JOURNAL OF
AGRICULTURAL AND FOOD CHEMISTRY

June 9, 2010

JAFCAU 58(11) 6543–7108 (2010) ISSN 0021-8561
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JOURNAL OF AGRICULTURAL AND FOOD CHEMISTRY
REVIEW

J. Agric. Food Chem. 2010, 58, 6543–6555 6543
DOI:10.1021/jf100003z

Nutritional, Biochemical, and Pharmaceutical Potential of Proteins and Peptides from Jatropha: Review

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Increased bioenergy consciousness and high demand for animal products have propelled the search for alternative resources that could meet the dual demands. Jatropha seeds have potential to fit these roles in view of their multipurpose uses, broad climatic adaptability features, and high oil and protein contents. During the past five years many large-scale cultivation projects have been undertaken to produce jatropha seed oil as a feedstock for the biodiesel industry. The present review aims at providing biological significance of jatropha proteins and peptides along with their nutritional and therapeutic applications. The nutritional qualities of the kernel meal and protein concentrates or isolates prepared from seed cake are presented, enabling their efficient use in animal nutrition. In addition, (a) biologically active proteins involved in plant protection, for example, aquaporin and betaine aldehyde dehydrogenase, which have roles in drought resistance, and β-glucanase, which has antifungal activity, as well as those having pharmaceutical properties, and (b) cyclic peptides with various biological activities such as antiproliferative, immunomodulatory, antifungal, and antimalarial activity are discussed. It is expected that the information collated will open avenues for new applications of proteins present in jatropha plant, thereby contributing to enhance the financial viability and sustainability of a jatropha-based biodiesel industry.

KEYWORDS: *Jatropha curcas*; proteins; cyclic peptides; animal nutrition

INTRODUCTION

The oilseed proteins have a descriptive history in both nutrition and therapeutic applications. In plants, proteins are broadly classified as (a) storage proteins, which are devoid of functional activity but are used during germination, and (b) functional proteins such as enzymes, hormones, defense proteins, and structural proteins that have definite roles in the plant system (*1*).

From a nutritional perspective, seed storage proteins have always been major players in supplying global protein needs and food energy intake. In recent years, increased global industrialization and increased demand for livestock products for meeting human food demand have greatly increased the pressure on agricultural land and the environment (*2*, *3*). Higher need for proteins in the livestock sector has accentuated the search for new protein sources that do not conflict with human food security interests. In the current situation, nonedible oil seeds are the potential and preferred choice for protein and other nutrients for livestock, provided these could be made free of toxic and antinutritional factors. One promising oilseed plant is *Jatropha curcas* (Euphorbiaceae), which has advantages over other oilseed plants (e.g., *Pongamia pinnata*, *Simarouba glauca*, *Ricinus communis*, *Azadirachta indica*) because of its wide adaptability to grow under various agroclimatic conditions, for example, adverse soil conditions, drought areas, marginal lands, arid as well as higher rainfall conditions, and land with thin soil cover (*4*). More importantly, jatropha seed oil has gained tremendous interest as a feedstock for biodiesel industries.

Large-scale jatropha cultivation projects have been initiated in the past 5–10 years with a projected worldwide cultivation of 12.8 million hectares yielding 2 t/ha of oil by 2015 (Global Exchange for Social Investment market study (GEXSI) (*5*)). In the future this will result in the availability of high amounts of pressed seed cake or kernel meal as byproducts, which are rich in proteins of high quality. These byproducts can be utilized in animal nutrition after detoxification and could also be a source for various bioactive protein molecules having a wide range of activities. Approximately 60% of the antitumor and anti-infectious drugs that are already in the market or under clinical trials are of natural origin. A vast majority of these compounds cannot yet be synthesized economically, and their use relies on wild or cultivated plants (*6*). In pharmaceutical, industrial, or agricultural perspectives, similar to other oilseed plants, jatropha species are also rich sources of phytochemicals. Jatropha proteins and peptides have been studied for their roles in the plant's own metabolic activities and defense against predators as well as a therapeutic and industrial potential.

In the present review an attempt has been made to discuss (a) the nutritional quality of jatropha proteins and their potential for animal nutrition, and (b) the chemistry, biological role, and potential applications of biologically active jatropha proteins and peptides. The jatropha plant also contains an interesting

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Published on Web 05/13/2010