EFFECT OF SOYBEAN SOLUBLE FRACTIONS IN THE FORMATION OF COMPLEXES WITH GUM ARABIC

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INTRODUCTION: The most of the food are dispersed systems where proteins and polysaccharides are involved, contributing to its structure, functionality and product stability. The interactions between them are determined by physicochemical characteristics of each biopolymer, concentration and dissolution conditions. The solubility of proteins depends on ionic strength, pH and temperature. Thus, alters the soybean soluble fractions that can participate in the formation of insoluble complexes **(IC)** with gum Arabic changing their techno-functional properties during the product development.

OBJETIVE: The aim of this work was to test two different soluble soybean protein fractions **(SS),** the first fraction was carried out using the methodology of Liu et al. (2007) this way is more specific to extract proteins **(SSE)**, while the other way selected was obtained only adjusted the pH with HCl, being less specific **(SSN)**, so the fractions of proteins presents can have an impact in the formation of complexes with gum Arabic **(GA)**.
In this study were identified the protein fractions of SSE and SSN by electrophoresis SDS-PAGE, the zeta potential measurement, the strength of the electrostatic interaction to get the GA/SS ratio of both fractions and the effect during the formation of the complexes between SS and GA.

MATERIALS AND METHODS

Soy protein isolated (Food Industry Co.) and gum Arabic (Colloides Natrules International) were used. The stock solutions were for protein after the extraction 4% soluble solids for SSE and 2.5% soluble solids for SSN (Fig. 1) and was determined protein by Bradford in each one and a solution of 10% GA (w/w) was used.

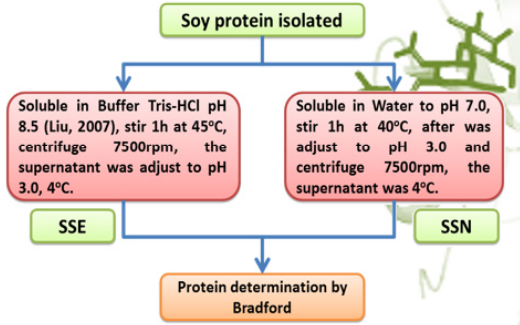

Fig. 1 Extractions of soluble soy protein fractions: SSE and SSN

For both extractions was performed a sodium dodecyl-polyacrylamide gel electrophoresis (SDS-PAGE) according to the method of Laemmli (1970). The study was carried out under reducing conditions.

The ζ-potential was determined using the Zetasizer Nano ZS90 equipment with an autotitrator MPT-2 to adjust the pH from 2.0 to 8.0, the samples were prepared according to the process described by Espinosa-Andrews et al (2013).

The titration curve was carried out at pH 3.0, between each SS with GA, two different ratio were obtained, which were used to prepare the complexes and be evaluated.

RESULTS AND DISCUSSIONS

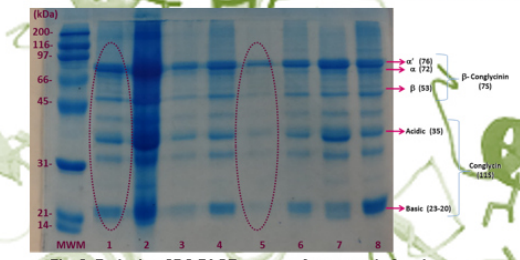

Fig. 2. Reducing SDS-PAGE pattern of soy protein fractions..
SSE: 1: pH 8.5, 2: pH 3.0, 3: Supernatant pH 3.0, 4: Precipitate pH 3.0.
SSN: 5: pH 7.0, 6: pH 3.0, 7: Supernatant pH 3.0, 8: Precipitate pH 3.0.

The protein content in SS at the beginning (Fig.2) was of 17.38mg/ml y 5.15mg/ml for SSE (Lane 1) and SSN (Lane 5) respectively. At pH 3.0 the protein content decreases to 0.99mg/mL (SSE) and 0.51 mg/Ml (SSN). The components in both SS are α, α' and β subunits from 7S and acidic and basic polypeptides from 11S, but separating the supernatant its less the content of fractions in both cases (Lanes 3 and 7). Qi et al. (2011) reported that the principal of soy protein globulin fractionation was based on the different solubilities of the proteins, so probably at pH 3.0 a part of the 7S precipitated and 11S are dissolved, being greater presence in SSE.

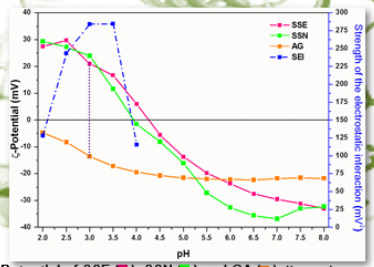

Fig. 3. ζ-Potential of SSE ( ), SSN ( ) and GA ( ) dispersions and Strength of the electrostatic interaction of GA:SSE and GA:SSN as a function of pH.

The behavior of charge in both SS was similar with isoelectric point (at ζ = 0; pH 4.3- 4.5) and maximum SEI at pH 3.0 (Fig. 3), and its expected that the interactive force pattern between the proteins with gum Arabic be carried out. Because of the composition of SS, the ratios were different requiring less of GA with SSE (0.65:1 GA:SSE) to form insoluble complexes (Fig. 4), while with SSN is needed more GA (1:1 GA:SSN).

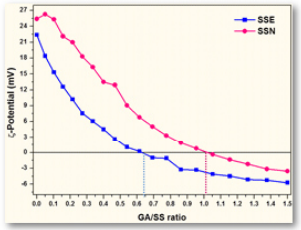

Fig. 4. Titration profile of Ratio GA:SSE and GA:SSN at pH 3.0.

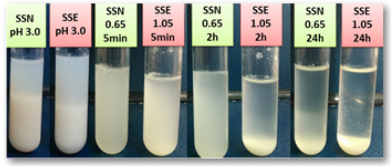

Fig. 5. Kinetic of insoluble complexes formation GA:SSE and GA:SSN at pH 3.0.

The interaction between SSE and GA let that the system of insoluble complexes was formed faster than SSN:GA (Fig. 5). Perhaps by the content and the behavior of aggregation of proteins present in the complex accelerate the complex formation.

CONCLUSIONS

The method of extraction can increase the content of proteins which can affect the way to form complexes, therefore it is possible that ionic strength increase the coiling of their skeins of SS impacting on the techno-functional properties.

LITERATURE

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