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AMINO ACID COMPOSITION OF GUAR GENOTYPES

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Seed powder of twenty seven guar genotypes was analysed by Waters PICO-TAG System for quantitation of their seventeen individual amino acids. Amino acid concentrations were found to vary considerably among the genotypes. Amino acid profile of salt soluble and salt insoluble guar protein of nine genotypes were also established to ascertain the superiority of two protein fractions with respect to the presence of sulfur containing amino acids. Compared to soybean, guar protein was also found having adequate balance of amino acids but low in methionine and cystine.

Key words : Amino acid composition, Guar, Soybean, Protein fractions

Guar flour is the ground endosperm of guar seeds. Its individual value rests upon the galactomannan (gum) concentration which generally varies within the range of 78 to 82% of the endosperm. In addition of its valuable endosperm component, the guar germ which constitutes 43-47% of the seed contains more than 51% protein (1). Presently guar protein as germ is mixed with hulls and sold as cattle feed. Comparatively very little work has been done to produce nutritious food out of guar germ as is now done for soybean protein.

With this objective, the present work was undertaken to study the nutritional value of guar protein by estimating the level of individual amino acid by most advanced analytical technique. The work was further extended to the salt soluble and insoluble storage protein for establishing their amino acid profile. Finally essential amino acids present in the storage protein of guar and soybean were compared for quality assessment.

MATERIALS AND METHODS

The experimental material for the present study comprised of guar seed powder of twenty seven promising lines namely, IGFRI 212-1, CP-42, JG-9, GAUG-14, IGFRI-1539-1, GAUG-44, GAUG-67, JGP-14, HG 75/87, RGC-182-1,

HFG-314, HG-365, FS-277, HG-182, JG-3, HG-75, HG-258, GAUG-34, Naveen, Suvidha, HGS-342, RGC-962, RGC-984, GAUG-26, RGC-988m HGS-329 and GAUG-66.

One hundred milligram of each sample was taken in a tube and 5ml of 0.2M phosphate buffer (pH-7.6) was added. It was stirred for 30 min. at room temp. then centrifused at 10,000 × g for 10 minutes. The pellet is termed as insoluble protein fraction and the supernatant is termed as soluble fraction. In the case of total protein, 0.1 g seed powder was suspended in 5.0 ml water.

Ten microlitre portion of supernatant, suspended insoluble and total protein parts in duplicate was taken in tubes and amino acid composition was determined by reverse phase liquid Chromatography of derivatized hydrolysates (3) in Waters Pico-tag amino acid analysis system.

RESULTS AND DISCUSSION

Ranges and mean concentrations of individual amino acid in mole percentage of total protein for twenty seven genotypes are given in Table 1.

Table 1. Maximum, Minimum and Mean Concentrations of Individual Amino Acids present in Twenty Seven Promising Guar varieties

Individual Amino Acids	Abbreviations	Max.	Min.	Mean
		Mole % of total protein		
Asparagine plus aspartate	ASX	10.03	6.49	8.51
Glutamate plus glutamine	GLX	18.07	8.36	13.45
Serine	SER	9.09	5.60	7.30
Glycine	GLY	15.71	9.50	12.45
Histidine	HIS	7.04	2.01	3.61
Arginine	ARG	9.72	4.80	7.68
*Threonine	THR	7.79	2.47	4.71
Alanine	ALA	10.40	7.45	8.93
Proline	PRO	6.70	4.61	5.60
*Tyrosine	TYR	4.04	1.19	2.15
*Valine	VAL	5.93	3.97	5.15
*Methionine	MET	1.70	0.48	0.75
*Cystine (0.5)	CYS	0.69	0.11	0.36
*Isoleucine	ILE	4.73	2.78	3.74
*Leucine	LEU	7.41	5.65	6.84
*Phenylalanine	PHE	4.82	3.07	3.68
*Lysine	LYS	6.21	4.16	5.08
				99.99

*Essential Amino Acids.

Considerable variation is observed among the varieties for individual amino acids. Earlier reported (2, 5, 6, 7) values also showed wide variation in concentration for individual amino acid in different seed components and also among accessions. It is therefore more appropriate to refer the mean value of the various guar varieties as the typical composition of individual amino acid for guar protein.

In general guar protein is low in sulphur containing amino acids (Methionine and cystine). Comparative levels of glutamate plus glutamine, glycine, alanine, asparagine plus aspertate are in higher proportion in guar protein. It has been observed, both in cereal and legume crops (4) that genetic enhancement of particular protein fraction improves protein quality with the improvement of amino acid balance. Keeping this approach in view, guar storage proteins were again separated in phosphate buffer (pH-7.4) soluble and insoluble parts. Amino acid composition of the proteins in both the parts for nine guar genotypes were again determined and mean value were presented in Table 2.

Table 2. Comparison of Amino Acid Composition in Soluble and Insoluble Part of Nine Promising Guar Varieties

Amino acid[a]	Mole % of soluble protein*	Mole % of insoluble protein*
ASX	8.49	7.61
GLX	20.42	12.79
SER	4.69	4.66
GLY	10.09	12.09
HIS	2.54	3.20
ARG	11.36	7.16
THR	3.14	4.69
ALA	7.46	9.35
PRO	4.89	5.84
TYR	1.43	1.16
VAL	4.46	6.74
MET	0.75	0.72
CYS	0.73	0.09
UKE	3.62	4.94
LEU	7.01	8.52
PHE	3.68	4.47
LYS	5.23	5.86

[a] Abbreviations as in Table 1; * Average concentration of nine promising lines.

Comparatively more percentage of glutamic acid, arginine and aspartic acid were found present in soluble part of guar seed protein. Insoluble part of the seed protein contains more percentages of glycine alanine, histidine and proline. Levels of serine, methonine and lysine were found almost same at both the parts of the guar protein. Other essential amino acids such as threonine, valine, isoleusine, leusine, phenylalanine were found in little higher proportion in insoluble part of the protien. The combine percentage of methionine and cystine is higher in soluble part. Therefore genotypes of a high soluble/insoluble storage protein fraction is desirable for having higher concentration of sulfur containing amino acids in guar protein.

In general essential amino acids concentration in guar protein is about 32.60 mole percentage of the total amino acids. In soybean the corresponding value is about 35.00 (Table 3). The combined percentage of sulfur containing amino acids (MET+CYS) in guar is only 1.11 in comparison to 4.00 mole percentage found in soybean protein.

Table 3. Comparison of Essential Amino Acid Composition Between Guar and Soybean Seed Protein

Amino Acid[a]	Guar[b]	Soybean[c]
	Mole % of total seed protein	
THR	4.71	3.52
TYR	2.15	2.59
VAL	5.15	5.28
MET	0.75	1.12
CYS	0.36	1.65
ILE	3.74	4.58
LEU	6.84	6.70
PHE	3.68	3.92
LYS	5.08	5.64
Total	**32.60**	**35.00**

a Abbreviations as in Table 1; b Average value of 27 promising guar varieties; c Standard soybean genotype

The sulfur containing amino acids are very low in guar seed protein and need to be improved. Such improvement could be expected to parallel the tremendous achievements obtained with soybeans.

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