

Amino Acid Composition of Some New Varieties of Leguminous Seeds

PRIYA SAXENA*, S.K. SHRIVASTAVA and P. SAXENA

Department of Applied Chemistry
Jabalpur Engineering College, Jabalpur-482 011, India

Six new varieties of leguminous seeds, *i.e.*, *Pisum sativum* variety Arkel and JM-1, *Cicer arietinum* variety Phule G81-1-1 Vijay, DTT RII BG-391 and JG-7 and *Lens esculenta* variety JL-1 were analysed for their amino acid composition by high performance liquid chromatography.

Key words: Amino acid, Composition, Leguminous seeds, HPLC.

INTRODUCTION

The nutritional quality of seed proteins largely depends on the amino acid composition of the storage proteins. In addition to their amino acid composition, the physico-chemical properties of storage proteins are important because they play a key role in food processing. Unless the amino acid composition of the protein in the food is balanced, in terms of the requirement of essential amino acids, the protein will be utilized only to the level of the limiting amino acid. The first limiting essential amino acid for man in all cereals and other non-legumes is lysine¹.

Besides animal protein, edible legumes play a major role in meeting food need. However, the present agricultural situation excludes the possibility of making more arable land available for cultivation of edible legumes¹. Proteins present in various foods differ in their nutritive value on account of the difference in the amino acid composition. An analysis for amino acid by modern methods has given an excellent nutritive evaluation of the absorbed fraction of the food protein and thus for this reason, one must be concerned with qualitative and quantitative adequacy of amino acids².

EXPERIMENTAL

The leguminous seeds *Pisum sativum* variety Arkel and JM-1, *Cicer arietinum* variety Phule G 81-1-1 Vijay, DTT RII BG-391 and JG-7 and *Lens esculenta* variety JL-1 under study were procured from Jawaharlal Nehru Krishi Vishwa-vidyalaya, Jabalpur and Indian Institute of Pulses Research, Kanpur.

The samples were hydrolyzed in 6N hydrochloric acid for 18 h at 110°C. The hydrolysate was filtered and the filtered hydrolysate was analyzed by "Jasco high

performance liquid chromatograph UV-975, amino acid analysis system". Since tryptophan is destroyed during hydrolysis, hence the method involving the hydrolysis of the samples in 5N sodium hydroxide was used for tryptophan.

RESULTS AND DISCUSSION

The results of amino acid composition of all the leguminous seeds are given in Table 1.

TABLE-1

AMINO ACID COMPOSITION OF SEED PROTEINS OF *PISUM SATIVUM* VARIETY ARKEL (I), *PISUM SATIVUM* VARIETY JM-1 (II), *CICER ARIETINUM* VARIETY PHULE G81-1-1 VIJAY (III), *CICER ARIETINUM* VARIETY DTT RH BG-391 (IV), *CICER ARIETINUM* VARIETY JG-7 (V) AND *LENS ESCULENTA* VARIETY JL-1 (VI)

Amino acid	Amino acid analysis (g/100g seeds)					
	(I)	(II)	(III)	(IV)	(V)	(VI)
Cystine	3.60	7.60	6.70	6.30	1.04	16.78
Arginine	1.69	1.47	1.28	1.01	0.54	0.53
Tryptophan	1.10	1.24	1.15	0.59	0.66	0.96
Leucine	1.02	1.06	1.37	0.91	0.09	12.40
Glutamic acid	0.66	0.52	0.50	0.84	1.70	7.60
Tyrosine	0.36	0.67	0.46	0.37	0.15	0.20
Threonine	0.24	0.14	0.35	0.24	0.35	0.07
Histidine	0.17	0.17	0.15	absent	0.30	absent
Methionine	0.08	0.07	0.06	0.04	0.04	absent
Phenylalanine	0.08	0.74	0.54	0.76	0.48	1.40
Valine	absent	absent	0.02	absent	0.33	0.42
Lysine	absent	0.18	0.15	0.15	0.11	0.05

The amino acid composition of seed proteins of *Pisum sativum* variety Arkel and JM-1 is given in Table-1. In both the varieties the quantity of cystine is found to be maximum, *i.e.*, 3.60 g/100 g seeds for Arkel and 7.60 g/100 g seeds for JM-1. It has been observed that in both the varieties the quantities of various amino acids are somewhat to the same extent but lysine which is an essential amino acid and is required for the formation of new body proteins for growth and repair³ is absent in the variety Arkel.

The decreasing order of amino acid in *Pisum sativum* variety Arkel is:

cystine > arginine > tryptophan > leucine > glutamic acid

> tyrosine > threonine > histidine > methionine = phenylalanine,

while in *Pisum sativum* variety JM-1 the decreasing order of amino acid is:

cystine > arginine > tryptophan > leucine > phenylalanine

> tyrosine > glutamic acid > lysine > histidine > threonine > methionine.

However, both these varieties are in general accordance with one another.

The amino acid composition of *Cicer arietinum* varieties Phule G81-1-1 Vijay, DTT RII BG-391 and JG-7 is given in Table-1. Upon comparing the amino acid values of these samples on the basis of lysine and phenylalanine, it is seen that the value of lysine is 0.15 g/100 g seeds in variety Phule G81-1-1 Vijay and variety DTT RII BG-391 and 0.11 g/100 g seeds in variety JG-7 while the value of phenylalanine is 0.54 g/100 g seeds in variety Phule G81-1-1 Vijay, 0.76 g/100 g seeds in DTT RII BG-391 and 0.48 g/100 g seeds in variety JG-7. As both these amino acids are essential for the synthesis of new body proteins needed for growth and repair⁴, it is proposed that variety DTT RII BG-391 is better as compared to variety Phule G81-1-1 Vijay and variety JG-7.

The decreasing order of amino acids in *Cicer arietinum* variety Phule G81-1-1 Vijay is:

cystine > leucine > arginine > tryptophan > phenylalanine > glutamic acid
> tyrosine > threonine > histidine = lysine > methionine > valine.

The amino acids of the seed proteins of *Cicer arietinum* variety DTT RII BG-391 in order of decreasing amount is:

cystine > arginine > leucine > glutamic acid > phenylalanine > tryptophan
tyrosine > threonine > lysine > methionine

whereas histidine and valine are absent.

The diminishing amount of amino acid in *Cicer arietinum* variety JG-7 is:

glutamic acid > cystine > tryptophan > arginine > phenylalanine > threonine
> valine > histidine > tyrosine > lysine > leucine > methionine.

However, no varietal variations exist with the reported values⁵⁻¹⁰.

The seed protein of *Lens esculenta* variety JL-1 is found to contain cystine in maximum amount, i.e., 16.78 g/100 g seeds which is higher than the value reported by Gopalan *et al.*⁶ *Lens esculenta* variety JL-1 is lacking in methionine and histidine and contains less amount of lysine, i.e., 0.05 g/100 g seeds, which directly affects its quality. The decreasing order of amino acids in variety JL-1 is:

cystine > leucine > glutamic acid > phenylalanine > tryptophan
> arginine > valine > tyrosine > threonine > lysine.

Conclusion

It has generally been found that when a liberal amount of a single essential amino acid such as phenylalanine or leucine is added to a basal diet, the nutritive value of the diet is decreased¹¹. In the thirteen legume seeds studied, methionine was the only limiting essential amino acid for the nutrition of the white rat except for pigeon pea where tryptophan as well as methionine was deficient. Methionine is of special importance to animals as a therapeutic and nutritional factor. It protects animals against liver injuries by chloroform, industrial halogenated fumes, protein deficient diets and prevents the great loss of body nitrogen in the case of fractures, burns and surgical operations.¹²

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For further information contact:

PROFESSORS CORRADO DI NATALE and AMALDO D'AMICO

Conference Chairpersons

Department of Electronic Engineering

University of Rome Tor Vergata

via di Tor Vergata 110; 00133 Rome (Italy)

email: dinatale@uniroma2.it

Conference web page:

<http://pendragon.eln.uniroma2.it>