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EAST AFRICAN STANDARD

Carob — Specification and grading



EAST AFRICAN COMMUNITY

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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:

ISO 7907:1987, *Carob — Specification*

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 STAN 230:2001 (Rev.1:2003), *Maximum levels for lead*

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 making fruit and vegetable production a viable means of wealth creation; and
- the need to keep unsatisfactory produce from the market by allowing the removal of unsatisfactory produce from the markets and to discourage unfair trade practices e.g. trying to sell immature produce at the beginning of the season when high profits can be made. Immature produce leads to dissatisfaction of customers and influences their choices negatively, which disadvantages those traders who have waited until the produce is mature.

Contents

1	Scope.....	1
2	Normative references	1
3	Definitions and description	1
3.1	Definitions	1
3.2	Description	2
4	Requirements.....	2
4.1	Odour and taste	2
4.2	Freedom from living insects and other pests	2
4.3	Spoiled carobs	2
4.4	Broken carobs	2
4.5	Undeveloped carobs	2
4.6	Extraneous matter.....	2
4.7	Moisture content.....	2
4.8	Classification	2
4.9	Sampling	2
4.10	Methods of test.....	3
5	Provisions concerning sizing	3
6	Provisions concerning tolerances	3
7	Provisions concerning presentation.....	3
7.1	Uniformity	3
7.2	Packaging	3
7.3	Presentation	3
8	Contaminants.....	3
8.1	Heavy metals	3
8.2	Pesticide residues	4
8.3	Mycotoxin and chemical limits.....	4
9	Hygiene.....	4
10	Marking or labelling	5
	Annex A (normative) Determination of spoiled carobs, broken carobs, undeveloped carobs and extraneous matter	7
	Annex B (normative) Determination of moisture content (Routine method)	8
	Annex C (normative) Carob (<i>Ceratonia siliqua</i>) — Fact sheet	10
	Annex E (informative) Carob — Codex, EU and USA pesticide residue limits.....	14

Carob — Specification and grading

1 Scope

This East African Standard specifies requirements for carob, obtained from the carob tree (*Ceratonia siliqua* Linnaeus) for human consumption or forage, or for industrial use.

NOTE Carobs broken into pieces for industrial use, and seeded carobs, lie outside the scope of this East African Standard.

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/GL 21, *Principles for the Establishment and Application of Microbiological Criteria for Foods*

CAC/RCP 1, *Recommended International Code of Practice — General Principles of Food Hygiene*

CAC/RCP 44, *Recommended International Code of Practice for the Packaging and Transport of Tropical Fresh Fruit and Vegetables*

CAC/RCP 53, *Code of Hygienic Practice for Fresh Fruits and Vegetables*

CODEX STAN 234, *Recommended methods of analysis and sampling*

EAS 38, *Labelling of prepackaged foods — Specification*

CD/K/378:2010, *Horticultural industry — Code of practice*

3 Definitions and description

3.1 Definitions

For the purpose of this standard the following definition shall apply:

3.1.1

pest-infested carobs

Pods damaged by insect infestation and/or mites

3.1.2

rodent-damaged carobs

Pods damaged by rodents

3.1.3

spoiled carobs

rotten, mouldy, sun-scalded, overly shrivelled and dried and stained pods. Light discoloration on some parts of the fruit and especially near the stem does not count as a defect.

3.1.4

broken carobs

incomplete pods of length greater than 3 cm of which parts are absent or separated. Carobs of which small parts near the stem are missing do not count as broken fruit.

3.1.5

undeveloped carobs

Pods longer than 3 cm but smaller than 5 cm, which are shrivelled and misshapen

3.2 Description

Carobs are the ripe, dry pods of *Ceratonia siliqua* Linnaeus. The fruits of the carob tree (pods) shall be sound, clean and well developed and dried. They shall have the characteristic shape and shall be at least 5 cm long.

4 Requirements

4.1 Odour and taste

Carobs shall have an odour and taste characteristic of the fruit. They shall be free from foreign odour and taste, particularly rancidity.

4.2 Freedom from living insects and other pests

Carobs shall be free from living insects and/or any other living animal pest.

4.3 Spoiled carobs

The proportion of spoiled carobs, including pest-infested and rodent-damaged fruits, shall not exceed the value given in the table.

4.4 Broken carobs

The proportion of broken carobs shall not exceed the value given in Table 1.

4.5 Undeveloped carobs

The proportion of undeveloped carobs shall not exceed the value given in Table 1.

4.6 Extraneous matter

The proportion of extraneous matter such as dirt, stones, stem, leaf and other foreign matter shall not exceed the value given in Table 1.

Whole pods or broken pods smaller than 3 cm are counted as extraneous matter.

4.7 Moisture content

The moisture content of carobs shall not exceed 12 % (m/m).

Table 1 — Requirements for carobs

Characteristic	Requirement
Spoiled carobs other than mouldy and rotten carobs, but including pest-infested and rodent-damaged fruits, % (m/m) max	9.5
Mouldy and rotten carobs, % (m/m) max	0.5
Broken carobs, % (m/m) max	25.0
Underdeveloped carobs, % (m/m) max	3.0
Extraneous matter, % (m/m) max	1.0

4.8 Classification

Carobs shall not be subject to grading or classification.

4.9 Sampling

Methods of sampling and analysis shall be in accordance with CODEX STAN 234.

4.10 Methods of test

Samples of carobs shall be tested for conformity of the product to the requirements of the table by the method of test specified in Annex A. The moisture content (4.7) shall be determined in accordance with Annex B.

5 Provisions concerning sizing

The fruits of the carob tree (pods) shall have the characteristic shape and shall be at least 5 cm long.

6 Provisions concerning tolerances

Tolerances in respect of quality and size shall be allowed in each package and shall be in accordance with the limits indicated in Table 1.

7 Provisions concerning presentation

7.1 Uniformity

The contents of each package must be uniform and contain only carobs of the same origin and quality.

The visible part of the contents of the package must be representative of the entire contents.

7.2 Packaging

Carobs shall be packed in such a way as to protect the produce properly. Carobs may be dispatched in packages or without packages (in bulk).

The materials used inside the package must be new, clean and of a quality such as to avoid causing any external or internal damage to the produce. The use of materials, particularly of paper or stamps bearing trade specifications is allowed provided the printing and labelling has been done with non-toxic ink or glue.

In any case the mass of the containers shall not be more than 50 kg.

In bulk carriage, the wagons, lorries, trucks or holds of ships loaded with carob shall be clean and free from leaves, stalks or other foreign matter and foreign odours which may affect the product.

7.3 Presentation

Carobs may be presented:

- in small packages
- in small open baskets
- in trays.

8 Contaminants

8.1 Heavy metals

Carobs 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 2.

Table 2 — 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.	0.20	
iv)	Cadmium (Cd), ppm max.	0.02	
v)	Mercury (Hg), ppm max.	0.01	

8.2 Pesticide residues

Carobs shall comply with those maximum pesticide residue limits established by the Codex Alimentarius Commission for this commodity.

8.3 Mycotoxin and chemical limits

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

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

9 Hygiene

9.1 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.

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

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

9.4 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 3;
- 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 3 — Microbiological limits for beans

	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	

10 Marking or labelling

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

- i) product name as “Carobs”;
- ii) the trade mark or brand name, if any;
- iii) name, address and physical location of the manufacturer/ packer/importer;
- iv) lot/batch/code number;
- v) net weight, in grams or kilograms;
- vi) the declaration “Food for Human Consumption”;
- vii) storage instruction as “Store in a cool dry place away from any contaminants”;
- viii) crop year;
- ix) packing date;
- x) expiry date or best before _____ month _____ year;
- xi) a declaration of the product lifespan;
- xii) instructions on disposal of used package;
- xiii) country of origin;
- xiv) a declaration on genetic modification status.

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

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



Carob pods on branch



Carob tree



Carob trees with pods



Dry carob pods and seeds



Carob flowering and mature green carob pods

Annex A
(normative)

Determination of spoiled carobs, broken carobs, undeveloped carobs and extraneous matter

A.1 Principle

Visual inspection of a test portion of carobs and physical separation of spoiled carobs, broken carobs, undeveloped carobs and extraneous matter.

A.2 Procedure

Weigh, to the nearest 0.1 g, a test portion of about 500 g. Separate the spoiled carobs, broken carobs, undeveloped carobs and extraneous matter carefully by hand or using tweezers. Separate mouldy and rotten pods from the other kinds of spoiled carobs.

Weigh each category separately to the nearest 0.1 g.

A.3 Expression of results

The content, expressed as a percentage by mass, of each category is equal to

$$\frac{m_1}{m_0} \times 100$$

Where

m_0 is the mass, in grams, of the test portion

m_1 is the mass, in grams, of the relevant category (see A.2)

Annex B
(normative)

Determination of moisture content (Routine method)

B.1 Definition

moisture content of carob

conventionally, the loss in mass determined under the operating conditions specified in this annex

B.2 Principle

Heating and drying of a test portion of carobs at a temperature of 103 ± 2 °C. Weighing, and determination of the loss in mass.

B.3 Apparatus

Usual laboratory equipment and in particular:

B.3.1 Electric oven, having effective ventilation and capable of being maintained at 103 ± 2 °C.

B.3.2 Dish with lid, of corrosion-resistant metal or of glass, with at least 50 cm² effective surface (for example minimum diameter 80 mm) and 35 to 40 mm deep.

B.3.3 Mortar and pestle, which permit the pods to be crushed without heating.

B.3.4 Desiccator, containing an effective desiccant.

B.4 Procedure

B.4.1 Preparation of test sample

Take approximately 100 g of carobs from the laboratory sample and crush them in a mortar (B.3.3) for 2 min, so that the greatest dimension of the particles does not exceed about 10 mm, while avoiding the formation of a paste.

B.4.2 Preparation of the dish and lid

Dry the dish and lid for 2 h in the oven maintained at 103 ± 2 °C. Leave to cool in the desiccator and weigh to the nearest 0.01 g.

B.4.3 Test Portion

Quickly place a test portion comprising approximately half of the test sample (B.4.1) in the dish (B.4.2). Cover the dish with its lid and weigh to the nearest 0.01 g.

B.4.4 Determination

Place the dish containing the test portion (B.4.3) in the oven (B.3.1) at 103 ± 2 °C, on its lid. Keep it there for 6 h. Do not open the oven during this period. At the end of this period, remove the dish, cover it immediately with its lid and place it in the desiccator (B.3.4). After cooling to ambient temperature (approximately 40 to 60 min after placing in the desiccator), weigh it, still covered, to the nearest 0.01 g.

B.4.5 Number of determinations

Carry out two determinations.

B.5 Note on procedure

The crushing and weighing operations for each determination shall be carried out as rapidly as possible, and in any event within 5 min.

B.6 Expression of results

The moisture content, expressed as a percentage by mass, is equal to

$$\frac{m_3 - m_4}{m_3 - m_2} \times 100$$

where

m_2 is the mass, in grams, of the empty dish and its lid;

m_3 is the mass, in grams, of the dish and its lid with the test portion before oven drying;

m_4 is the mass, in grams, of the dish and its lid with the test portion after oven drying.

Take as the result the arithmetic mean of the two determinations; give the result to one decimal place.

B.7 Test report

The test report shall show the method used and the results obtained. It shall also mention any operating details not specified in this annex, or regarded as optional, together with details of any incidents likely to have influenced the results.

The test report shall include all the information necessary for the complete identification of the sample.

Annex C (normative)

Carob (*Ceratonia siliqua*) — Fact sheet

C.1 Introduction

Non-fleshy and bean-like, the carob would not be generally regarded as a fruit, in the food-use sense, except for its sweetness. To many people it is familiar only by name as "St. John's Bread", in allusion to the "locusts" which, according to the Bible, sustained St. John the Baptist in the desert, and the "husks" which tempted the hungry Prodigal Son, though "no man gave unto him." The word "locust" was originally applied to the carob tree; later to migratory and other grasshoppers; and the name is attached to a number of other leguminous trees with pinnate leaves and oblong pods (*Gleditsia*, *Hymenaea*, *Parkia*, *Robinia*). The carob tree is called *carrubo* in Sicily, *carrubio* in Italy, *algarrobo* in Guatemala, *alfarrobeira* in Brazil. The genus *Ceratonia* belongs to the family Leguminosae (syn. Fabaceae) of the order Rosales.

C.2 Description

The tree reaches 15-17 m in height and at an age of 18 years may have a trunk 85 cm in circumference. The evergreen leaves are pinnate with 6 to 10 opposite leaflets, oval, rounded at the apex, dark-green, leathery, 2.5-6.25 cm long. The tiny red flowers are in short, slender racemes borne in clusters along the branches—male, female or hermaphrodite on separate trees. The pod is light- to dark-brown, oblong, flattened, straight or slightly curved, with a thickened margin; 10 cm to 30 cm long, 1 cm to 2.5 cm wide, glossy, tough and fibrous. It is filled with soft, semi-translucent, pale-brown pulp, scant or plentiful, and 10 to 13 flattened, very hard seeds which are loose in their cells and rattle when the pod is fully ripe and dry. The unripe pod is green, moist and very astringent; the ripe pod sweet when chewed (avoiding the seeds) but the odour of the broken pod is faintly like Limburger cheese because of its 1.3% isobutyric acid content.

C.3 Origin and distribution

The carob tree has been grown since antiquity in most countries of the Mediterranean basin, usually in mild and dry places with poor soils. Its value was recognized by the ancient Greeks, who brought it from its native Middle East to Greece and Italy, and by the Arabs, who disseminated it along the North African coast and north into Spain and Portugal. It was spread in recent times to other Mediterranean-like regions such as California, Arizona, Mexico, Chile and Argentina by Spaniards, to parts of Australia by Mediterranean emigrants and to South Africa and India by the English.

In the Mediterranean region, peasants have virtually lived on the pods in times of famine, but the tree is valued mostly as providing great amounts of pods as feed for livestock, as it is also in the State of Campinas, Brazil. Imported pods used to be regularly sold by street vendors in the Italian section of lower New York City for chewing. In the early 1920's, there was much promotion of carob culture in California, especially allied with the development of arid lands, and there was a flurry of activity in producing "health food" products from imported pods. Some of these products are still sold today, especially as substitutes for chocolate. Dr. J. Eliot Coit, of Vista, California, led in the study of the carob and wrote extensively on its potential improvement as a crop and its utilization.

C.4 Varieties

From more than 80 clones, 7 selections made by Coit were set out at the Citrus Research Center of the University of California for preservation. The 7 are, briefly:

'Amele'-an old commercial variety from Italy; S.P.I. #19437. Female. Pods light-brown, straight or slightly curved, 14-16 cm long, 2-2.5 cm wide; 53.8% sugar content under irrigation near Indio. Flavour good. Season: September at Indio; October at Vista.

'Casuda'-a very old cultivar from Spain. Female. Pod brown, mostly straight; 12 cm long; 1.5 cm wide; 51.7 % sugar at Vista; 56.7 % under irrigation at Indio. Flavour fair. Season: September at Indio; October at Vista.

'Clifford'-seedling street tree in Riverside. Hermaphrodite. Pod light-brown, slightly curved, 13 cm long, 2 cm wide; 52.9% sugar content. Flavour fair. Season: early October; bears regularly and heavily.

'Sfax'-from Menzel bou Zelfa, Tunisia; S.P.I. #187063. Female. Pod red-brown, straight or slightly curved; 15 cm long, 2 cm wide; 56.6% sugar at Vista, 45.6% at Indio. Excellent flavour. Season: August at Indio, September at Vista. A regular, medium-heavy bearer.

'Santa Fe'-seedling from Santa Fe Springs, California. Hermaphrodite; self-fertile. Pod light-brown, slightly curved, often twisted; 18-20 cm long, 2 cm wide; 47.5% sugar at Vista. Excellent flavour. Season: October. Bears regular, good crops. Good for coastal foothills. Not suited to irrigated culture at Indio.

'Tantillo'-from Sicily; S.P.I. #233580. Hermaphrodite. Pod dark-brown, mostly straight; 5 1/8 to 6 in (13-15 cm) long, 3/4 in (2 cm) wide. Of fair flavour. Season: mid-September to mid-October. Bears heavily and regularly.

'Tylliria'-from Cyprus; their chief export variety; S.P.I. # 189008. Female. Pod dark mahogany-brown, slightly curved, 15 cm long, 2-2.5 cm wide; 47.4% sugar at Vista; 50.9% at Indio; 48.8% in Cyprus. Good flavour. Season: mid-August to mid-September at Indio, October at Vista. Adapted to coastal foothills. (As reported from Cyprus, seed content is 7.6 to 10.6%; pod contains 51 % sugar and the seeds 49% gum).

These 7 superseded some older cultivars, including 'Bolser', 'Conejo', 'Gabriel', 'Horne', and 'Molino'; all hermaphroditic.

Other common cultivars in Cyprus are:

'Koundourka'-a tree with weeping branches; mature pods generally less than 17 cm long; they split readily; have 14.7% seeds with a high (58%) gum content.

'Koumbota'-a large-growing tree with "knotty" pods with low seed content. Pods contain 53% sugar; seeds, 53% gum.

Grafted types are classed as 'Imera'. The name 'Apostolika' is a general term for seedlings of fair quality. Wild types as a group are called 'Agria'.

C.5 Pollination

In a planting of female trees, one male should be included for every 25 or 30 females. In southern Europe, branches from male trees are grafted onto some of the females in an orchard instead of interplanting male trees.

C.6 Climate

The carob is slightly hardier than the sweet orange. Young trees suffer frost damage. Mature trees can endure a temperature drop to -6.67 °C. Frost during the blooming period will reduce or prevent fruit-set. The tree does best in a Mediterranean-type climate with cool, not cold, winters, mild to warm springs, and warm to hot summers with little or no rain. Temperatures in carob-growing regions of Israel may reach 40 °C to 50 °C in summer. Ideal annual precipitation is 75 cm, but widely spaced trees will thrive with only 15 cm to 37.5 cm without irrigation in mild climates. The pods should not be exposed to rain or heavy dew after they have turned brown and developed a high sugar content. Wet pods ferment quickly.

C.7 Soil

The tree flourishes in widely divergent soils, from rocky hillsides to deep sand or heavy loam, but must have good drainage. In Nicosia, Cyprus, a large plantation was developed by dynamiting planting holes in caprock underlaid with limestone (pH 9). The carob is not tolerant of acid or wet soils; it is extremely drought-tolerant.

C.8 Propagation

Fresh seeds germinate quickly and may be sown directly in the field. Dried, hard seeds need to be scarified or chipped and then soaked in water or dilute sulfuric or hydrochloric acid solutions until they swell. In Cyprus, seeds are planted in sand and kept wet for 6 weeks or more, periodically sifting out those that have swollen to 3 times normal size. Germination rate may be only 25%. The swollen seeds are traditionally planted in flats and when they produce the second set of leaves they are transferred to small pots. When 30 cm tall, they are transplanted to large containers or nursery rows. A recently developed technique is to plant the seeds in 2 halves of clay drainpipes bound together or in plastic tubes packed in deep wooden boxes to accommodate the long taproot. In perhaps a year, the tubes are split and the seedlings are planted in the field in holes made with a post-hole digger. Budding is done when the stem is at least 1 cm thick.

The shield-budding system is employed, or sometimes a blend of budding and grafting, in February and March in Cyprus, in April, May and June in California and Mexico. Male trees or those that bear poorly are top-worked to productive cultivars.

C.9 Culture

The carob grows slowly during the first year. Stem-elongation in young plants has been expedited by application of gibberellin (50 mg/litre monthly, or 25 mg/litre semi-monthly) for 5 months. It is necessary to cut back the taproot 6 months before transferring to the field if the plant is not grown by the tube/post-hole method. Large trees cannot be successfully transplanted.

A good spacing is 9 m apart each way. Most carob growers consider fertilizing unnecessary. Irrigation must be provided in very dry seasons if the tree is grown for its fruits. Budded trees begin to bear in the 6th year from planting. A carob tree may remain productive for 80 to 100 years.

C.10 Harvesting

The pods must be harvested before rains. They are shaken down by means of a long pole with a terminal hook to grasp the branches. Those that don't fall readily are knocked off with the pole. The pods are caught on canvas sheets laid on the ground. Then they are sun-dried for 1 or 2 days until the moisture content is reduced to 8% or below and then go through a kibbling process—crushing and grading into 4 categories: cubed, medium-kibbled, meal, and seed kernels.

C.11 Yield

At 6 years of age, a budded tree in California should yield about 2.25 kg. At 12 years, the crop should be 45 kg. Productivity increases steadily up to 25 or 30 years when the yield may average 90 kg. In Israel individual trees have produced 204-227 kg 18 years after grafting. Some ancient trees in the Mediterranean area are reported to have borne 1 360 kg in a season.

C.12 Pests and diseases

In the Mediterranean area, the major pest is the carob moth, *Myelois ceratoniae*. It lays eggs on the flowers or newly-formed pods and the larvae bore into the pods and ruin them. The larvae of a midge, *Asphondylia gennadii*, cause stunting of the pods. Some of the best cultivars are resistant to these pests.

In Cyprus, the tree is subject to several scale insects: *Aspidiotus ceratoniae*, *Lecanium sp.*, *Lepidosaphes sp.* and the red scale, *Aonidiella aurantii*. A beetle, *Cerambyx velutinus*, may bore holes in the trunk. Rats climb the trees, hide among the branches, gnaw the bark until the branches die. Such branches are pruned out twice a year. The only pests reported as attacking carob trees in California are scale insects, including the red scale. Ground squirrels feed on plants under 2 years of age. Pocket gophers are very fond of carob roots, and rabbits and deer graze on the young trees.

Diseases are few. In Cyprus, deformation of young pods may be caused by the fungus *Oidium ceratoniae*. *Cercospora ceratoniae* occasionally induces leaf-spotting.

C.13 Food uses

Apart from being chewed as a sweetmeat, carob pods are processed to a cocoa-like flour which is added to cold or heated milk for drinking. It has been combined with wheat flour in making bread or pancakes. A flour made by beating the seeded pods is high in fibre and has been utilized in breakfast foods. The finer flour is also made into confections, especially candy bars. The pods, coarsely ground and boiled in water yield a thick, honey-like syrup, or molasses.

The seeds constitute 10 to 20% of the pod. They yield a tragacanth-like gum (manogalactan), called in the trade "Tragasol", which is an important commercial stabilizer and thickener in bakery goods, ice cream, salad dressings, sauces, cheese, salami, bologna, canned meats and fish, jelly, mustard, and other food products. The seed residue after gum extraction can be made into a starch- and sugar-free flour of 60% protein content for diabetics.

In Germany, the roasted seeds have served as a substitute for coffee. In Spain, they have been mixed with coffee.

It has been demonstrated that the extracted sugars of the pod (sucrose, glucose, fructose and maltose in the ratio 5:1:1:0:7) can be utilized to produce fungal protein. Infusions of the pulp are fermented into alcoholic beverages.

Food value per 100 g of carob flour

Calories	180
Moisture	11.2 g
Protein	4.5 g
Fat	1.4 g
Carbohydrates*	80.7 g
Fiber	7.7 g
Ash	2.2 g
Calcium	352 mg
Phosphorus	81 mg
*Sugar content may be as high as 72%.	

The pods contain up to 1.5% tannins which interfere with the body's utilization of protein.

C.14 Other uses

Pods: The pods are relished by horses, cattle, pigs, goats and rabbits. Whole pods are broken up in a hammermill in order to crush the seeds as well. Because of the tannin content, carob pods should constitute no more than 10% of total feed, otherwise they will depress growth rate. They cannot be fed to chickens. The flour is often utilized in dog biscuits. Great quantities of pods have been imported into the United States for flavouring uncured tobacco.

Seeds: The seed gum is much employed in the manufacture of cosmetics, pharmaceutical products, detergents, paint, ink, shoe polish, adhesives, sizing for textiles, photographic paper, insecticides and match heads. It is also utilized in tanning. Where rubber latex is produced, the gum is added to cause the solids to rise to the surface. It is also used for bonding paper pulp and thickening silkscreen pastes, and some derivatives are added to drilling mud. It has many other actual or potential applications. A flour made from the seeds serves as cattle feed.

Wood: The heartwood is hard and close-grained. It is prized for turnery and cabinetwork. As a fuel it burns slowly and makes excellent charcoal. It yields algarrobin, which gives textiles a light-brown hue.

Annex E
(informative)

Carob — 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

Not yet established.

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