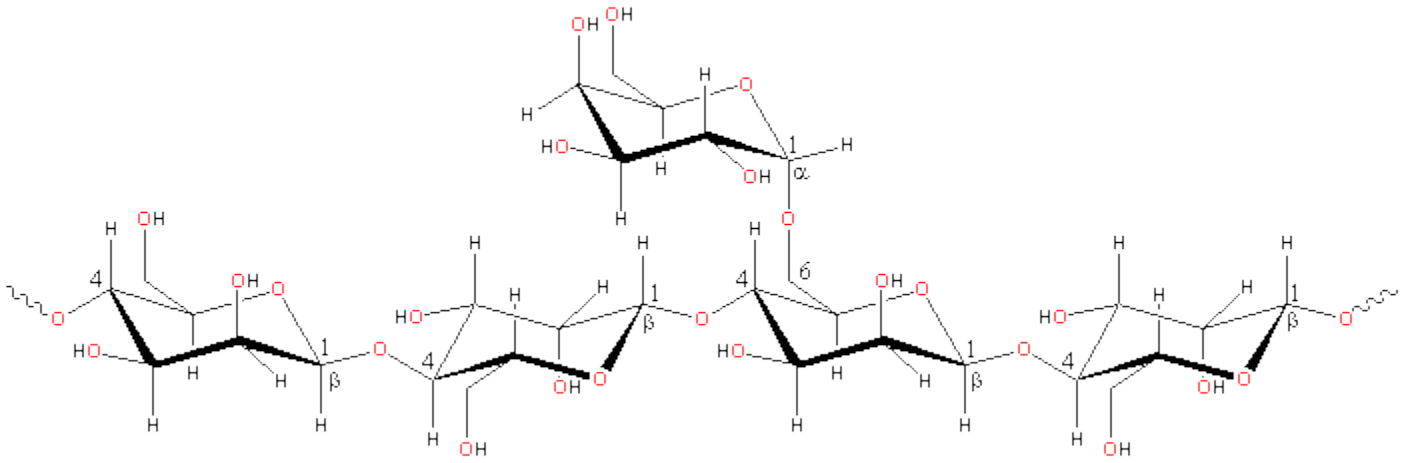
Locust Bean Gum

Source

Locust bean gum (E410; also called Carob bean gum and Carubin) is extracted from the seed (kernels) of the carob tree (*Ceratonia siliqua*) [1968]. It forms a food reserve for the seeds and helps to retain water under arid conditions.

Structural unit

Locust bean gum is a galactomannan[a] similar to guar gum consisting of a (1⟶4)-linked β-D-mannopyranose backbone with branchpoints from their 6-positions linked to α-D-galactose (that is, 1⟶6-linked α-D-galactopyranose). There are about 3.5 (2.8 - 4.9) mannose residues for every galactose residue.



Molecular structure

Locust bean gum is polydisperse consisting of non-ionic molecules made up of about 2000 residues. Lower galactose substitution also decreases the stiffness (that is, increases the flexibility) but increases the extensibility of the isolated chains [291]. Its persistence length is less than that for guar at about 7 nm [1378]. The galactose residues prevent strong chain interactions but there may be up to 10 -11 unsubstituted mannose residues in a row and junction zones may form between such clear areas when they consist of greater than about six residues. These nano-crystalline links dissociate in hot water. If the galactose residues were perfectly randomized or blocked, it is likely that each molecule would have more than four such areas capable of acting as junction zones, so allowing gel formation.

Functionality

Locust bean gum is less soluble and lower viscosity than guar gum as it has fewer galactose branchpoints. It needs heating to dissolve but is soluble in hot water. Locust bean gum differs from guar gum in that it does form thermally-irreversible weak gels by association of the galactose deficient regions and therefore has poorer freeze thaw behavior. These unsubstituted areas also allow increased interaction with cellulose. Being non-ionic, locust bean gum is not affected by ionic strength or pH but will degrade at pH extremes at higher temperatures.

Locust bean gum specifically retards ice crystal growth by forming structured gel at solid/liquid interface This particularly occurs on freeze-thaw cycling, which encourages the frustrated crystallization of the galactomannan so causing the gel to form. It encourages phase separation with skimmed milk powder showing synergistic viscosity with casein and becoming slightly thixotropic on forming a biphasic system containing casein micelles within a polysaccharide continuous network. To aid this it may usefully be combined with xanthan [1071], with which it shows viscosity synergy, and κ-carrageenan to super helices of which it adsorbs (as do cassia[a] and tara gums but not guar gum) [475].

Interactive structures are available (Jmol).

Source : http://www1.lsbu.ac.uk/water/hyloc.html