EVALUATION OF BIOACTIVE AMARANTH COMPOUNDS WITH HYPOGLYCEMIC EFFECT

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1. INTRODUCTION AND OBJECTIVE

Type 2 diabetes is a disease characterized by high blood sugar levels. The World Health Organization (WHO), estimates that by 2040, 642 million people worldwide will suffer from diabetes. Alternatives such as Amaranth (Amaranthus hypochondriacus), an endemic plant from Mexico, have shown to have a hypoglycemic effect in some preclinical studies, based on protein fractions. However, in this study, the effect of amaranth´s total protein hydrolysates was evaluated in a preclinical animal model (Wistar rat) and in a clinical pilot phase in healthy people, under the prior approval of the Research Ethics Committee of Biomedical Research for Drug Development S. A. de C.V.

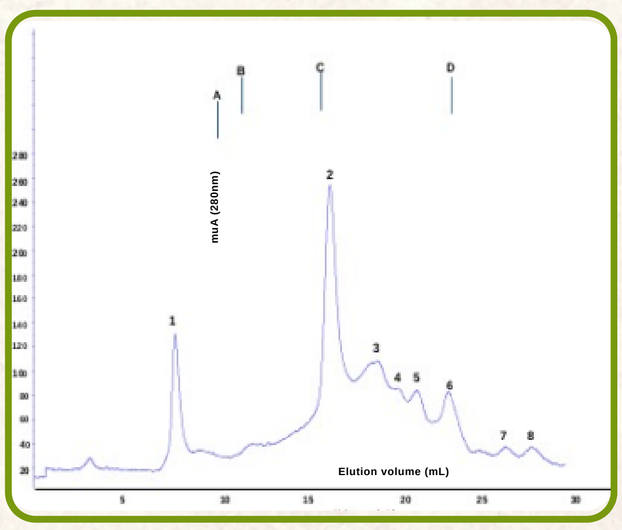
2. METHODS

Obtaining protein isolates and hydrolysates from amaranth flour.

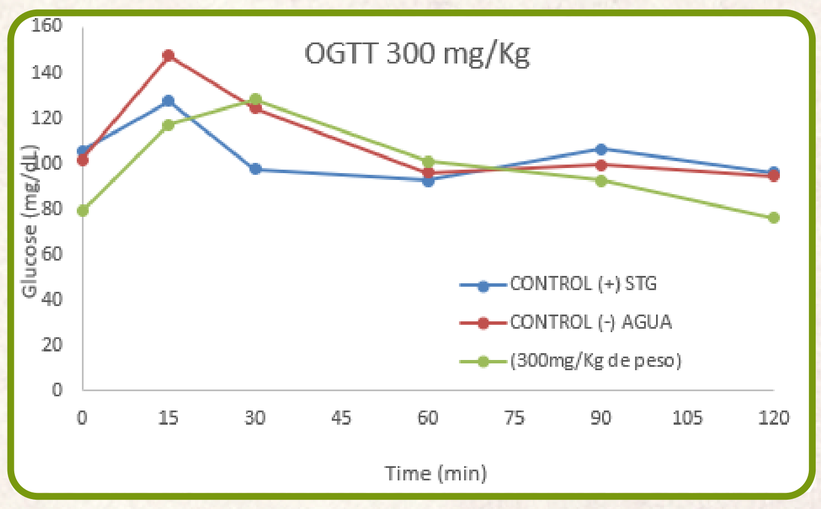
Determination of protein percentage by Kjeldahl method, evaluation of the degree of hydrolysis by OPA method and evaluation of molecular weights of amaranth hydrolysates by mass exclusion chromatography.

Evaluation of the hypoglycemic effect in a preclinical model (murine) and pilot test in a clinical model, with glucose tolerance curves (OGTT) whit amaranth hydrolysates.

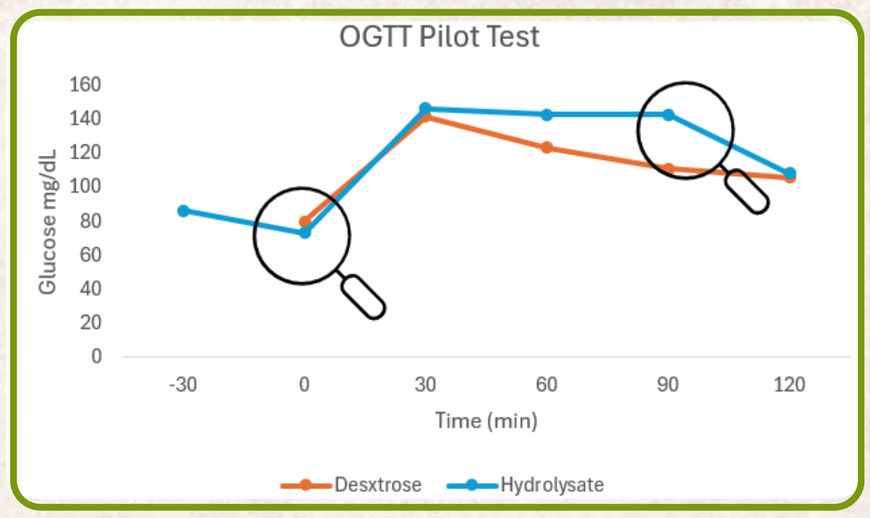
3. RESULT AND DISCUSSION



Mass exclusion chromatography. Peaks 2, 3, 4 and 5, since they are within the column separation range. Peak 1 falls out of the elution volume, in the case of peaks 6, 7 and 8, they fall out after the smallest molecular weight marker.



OGTT model animal. The dose of 300 mg/kg bw with a degree of hydrolysis of 33.5 ± 1.5 showed a decrease in glucose levels in the murine model (n=10) with no significant difference compared to the positive control (Sitagliptin) Tukey's test (α 0.5).



OGTT Pilot clinical model. The dose of 145 mg/kg a degree of hydrolysis of of 33.5 ± 1.5. Showed a decrease in glucos in the first 30 minutes after taking the hydrolysate, compared to the control without hydrolysate, However, in the following points there is no significant difference with respect to the control, another accelerated decrease is observed between 90 and 120 minutes. The data were analyzed with Wilcoxon test, obtaining a P=0.138.

Protein isolates with 80-86 % protein were obtained, having a high percentage ensures that the final product will contain a higher amount of amino acids or oligopeptides which is beneficial for biofunctionality and solubility (Santi et al., 2017). The choice of this effective dose is reproduced from a previous study with different doses and different degrees of hydrolysis of amaranth hydrolysate compared to a positive control with Sitagliptin (Becerril L et al., 2023). Hydrolysates have been shown to contain peptides with the ability to inhibit Dipeptidyl peptidase IV, which could explain the hypoglycaemic effect of amaranth compounds (Soriano J et al., 2015).) in the murine model, however in the pilot clinical model (n=5), the calculation of the dose of 145mg/kg of hydrolysate was performed by equivalence conversion (Nair and Jacob, 2016), respecting the effective dose of the murine model (300 mg/ kg body weight) the behaviour of glucose after taking the hydrolysate showed a different behaviour in the serum glucose concentration of the curve compared to the murine model, this response could happen due to the existence of glucogenic amino acids present in the hydrolysate (Cardona S. 2020), in addition to the fact that the test individuals presented a significant dispersion in their metabolism due to factors such as body composition, differences in fasting hours and stress level.

4. CONCLUSION

With these preliminary results in a preclinical pilot test, it was possible to identify some biochemical conditioning factors that may affect carbohydrate metabolism, such as the previous diet (24 hr before sampling), the level of stress at the time of sampling, body composition, sex and the difference in fasting time. Therefore, we will continue with a pilot test that takes into account these specifications in order to reduce bias and obtain reproducible results on the desired effect. The results of the preclinical model showed that the bioactive components of the hydrolysates may be a potential nutraceutical with a hypoglycaemic effect.

5. REFERENCES

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