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Full Length Research Paper

Nutritional value of some legumes seeds from Elseleim agricultural scheme Sudan

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The objective of the study was to evaluate the nutritional value of some legume seeds obtained from Elseleim Agricultural Scheme in Dongla-Sudan. Eight legume seeds. Garden pea (*Pisum sativum*), pigeon pea (*Cajanus cajan*), chick pea (*Cicer areitenum*) peas grass (*Lathyerus sativus*) Cow pea (*Vigna unguiculata*), Broad bean (*Vicia faba*), Bonavist bean (*Lablab purperus*) and common bean (*Phaseolus vulgaris*) were analyzed for chemical composition, and amino acid profile of the protein of each species. Protein content range from 17.6 to 27.93%, the highest protein content 27.93% was reported for Broad beans carbohydrate from 45.9 to 55.8%, ash from 3.7 to 5.8%, fibre from 1.2-7%, either extract from 1.2 to 4.3%. Protein fractions were varied among the different species, generally albumin ranked first and the least is prolamin. The essential amino acid content g/100g, Arganine content 2.5-0.8, Histidine. 0.9-0.2 lysine 1.2 – 0.3, phenylalanine 1.3 – 0.7, lucine 1.9 – 1.0, isolucine 1.2 – 0.6, valine 1.2-0.7, theronine 0.9 – 0.3 and mehionine 0.3 – 0.1g/100g. All legume seeds studied were low in sulphur – contains amino acids. The studied legume Seeds constitute an excellent source of protein and adequate essential amino acid profile to improve diets in low-income countries.

Keywords: Legumes, Seeds, Protein fractions, Amino acids.

INTRODUCTION

El seleim Agriculture Scheme in Elseleim basin which is considered to be the greatest in the northern State of the Sudan it was 90 thousand Fedden in 1939 and it reduced to 55 Fedden in 1974. The basin lies on the eastern Bank of the River Nile extended from El Kawa in the south until El Bergag in the North.

Leguminous plant is found throughout the world, but the greatest variety grows in the tropics and subtropics. Legume seeds or pulses were among the first food and their domestication and cultivation in many areas occurred at the same time as that of the major cereals, nutritionally they are 2-3 Times richer in protein than cereal grain. Legumes are a major source of dietary protein and calories in food and feed products through out the world. They are especially important as food in those regions where animal proteins are scarce or where poverty, religious or ethnic preferences preclude the consumption of meat, oil seed legumes are the major contributor to the world supply of edible oil, as well as furnishing protein rich residues. Unfortunately, the protein in grain legume seeds are regarded as dietary inferior to animal protein because of their low sulphr –amino acid concentrations. (Norton et al., 1985).

Food legumes are important economically and a good source of protein, calories, vitamins and minerals in the diet of many individual in developed and developing countries, it is estimated that the national consumption of legume crops in Sudan is around 25.000 tons. Dry bean are known to be good sources of iron, potassium, calcium, phosphorus, Zinc, and Magnesium and differences in chemical composition have been attributed to soil climate, strain, and fertilizer treatment (Esh et al., 1959).

Legume Seeds constitute an excellent source of protein and energy for improving diets based on cereals and roots in low-income countries.

The aim of this study is to evaluate the nutrient content, in terms of proximate component protein quality and amino acids profile of some legume seeds grown in

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Table 1. Chemical composition of legume seeds.

Samples	CP%	Ash %	C.F%	E.E%	carbohydrates
Garden pea	$27.63^{a} \pm 0.46$	$3.66^{d} \pm 0.03$	$2.27^{f} \pm 0.21$	$1.64^{c} \pm 0.31$	$49.62^{c} \pm 0.33$
Chick pea	$24.33^{c} \pm 0.89$	$4.32^{c} \pm 0.02$	$1.16^{g} \pm 0.15$	$4.33^{a} \pm 0.91$	$52.23^{b} \pm 1.35$
pigeon pea	$17.86^{f} \pm 0.26$	$4.41^{c} \pm 0.06$	$6^{c} \pm 0.20$	$1.66^{c} \pm 0.29$	$55.34^{a} \pm 0.30$
Pea grass	$20.90^{d} \pm 0.39$	$3.87^{d} \pm 0.41$	$6.17^{b} \pm 0.32$	$1.79^{c} \pm 0.50$	$49.77^{c} \pm 0.58$
Broad beans	$27.93^{a} \pm 0.66$	$4.32^{c} \pm 0.02$	$1.27^{g} \pm 0.15$	$1.37^{c} \pm 0.31$	$50.43^{c} \pm 1.04$
Bonavist bean	$25.95^{b} \pm 0.19$	$5.05^{b} \pm 0.58$	$7^{a} \pm 0.20$	$1.70^{c} \pm 0.52$	$45.07^{d} \pm 1.22$
Cow pea	$20.27^{de} \pm 0.35$	$4.47^{c} \pm 0.04$	$3.75^{d} \pm 0.15$	$1.16^{c} \pm 0.24$	$55.80^{a} \pm 0.69$
Phaseolus vulgaris	$19.65^{e} \pm 0.46$	$5.75^{a} \pm 0.05$	$3^{e} \pm 0.20$	$2.73^{b} \pm 0.80$	$54.87^{a} \pm 1.47$

Means within the rows having different superscripts are significantly (P≤0.05) differ.

Northern-Sudan (Elseliam).

MATERIALS AND METHODS

Sample preparation

1. Cleaning plant tissue to remove dust, pesticide and fertilizer residues: normally by washing the plant tissue with distilled water.
2. Drying in an oven to stop enzymatic activity at 70°C for 72 hours.
3. Mechanical grinding to produce a material suitable for analysis usually to pass a 60-mesh sieve.
4. Finally dried at 65°C to obtain a constant weight for chemical analysis.

Proximate analysis of CP, Cf, E.E and Ash were carried using (AOAC, 1984).

Total carbohydrates were calculated by the following equation. The sum of moisture content + sum of fiber + sum of crude fat + sum of crude ash + sum crude protein was subtracted from (100%) to obtain the total carbohydrate by difference.

Amino Acid content determined using amino acids analyzer (Sykam-S7130/Germany) bassed on high performance liquid chromatography technique. Sample hydrolysates were prepared following the method of Moore and Stein (1963).

Protein fractions from defatted seeds were determined according to methods described by Landry and Moureaux (1970).

The data was analyzed according to the analysis of variance (ANOVA) appropriates for CRD was used according to Gomaez and Gomez (1984). Means separation was carried out using the least significance difference (LSD).

RESULT AND DISCUSSION

Chemical content of legume seeds were significantly (P<0.05) varied (Table 1) protein level of legumes seeds has been influenced by several factors such as season genetic soil and environment, wide variation of protein content (20-41%) has been reported by Chavan, (1989) and Bond *et al*,. (1985), in this study CP was higher in Broad beans and Garden pea 27.93% and 27.63% respectively. The least CP observed in pigeon pea 17.86%. However these amounts of protein were adequate to sustain human and livestock nutrition. Soluble carbohydrates ranged from 49.6 to 55.8% that may support excellent energy level, the highest level of soluble carbohydrate was found in cow pea (55.8%) similar result was reported by Walker, (1981). In this study Ash content of legumes seeds were ranged between 5.75 and 3.66% in phaseolus vulagris and garden pea, respectively table (1). These results were higher than 2.7% reported by Duke and Ayensu, (1985). Ash content in garden pea 3.66% is similar to that in phaseolus vulgaris reported by James, (1996). Fiber content of the legumes seeds ranged between 7% and 1.2% in bonavist been and chick pea, respectively, the lowest oil content 1.2% observed in cow pea, similar exactly to that reported by Walker (1981).while the highest 4.3% reported for chick pea, which is higher than 2.06% found by (Salem, 2009).

Amino acids content were shown in Table (2) amino acids were significantly (P<0.05) differ between legumes seeds but all legume seeds seems to be low in sulphur – containing amino acids and there is some legume having high level of lysine like garden pea and pea grass 1.2 g/100g in each. Amino acid Profiles of proteins in leguminous seeds are unbalanced when compared to egg protein. The indispensable Sulphur – containing amino acid are at a much lower concentration (Mahe et al., 1994), Sulphur – containing amino acid i.e, Methionine and Cystine are considered as the most critical limiting component of the proteins. Differences in amino acids composition were also observed among the protein fractions of the seeds. Globulins are relatively poor in Sulphur – containing amino acid. Albumin are richer in sulphur-amino acid and other essential amino

Table 2. Shows the amino acids content g/100g.

Amino acids	A	B	C	D	E	F	G	H	SE
Aspartic acid	2.6^{a}	1.3^{c}	0.81^{d}	2.2^{b}	2.3^{b}	2.64^{a}	2.37^{b}	1.22^{c}	0.056
Threonine	0.85^{a}	0.5^{d}	0.32^{e}	0.67^{c}	0.68^{b}	0.78^{a}	0.78^{b}	0.48^{d}	0.0217
Serine	0.85^{b}	0.42^{d}	0.25^{e}	0.67^{c}	0.65^{c}	0.97^{a}	0.85^{b}	0.43^{d}	0.024
Glutamic acid	3.5^{a}	1.3^{d}	0.83^{e}	2.2^{c}	2.9^{b}	3.34^{a}	3.40^{a}	1.07^{de}	0.093
Glycine	0.6^{a}	0.24^{d}	0.08^{e}	0.66^{a}	5.2^{c}	0.58^{b}	0.53^{c}	1.35^{a}	0.020
Alanine	1.3^{b}	1.1^{c}	0.92^{e}	1.1^{a}	1.3^{a}	1.34^{a}	1.26^{a}	0.92^{d}	0.024
Cystine	0.06^{d}	0.05^{d}	0.05^{d}	0.14^{a}	0.07^{c}	0.058^{d}	0.05^{d}	0.13	0.004
Valine	1.2^{b}	0.87e	0.73^{f}	1.03^{c}	1.16^{b}	1.22^{a}	1.19^{a}	0.93^{d}	0.013
Methionin	0.2^{b}	0.15^{c}	0.10^{f}	0.15^{c}	0.12^{e}	0.13^{e}	0.23^{a}	0.14^{b}	0.003
Isoleucine	1.2^{a}	0.89^{b}	0.62^{d}	0.93^{b}	1.16^{a}	1.21^{a}	1.14^{a}	0.78^{c}	0.020
Leucine	1.8^{b}	1.3^{d}	0.97^{f}	1.5^{c}	1.8^{d}	1.94^{a}	1.79^{b}	1.17^{e}	0.026
Tyrosine	0.36^{a}	0.15^{c}	0.11^{c}	2.3^{b}	0.34^{a}	0.35^{a}	0.25^{b}	0.17^{c}	0.016
Phenylalanine	1.2^{b}	0.88^{e}	1.02^{c}	0.91^{d}	0.98^{c}	1.23^{a}	1.28^{a}	0.69^{f}	0.021
Histidine	0.72^{b}	0.23^{f}	0.25^{f}	0.55^{c}	0.45^{d}	0.88^{a}	0.88^{a}	0.38^{e}	0.016
Lysine	1.2^{a}	0.66^{e}	0.33^{g}	1.2^{a}	1.01^{d}	1.11^{b}	1.08^{c}	0.46^{f}	0.026
Argnine	2.3^{b}	1.4^{e}	0.77^{f}	1.6^{c}	2.48^{a}	1.57^{c}	1.48^{d}	0.74^{g}	0.034

The rows with different superscript were significantly (P<0.05) varied.
Where A=garden pea, B= chick pea, C= pigeon pea, D= pea grass, E = broad beans, F = bonavist beans, G = cow pea and H = phaseolus vulgaris.

Table 3. protein fraction percentage of legumes seeds.

Protein/ Fraction	A	B	C	D	E	F	G	H	SE
Albumin	7.63^{g}	46.89^{c}	29.91^{f}	4.79^{h}	53.66^{b}	36.51^{e}	43.03^{d}	59.81^{a}	0.46
Globulin	17.94^{c}	25.55^{b}	42.43^{a}	17.87^{c}	11.64^{e}	14.15^{d}	19.97^{c}	24.48^{b}	0.8
Prolamin	3.03^{c}	4.30^{a}	4.30^{a}	3.34^{b}	1.8^{e}	2.02^{e}	2.75^{d}	1.76^{e}	0.09
Glutelin	22.02^{a}	12.34^{d}	9.78^{e}	19.48^{b}	19.03^{c}	10.78^{e}	19.46^{b}	5.09^{f}	0.44

Columns of different superscripts were significantly (P<0.05) different.
Where A=garden pea, B= chick pea, C= pigeon pea, D= pea grass, E = broad beans, F = bonavist beans, G = cow pea and H = phaseolus vulgaris.

acid (such as lysine) than globulins (Norton *et al.,* 1985).

Legumes containing 7.63- 59.81%, Albumin, 14.15 – 42.43%, Globulin, 1.76 – 4.3% Prolamin.and 5.09 to 22.02%, Glutelin.

Broad bean protein fraction percentage in this study is as follows albumin 53.7, globulin 11.6 prolamin 1.8 and glutamin 19.0, However Hossain and Mortuza, (2006) reported that most of these proteins comprise of globulins (79%), albumins (7%), glutelin (6%), and Musallam et al.,(2004) reported that protein fraction in legume seeds were 1.41 to 3.01 globulin, from 69.5% to 78.1%, albumin, from 1.83% to 3.57% prolamin, and from 12.0% to 18.4% glutelin. Protein fractions were varied among the different species, generally albumin ranked first and the least is prolamin. This result was inconsistently with Salem 2009 who ranked globulin first and the albumin last. These differences may be due to different soils, environment and irrigation regimes. (Table 3)

CONCLUSION

Legumes seeds having considerably high level of CP content with good quality protein fractions and excellent amino acids profiles, to sustain human and livestock nutrition.

REFERENCES

AOAC (1984). Association of Official Analytical Chemists. Official Methods of analysis of the association of official Analytical chemists 14th edition.

Bond DA, Lawes GC, Hawtin MCS, Stephens JH (1985). Faba bean; 199-265. In R.J. Summerfieid and E. H. Roberts (eds.).

Duke JA, Ayensu ES (1985). Medicinal plants of china Reference Publications.Inc. ISBN 0-917256- 20-4.

Esh GCDE, BASU KP (1959). Influence of genetic strain and environment on Protein Content of pulses. Science 129:148-149.

Gomoez KA, Gomez AA (1984). CRD design In: Statistical procedure for agricultural research. Johnwilly and Sons, New York.

Hossain MS, Mortuza MG (2006). Chemical composition of Kalimatar,

alocally grown strain of faba beans (Vicia faba) Pak.J.biol.sci. 9:1817-1822.
Jams Man AJM (1996). Bioavailability of protein in legume seeds. Grain legume (AEP) 11-19.
Landry J, Moureaux T (1970) Heterogeneity of the glutelins of the grain of corn : selective extraction and composition in amino acids of the three isolated fraction. Bull.Soc.Biol., 52: 1021 – 1237.
Mahe S, Gausseres N, Tome D (1994). Legume (Protein for human requirements, Grain legume (A E P) 7:15-17.
Moore S, Stain WH (1963).Chromatographic amino acids determination by the use of automatic recording equipment. Methods. Enzymol, 63:819-831.
Musallam IW, Al-Karaki GN, Ereifej KI (2004). Chemical composition of Faba bean genotypes under rainfed and irrigation conditions. Int. J. Agi. Bio. 6:359-362.
Norton G, Bliss FA, Bress ani R (1985). Biochemical and Natrtional attributes of grain Legumes. In Summer field R.J., Roberts E H. Grain Legume crops-London: Collins, 73-114.
Salem S (2009) Chemical composition of faba bean (Vicia faba) genotypes under varius water regimes. Pak.J. Nutri. 8 (4): 477–482.
Walker AF (1981). Pulses: A neglected part of diet. Br. Nutr. Found Bull. 31,6 (1): 24-36.