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Short Communication

A Comparison of Nutrient and Dietary Compositions of Cereals and Pulses Commonly Consumed in Pakistan

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Abstract. The present study was taken to evaluate the proximate content and dietary fibre composition of locally available cereal (wheat, maize, oat and barley) and the legumes (mash beans, lentils, mung beans and chickpea). In cereal samples, crude proteins in all cereals were found in the range of 8.75-10.93% but in legumes this range was significantly higher i.e. (19.91-22.06). Crude fibre analysis in cereal samples showed values between 1.89-10.6, but in legume samples it ranged between 2.64 to 4.41. Total dietary fibre was higher in oat and barley 19.0 and 18.34, respectively, whereas total dietary fibre contents in selected legumes ranged between 18.00 (chick pea) to 24.93 (mung bean).

Keywords: chemical composition, cereals, dietary fibre, legumes, human nutrition

The cereal grains such as wheat, rice, sorghum and maize, and the food legumes which include a wide variety of beans provide more than 70% of the calories and protein for the majority of poor people in the developing world (Yasin *et al*., 2014). Pulse proteins (18-32%) possess functional properties such as fat binding, water holding, foaming and gelation that boost up their potential use in wide variety of foods (Boye *et al*., 2010).

Legumes are vital source of dietary protein for large sector of the world's population. Legumes are high in protein and complex hydrocarbons along with the presence of appreciable quantities of bioactive ingredients and minerals. Moreover, legumes possess phytochemicals of interest including antioxidants, phytosterols and bioactive carbohydrates (Amarowicz and Pegg, 2008).

Cereals are deficient in the amino acid lysine, which legumes can provide; legumes are low in sulphur-rich amino acids, which cereals can provide. When consumed together, cereals and legumes contribute significantly to a healthy and balanced diet. High in protein and easy to digest, mung bean consumed in combination with cereals can thus significantly increase the quality of protein in a meal (Saltzman *et al*., 2001).

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Biologically active constituents of cereals that promote beneficial physiological effects are dietary fibre, starch and polyphenols. Dietary fibre (DF) may protect against cardiovascular diseases such as diabetes, obesity, colon cancer and other diverticular diseases (McPherson, 1992).

The importance of food fibers has led to the development of a large and potential market for fibre-rich products and ingredients, and in recent years, there is a trend to find new sources of dietary fibre that can be used as food components (Chau and Huang, 2003). Whole grains contain many bioactive components that might be responsible for their protective effect, including fibre, resistant starch, and oligosaccharides, as well as vitamins, minerals, phytate, phytoestrogens, and phytosterols. Legumes are second to cereals as important source of dietary fibre (DF), protein and starch. Compared with cereal grains, legumes overall are a very good source of dietary fibre. Dietary fibre includes resistant starch, non-starch polysaccharide (cellulose, hemi cellulose, pectin, gums and B-glucans), non-digestible oligosaccharides and lignin (Slavin, 2003).

These observations stimulated to focus on the study of dietary fibre composition of various cereals and legumes, which may provide a wide range of dietary fibre to human nutrition. On the basis of recent evidences related to whole cereal grains and legume beans, this study

aims to determine nutritional value and dietary fibre composition of selected cereals (wheat, maize, oat and barley) and the legumes (mash beans, lentils, mung beans and chickpeas). All these legumes and cereals are mostly consumed in Pakistan. Nutritional composition of all cereals as proximate analysis is shown in Table 1.

The variation in range of moisture content (6.03-10.63) of all cereal is due to environmental conditions or due to processing conditions after their production. Protein and crude fibre contents are higher in oat 10.93 and 10.60, respectively as compared to other cereals. Ash contents of certain cereals observed to be in range of 1.43-3.64% depending upon the mineral concentration of each cereal. Higher fat contents were observed in maize (4.34%) as compared to other selected cereals.

Results of moisture contents of selected cereals in present study(6.03-10.63) are similar to the values (7.19-10.97) obtained by Kaur *et al*. (2014). Maximum ash contents recorded in oat (3.62) is slightly more than observed by Souci *et al*. (2008). Protein contents are one of the major nutrients in cereals because most of the required protein for body development is gained by cereals. In the present study values of protein lie in the insignificant variations i.e. (8.75-10.93) which is similar to studies by Belitz *et al*. (2009). The differences are due to soil conditioning by nitrogen fertilizer and other environmental effects. Fat and fibre values in cereals of present study resembles to the values estimated by Ridhi (2014) with some differences which are due to area of harvesting crop or sample preparation and processing methods. The proximate nutrient analysis of selected legumes is presented in Table 2. Nutritional value of chickpea and lentil as found in current study fairly agrees to that of Perez-Hidalgo *et al*. (1997). Percentage value of moisture, fat, ash and protein of mung bean investigated in the present study appear to be closer to the contents examined by Habibullah *et al*. (2007).

Total dietary fibre and constituents of nominated legumes is shown in Table 3. The results of total dietary fibre revealed that mung bean is rich in TDF (24.93%) than lentil, mash bean and chickpea. High percentage of cellulose (6.30) and hemicellulose (14.16) was observed in lentil. Lignin content was observed to be higher in mash bean (1.67%) and lower in chickpea (0.80%).

In present study reported results are similar to the study described by Azizah and Zainon (1997). It was observed that wheat contain higher lignin contents (3.70%) than oat and barley in descending order as depicted in Table 4. These results are in agreement with the studies by Karin Petersson (2012). The results of cellulose of selected cereals indicated that oat is higher in cellulose contents as compared to others which resembles to the results of Vergas *et al*. (2012).

As resulted values of lignin, cellulose and hemicellulose contents of selected legumes (mung bean, mash bean, chickpea and lentil) are concerned, these findings are much concordant with findings of Perez-Hidalgo *et al*. (1997).

Table 1. Proximate analysis of selected cereal

Contents	Wheat	Maize	Barley	Oat
Ash	1.69±0.297	1.43±0.152	2.72±0.266	3.64±0.014
Fat	2.13±0.134	4.34±0.077	2.38±0.049	3.71±0.098
Moisture	8.59±0.042	10.63±0.304	7.12±0.007	6.03±0.169
Protein	10.2±0.565	8.82±0.820	8.75±0.495	10.93±0.438
Crude Fibre	1.89±0.092	2.55±0.212	5.2±0.424	10.6±0.424

Table 2. Proximate analysis of selected legumes

Contents	Mung beans	Mash beans	Chickpeas	Lentils
Ash	3.42±0.113	3.83±0.056	3.25±0.042	2.35±0.077
Fat	1.2±0.127	1.10±0.064	4±0.085	2.165±0.092
Moisture	8.59±0.042	9.63±0.304	9.03±0.169	10.12±0.007
Protein	22.065±0.926	20.09±0.254	20.41±0.127	19.91±0.141
Crude Fibre	2.64±0.452	4.2±0.565	4.41±0.297	3.2±0.141

Table 3. Dietary fiber compositional analysis of selected legumes

Contents	Mung beans	Mash beans	Chickpeas	Lentils
Lignin	1.6±0.141	1.675±0.035	0.805±0.049	1.49±0.071
Cellulose	5.85±0.919	5.05±0.353	5.95±1.06	6.3±0.565
Hemi-cellulose	14.05±0.361	12.75±0.926	10.04±0.262	14.16±0.367
TDF	24.93±0.396	23.125±1.676	18±0.565	24.15±0.495

Table 4. Dietary fibre compositional analysis of selected cereals

Contents	Wheat	Maize	Barley	Oat
Lignin (%)	3.70±0.028	4.30±0.014	2.65±0.106	3.10±0.608
Cellulose	4±0.424	3.55±0.954	3.45±0.353	6.68±0.262
Hemi-cellulose	7.9±0.424	8.15±0.494	9.02±0.254	9.0±0.283
TDF	15.65±1.061	18.34±1.782	16.25±1.732	19.0±0.989

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