NUTRACEUTICAL AND FUNCTIONAL PROPERTIES OF PROTEIN HYDROLYSATES FROM *Jatropha curcas* EXTRUDED RESIDUAL MEAL

Marco A. Valdez-Flores, Lourdes J. Germán-Báez, Sergio Medina-Godoy, Roberto Gutiérrez-Dorado, Cindy I. Fuentes-Gutiérrez, Luis M. Sánchez-Magaña, Cuauhtémoc Reyes-Moreno and Angel Valdez-Ortiz*. Facultad de Ciencias Químico-Biológicas, Universidad Autónoma de Sinaloa, Av. de las Américas y Josefa Ortiz S/N, Culiacán, Sin., México 80030. *e-mail: angelvaldezortiz@yahoo.com.mx

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Introduction. Jatropha (*Jatropha curcas* L.) is an oilseed plant, whose seed contains around 55-60% of oil that can be converted into biodiesel, meanwhile the residual meal (after oil removal) contains 45 to 65% of high quality crude protein; nevertheless, jatropha meal protein is poorly used, because of its anti-nutritional compounds which have been widely reported (1). Hence, extrusion process has been proposed as an effective solution to remove these kinds of compounds and also to improve protein digestibility (2). In addition, it has been reported that functional properties of several food sources can be modified varying the degree of enzymatic digestion. Thus, the objective of this study was to evaluate the nutraceutical and functional properties of protein hydrolysates of extruded *Jatropha curcas* meal protein (JPH) at optimal conditions of temperature and screw speed, to obtain the higher antioxidant (AOXC) and ACE-inhibitory (ACE-I) activity.

Methods. The optimization was realized using rotable central composite design of Surface Response Methodology. Extrusion process was carried out according to the reported by Milán-Carrillo et al (2). The different extrudeds were submitted to enzymatic hydrolysis using alcalase at optimal conditions. The AOXC of each JPH was determined using the oxygen radical absorbance capacity (ORAC) assay (3); while, the antihypertensive potential was determined by its *in vitro* ACE-I activity (4).

Results. Our results showed that the extrusion process improved the nutraceutical (AOXC and ACE-I) activities, finding higher values in all the extrusion treatments than the raw material. The optimal operating conditions, according to the design, were 160 °C and 200 rpm for temperature and screw speed respectively (Fig. 1); obtaining predicted values of 170 mMol TEAC/mg and IC_{50}= 0.035 x 10^{-2} µg/ml for antioxidant and ACE-I activities respectively. Even though, the AOXC and ACE-I activities, were evaluated for JPH extruded at optimal conditions obtaining 173.8 mMol TEAC/mg and 0.06 x 10^{-2} µg/ml respectively.

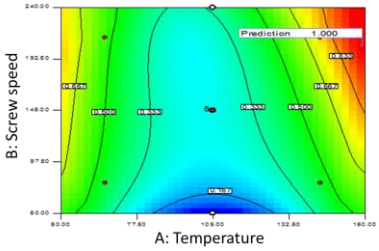

Figure 1. Optimal region of the extrusion process of the two independent variables to obtain JPH with the best nutraceutical activities.

On the other hand, as shown in Table 1, the functional properties for extruded JPH at optimal conditions showed good protein solubility (PSI) and foaming index (FI), thus, it could be used for functional beverages processing.

Table 1. Funtional properties

CONDITIONS	PSI	EAI	ES	FI	FS
pH 4	75.65	51 ± 2.52	83.63 ± 1.25	60.77 ± 4.15	40.44 ± 2.1
pH 7	90.41	5.33 ± 1.12	0	156.62 ± 7.21	80.2 ± 3.4
pH 10	94.14	4.66 ± 0.96	0	110.65 ± 5.35	69.96 ± 2.67

PSI: Protein solubility index, EAI: Emulsion Activity Index, ES: Emulsion Stability, FI: Foaming Index, FS: Foaming Stability

Conclusions. The results of our work showed that protein hydrolysates obtained from extruded nontoxic *Jatropha curcas*, are suitable for development of a nutraceutical food product that can be used to prevent and control degenerative diseases such as hypertension and those derived from cellular oxidation.

References

1. Makkar H, Becker K. (1997). Proceedings of Jatropha 97: International Symposium on Biofuel and Industrial Products from *Jatropha curcas* and other Tropical Oil Seed Plants, February 23-27
2. Milán-Carrillo J, Reyes-Moreno C, Camacho-Hernandez IL, & Rouzaud-Sandez O. (2002). *J Sci Food Agr* 82: 1718–1728.
3. Prior RL, Hoang H, Gu L, Wu X, Bacchiocca M, Howard L, Hampsch-Woodill, M, Huang D, Ou B, Jacob R. (2003). *J Agr Food Chem* 51: 3273–3279.
4. Miguel M, Aleixandre MA, Ramos M, López-Fandiro R. (2006). *J Agr Food Chem* 54:726-731.