

# PHYSICOCHEMICAL, PASTING AND THERMAL PROPERTIES OF WATER CHESTNUT FLOURS: A COMPARATIVE ANALYSIS OF TWO GEOGRAPHIC SOURCES

NISAR AHMAD MIR<sup>1</sup>, KHALID GUL<sup>2,3</sup> and CHARANJIT SINGH RIAR<sup>1</sup>

<sup>1</sup>Department of Food Engineering & Technology, Sant Longowal Institute of Engineering & Technology, Longowal, Punjab, India

<sup>2</sup>Department of Processing & Food Engineering, Punjab Agricultural University, Ludhiana, Punjab 141004, India

<sup>3</sup>Corresponding author.

TEL: 911932241538;

EMAIL: fud.biopolymer@gmail.com

Received for Publication March 13, 2014

Accepted for Publication July 30, 2014

doi:10.1111/jfpp.12359

## ABSTRACT

Comparative analysis of physicochemical, pasting and thermal properties of water chestnut (*Trapa natans*) flours from Jammu and Kashmir (WCF [K]) and Punjab (WCF [P]) was carried out. Flour from WCF (P) had higher moisture, ash, bulk density, true density and apparent density while that from Jammu and Kashmir had higher protein, fat, carbohydrate content and *L*, *a*, *b* values. WCF (P) had larger particle size than WCF (K) and most of the sieves retained maximum number of flour particles of WCF (P). Water-binding capacity (90%) and oil-binding capacity (60%) of WCF (P) were significantly higher than that of WCF (K), 88% and 57%, respectively. WCF (P) exhibited higher swelling power than flour from WCF (K). Thermal analysis results showed that onset, peak and end temperature, and enthalpy of gelatinization were higher in WCF (P). Peak viscosity (2,581 cP) and breakdown viscosity (870 cP) were found to be higher in case of WCF (K).

## PRACTICAL APPLICATIONS

Water chestnut is an underutilized crop found abundantly in fresh lakes and ponds. It is gluten-free, high in fiber and contains myriad of essential nutrients. This study will open new horizons toward utilization of this underutilized crop for development of various bakery ingredients.

## INTRODUCTION

The bakery industry today has an important place in the industrial map of the country. The bakery industry comprises mainly of bread, biscuits, cakes and pastry manufacturing units. The annual turnover at present is estimated at over 2000 crores (Abdel-Aal and Rabalski 2013). The contributing factors for the popularity of bakery products are urbanization resulting in increased demand for ready-to-eat and convenient products, availability at reasonable costs, greater nutritional quality and myriad of products with different textural and taste profiles (Miller 2006).

Water chestnut (*Trapa natans*) locally called as “Singhara” in India is used as a substitute for cereals in Indian subcontinent during fasting days (Singh *et al.* 2011). Water chestnuts are known to possess a remarkable nutritional composition, which makes them an excellent food source

that can serve as a dietary staple (Gul *et al.* 2014). For this reason, they are set apart from all the other nuts. The best part is that they are free of any cholesterol and are almost fat-free (Singh *et al.* 2010). Water chestnut flour (WCF) contains high-quality proteins with essential amino acids (4–7%), relatively higher amount of sugars (20–32%), starch (50–60%), dietary fiber (4–10%) and low amount of fat (2–4%). It also contains vitamin E, vitamin B group, potassium, phosphorous and magnesium (Sacchetti *et al.* 2004; Chelno *et al.* 2007).

Jammu and Kashmir (37°4′N latitude and 72°84′E longitude) and Punjab (31°14′N latitude and 74°34′E longitude) states in India differ widely in agroclimatic and geographical conditions and are the leading producers of water chestnuts in India. Being widely available, cultivation of this crop has been an age-old occupation in many parts of these two states, however not being widely used in food industry. Present study was as such carried out to study the