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Amylose lipid nano-materials in food systems: Functionality and nutritional implication

Naushad M Emmambux
University of Pretoria, South Africa

Amylose lipid complexes (ALC) exist naturally in cereal starches at nanoscale. This presentation deals with the nutritional and functionality of ALC in three food systems (mayonnaise, high Glycaemic Index (GI) porridge and encapsulation of fat soluble vitamin C). When a fatty acid such as, stearic acid was pasting with maize starch, a non-gelling, a modified starch with high viscosity fat like paste was formed. This paste was used as a fat replacer to produce a mayonnaise type emulsion. The oil in the mayonnaise was reduced up to 80% without any significant change in the rheological properties of the mayonnaise. The ALC formed during starch pasting were isolated and found to be at nanoscale of 50-100 nm. The isolated ALC was also used to reduce fat up to 25% in margarine. When lipid (stearic acid as fatty acid) was cooked with maize meal to make soft (a common breakfast cereal) and stiff porridge (a staple food in Sub-Saharan Africa), ALC were formed. The presence of ALC in the porridge reduced the *in vitro* starch digestibility and estimated glycaemic index (EGI). This showed that starch modification reduced α-amylase enzyme accessibility for reduced hydrolysis. Ascorbyl palmitate a fat soluble derivative of vitamin C is a potent antioxidant. Ascorbyl palmitate were encapsulated by forming ALC with maize starch. The encapsulated materials was slowly released during *in vitro* enzyme hydrolysis and showed antioxidant properties. The above three examples showed the potential of ALC as a smart ingredient for extra health benefits in food systems

naushad.emmambux@up.ac.za

Functional bionutrients of Chlorella hydrolysates fermented by probiotic

Li-Jung Yin
National Kaohsiung Marine University, Taiwan

Chlorella is a good material for the production of functional foods, rich in chlorophyll, vitamins, minerals, proteins and peptides. Because of the hard cell wall, it was difficult to be digested and release the nutrients, which consequently lowered its nutritional value. *Chlorella* was hydrolyzed with 10% of cellulase and 1% of protease at 50°C to rupture the cell walls. The hydrolysate was further fermented with *Lactobacillus johnsonii* BCRC 17010 or *Lactobacillus plantarum* subsp. BCRC 10069 at 37°C for 24 hr. According to the scanning electron microscope photograph, obvious lysis of cell walls was observed after hydrolysis. The total protein content in the samples after 24 hr fermentation by *L. plantarum* subsp. BCRC 10069 decreased from 213.13 to 128.78 mg/g, while the peptides and free amino acids increased from 62.52 to 197.63 and 227.68 mg/g, from 10.19 to 23.65 and 17.91 mg/g, respectively. Essential amino acids increased significantly from 5.04 to 5.17 and 10.88 mg/g. Aspartic acid, arginine, methionine, leucine and phenylalanine also increased significantly after probiotic fermentation. The chlorophyll (chlorophyll a + b), lutein and anthocyanins in the samples after 24 hr fermentation by *L. johnsonii* BCRC 17010 or *L. plantarum* subsp. BCRC 10069 increased from 6.18 to 22.93 and 41.58 μg/mL, from 0.291 to 0.808 and 0.779 μmol/g and from 0.284 to 1.398 and 2.107 mg/100 mg, respectively. These data suggested that hydrolysis and fermentation have high potential to improve the functionality of Chlorella.

ljyin@mail.nkmu.edu.tw

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