Abstract

Digestibility of any starch granule primarily varies greatly on system to system, but origin of starch also plays a significant role in contributing the prosprandial blood glucose levels. Based on *in vivo* and *in vitro* digestibility of starch, its glucose release profile and absorption in the gastrointestinal tract, starch can be classified into Rapidly Digestible Starch (RDS), Slowly Digestible Starch (SDS) and Resistant Starch (RS). RDS and SDS are the amorphous fractions of the starch, which gets completely digested in the small intestine of normal healthy individuals whereas RS is the crystalline to semi-crystalline fraction of starch which manages to escape from the small intestine resisting digestion by enzymes and absorption by the human digestive system.

Glucose metabolism has been considered as an integral part of every living system, since availability of simple sugars facilitates maintenance of homeostasis via sensing the presence of nutrients and switching the metabolic cascades in a systematic manner. Although, high blood glucose and insulin concentrations are associated with complications of type 2 diabetes, obesity and cardiovascular diseases but glucose is also the primary form of nutrition for obtaining energy via formation of ATP. In this context, digestion of starch has been identified as the critical rate limiting phenomenon in determining the prosprandial blood glucose levels and its further signalling system. For the reason, intake of dietary/ complex carbohydrates or slowly digestible starches has been recommended by health regulatory authorities.

To accomplish the rationale of developing a RS rich modified granule, capable of resisting rapid release of glucose by human digestive system, a novel bifunctional biocatalyst named amylopullulanase along with amyloglucosidase has been used as debranching enzymes. It is hypothesized that enzymes capable to cleave α 1, 6 glycosidic bond of branched amylopectin will make linear chains resembling amylose, which upon recrystallization will increase the RS content. But as amylose chains are very long polymeric chains, intermittent cleavage of these high molecular weight polymers will promote smooth retrogradation of low molecular weight amylose chains and its suitable formulation for cookies that release glucose in the controlled fashion. Systematic alignment of these amylose chains has been found to form a compact crystalline structure, thereby reducing the accessibility of enzymes by directly decreasing the number of reducing ends. As a result, the developed cookies became a low glycemic food, which in turn has controlled the rapid increase of postprandial glucose, provide energy for a long period of time, reduce glycogen formation, make mTOR signalling pathway function normally and reduce satiety. Thereafter, the modified RS rich designer food has been thoroughly characterized and clinically tested on 30 diabetic patients to observe its effect on the human system. The obtained results have been documented and analysed scientifically which were highly encouraging.

***Keywords*: Resistant Starch, Amylopullulanase, Amyloglucosidase, Designer Food, Diabetes, Clinical trial**