# Ceratonia

## 1 Nonproprietary Names

None adopted.

## 2 Synonyms

Carob bean gum; carob flour; ceratonia gum; Cheshire gum; E410; gomme de caroube; locust bean gum; *Meyprofleur*; St. John's bread.

## 3 Chemical Name and CAS Registry Number

Carob gum [9000-40-2]

## 4 Empirical Formula Molecular Weight

Ceratonia is a naturally occurring plant material that consists chiefly of a high molecular weight hydrocolloidal polysaccharide, composed of D-galactose and D-mannose units combined through glycosidic linkages, which may be described chemically as galactomannan. The molecular weight is approximately 310 000.

## 5 Structural Formula

*See* Section 4.

## 6 Functional Category

Controlled-release vehicle; stabilizing agent; suspending agent; tablet binder; viscosity-increasing agent.

## 7 Applications in Pharmaceutical Formulation or Technology

Ceratonia is a naturally occurring material generally used as a substitute for tragacanth or other similar gums. A ceratonia mucilage that is slightly more viscous than tragacanth mucilage may be prepared by boiling 1.0–1.5% of powdered ceratonia with water. As a viscosity-increasing agent, ceratonia is said to be five times as effective as starch and twice as effective as tragacanth. Ceratonia has also been used as a tablet binder[1] and is used in oral controlled-release drug delivery systems approved in Europe and the USA.

Ceratonia is widely used as a binder, thickening agent, and stabilizing agent in the cosmetics and food industry. In foods, 0.15–0.75% is used.

## 8 Description

Ceratonia occurs as a yellow-green or white colored powder. Although odorless and tasteless in the dry powder form, ceratonia acquires a leguminous taste when boiled in water.

## 9 Pharmacopeial Specifications

*See* Section 18.

## 10 Typical Properties

**Solubility:** ceratonia is dispersible in hot water, forming a sol having a pH 5.4–7.0 that may be converted to a gel by the addition of small amounts of sodium borate. In cold water, ceratonia hydrates very slowly and incompletely. Ceratonia is practically insoluble in ethanol.

## 11 Stability and Storage Conditions

The bulk material should be stored in a well-closed container in a cool, dry place. Ceratonia loses not more than 15% of its weight on drying.

## 12 Incompatibilities

The viscosity of xanthan gum solutions is increased in the presence of ceratonia.[2] This interaction is used synergistically in controlled-release drug delivery systems.

## 13 Method of Manufacture

Ceratonia is a naturally occurring material obtained from the ground endosperms separated from the seeds of the locust bean tree, *Ceratonia siliqua* (Leguminosae). The tree is indigenous to southern Europe and the Mediterranean region.

## 14 Safety

Ceratonia is generally regarded as an essentially nontoxic and nonirritant material. Therapeutically, it has been used in oral formulations for the control of vomiting and diarrhea in adults and children; 20–40 g daily in adults has been used dispersed in liquid.[3] As an excipient, ceratonia is used in oral controlled-release formulations approved in Europe and the USA.

Ceratonia is also widely used in food products. The WHO has not specified an acceptable total daily intake for ceratonia as the total daily intake arising from its use at the levels necessary to achieve the desired effect, and from its acceptable background in food, was not considered to represent a hazard to health.[4]

$LD_{50}$ (hamster, oral): 10.0 g/kg[5]
$LD_{50}$ (mouse, oral): 13.0 g/kg
$LD_{50}$ (rabbit, oral): 9.1 g/kg
$LD_{50}$ (rat, oral): 13.0 g/kg

## 15 Handling Precautions

Observe normal precautions appropriate to the circumstances and quantity of material handled. When heated to decomposition ceratonia emits acrid smoke and irritating fumes.

## 16 Regulatory Status

GRAS listed. Accepted for use in Europe as a food additive. In Europe and the USA, ceratonia has been used in oral tablet formulations.

## 17 Related Substances

Acacia; ceratonia extract; tragacanth; xanthan gum.

**Ceratonia extract**

**Synonyms:** ceratonia siliqua extract; extract of carob; locust tree extract.

**CAS number:** 84961-45-5

**Comments:** ceratonia extract is used as an emollient. The EINECS number for ceratonia extract is 284-634-5.

## 18 Comments

The EINECS number for ceratonia is 232-541-5.

Although not included in any pharmacopeias, a specification for ceratonia is contained in the Food Chemicals Codex (FCC), *see* Table I.[6] However, ceratonia (locust bean gum) is described under reagent specifications in the USP 25, where the reader is directed to the FCC specifications. Ceratonia (carob bean gum) is mentioned in the BP 2001 under general reagents and is described as a white powder containing 70–80% of a water-soluble gum consisting mainly of galactomannoglycone.

**Table I:** Food Chemicals Codex 1996 specifications for ceratonia.[6]

| Test | FCC 1996 |
|---|---|
| Identification | + |
| Acid-insoluble matter | ≤4.0% |
| Arsenic | ≤3 mg/kg |
| Ash | ≤1.2% |
| Galactomannans | ≥75% |
| Heavy metals (as Pb) | ≤0.002% |
| Lead | ≤5 mg/kg |
| Loss on drying | ≤14.0% |
| Protein | ≤7.0% |
| Starch | + |

## 19 Specific References


1 Georgakopoulos PP, Malamataris S. Locust bean gum as granulating and binding agent for tablets. *Pharm Ind* 1980; **42**(6): 642–646.

2 Kovacs P. Useful incompatibility of xanthan gum with galactomannans. *Food Technol* 1973; **27**(3): 26–30.

3 Wade A, ed. *Martindale: The Extra Pharmacopoeia*, 27th edn. London: Pharmaceutical Press, 1977: 921.

4 FAO/WHO. Evaluation of certain food additives. Twenty-fifth report of the FAO/WHO expert committee on food additives. *World Health Organ Tech Rep Ser* 1981; No. 669.

5 Lewis RJ, ed. *Sax's Dangerous Properties of Industrial Materials*, 10th edn. New York: Wiley, 2000: 2249.

6 *Food Chemicals Codex*, 4th edn. Washington DC: National Academy of Sciences, 1996: 228.


## 20 General References


Bhardwaj TR, Kanwar M, Lal R. Natural gums and modified gums as sustained-release carriers. *Drug Dev Ind Pharm* 2000; **26**(10): 1025–1038.

Griffiths C. Locust bean gum: a modern thickening agent from a biblical fruit. *Manuf Chem* 1949; **20**: 321–324.

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Woodruff J. Ingredients for success in thickening. *Manuf Chem* 1998; **69**(9): 49, 50, 52.


## 21 Author

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## 22 Date of Revision

27 May 2002.