Research Article

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Antioxidant and chelating activity of *Jatropha curcas* L. protein hydrolysates

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Abstract

BACKGROUND: Antioxidant and chelating activities were determined in protein hydrolysates that were produced by treating a protein isolate of a non-toxic genotype of *Jatropha curcas* with the protease preparation alcalase.

RESULTS: 50 min protein hydrolysate with a degree of hydrolysis of 31.7% showed highest antioxidant and chelating activity. These activities were also determined in six peptidic fractions that were separated by gel filtration chromatography of the 50 min hydrolysate. The lower-molecular-weight peptidic fractions had the highest antioxidant and chelating activities, which correlated with a higher content in antioxidant and chelating amino acids such as tyrosine and histidine.

CONCLUSION: Results show that *J. curcas* represents a good source of bioactive peptides. This may be important for the revalorization of defatted *J. curcas* flour, a by-product resulting form oil extraction for biodiesel production. This is especially important in Third World and developing countries such as Mexico.

Keywords: *J. curcas*; protein hydrolysate; antioxidant activity; chelating activity

INTRODUCTION

Jatropha curcas L., a member of the Euphorbiaceae family, is a drought-resistant small tree of great economic importance in developing countries because of its several industrial and medicinal uses.[1,2] The seeds contain around 600 g kg^{-1} oil and 300 g kg^{-1} protein.[3] The seed oil is used for biodiesel production and for manufacturing cosmetics, but the protein-rich defatted meal resulting from oil extraction is mostly wasted. This is so because of the presence of toxic phorbol esters in this material.[3] However, non-toxic genotypes which do not contain phorbol esters have been reported in Mexico.[1]

The concentration of antinutritional and toxic components in the defatted seed meal is reduced during the preparation of *J. curcas* protein isolates.[4] These protein isolates are a good substrate for the production of hydrolysates with improved functional and nutritional properties, which facilitates the revalorization of numerous oilseeds and grain legumes.[5] In addition, protein hydrolysates are a source of bioactive peptides, which are short-chain peptides with beneficial biological activities which are released from food proteins during hydrolysis.[6] For example, bioactive peptides with antihypertensive, immunomodulatory, opioid, antioxidant, hypocholesterolemic, and metal-chelating activity have been described.[6,7]

Oxidative damage due to generation of reactive oxygen species has been related to a variety of diseases, including cancer, cardiovascular disease, and neurodegenerative diseases. Excessive production of oxygen reactive species, and/or decreased antioxidant defenses, lead to damage to various cell components, including lipids, proteins and nucleic acids, and to blood lipoproteins. In foods, the main targets of oxidative reactions are polyunsaturated lipids. The oxidative alterations of lipids have a negative effect on flavor, texture, nutritive value, and shelf life of food products. Therefore, natural and synthetic antioxidants play a very important role in both health promotion and the conservation of foodstuffs. A variety of antioxidant peptides have been purified from various plant protein hydrolysates.[8,9] Thus antioxidant peptides generated by hydrolysis of food proteins constitute a new source of functional components that could inhibit deleterious oxidative processes both *in vivo* and in foods. One of the mechanisms for the antioxidant effect of peptides is metal chelation, because transition metals catalyze numerous oxidative reactions.[10] In addition to this, metal-chelating peptides are of interest because they can increase the bioavailability of essential trace elements such as calcium, iron, and zinc.

The goal of this work was to determine the presence of antioxidant and metal-chelating peptides in *J. curcas* protein hydrolysates produced by treatment with the food-grade protease preparation alcalase. The presence of these peptides in *J. curcas*

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