International Journal of Research in Engineering, Science and Management
Volume-2, Issue-11, November-2019
www.ijresm.com | ISSN (Online): 2581-5792

A Study of Nutritional Profile and Antioxidant Properties of Chick Pea (Cicer arietinum L) and Horse Gram (Macrotyloma Uniflorum)

Verma Shilpa[1], Sood Sangita[2]
[1]*Ph.D. Scholar, Department of Food Science Nutrition and Technology, CSK Himachal Pradesh Agriculture University, Palampur, India*
[2]*Professor, Department of Food Science Nutrition and Technology, CSK Himachal Pradesh Agriculture University, Palampur, India*

***Abstract*: India is the largest producer (25% of global production), consumer (27% of world consumption) and importer (14%) of pulses in the world. Pulses are good source of protein, high in fibre and have a low glycemic index. The objective of this work was to assess the physico-chemical properties, nutritional composition, dietary fibre (DF) and antioxidant properties of locally available chickpea (Cicer arietinum L) Horse Gram (Macrotyloma uniflorum). The color and shape of the chick pea was observed to be creamish with irregular shape and horse gram was black color with kidney bean shape. The density and one thousand kernel weight of the samples chick pea and horse gram were came out to be 2.81,1.39g/ml and 391, 32.69g respectively. The values for crude fiber and crude protein were calculated as 3.84, 5.4 and 22.4, 21.28 per cent respectively. Chick pea contain a good amount of dietary fiber than horse gram as the values were established as 22.38 and 15.99 per cent respectively. Horse gram flour was observed with good antioxidant properties and the values for total phenolic compound (TPC), total favonoid compound (TFC) and FRAP were calculated as 0.78, 0.91, and 1.2mg/g respectively. Samples comes under low glycemic index (GI) pulse and the value calculated as 40.23 for chick pea and 40.28 for horse gram. From the aforesaid discussion it conferred that these pulses chick pea and horse gram are suitable to the palate of diabetic and other health conscious persons.**

***Keywords*: Chick pea (C.P), Horse gram (H.G), Physico-chemical, Total flavonoid content (TFC), Total phenolic contents (TPC)**

1. Introduction

Pulses has important role in contributing to food and nutritional security and replenishing soil nutrients having a huge potential in addressing needs like future global food security, nutrition and environmental sustainability needs. They also play an important role in mitigating greenhouse gas emissions in agriculture production by lowering GHG emissions. For both large and small farmers, pulses represent important economic opportunities to boost income and reduce risk by diversifying their crop and income stream portfolio. Besides the environmental benefits of adding pulses to crop rotations, there is an also social and economic benefit of pulse production as it helps needs for protein, minimize soil degradation, and support diversification in food production and consumption. Pulses have been consumed for at least 10 000 years and are among the most extensively used foods in the world. A wide variety of pulses can be grown globally, making them important both economically as well as nutritionally. Pulses are high in fibre and have a low glycemic index, making them particularly beneficial to people with diabetes by assisting in maintaining healthy blood glucose and insulin levels.

Chickpea is an important pulse crop with a wide range of potential nutritional benefits because of its chemical composition. The purpose of the current work is to assess the physico-chemical properties, nutritional composition, dietary fibre (DF) and antioxidant properties of locally available chickpea (Cicer arietinum L) Nobile et al (2013). Chickpea (Cicer arietinum L.), originally domesticated in Middle Eastern, African and Asian countries, is the third largest pulse crop in the world FAO (2011). It has become an important source of vitamins and minerals to the cereal-based daily diet of millions of people in under-developed countries Jukanti et al (2012). Horse gram (Macrotyloma uniflorum) commonly known as kulth is a minor, under-exploited legume of tropics and subtropics grown mostly under dry-land agriculture. Horse gram is largely cultivated, especially in dry areas of Australia, Burma, India and Sri Lanka mainly for animal feed. It is an important source of protein, iron and molybdenum. It has been identified as one of the potential food sources for the future by the US National Academy of Sciences (1979) Sreerama et al (2007). The high content of dietary fibre in horse gram flour might be helpful in terms of maintaining positive effects on intestine and colon, besides other homoeostatic and therapeutic functions in human nutrition Sreerama et al. (2012).

2. Material and Method

Chick pea and Horse gram were purchased from local market at Palampur, Himachal Pradesh, India. All the grains were cleaned from soil particles and debris. The grains were ground directly using electrical grinder and passed through 52 mesh sieve to obtain fine flour. All the reagents used in the study were of analytical grade.

A. Physico-chemical properties

Bulk density of flours was measured by method of Wang and Kinsella, 1976). True density was determined by liquid displacement method ASAE (2001). Porosity of flour mixture was measured by method of Thompson and Issac (1967) Proximate analysis was done by method of AOAC (2010) and minerals were analyzed with atomic absorption spectrophotometer Model 3100, perkin Elmer, and flame photometer, Mediflame127.

B. Functional properties

Water absorption index (WAI) and water solubility index (WSI) were determined by the method of Anderson (1982). Foaming Capacity (FC) and Foam Stability (FS) were determined by method of Narayana and Narasinga Rao (1982). Oil absorption capacity was determined with slight modification to the method of Wani et al. (2013).

C. Antioxidant profile

Antioxidant profile was as total phenolic content, total flavonoid content and ferric reducing antioxidant power was measured by method Chandra and Dave (2009). Statistical analysis The data reported in all of the tables are the averages of triplicate observations. Statistical analysis of the results was done with Microsoft Excel 2007 (Microsoft Office) determine the means.

3. Result and Discussions

A. Physical properties

The raw material flours were analyzed for physical properties and the data shown in Table 1. The colors of the crops were observed manually and found creamish for chick pea and black for horse gram.

Table 1
Physical parameters of selected test crops

Crops	Horse Gram	Chick Pea
Colour	Black	Pale cream
Shape	Kidney	Irregular
1000K Wt (g)	32.69	391
Density(g/ml)	1.39	2.81
B.Density(g/ml)	0.79	0.8
Porosity(g/100g)	43.32	71.44

Shapes of the selected crops were also observed manually and reported as irregular (chick pea) and kidney shape (horse gram). The bulk density of chick pea and horse gram evaluated as 0.8g/ml and 0.79g/ml. Sreerama et al. (2007) also observed the bulk desity of horse gram as 0.83±0.02g/ml. The differences in the values of bulk density between these flours are likely due to varietal differences. Bulk density is a measure of heaviness of flour and is generally affected by the particle size and the density of the flour. It is very important in determining the packaging requirement, material handling and application in wet processing in the food industry. Thousand kernel weight (1000 K Wt) was observed as 391 and 32.69 (g) and porosity from 71.44 & 43.32 g/100g for chick pea and horse gram respectively. Kilican and Guner (2010) also reported the chick pea thousand kernel weight 383g and bulk density as 741.50 kg/m3.

B. Chemical composition

Table 2 showed the chemical composition of chick pea and horse gram flour. Moisture content of chick pea and horse gram flour were 7.43 and 6.65 per cent and ash content 2.83 and 3.45 percent respectively. chick pea had high fat content of 5.05 per cent as compared to horse gram as 1.8 per cent dietary fiber was also high as 22.38 in chick pea than 15.99 in horse gram.

Table 2
Chemical Composition of selected test crops

Crops	Horse Gram	Chick Pea
Moisture(g/100g)	6.65	7.43
Ash (g/100g)	3.45	2.83
CrudeFat /100g)	1.8	5.05
C. Fiber (g/100g)	5.4	3.84
C.Protein /100g)	21.28	22.36
Carbohydrates(g/100g)	61.42	58.49
T.D.Fiber (g/100g)	15.99	22.38
Calcium (mg/100g)	289.32	156.13
Magnesium(mg/100g)	160.73	162.21
Phosphorus(mg/100g)	295.81	695.1
Potassium(mg/100g)	370.07	670.14
Iron (mg/100g)	6.97	7.15
Zinc (mg/100g)	3.29	3.58
Sodium (mg/100g)	7.95	146.01
T.D.Fiber (g/100g)	15.99	22.38

Protein and Carbohydrate content of chick pea and horse gram was slightly different as 22.36 and 21.28 per cent protein and 58.49 and 61.42 per cent respectively. Wani and Kumar (2014) also evaluate the proximate composition of chick pea and Bhokre et al (2012) evaluate horse gram, only slight variation was observed. In minerals composition, calcium was high (289.32mg/100g) in horse gram than chick pea (156.13mg/100g). These results coincide with those reported by Abu Salem and Abou Arab (2011) for chick pea and Thirukkumar and Sindumati (2014) for horse gram.

C. Functional properties

The raw materials chick pea and horse gram flour, were analyzed for functional properties and data shown in (Table 3). Water absorption capacity (WAC) was observed high in chick pea as 73.38g/100g than horse gram 62.38 g/100g.Related to oil absorption capacity (OAC) of studied pulses flours, OAC was also found in chick pea flour 86.05 g/100g than horse gram flour 80.85g/100g.There is an advantage for best organoleptic characteristics of meal that high water and oil absorption capacity of the flour can positively influence the flavor, moisture and fat content in food. The foaming capacity (FC) of a flour refers to the amount of interfacial area that can be created by the protein and foam stability (FS) refers to the ability of protein to stabilize against gravitational and mechanical stresses.

Table 3
Functional properties evaluation of Selected Test Crops

Crops	Horse Gram		Chick Pea
WAC (g/100g)	62.38		73.38
OAC (g/100g)	80.85		86.05
FC (g/100g)	47.00		54.00
FS (g/100g)	37.00		45.00
WSI (g/g)	6.53		23.64
WAI (g/100g)	7.24		1.72

Foaming capacity of chick pea and horse gram flour was found to be 54 and 47 per cent respectively. Chick pea having low foaming stability than horse gram. This could be due to the protein denaturation caused by grinding. It has been reported that the native proteins provide high foam stability than denatured proteins. Moreover, the low or absence of foaming capacity of certain meals could affect their stability during storage. Water solubility index (WSI) was observed high in chick pea 23.64g/g while in case of water absorption index (WAI) was observed high 7.24 in horse gram than 1.72 per cent in chick pea. Abu Salem and Abou Arab (2011) also analyze the WAI and WSI of chick pea and reported as 1.90 g/100g and 27.94 g/g respectively. These results coincide with those reported by Sreerama et al (2007) for horse gram.

D. Antioxidant profile of selected crops

The data for antioxidant profile of raw materials chick pea and horse gramflour presented in Table. The antioxidant profile of chick pea is good with the values of 0.78mg/ml TPC, 0.91 mg/100g Quercitien TFC, and 1.2 mg/100g FRAP as compare to chick pea flour 0.17mg/ml TPC, 0.01 mg/100g Quercitien TFC, and 0.09 mg/100g FRAP.

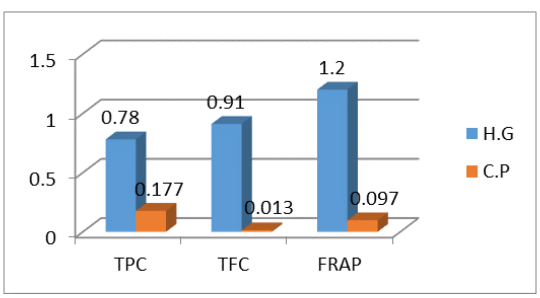

Fig. 1. Antioxidant Profile of Selected Crops

The concentration of antioxidants present in the grains may vary depending on the species, cultivar, and growing location and environmental conditions, among others. Also dehulling decreased the TPC of whole grain millets and this change was essentially due to the removal of the outer layers of the grain, as phenolic compounds of cereal grains are mainly concentrated in the outer layers of the grain.

4. Conclusion

The results of the study revealed great potential of pulses to address the food security nutrition and environmental sustainability needs. Pulses can be produced with a minimum use of resources and hence, it becomes less costly even than animal protein. Pulses are mostly cultivated under rainfed conditions and do not require intensive irrigation facility and this is the reason why pulses are grown in areas left after satisfying the demand for cereals/cash crops. These crops are more important from the nutritional point of view because of which they play important role in human health also. These pulses can be use in food industry and can be replace the conventional costly protein sources

References

[1] Abu-Salem Ferial. M. and Abou-Arab Esmat A. “Physico-chemical properties of tempeh produced from chickpea seeds,” Journal of American Science, 7, 2011.
[2] Anderson, R.A. “Water absorption and solubility and amylograph characteristics of roll-cooked small grain products,” Journal of Cereal Chemistry, vol. 59, pp. 265– 269, 1982.
[3] AOAC 2010 Official Methods of Analysis. 18th Edition, Revision 3, Association of Official Analytical Chemists, Washington DC.
[4] Asae, Cubes, Pellets and Crumbles. “Definitions and methods for determining density, durability and moisture content,” American society of agricultural engineers, vol. 48, 2001.
[5] Bhokre Chandralekha, Udhavrao Ghatge Pravin , Machewad Girish and Rodge Ashok. “Studies on Preparation of Buns Fortified with Germinated Horse Gram Flour,” International journal of scientific reports, vol. 2, pp. 228, 2012.
[6] Chandra S and Dave R. “In vitro models for antioxidant activity evaluation and some medicinal plants possessing antioxidant properties, “African Journal of Microbiology research, vol.13, pp. 981-996, 2009.
[7] Food and Agriculture Organization of the United Nations- Statistics Division, 2011. http://faostat.fao.org/
[8] Jukanti A.K, Gaur P.M, Gowda L.L.C and Chibbar R.N. “Nutritional quality and health benefits of chickpea (Cicer arietinum L.),” A review. British Journal of Nutrition, pp. S11-S26, 2012.
[9] Kiliçkan Ahmet, and Güner Metin. “The determination of pneumatic conveying characteristics of chickpea,” Turkish Journal of Agriculture and Forestry, pp. 265-274, 2010.
[10] Marioli Nobile Carla G., Carreras Julia, Grosso Rubén, Inga Marcela, Silva Mercedes, Aguilar Roxana, Allende María José, Badini Raúl and Martinez María José. “Proximate composition and seed lipid components of “kabuli”-type chickpea (Cicer arietinum L.) from Argentina,” Journal of Agricultural Sciences, pp. 729-737, 2013.
[11] Narayana, R. and M.S. Narasinga Rao. “Functional properties of raw and heat processed winged bean (Psophocarpus tetragonolobus) flour,” Journal of Food Science, vol. 57, pp. 1534 -1538, 1982.
[12] Sreerama Yadahally N., Sasikala Vadakkoot B., Vishwas M. Pratape. Nutritional implications and flour functionality of popped/expanded horse gram. Journal of Food Chemistry, pp. 891-899, 2007.
[13] Thirukkumar. S and Sindumati. G. “Studies on Preparation of Processed Horse Gram (Macrotyloma Uniflorum) Flour Incorporated Chappathi,” International Journal of Scientific Research, pp. 110-111, 2014.
[14] Thompson, R. V., and Issac, G. W. “Porosity determination of grain and seeds with air comparison pycnometer,” Transactions of the American society of Agricultural Engineers, vol. 10, pp. 693-696, 1967.
[15] Wang, J. C. and Kinsella, J. E. “Functional properties of novel proteins: alfalfa leaf protein,” Journal of Food Science, vol.41, pp. 286-292, 1976.
[16] Wani Sajad Ahmad and Kumar Pradyuman, “Comparative Study of Chickpea and Green Pea Flour Based on Chemical Composition, Functional and Pasting Properties,” Journal of Food Research and Technology, pp. 124-129, 2014.
[17] Wani, I.A., Sogi D.S., Wani A.A. and Gill B.S. “Physicochemical and functional properties of flours from Indian kidney bean (Phaseolus

vulgaris L.) Cultivars," Journal of Lebensmittle-Wissenchaftund-Technologies, vol.53, pp. 278-284, 2013.

[18] Y.N Sreerama, V.B Sashikala, V.M Pratape and Singh V. "Nutrients and anti-nutrients in cowpea and horse gram flours in comparison to chickpea flour, evaluation of their flour functionality," Journal of Food Chemistry, vol. 8, 2012.