PHYTOCOMPLEX FROM *FUCUS VESICULOSUS* AND *ASCOPHYLLUM NODOSUM* CONTROLS POSTPRANDIAL PLASMA GLUCOSE LEVELS: AN *IN VITRO* AND *IN VIVO* STUDY IN A MOUSE MODEL OF NASH

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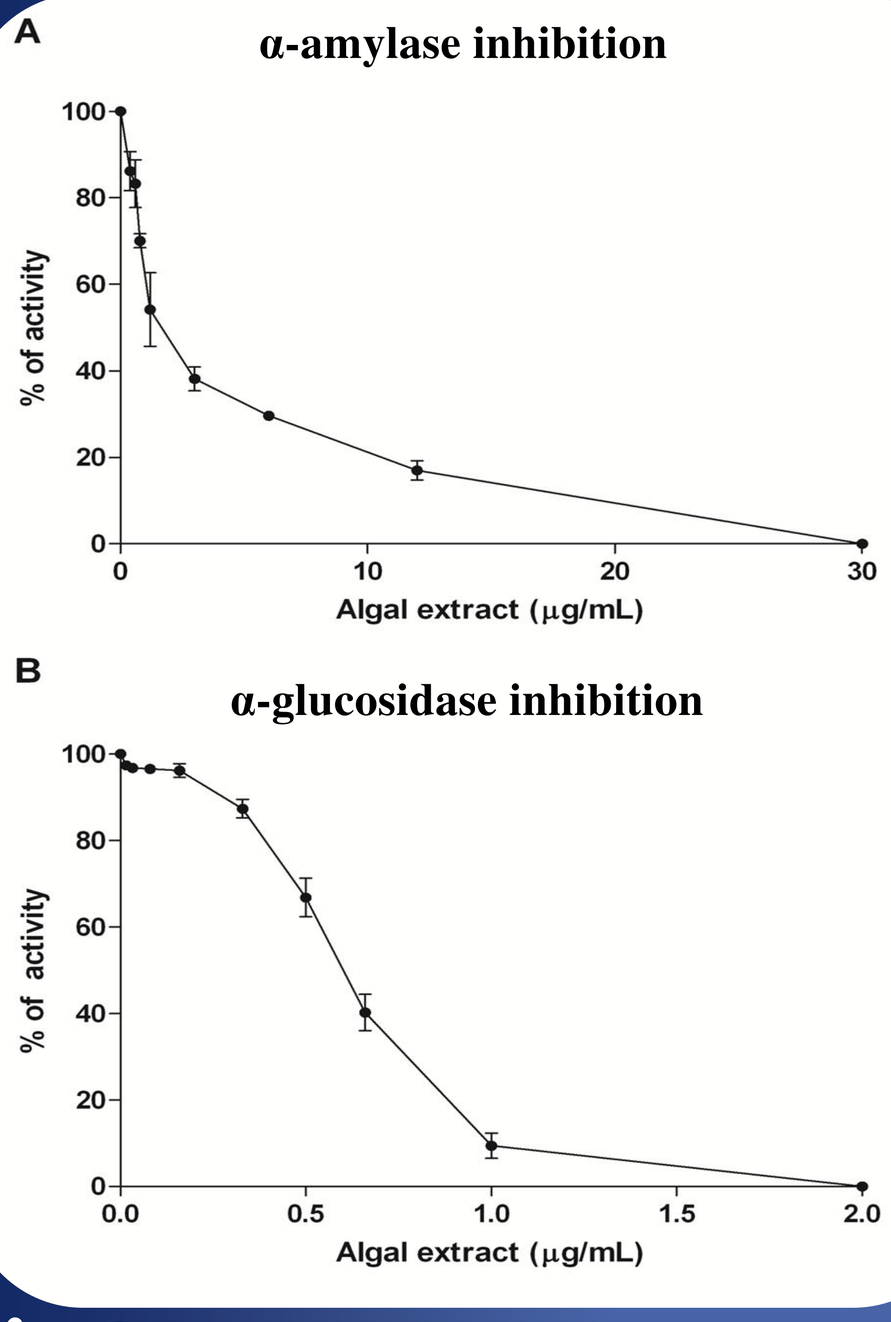
Introduction: Edible seaweeds, an easily available food source, have been consumed by Asian coastal communities since the dawn of time. Seaweeds *Fucus vesiculosus* (bladder wrack) and *Ascophyllum nodosum* (egg wrack) contain several bioactive polysaccharides and fibers with numerous health benefits and their extracts have been traditionally used for the treatment of obesity and several gastrointestinal diseases. Moreover, it has been reported that seaweed fiber consumption is associated with a significant reduction of chronic diseases, such as diabetes, obesity, and hypertension. Since postprandial hyperglycemia plays an important role in the development of Type 2 diabetes (T2DM), which is often preceded by nonalcoholic steatohepatitis (NASH), the ability of seaweed extracts of slowing the digestion of dietary starch could represent an efficient strategy to decrease blood sugar absorption.

Aim: to ascertain whether extracts obtained from *Fucus vesiculosus* and *Ascophyllum nodosum* may be useful for postprandial glycaemic control in a mouse model of nonalcoholic steatohepatitis (NASH).

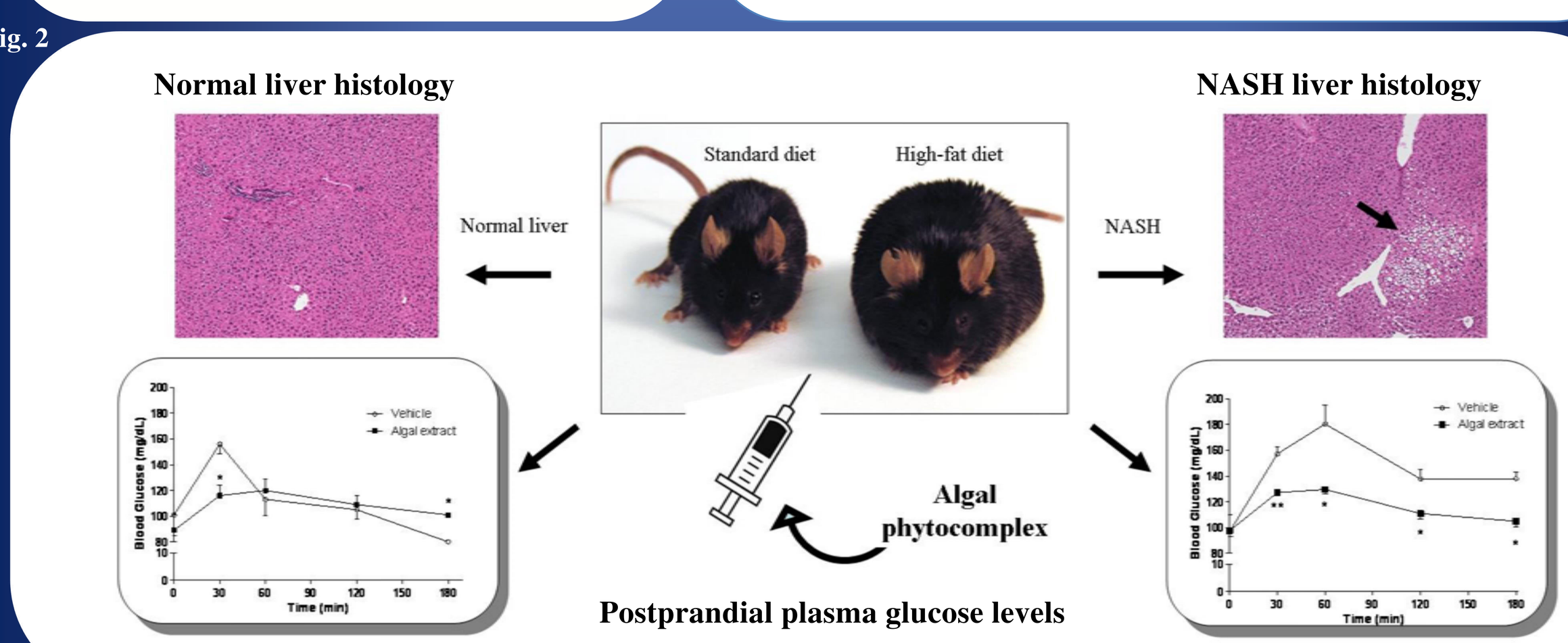
Materials and Methods: We evaluated the *in vitro* capability of *Fucus vesiculosus* and *Ascophyllum nodosum* extracts to inhibit α-amylase and α-glucosidase, two digestive enzymes responsible for starch digestion. We measured the *in vivo* effect of a single dose administration of these extracts on postprandial plasma glucose levels in a mouse model of NASH, obtained by the administration of a high-fat diet for 5 weeks.

Fig. 1



Results: Our results confirm the capability of the phytocomplex obtained from *Fucus vesiculosus* and *Ascophyllum nodosum* to inhibit both α-amylase and α-glucosidase. In particular, Figure 1 shows that complete inhibition of α-amylase and α-glucosidase activities could be reached at a concentration of algal extract of 30 μg/mL and 2 μg/ml, respectively. IC_{50} values were 1.490 ± 0.030 g/mL for α-amylase and 0.600 ± 0.004 g/mL for α-glucosidase.
In the *in vivo* study (Fig. 2), the phytocomplex shows a differential effect in the modulation of postprandial plasma glucose levels in control and NASH mice. In mice fed with normal diet, this extract delayed and reduced the peak of blood glucose without affecting the area under the blood glucose curve (AUC), since blood glucose levels of treated mice were significantly higher after 180 min with respect to controls ($p<0.05$). On the contrary, in the mouse model of NASH, this phytocomplex was able to affect both the postprandial glycaemic peak, which was considerably reduced ($p<0.05$), and AUC, which was significantly decreased ($p<0.05$).
In conclusion, these results indicate that this algal extract may be useful in the control of carbohydrate digestion and absorption. This effect may be therapeutically exploited to prevent the transition of NASH to T2DM.

Fig. 2



Data are presented as mean ± SD.* $p<0.05$ and **$p<0.01$ vs mice treated with vehicle, Student's t test for unpaired data.