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Study the Physical and Functional Properties of Chickpea and Black Gram Flours

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A B S T R A C T

The purpose of this study is to determine the quality of chickpea and black gram flour used in preparation of traditional products. As the study of physical properties of flour, both chickpea as well as black gram flour shows higher in bulk density. Water absorption index show lower level of both chickpea as well as black gram flour and water solubility index shows both chickpea as well as black gram flour in between bulk density and water absorption index. While the functional properties of flour, water absorption capacity lower for chickpea flour but higher oil absorption capacity. Higher the water absorption capacity for black gram flour and lower the oil absorption capacity for black gram. This concluded that bulk density for both chickpea flour and black gram is highest while oil absorption capacity is lower in both chickpea flour and black gram flours.

Keywords

Black gram Flour, Chickpea Flour

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Introduction

India is the major harvesters of Bengal gram globally because of its health benefits. Bengal gram is widely appreciated and promoted and it is supplemental to cereal based diets with its rich protein content. Pulses are containing proteins with amino acids with low sulphur and rich in lysine respectively. These compromises the most practical ways of malnutrition of protein. The bengal gram is a very important human diet ingredient in India. Hence chickpea is a yearly pea family plant (*Fabaceae*) it is extensively grown with its nutritious seeds (Curic, 2007).

Gram flour in India is commonly called as Besan. It can be produced through fine

grinding of chickpeas. This type of flour is used for preparing several fried snacks and side dishes. The nutritional value of the chickpea provide energy 372 cal, protein 20.8 gram, fat 5.3 gram, calcium 56 milligram, iron 5.6 milligram, thiamine 56 milligram, riboflavin 0.18, niacin 2.4 milligram, Vitamine C 1 milligram, Vitamine 129 milligram (Milan Carrillo, 2000).

Use of dal is several ways in India dal is prepared in the form of curry where the tomato, chili, coriander, salt and other spices are added to the dal and curry is prepared it may used in the dinner and lunch purpose while in some region it served as the soups purposes. The outer hull or cover is not removed and it is known as unhull or sabut dal. There are three types of dal unhull dal, split hull with polished dal, split dal into two half they used in house hold purpose. Nutritional information of dal content cooked boiled dal content of 9 % protein, 70 % water, 20 % carbohydrates along with the 8 % of fibers and 1 % of the fat. The daily value of 20 % of Vit. B and folate 45 % and manganese 25 % the other minor nutrient and vitamins are available thiamine 11 %, iron available in 19 % while phosphorus 18 %.

Chickpea flour is the main traditional ingredients in the preparation of traditional food products in festive seasons. Black gram flour is blended with the chickpea flour for the purpose of increased protein content as well as it contains less fat and has more binding property.

Materials and Methods

Physico Chemical Properties of Flours

Bulk Density

The strategy for assurance of bulk density of various flours was recommended by (Vishwakarma, 2012). This technique flour samples are delicately filled into 25 ml graduated chamber at previously tare.

Each base of chambers has been delicately tapped on a bench research centre at ordinarily till no more decrease in the flour sample levels occurs filling to 25 ml mark.

Calculation

Bulk Density (gm/ml) = Weight of Sample/Volume of Sample

Water Absorption Index (WAI) and Water Solubility Index (WSI)

Various floors have their own index through alternating there is marginally procedure for resolved the technique (Ding Q.B., 2006).

Take a 2 gm of sample for determination and spread for 30 ml of refined water and all are kept in glass beaker to blend then heat or cook for the 90 °C for 15 min and mix it with water normally. The mixed paste has been taken and allows cooling the paste at room temperature and separated the supernatant and bottom solid material this is to be done by previously centrifuged in centrifugal machine at 3000 rpm for 15 min.

Supernatant was separated and dry solid are separated both are placed in petri plate and allow to dry for 3 hour at 110 ^{o}C at hot air oven.

WAI and WSI estimated by the conditions:

Calculations

WAI (g/g) = Weight of sediment/ weight of flour

WSI (%) = Weight of dissolved solid in supernatant/ Weight of flour sample × 100

Functional Properties of Flours

Water absorption capacity (WAC)

Various flours water absorption was calculated using a strategy for centrifugation (Sosulski 1962).

Sample has been taken 3 g was scattered in 25 ml of refined water and keep inpregauged centrifuge tubes. Scatterings were blended every so often for 30 min. trailed by centrifugation for 25 min at 3000 rpm without bother.

Supernatant was tapped and the over dampness was expelled from centrifuge tubes when dried at 50 ºC per 25 min using a tourist oven where the sample has been taken reweight.

Water absorption capacity was refer as the gram of water bound per gram of the sample on a dry premise.

WAC is determined using accompanying recipe:

Calculations

WAC = (Weight of centrifuge tube after drying – Weight of centrifuge tube) –Sample Weight/ Sample Weight

Oil Absorption Limit (OAC)

Assurance of oil absorption limit the technique for (Lin Humbert and Sosulski 1974) has been utilized.

The food sample has been taken and blended for 1 min using slight brass wire for scattering a chosen sample in oil.

After holding for some period (30 min) the tubes has been centrifuged for 25 min at 3000 rpm.

Isolated oil has been evacuated using tubes and pipette is modified for 25 min to deplete the oil before reweight.

OAC was referenced in gram for oil bound of per 1 gram of sample at dry premise. OAC is determined by given equation:

Calculations

OAC = Weight of centrifuge tube after draining oil – weight of centrifuge tube + sample / Sample weight

The purpose of the study to understand the physical and functional properties of flor and this investigation was carried out in the year 2017.

Results and Discussion

Physio Chemical Properties of Flours

Bulk density (BD)

The bulk density of flour is also utilized for determining the wrapping necessities. The bulk density of black gram flour (347.96 Kg/m^3) was lower than that of chickpea flour (425.83 Kg/m^3). High BD of chickpea flour has been recommending that it has a denser than black gram flour respectively. Flours with high bulk density have been recommending its appropriateness to be used in different food arrangements. High bulk density was required to provide greater dispersibility ease in flours. Hence low bulk density proved to be of benefit for preparing corresponding food products.

Table.1 Physicochemical property of chickpea flour and black gram flours

Flours	Bulk Density (Kg/m^3)	WAI (g/g)	WSI (%)
Chickpea flour (CF)	425.83	5.9	26.75
Black gram flour (BGF)	347.96	5.8	29.79

Table.2 Functional properties of various flours

Flour	WAC (g/g)	OAC (g/g)
Chickpea flour (CF)	2.21	0.67
Black gram flour	2.14	0.56

Fig. 1 Bulk Density, Water Absorption Index and Oil Absorption Capacity of various flours

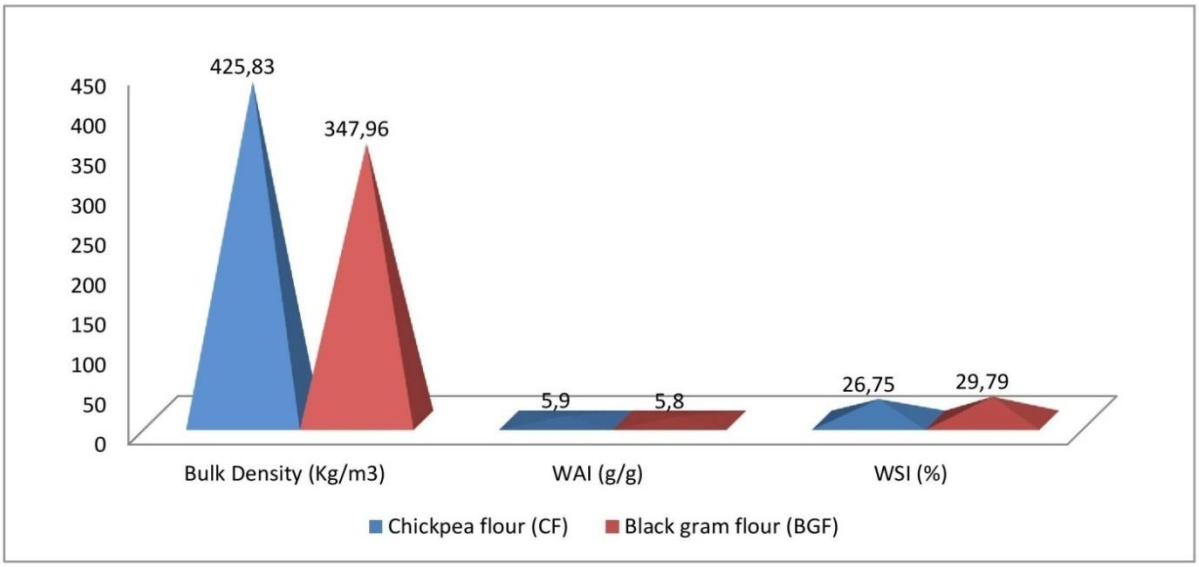
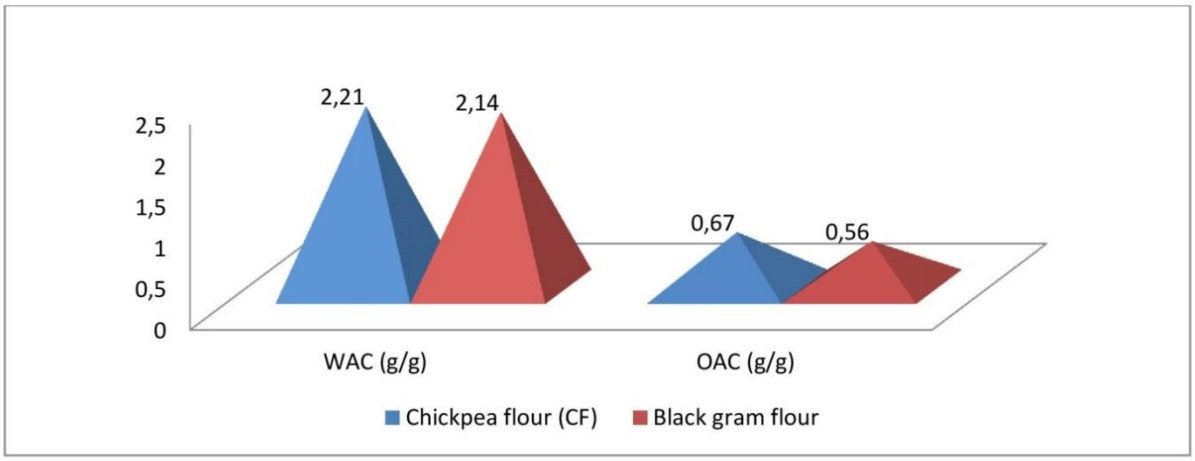


Fig. 2 WAC and OAC of different flours



Water Absorption Index (WAI)

The WAI (Water Absorption Index) of chickpea flour is 5.9 g/g and black gram flour is 5.8 g/g. WAI of black gram flour was found to have high value as compared to chickpea flour.

Water Solubility Index (WSI)

WSI (Water Solubility Index) refers to the presence of soluble substances in products. Water solubility index of chickpea flour and black gram flour were found to 26.75 % and 29.79 % respectively.

Samples in triplicates were taken. Values depicted using various superscripts in same column differs expressively ($P \leq 0.05$). Above fig 1 indicates that bulk density in blue column is at higher level so BD is higher for both chickpea as well as black gram flour. Water absorption index is show in brown color and lower level of both chickpea as well as black gram flour. Water solubility index is show in green color and level of both chickpea as well as black gram flour in between bulk density and water absorption index.

Functional Properties of different flours

Water Absorption Capacity (WAC)

The water absorption properties represent the products capability to be associated to the conditions of underwater where limiting water is available. The water absorption capacity of chickpea flour is 2.21 g/g whereas for black gram flour was 2.14 g/g respectively. WAC of black gram flour was found higher than chickpea flour. The analysis also recorded the values for carbohydrates influencing the capacity of absorbing water of food and food products, higher the water absorption capacity of flours suggests that they could be useful functional ingredients in bakery ingredients. Therefore, the high water absorption capacity of black gram flours should be qualified to an occurrence of higher quantity of hydrophilic constituent in them.

Oil Absorption Capacity (OAC)

Flours with good oil absorption capacity factor is also an effecting factor as it expands the good feel of mouth and preserves the flavors especially in bread and the baked products of food. Binding capacity of oil and water in food proteins is dependent on few of the intrinsic factors likewise protein conformation hydrophobicity or surface polarity as well as composition of amino acid. Absorption of oil is also attributed as physical entrapment of oil within the protein isolated.

The noncovalent bond likewise electrostatic hydrogen bonding hydrophobic and were the involved forces among lipid protein interaction respectively. The OAC of chickpea flour is 0.67 g/g and black gram flour is 0.56 g/g. OAC of black gram flour is found to be less in chickpea flour.

As fig. 2 shows capacity of water absorption as well as oil absorption. Chickpea flour shows in blue column and black gram flour in brown column and it had water absorption capacity lower for chickpea flour and higher oil absorption capacity.

While higher Water absorption capacity for black gram flour and for oil absorption capacity lower for black gram.

The study of chickpea flour and black gram flour it is concluded that the physical property shows higher the bulk density on both the flours chickpea flour and black gram flour while oil absorption capacity shows lower absorption and negative effect on both the flours chickpea flour and black gram flour.

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