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## The Effect of Ultrasonic and Heat Pre-Treatments on Enzyme Hydrolysis of Tapioca Starch

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Tapioca starch is low-cost raw material and widely used in food industry. However, for encapsulation application, the properties of starch granules in its native form are limited. Thus, the surface of the granules can be modified by enzymatic and/or physical modifications. In this study, native granule surfaces were pre-treated with ultrasonic/heat pre-treatments (25% (w/v) starch slurry, 15 min) prior to enzymatic treatment using 5% (w/v) of STARGEN™ 002 for 24 h at 3 different temperatures (35, 40 and 45 °C). The ultrasonic pre-treatment involved treating starch slurry in an ultrasound bath (100 W and 25 kHz). In heat pre-treatment, the starch slurry was incubated in a shaker water bath (60 °C). Dextrose equivalent (DE %), morphology and adsorption properties of the modified starches granule were analyzed to evaluate the quality of the treatments. The DE value among the samples was significantly influenced by incubation temperatures and pre-treatments, with enzymatic treatment 33.32%, 53.05% and 69.85%, ultrasonic pre-treatment 43.71%, 58.68% and 76.67% and heat pre-treatments 66.65%, 51.07% and 69.71%, respectively. The increase of incubation temperature by 5 °C enhanced the hydrolysis reaction. Enzyme reactions have high activity when the environmental temperature is increased. Among enzyme treatment, heat/ultrasonic pre-treatment, the greatest DE value was observed when pretreated by ultrasonic. This could be due to the disruption of starch molecules during the pre-treatment, allowing greater access for enzyme reaction during hydrolysis. As increased in incubation temperatures, more randomly distributed notches and grooves were observed on the surface granules of enzyme treatment, while more grooves with deep surface erosion appeared on the surface of ultrasonic and certain granules were ruptured in heat pre-treatment. However, when the incubation temperatures increase, more erosion occurs, which leads to increase adsorption properties. In overall, the best result was obtained by using different pre-treatments and incubation temperature at 40 °C.

### Biography

Syuzeliana Shaari is currently M.Sc. student in Food Technology Division, Universiti Sains Malaysia (USM). Her research work focused on starch modification. The main objective of her research is to overcome disadvantages of native tapioca starch as encapsulating agents.

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