.5 PPM for its "Pea and Bean, Dried Shelled, Except Soybean, Subgroup 6C" group. 5. European Union does not maintain a specific MRL for the Azoxystrobin/Chickpea combination, but does maintain an MRL of 0.1 PPM for its "Pulses, Dry" group.		
	US	Cod	EU
Benoxacor	0.01	---	---
	US 6	Cod	EU
Beta-cyfluthrin	0.15	---	---
	6. United States does not maintain a specific MRL for the Beta-cyfluthrin/Chickpea combination, but does maintain an MRL of 0.15 PPM for its "Pea and Bean, Dried Shelled, Except Soybean, Subgroup 6C" group.		
	US 7	Cod	EU 8
Bifenthrin	0.15	---	<i>{0.05}</i>
	7. United States does not maintain a specific MRL for the Bifenthrin/Chickpea combination, but does maintain an MRL of 0.15 PPM for its "Pea and Bean, Dried Shelled, Except Soybean, Subgroup 6C" group. 8. European Union does not maintain a specific MRL for the Bifenthrin/Chickpea combination, but does maintain an MRL of 0.05 PPM for its "Pulses, Dry" group.		
	US 9	Cod	EU 10
Boscalid	2.5	---	<i>{0.5}</i>
	9. United States does not maintain a specific MRL for the Boscalid/Chickpea combination, but does maintain an MRL of 2.5 PPM for its "Pea and Bean, Dried Shelled, Except Soybean, Subgroup 6C" group. 10. European Union does not maintain a specific MRL for the Boscalid/Chickpea combination, but does maintain an MRL of 0.5 PPM for its "Pulses, Dry" group.		
	US 11	Cod	EU 12
Captan	0.05	---	<i>{0.02}</i>
	11. United States does not maintain a specific MRL for the Captan/Chickpea combination, but does maintain an MRL of 0.05 PPM for its "Vegetable, Legume, Group 6" group. 12. European Union does not maintain a specific MRL for the Captan/Chickpea combination, but does maintain an MRL of 0.02 PPM for its "Pulses, Dry" group.		

	US 13	Cod	EU 14
Carbaryl	1	---	{0.05}
	13. United States does not maintain a specific MRL for the Carbaryl/Chickpea combination, but does maintain an MRL of 1 PPM for its "Pea and Bean, Dried Shelled, Except Soybean, Subgroup 6C" group.		
	14. European Union does not maintain a specific MRL for the Carbaryl/Chickpea combination, but does maintain an MRL of 0.05 PPM for its "Pulses, Dry" group.		
	US 15	Cod	EU 16
Carfentrazone-ethyl	0.1	---	{0.01}
	15. United States does not maintain a specific MRL for the Carfentrazone-ethyl/Chickpea combination, but does maintain an MRL of 0.1 PPM for its "Vegetable, Legume, Group 6" group.		
	16. European Union does not maintain a specific MRL for the Carfentrazone-ethyl/Chickpea combination, but does maintain an MRL of 0.01 PPM for its "Pulses, Dry" group.		
	US 17	Cod	EU 18
Chlorpyrifos	0.05	---	0.05
	17. United States does not maintain a specific MRL for the Chlorpyrifos/Chickpea combination, but does maintain an MRL of 0.05 PPM for its "Vegetable, Legume, Group 6" group.		
	18. European Union does not maintain a specific MRL for the Chlorpyrifos/Chickpea combination, but does maintain an MRL of 0.05 PPM for its "Pulses, Dry" group.		
	US	Cod	EU 19
Clethodim	3.5	---	{0.5}
	19. European Union does not maintain a specific MRL for the Clethodim/Chickpea combination, but does maintain an MRL of 0.5 PPM for its "Pulses, Dry" group.		
	US 20	Cod	EU 21
Cyfluthrin	0.15	---	{0.02}
	20. United States does not maintain a specific MRL for the Cyfluthrin/Chickpea combination, but does maintain an MRL of 0.15 PPM for its "Pea and Bean, Dried Shelled, Except Soybean, Subgroup 6C" group.		
	21. European Union does not maintain a specific MRL for the Cyfluthrin/Chickpea combination, but does maintain an MRL of 0.02 PPM for its "Pulses, Dry" group.		
	US	Cod	EU 22
Etridiazole	0.1	---	{0.05}
	22. European Union does not maintain a specific MRL for the Etridiazole/Chickpea combination, but does maintain an MRL of 0.05 PPM for its "Pulses, Dry" group.		
	US 23	Cod	EU 24
Fluazinam	0.02	---	0.05
	23. United States does not maintain a specific MRL for the Fluazinam/Chickpea combination, but does maintain an MRL of 0.02 PPM for its "Pea and Bean, Dried Shelled, Except Soybean, Subgroup 6C" group.		
	24. European Union does not maintain a specific MRL for the Fluazinam/Chickpea combination, but does maintain an MRL of 0.05 PPM for its "Pulses, Dry" group.		
	US 25	Cod	EU 26
Fludioxonil	0.01	---	0.05
	25. United States does not maintain a specific MRL for the Fludioxonil/Chickpea combination, but does maintain an MRL of 0.01 PPM for its "Vegetable, Legume, Group 6" group.		
	26. European Union does not maintain a specific MRL for the Fludioxonil/Chickpea combination, but does maintain an MRL of 0.05 PPM for its "Pulses, Dry" group.		
	US 27	Cod	EU 28
Fluoride	70	---	{2}
	27. United States does not maintain a specific MRL for the Fluoride/Chickpea combination, but does maintain an MRL of 70 PPM for its "Vegetable, Legume, Group 6" group.		
	28. European Union does not maintain a specific MRL for the Fluoride/Chickpea combination, but does maintain an MRL of 2 PPM for its "Pulses, Dry" group.		
	US	Cod	EU
Gamma Cyhalothrin	0.1	---	---
	US 29	Cod	EU 30
Glyphosate	5	---	{0.1}
	29. United States does not maintain a specific MRL for the Glyphosate/Chickpea combination, but does maintain an MRL of 5 PPM for its "Vegetable, Legume, Group 6" group.		
	30. European Union does not maintain a specific MRL for the Glyphosate/Chickpea combination, but does maintain an MRL of 0.1 PPM for its "Pulses, Dry" group.		
	US 31	Cod	EU
Imazethapyr	0.1	---	---

	31. United States does not maintain a specific MRL for the Imazethapyr/Chickpea combination, but does maintain an MRL of 0.1 PPM for its "Vegetable, Legume, Group 6" group.		
	US 32	Cod	EU 33
Imidacloprid	4	---	{0.05}
	32. United States does not maintain a specific MRL for the Imidacloprid/Chickpea combination, but does maintain an MRL of 4 PPM for its "Vegetable, Legume, Group 6" group. 33. European Union does not maintain a specific MRL for the Imidacloprid/Chickpea combination, but does maintain an MRL of 0.05 PPM for its "Pulses, Dry" group.		
	US 34	Cod	EU 35
Ipconazole	0.01	---	0.01
	34. United States does not maintain a specific MRL for the Ipconazole/Chickpea combination, but does maintain an MRL of 0.01 PPM for its "Pea and Bean, Dried Shelled, Except Soybean, Subgroup 6C" group. 35. European Union does not maintain a specific MRL for the Ipconazole/Chickpea combination, but does maintain an MRL of 0.01 PPM for its "Pulses, Dry" group.		
	US 36	Cod	EU 37
Lambda Cyhalothrin	0.1	---	{0.02}
	36. United States does not maintain a specific MRL for the Lambda Cyhalothrin/Chickpea combination, but does maintain an MRL of 0.1 PPM for its "Pea and Bean, Dried Shelled, Except Soybean, Subgroup 6C" group. 37. European Union does not maintain a specific MRL for the Lambda Cyhalothrin/Chickpea combination, but does maintain an MRL of 0.02 PPM for its "Pulses, Dry" group.		
	US 38	Cod	EU 39
Metalaxyl	0.2	---	{0.05}
	38. United States does not maintain a specific MRL for the Metalaxyl/Chickpea combination, but does maintain an MRL of 0.2 PPM for its "Vegetable, Legume, Group 6" group. 39. European Union does not maintain a specific MRL for the Metalaxyl/Chickpea combination, but does maintain an MRL of 0.05 PPM for its "Pulses, Dry" group.		
	US 40	Cod	EU 41
Metolachlor	0.1	---	{0.05}
	40. United States does not maintain a specific MRL for the Metolachlor/Chickpea combination, but does maintain an MRL of 0.1 PPM for its "Pea and Bean, Dried Shelled, Except Soybean, Subgroup 6C" group. 41. European Union does not maintain a specific MRL for the Metolachlor/Chickpea combination, but does maintain an MRL of 0.05 PPM for its "Pulses, Dry" group.		
	US	Cod	EU 42
Oxyfluorfen	0.05	---	0.05
	42. European Union does not maintain a specific MRL for the Oxyfluorfen/Chickpea combination, but does maintain an MRL of 0.05 PPM for its "Pulses, Dry" group.		
	US 43	Cod 44	EU 45
Paraquat dichloride	0.3	0.5	{0.02}
	43. United States does not maintain a specific MRL for the Paraquat dichloride/Chickpea combination, but does maintain an MRL of 0.3 PPM for its "Pea and Bean, Dried Shelled, Except Soybean, Subgroup 6C" group. 44. Codex does not maintain a specific MRL for the Paraquat dichloride/Chickpea combination, but does maintain an MRL of 0.5 PPM for its "Pulses" group. 45. European Union does not maintain a specific MRL for the Paraquat dichloride/Chickpea combination, but does maintain an MRL of 0.02 PPM for its "Pulses, Dry" group.		
	US 46	Cod	EU 47
Phosphine	0.01	---	0.05
	46. United States does not maintain a specific MRL for the Phosphine/Chickpea combination, but does maintain an MRL of 0.01 PPM for its "Vegetable, Legume, Group 6" group. 47. European Union does not maintain a specific MRL for the Phosphine/Chickpea combination, but does maintain an MRL of 0.05 PPM for its "Pulses, Dry" group.		
	US 48	Cod	EU 49
Prothioconazole	0.9	---	{0.02}
	48. United States does not maintain a specific MRL for the Prothioconazole/Chickpea combination, but does maintain an MRL of 0.9 PPM for its "Pea and Bean, Dried Shelled, Except Soybean, Subgroup 6C" group. 49. European Union does not maintain a specific MRL for the Prothioconazole/Chickpea combination, but does maintain an MRL of 0.02 PPM for its "Pulses, Dry" group.		
	US 50	Cod	EU 51
Pyraclostrobin	0.5	---	{0.3}
	50. United States does not maintain a specific MRL for the Pyraclostrobin/Chickpea combination, but does maintain an MRL of 0.5 PPM for its "Pea and Bean, Dried Shelled, Except Soybean, Subgroup 6C" group.		

	51. European Union does not maintain a specific MRL for the Pyraclostrobin/Chickpea combination, but does maintain an MRL of 0.3 PPM for its "Pulses, Dry" group.		
	US	Cod	EU 52
Pyridate	0.1	---	{0.05}
	52. European Union does not maintain a specific MRL for the Pyridate/Chickpea combination, but does maintain an MRL of 0.05 PPM for its "Pulses, Dry" group.		
	US 53	Cod	EU 54
Pyriproxyfen	0.2	---	{0.05}
	53. United States does not maintain a specific MRL for the Pyriproxyfen/Chickpea combination, but does maintain an MRL of 0.2 PPM for its "Vegetable, Legume, Group 6" group.		
	54. European Union does not maintain a specific MRL for the Pyriproxyfen/Chickpea combination, but does maintain an MRL of 0.05 PPM for its "Pulses, Dry" group.		
	US 55	Cod	EU 56
S-metolachlor	0.1	---	{0.05}
	55. United States does not maintain a specific MRL for the S-metolachlor/Chickpea combination, but does maintain an MRL of 0.1 PPM for its "Pea and Bean, Dried Shelled, Except Soybean, Subgroup 6C" group.		
	56. European Union does not maintain a specific MRL for the S-metolachlor/Chickpea combination, but does maintain an MRL of 0.05 PPM for its "Pulses, Dry" group.		
	US 57	Cod	EU 58
Sethoxydim	25	---	{0.5}
	57. United States does not maintain a specific MRL for the Sethoxydim/Chickpea combination, but does maintain an MRL of 25 PPM for its "Pea and Bean, Dried Shelled, Except Soybean, Subgroup 6C" group.		
	58. European Union does not maintain a specific MRL for the Sethoxydim/Chickpea combination, but does maintain an MRL of 0.5 PPM for its "Pulses, Dry" group.		
	US 59	Cod	EU 60
Spinetoram	0.04	---	0.05
	59. United States does not maintain a specific MRL for the Spinetoram/Chickpea combination, but does maintain an MRL of 0.04 PPM for its "Pea and Bean, Dried Shelled, Except Soybean, Subgroup 6C" group.		
	60. European Union does not maintain a specific MRL for the Spinetoram/Chickpea combination, but does maintain an MRL of 0.05 PPM for its "Pulses, Dry" group.		
	US 61	Cod	EU 62
Spinosad	0.02	---	0.02
	61. United States does not maintain a specific MRL for the Spinosad/Chickpea combination, but does maintain an MRL of 0.02 PPM for its "Pea and Bean, Dried Shelled, Except Soybean, Subgroup 6C" group.		
	62. European Union does not maintain a specific MRL for the Spinosad/Chickpea combination, but does maintain an MRL of 0.02 PPM for its "Pulses, Dry" group.		
	US	Cod	EU
Sulfentrazone	0.15	---	---
	US 63	Cod	EU 64
Sulfuryl fluoride	0.5	---	{0.01}
	63. United States does not maintain a specific MRL for the Sulfuryl fluoride/Chickpea combination, but does maintain an MRL of 0.5 PPM for its "Vegetable, Legume, Group 6" group.		
	64. European Union does not maintain a specific MRL for the Sulfuryl fluoride/Chickpea combination, but does maintain an MRL of 0.01 PPM for its "Pulses, Dry" group.		
	US 65	Cod	EU 66
Thiamethoxam	0.02	---	0.05
	65. United States does not maintain a specific MRL for the Thiamethoxam/Chickpea combination, but does maintain an MRL of 0.02 PPM for its "Vegetable, Legume, Group 6" group.		
	66. European Union does not maintain a specific MRL for the Thiamethoxam/Chickpea combination, but does maintain an MRL of 0.05 PPM for its "Pulses, Dry" group.		
	US	Cod	EU 67
Trifluralin	0.05	---	0.1
	67. European Union does not maintain a specific MRL for the Trifluralin/Chickpea combination, but does maintain an MRL of 0.1 PPM for its "Pulses, Dry" group.		
	US 68	Cod	EU 69
	0.05	---	0.05
	68. United States does not maintain a specific MRL for the Zeta-Cypermethrin/Chickpea combination, but does maintain an MRL of 0.05 PPM for its "Pea and Bean, Dried Shelled, Except Soybean, Subgroup 6C" group.		
Zeta-Cypermethrin	69. European Union does not maintain a specific MRL for the Zeta-Cypermethrin/Chickpea combination, but does maintain an MRL of 0.05 PPM for its "Pulses, Dry" group.		

Annex F
(informative)

Sieves for assessing dockage and grading factors

Type	Sieve name	Hole size (millimetres)	Manufacturer's designation (inches)
Round-hole	No. 4.5	1.79	4 ¹ / ₁₆
	No. 5	1.98	5/64
	No. 5.5	2.18	5 ¹ / ₁₆
	No. 6	2.38	6/64
	No. 6.5	2.58	6 ¹ / ₁₆
	No. 7	2.78	7/64
	No. 7.5	2.98	7 ¹ / ₁₆
	No. 8	3.18	8/64
	No. 8.5	3.37	8 ¹ / ₁₆
	No. 9	3.57	9/64
	No. 10	3.97	10/64
	No. 11	4.37	11/64
	No. 12	4.76	12/64
	No. 14	5.56	14/64
	No. 15	5.95	15/64
	No. 16	6.35	16/64
	No. 17	6.75	17/64
	No. 18	7.14	18/64
	No. 20	7.94	20/64
	No. 21	8.33	21/64
	No. 22	8.73	22/64
	No. 24	9.52	24/64

Type	Sieve name	Hole size (millimetres)	Manufacturer's designation (inches)
Slotted	No. 3	1.19 x 7.94	3/64 x 5/16
	No. 4.5	1.79 x 12.70	4 ¹ / ₁₆ x 1/2
	No. 5	1.98 x 19.05	5/64 x 3/4
	No. 6	2.38 x 19.05	6/64 x 3/4
	No. 8	3.18 x 19.05	8/64 x 3/4
	No. 9	3.57 x 19.05	9/64 x 3/4
	No. 11	4.37 x 19.05	11/64 x 3/4
	No. 12	4.76 x 19.05	3/16 x 3/4
	No. .064	1.60 x 9.53	0.064 x 3/8
	No. .028	0.71 x 11.90	0.028 x 15/32
	No. .032	0.81 x 11.90	0.032 x 15/32
	No. .035	0.89 x 11.90	0.035 x 15/32
	No. .038	0.96 x 11.90	0.038 x 15/32
	No. .040	1.02 x 11.90	0.040 x 15/32
	Buckwheat	No. 5	triangle with 1.98 mm inscribed circle
No. 6		triangle with 2.26-mm inscribed circle	triangle with 0.089-inch inscribed circle
Wire	No. 3 x 16	3 x 16 mesh per 25.4 mm	3 x 16 wire mesh per inch
	No. 4 x 14	4 x 14 mesh per 25.4 mm	4 x 14 wire mesh per inch
	No. 10 x 10	10 x 10 mesh per 25.4 mm	10 x 10 wire mesh per inch
	No. 9 x 9	9 x 9 mesh per 25.4 mm	9 x 9 wire mesh per inch

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