IJFANS
International Journal of Food And Nutritional Sciences

Volume 5, Issue 2, April 2016, www.ijfans.com e-ISSN: 2320-7876

INTERNATIONAL JOURNAL OF FOOD AND NUTRITIONAL SCIENCES

IMPACT FACTOR ~ 1.021

Official Journal of IIFANS

International Journal of Food and Nutritional Science

e-ISSN 2320 -7876 www.ijfans.com
Vol. 5, No. 2, April 2016

Research Paper *Open Access*

STUDY ON FUNCTIONAL PROPERTIES OF CAPSICUM ANNUUM (GREEN CHILLI) AND CAPSICUM CHINENSE (YELLOW LANTERN CHILLI)

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Received on: 21st February, 2016 Accepted on: 31st March, 2016

Objective of this research was to study the functional properties of two capsicum species capsicum annuum and capsicum chinense. Water absorption capacity of yellow lantern chilli and green chilli was found to be 3.8 and 5.53% respectively. Bulk density of yellow lantern chilli and green chilli was found 0.75 and 0.50 g/ml respectively. Foaming capacity of yellow lantern chilli and green chilli was found to be 10.13 and 33.36%. Results of the study indicated that functional properties of yellow lantern chilli and green chilli may cause improvement in some food products when it is added to them.

Keywords: Functional properties, Bulk density, Water absorption, Foaming capacity

INTRODUCTION

Capsicum, the pungent spice became popular indispensable spice all over the world.The fresh and dried capsicum fruit with varying degrees of flavor, pungency, and aroma are used in diverse cuisines of the world. Utilization of dried fruit as a carrier of functional ingredients is a relatively novel concept, although the functional properties of such foods originated from drying method, where the loss of moisture results in natural concentration of healthy fruit (Jesionkowska *et al.*, 2009). Dried foods are concentrated and have better shelf life than fresh foods due to reduced moisture contents (Araujo *et al.*, 2004; and Veag-Galvez *et al.*, 2007). Use of dried products can prevent high losses of perishables like vegetables during storage. It also makes seasonal vegetables available throughout the year.

Functional properties are intrinsic physico-chemical characteristics which affect the act of a food ingredient in food systems during processing, manufacturing, storage and preparation (Henshaw *et al.*, 1996; and Jideani, 2011). These functional properties are greatly dependent on the specific surface area, which is associated to structural parameters like total pore volume, porosity, mean pore radius, particle mean size, particle size distribution and presence of fine particles (Walton and Mumford, 1999; and Nguyen *et al.*, 2015). The functional properties of powders are usually related to the interaction between water/oil and powder. Functional properties of food also associated with the protein structure, protein surface, rheological characteristics and compatibility with other food components (Moure *et al.*, 2006). Thus functional properties are so important in determining the nutritional, sensory, physico-chemical and organoleptic properties of the final food product as well as enabling processing such as improved machinability of cookie dough or slicing of processed meats (Jideani, 2011). Consumer demands have risen remarkably for high quality,

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minimally processed products in recent years. Preferences have shifted towards the healthy and good flavored ready-to-eat foods with improved shelf life (Nguyen *et al.*, 2015). Functional properties are significantly important for developing a desirable food product for the consumers. Much of the studies have been conducted on antioxidant activity and phenolic content of capsicum but very less stress has been given on the functional properties of capsicum. Thus the present research was carried out for the estimation of functional properties (Bulk density, water absorption and foaming capacity) in two species of capsicum *i.e.*, *Capsicum annuum* (green chilli) and *Capsicum chinense* (yellow lantern chilli).

MATERIALS AND METHODS

The fresh fruits of green and yellow chilli were collected from Delhi, India during the month of June-October and identified at Indian Agriculture Research Institute, Delhi. The variety of green chilli and yellow chilli used for the study was *Capsicum annuum* and *Capsicum Chinese* respectively. Both species were washed thoroughly with distilled water. Drying method used for green chilli and yellow lantern chilli were oven air drying and sun drying respectively. Dried samples were made in to the fine powder to use for the further analysis.

Determination of Water Absorption Capacity

Water absorption capacity of capsicum powders was determined using a method followed by an earlier study (Aremu *et al.*, 2007). One gram capsicum powder was mixed with 10 ml of distilled water (density of 1 g/cm^3) in a centrifuge tube and allowed to stand at room temperature (30 ºC) for one hour. It was then centrifuged at 200 rpm for 30 minutes and the supernatant was noted in a 10 ml graduated cylinder. Water absorption capacity was calculated as volume of water (ml) absorbed per gram of the capsicum powder.

Water absorption capacity was calculated from the equation:

Water absorption capacity = 10-V

Where V = Volume of water left unabsorbed after centrifugation.

Determination of Bulk Density

Bulk density of capsicum powders was determined by using a method followed by an earlier study (Oladele and Aina, 2007).

Fifty gram capsicum powder was placed in a 100 ml measuring cylinder. The cylinder was tapped continuously until a constant volume was obtained. The bulk density was calculated as weight of the capsicum powder (g) divided by its volume (ml).

$$Bulk\ density = \frac{weight\ of\ ground\ capsicum}{Volume}$$

Determination of Foaming Capacity

Foaming capacity and stability of capsicum powder samples were determined by using a method followed by an earlier study (Aremu *et al.*, 2007). One gram capsicum powder was dispersed in 50 ml distilled water. The resulting solution was vigorously whipped for 30 minutes in a Kenwood blender and poured into a 100 ml graduated cylinder. The volume before and after whipping was recorded and foaming capacity was calculated as percentage volume increase.

The foaming stability was calculated from the equation:

$$Volume\ increase(\%) = \frac{Volume\ after\ whipping - Volume\ before\ whipping}{Volume\ before} \times 100$$

Foaming stability was determined as the volume of foam that be remained after 8 hours expressed as a percentage of the initial volume.

RESULTS AND DISCUSSION

Water Absorption Capacity

Water absorption capacity describes flour – water association ability under limited water supply. It gives an indication of volume of water available for gelatinization. Water binding capacity is a valuable indication of whether flour or isolates can be unified into aqueous food formulations.

Table 1 show that water absorption capacity was found to be 3.8±0.1% in yellow lantern chilli and 5.53±0.11% in green chilli. The water absorption capacity of jack fruit powder is 2.3 ml/g (Odoemelam, 2005) while that of water yam variety is found to have 3.65 ml/g (Udensi *et al.*, 2008). The tigernut flour is also found to have 1.37 ml/g water absorption capacity (Oladele and Aina, 2007). The water absorption capacity of the both capsicum species was found to be high than jack fruit flour, water yam variety and tigernut flour. So, all the two varieties of capsicum have medium water absorption capacity. Hence the powder of both varieties of capsicum can be incorporated in aqueous food formulations.

Table 1: Functional Capacity of Yellow Lantern Chilli and Green Chilli

Functional Properties (%)	Yellow Lantern Chilli	Green Chilli
Bulk Density	0.75±0.005	0.55±0.005
Foaming Capacity	10.13±0.15	33.36±0.11
Water Absorption	3.8±01	5.53±0.11

Bulk Density

Bulk density is a measure of heaviness of a flour sample. It gives an indication of the relative volume of packaging material required. Higher bulk density is desirable for the greater ease of dispersion and reduction in thickness of paste. Table 1 depicts that bulk density was found to be 0.55±0.005 g/ml in green chilli and 0.75±0.005 g/ml in yellow lantern chilli. Similar values for some varieties of legume seed flour were reported in a study (Aremu *et al.*, 2007). Yellow lantern chilli has higher bulk density than green chilli.

Foaming Property

Foaming property is important in cake preparation, whipping and topping (Kinsella, 1979). Foaming capacity was found to be10.13±0.15% in yellow lantern chilli whereas 33.36±0.11% in green chilli. Results are comparable favorably with benniseed (18.0%), pearl millet (11.3%), guinea (9.0%) (Oshodi *et al.*, 1999), bilphiasapida pulp (26.62%), seed flour (8.2%) (Akintayo *et al.*, 2002) and fluted pumpkin seed flour (10.8%) (Fagbemi and Oshodi, 1991). Foaming property has been shown to be related to the amount of native protein. Native protein gives high foam stability than the denatured protein. The low foaming capacity of yellow lantern chilli may be due to low soluble protein content. Hence green chilli can be used to form foam in food in better manner compared to capsicum (Kinsella, 1979).

CONCLUSION

Green chilli is more suitable than yellow lantern chilli to be used in aqueous food and bakery products. Bulk density of yellow lantern chilli is slightly higher than green chilli which indicates that cost of the packaging may be economical for yellow lantern chilli powder when compared to green chilli powder but the flow of the green chilli powder may be better than that of yellow lantern chilli.

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