EFFICIENCY IN SEED PROTEIN EXTRACTION FROM COMMON BEAN CULTIVARS GROWN IN MEXICAN NORTHERN HIGHLANDS

R. Jiménez O.[a], E. Delgado[b], R. Rosales S.[a], F. O. Reveles S.[c], A. Ochoa[b], C. A. Nava B.[a] and M. Ibarra A.[b]

[a]Campo Experimental Valle del Guadiana, INIFAP. km 4.5 Carretera Durango-El Mezquital, C.P. 34170. Durango, Dgo. México. Tel. 618-8260426, ext. 222. Fax. 618-8260433. e-mail: jimenez.rafael@inifap.gob.mx; [b]Instituto Tecnológico de Durango, Postgrado en Ingeniería Bioquímica. Boulevard Felipe Pescador 1830 Ote. C. P. 34000. Durango, Dgo. México. Tel. 618-8186936, ext. 105; and [c]Facultad de Medicina Veterinaria y Zootecnia. UJED. km 11.5 Carretera Durango-El Mezquital, C. P. 34170. Durango, Dgo. México

INTRODUCTION

Common bean (*Phaseolus vulgaris* L.) is grown in 1.1 million of hectares in Mexican Northern Highlands. Significant grain surplus and marketing problems are observed during high production years. Due to women job involvement, significant reduction has been observed for common bean consumption among Mexican urban population (Sánchez *et al.*, 2001). Market alternatives for common bean are needed to increase farmers' income and recover healthy tradition in Mexican food. Grain industrialization is an important alternative to use seed benefic elements as protein, fiber, starch, polyphenols, etc. Those elements present in common bean seed could be used as functional components in processed foods. The objective was to evaluate efficiency in protein extraction using two common bean cultivars widely grown in the Mexican Northern Highlands.

MATERIAL AND METHODS

Commercial grain samples for Pinto Saltillo and Negro San Luis (Negro Bola) cultivars were obtained in Los Llanos, the main common bean producing area in Durango State. Samples were milled and proximate analysis was performed in whole grain flour according to micro-Kjeldhal (AOAC, 1990) and Bradford (Bradford, 1976) methods. Bean protein was extracted in two separate stages such as aqueous extraction followed by saline extraction. For aqueous extraction common bean grain flour was suspended in water (1:8 w/v), shaken for 15 min at 5°C and centrifuged for 5 min at 4000 g. Water-insoluble solids was protein extracted using 0.5 N saline solution, shaken for 15 min at 5°C and centrifuged for 5 min at 4000 g. Supernatant in both aqueous and saline solutions were acidified (pH 4.5) for protein precipitation and an additional 4000 g centrifugation cycle was applied. Isolated protein was neutralized, quantified and spray dried to obtain protein powder. Protein quantification was performed in original flour, products obtained in each extraction and discarded residues in order to establish process efficiency. Protein determinations were performed in duplicate using Bradford protein assay.

RESULTS AND DISCUSSION

Protein content in original flour sample reached 21 % in Pinto Saltillo and 20 % in Negro San Luis, according to micro-Kjeldahl method. Using Bradford assay grain flour protein content reached 124.9 mg g^{-1} of grain flour in Pinto Saltillo and 87.0 mg g^{-1} of grain flour in Negro San Luis. Aqueous extraction recovered 47.3 % of total protein content in Pinto Saltillo and 52.4 % in Negro San Luis (Figure 1). Saline extraction yielded 26.3 % of total protein in Pinto Saltillo and 16.8 % in Negro San Luis. Efficiency in protein extraction reached 73.6 % in Pinto Saltillo and 66 % in Negro San

Luis. Pinto Saltillo showed 17.5 % for protein losses after aqueous extraction, 3.1 % after saline extraction and 6.2 % in solid rest. Losses registered in Negro San Luis reached 20.1 % after aqueous extraction, 3.5 % after saline extraction and 6.5 % in solid rest. Losses observed in supernatant obtained after aqueous extraction need to be reduced increasing acidifier solution dosage and centrifugation speed and time period. Genetic breeding increased grain protein content and extractable proportion in Pinto Saltillo compared to Negro San Luis. Protein extraction performed combining aqueous followed by saline extraction showed high efficiency and represents an industrial option in Mexican Northern Highlands where common bean is widely grown. Extracted and spray dried protein form a bland tasting white powder which could be used to fortificate processed foods.

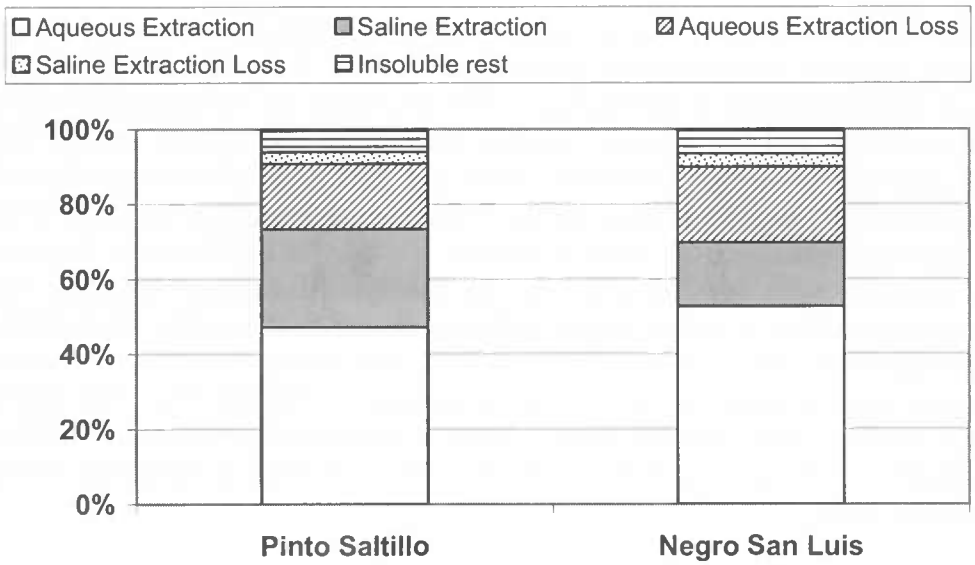

Figure 1. Proportions of protein recovery in different products obtained using aqueous and saline extraction in grain of two common bean cultivars.

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