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The impact of commercially available, seaweed-based food products on α-amylase activity

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Type 2 Diabetes mellitus is a metabolic disorder with a risk of further complications. The current drug therapy for management of postprandial glycaemia/insulinaemia (e.g. acarbose) targets inhibition of the major enzyme involved in dietary starch digestion (α-amylase). However such treatments are often associated with adverse gastrointestinal symptoms[1]. Seaweed's have previously been evidenced to partially inhibit digestives enzyme α-amylase and thus may form a relevant dietary approach. Seaweed snack and soup-base products are readily available in Singapore and would be subject to heating and/or drying procedures in their production and preparation. This study therefore aims to assess whether commercially available seaweed preparations can exhibit/retain any α-amylase inhibitory potential.

A 96-well microplate colorimetric assay was utilised to determine the inhibitory activities of five commercially available seaweeds in Singapore. Seaweed extracts (roughly and finely ground) were assessed for their ability to inhibit α-amylase using a previously described colorimetric methodology based on estimation of reducing sugar production ($n = 3$ for each sample)[3]. One sample T-test and ANOVA was carried out to determine statistical significance between control and seaweed extracts.

All five seaweed extracts inhibited α-amylase significantly ($p < 0{\cdot}001$). Kelp-knot inhibited α-amylase by the largest mean (± SD) amount ($72{\cdot}5 \pm 1{\cdot}4\%$ and $71{\cdot}1 \pm 2{\cdot}8\%$) for roughly and finely ground seaweed respectively ($p < 0{\cdot}05$). There were also no observed differences in inhibitory activity between seaweed isolates extracted using hot or cold aqueous media ($p > 0{\cdot}05$) up to a 60 minute time period. However, the inhibitory activities of roughly ground seaweeds were significantly more ($p < 0{\cdot}05$) than finely ground seaweed extracts possibly due to differences in mechanical load acting on the seaweeds plant cellular structure during pounding versus grinding.

In conclusion, this study has highlighted that the bioactive components of seaweeds that reduce α-amylase activity are resistant to common processing techniques (heating and drying) used in the manufacture of food products. Further participant-based intervention trials are required to test whether commercially available seaweed-based foods have an impact on postprandial glycaemic control.

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