

In 1935, the presence of gluten-like material in the germ of the carob seed was confirmed. The viscoelastic properties of the water-insoluble proteins isolated from carob germ, which was proposed to call caroubin, have been confirmed by dynamic ( $G'$  and  $G''$ ) and static rheological measurements (texture profile analysis, visco-elastogram). Biochemical analyses showed important similarities (e.g. high glutamic acid content) as well as large differences (high arginine and low cysteine and proline content of caroubin, and carbohydrate composition) between caroubin and wheat gluten.

## What is carob germ protein?

The carob tree (*Ceratonia siliqua*) is native to the Mediterranean region - including Southern Europe and Northern Africa and spreading into East Mediterranean countries like Jordan and across to Iran. Morocco and Spain are the biggest producers of carob by quantity, with Italy, Portugal, Greece and Turkey being the smaller ones.

The seeds of the fruit of the carob trees have long been exploited predominantly to obtain locust bean gum (LBG), which is used in food, pharmaceutical and cosmetic industries because of its ability to form viscous solutions and to stabilize emulsions and dispersions. Also, the pod can be ground into flour and used as a chocolate or cocoa substitute.

Carob Germ Protein is a raw food protein derived from carob seed and has a similar amino acid profile to soy protein with 54% protein. It is rich in soluble and insoluble fibre and has a nutty flavour. It can also be used for dietetic supplements and as a celiac-friendly ingredient in cereal-based products.

The alternative protein market is growing at a rapid pace, for a variety of reasons. Alternative sources of protein are having a profound influence on the formulation of weight-conscious food and diets based on the low glycaemic index (GI) and high protein intake, and traditional manufacturers are looking at new protein sources as a means of enriching their products. In Spain, some industries process carob for obtaining carob germ flours (40 – 50% % protein) with the major amino acids present are characterised as glutamic acid, arginine, aspartic acid, leucine and lysine. This flour is used in dietetic formulas for sports and celiac people.

## Nutrition & functional potential, applications.

Carob germ protein could be used as an alternative raw material and incorporated as an ingredient in new food formulations. Its antioxidant properties make it a potentially interesting ingredient for functional foods and a low-cost alternative for other proteins.

Carob germ protein is of great interest in gluten-free breadmaking for its ability to form a gluten-like network, due to the presence of caroubin, the group of proteins with different sizes and polymerization degrees, which acts as an elastifying agent especially in gluten-free doughs or batters. It is a low-cost competitor to other food proteins, like dairy or soy protein, commonly used in gluten-free bread.

Addition of carob germ protein to wheat flour is of interest as its caroubin possesses functional properties similar to wheat gluten, strengthening the dough and adding stability during mixing.

Suitable for protein-enriched bars and drinks, and in processed meat, dressings and sauces (emulsification properties can be achieved if heated to at least 80°C).

**Label declaration:** Carob Protein, Carob Germ Protein