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20 General References

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21 Author

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22 Date of Revision

4 May 2017.

Ceratonia

1 Nonproprietary Names

None adopted.

2 Synonyms

Algaroba; carob bean gum; carob flour; carob gum; carob seed gum; caruba; carubin; ceratonia gum; *Ceratonia siliqua*; *Ceratonia siliqua* 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 and Molecular Weight

Ceratonia is a naturally occurring plant material that is obtained from milling of the seed endosperm of the leguminous plant *Ceratonia siliqua* Linn. (carob tree). It 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. These glycosidic linkages have a linear chain of (1→4)-linked β-D-mannopyranosyl units with (1→6)-linked α-D-galactopyranosyl side chain residues. The side chains are not uniformly distributed across the mannose backbone and vary according to the region where the plant has grown. Ceratonia has the lowest galactose content (20–25%) amongst the commercially available galactomannans (e.g. guar gum and tara gum).^(1,2) The molecular weight is approximately 310 000. However, this varies significantly depending on the seed source and preparation procedure.

5 Structural Formula

See Section 4.

6 Functional Category

Coating agent; emulsifying agent; gelling agent; modified-release agent; suspending agent; tablet and capsule binder; tablet and capsule disintegrant; 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 of the galactomannan group (e.g. guar and tara 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. The viscosity and water-solubility of the gum is determined by its galactose content.⁽²⁾ 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⁽³⁾ and is used in oral controlled-release drug delivery systems approved in Europe and the US. An example is the TIMERx[®] system that is based on a hydrophilic matrix formed by xanthan gum and ceratonia with dextrose.⁽⁴⁾

Ceratonia has a wide range of applications in the pharmaceutical industry. It is known to be used in the manufacture of films, beads, micro and nano-particles, solid monolithic matrices and viscous formulations of liquids and gels. Here, it may function as a stabilizing agent, binder, coating ingredient, modifier of drug release pattern, emulsifying agent, thickener, disintegrants, suspending agent, solubilizer or gelling agent. It has also been used as a biologically active substance to reduce elevated plasma cholesterol.⁽⁵⁾

8 Description

Ceratonia occurs as a yellow-green or white colored powder depending on the method of isolation from the plant. 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

Acidity/alkalinity pH = 5.3 (1% w/v aqueous solution)

Solubility The gum has shown very low solubility in most organic solvents and requires heating at temperatures greater than 85°C in order to be completely soluble in water. Ceratonia is dispersible in hot water (>70°C), forming a sol having a