SUMMARY

Hyperglycaemia (high blood sugar levels) is one of the risk factor of type 2 diabetes (T2D) when it is sustained over a longer period of time. Various factors that can lead to high blood glucose levels include glucose absorption by the small intestine and the production of glucose by liver cells. Maintenance of normal plasma glucose concentration is essential for the human health. Diet and exercise play important role to control blood sugar level. Limiting intake of high Glycaemic Index (GI) foods as part of a balanced diet is known to be important. In addition, having the right food intake such ad functional foods that affect the blood sugar increase, e.g by containing inhibitors of α-amylase and/or α-glucosidase, may also help lowering the average blood sugar levels. Thus, such foods may in theory help to lower blood glucose postprandially and could potentially help delay the development of T2D in subjects with impaired glucose tolerance who regularly consume starchy foods.

The present study involved the investigation of crude extracts of dried edible seaweeds in inhibiting the carbohydrate digestive enzymes, α-amylase and α-glucosidase. Bioactive compounds from selected edible seaweeds that inhibit α-amylase and α-glucosidase were identified. The edible seaweeds that were showing high potential for inhibiting the enzymes were selected to investigate their effect on the postprandial blood glucose and insulin levels following a starch load in a human meal study.

In vitro studies and a human study were performed as part of this thesis. In Paper 1 and Paper 2, the inhibition of α-amylase and α-glucosidase activity in vitro by edible red, green and brown seaweeds were investigated. Aqueous and alcoholic extracts of dried edible seaweeds were tested to investigate the inhibition kinetics on these enzyme activities. The most potent edible seaweed extracts were showing mixed-type inhibition (lowering both $K_m$ and $V_{max}$) and were selected for bioactive compound identification. The brown seaweeds, Laminaria digitata and Undaria pinnatifida, were found to be the most potent inhibitors of α-amylase and α-glucosidase activities. Polyphenols, alginates and fucoxanthin found in the selected seaweeds are among the bioactive compounds that contributed to inhibition of the enzyme activities.
In Paper 3, the same two edible seaweeds were tested in a human study. The primary endpoint was the ability of the edible seaweeds to reduce human postprandial blood glucose and insulin concentrations following a starch load in a human meal study. There was no significant effect in plasma glucose but both brown seaweeds lowered postprandial insulin response following consumption of *Laminaria digitata* or *Undaria pinnatifida* compared to the control meal.

In conclusion, two brown seaweeds, *Laminaria digitata* and *Undaria pinnatifida*, inhibited α-amylase and α-glucosidase activities due to their content of several bioactive components with a potential use for future functional foods. Their effects on the postprandial insulin response and the *in vitro* findings regarding the phenolics, alginate and fucoxanthin in these seaweeds may further support that brown seaweeds, particularly *Undaria pinnatifida*, might be used as a potential functional food to help control postprandial hyperinsulinaemia.