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Biochemical Evaluation of Moong Bean (*Vigna radiata* L.) Characterstics for Nutraceutical Applications

Mamta Rathore[1], H.G. Prakash[1], D.P. Singh[1], Khalil Khan[1]

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ABSTRACT

Background: Moong bean (*Vigna radiate* L.) plays an important role in antioxidant, antimicrobial, antidiabetic, anti inflammatory, antihypertensive and antitumor effects. Mostly beans and legumes cause gas and abdominal bloating in some people but the moong beans are the easy to digest. Soaking the beans in water before cooking and also sprouting them reduces this issue. The high levels of amino acids, oligosaccharides and polyphenols provide high antioxidant levels not only fight tumors and cancer but also protect against DNA damage and cell mutation. The seed of moong bean acts as a nutraceutical because it provides beneficial effects on human health and also helps in the prevention of cardiovascular disease, diabetes, digestive tract diseases, overweight, obesity and cancer *etc*. The flavonoids vitexin and isovitexin have high free radical scavenging activities which help lower oxidative stress, the cancer causative factor. It is not only lower blood glucose levels, but also reduce total cholesterol levels, triglycerides, plasma C peptides and glucagon levels. Samples of moong bean were collected from Legume Section of the University.

Methods: Through NIRS-2500 evaluated samples of moong bean. It is an instrument through which Near Infrared (NIR) analysis a spectroscopic technique that makes use of the naturally occurring electromagnetic spectrum. This works in the region of the spectrum defined by wavelengths between 700 nm and 2500 nm. All the cultivars were found to cluster in major four groups on the basis of principal component analysis. The result showed the diversity between nutritional and antinutritional factors in the cultivars that could be further used by plant breeders to develop superior genotypes. The moong bean has lots of advantages which cure the several diseases such as cardiovascular disease, type 2 diabetes, digestive diseases and some cancers.

Result: Histidine amino acid was varied from 6.40% to 8.81%, arginine amino acid from 2.21% to 3.87%, valine amino acid from 2.92% to 4.44%, phenylalanine from 9.73% to 13.86%, isoleucine from 9.28% to 10.02%, methionine from 0.09% to 1.26%, leucine from 6.02% to 7.65%, tryptophan from 0.30% to 0.68%, lysine from 2.03% to 2.22% and threonine from 4.32% to 5.56%. The grain color have the direct related to carotenoids and polyphenols. The hardness of the grain is due to fiber amount of the grain. The moisture is related to the properties such as sphericity, porosity, bulk density. Mostly anti-nutrients factors such as phytic acid, tannins, hemagglutinins and polyphenols associated with the grain. The effects of storage and processing on nutrients and food processing properties are needed to enable optimization of processing steps, for better mung bean food quality and process efficiency.

Key words: Antimedicinal, Antioxidants, Protein source, Seed coat, Vitamin.

INTRODUCTION

In leguminosae family or fabaceae includes beans, pea, lentils and groundnut. Protein is a very important nutrient in human life it works as a building block of human body (Butt, 2010). The moong bean seed coat acts as an important food source for human beings. The vegetarian people eats protein rich leafy vegetables and minerals. Commonly known that moong bean or green gram which is a tropical legume in Thailand, India and Pakistan (Oplinger *et al*., 1990). Due to rich in protein and amino acid it suits for food and also supplement for cereal based diets. The lower in saturated fatty acid and also in sodium salt concentration. It is important for cardiac patient and obesity person. This pulse helps to reduce the cholesterol level. It also a good source of thiamin, niacin, vitamin B6, pantothenic acid, iron, magnesium, phosphorus and potassium and a very good source of dietary fiber, vitamin C, vitamin K, riboflavin, folate, copper and manganese (Kishumura, 2013). In India dal and rice combination acts as a staple food. To prepare noodles, soups and bread to select the milled form of the grain. In the India people wants to prefer snacks of moong bean which is spiced and salty in taste. This grain is used as a vegetable in the rural area. The whole form of moong bean such as bean stalks, leaves and husks are all used as a livestock feed source (Sefa Dedeh and Stanley, 1979). It improves the soil fertility. It's important features are effected by genetic and environment conditions.

Currently, the world production area of moong bean is about six million hectares per year, out of which 90% is in Asia, with an average yield of 400 kg.ha^{-1}. The moong bean has rich dietary quality but the productivity is not as similar as a demand. In human diet it is a source of protein,

[1]Directorate of Research, C.S. Azad University of Agriculture and Technology, Kanpur-210 203, Uttar Pradesh, India.

Corresponding Author: Mamta Rathore, Directorate of Research, C.S. Azad University of Agriculture and Technology, Kanpur-210 203, Uttar Pradesh, India. Email: mamtacsa@gmail.com.

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carbohydrate and micronutrients (Mubarak, 2005). It is rich in very desirable amino acid lysine which is mostly deficient in cerearls crop and less amount in methionine amino acid which is a sulphur containing amino acid. The bean consists of high level of antioxidant which is helpful for cleaning the body inside.

Nutritionally rich moong bean

In comparison to other legumes, such as chickpea (*Cicer arietinum*), pigeon pea (*Cajanus cajan*) and lentils (*Lens culinaris*), moong bean starch is easier to digest. Moong bean also induces less flatulence and is well tolerated by children. This has low amount of phytic acid than pigeon pea, soybean and cereals (Adsule *et al*., 1986). Phytic acid is commonly found in cereal and legume crops and has a negative impact on iron and zinc bioavailability in plant-based human diets. Moong bean is a rich source of iron so that it is used as baby food (Misiak *et al*., 2017). In addition, dynamic changes in metabolites during the sprouting process and related biological activities, including antioxidant and health promoting effects, are evidence of its use as a medicine.

1. Prevents heart ailments.
2. Help in to minimize the cholesterol.
3. Provide protein supplement for the children and old age people.

MATERIALS AND METHODS

Sample preparation

Moong bean samples from the crops were picked and threshed to remove the peels. The seed samples were kept at a temperature of 25°C and a relative humidity of approximately 85% in an air-conditioned laboratory overnight to attain temperature equilibrium of the seeds before measurement. The samples of these crop were analyzed for their proximate composition. All the work pertaining to this investigation was done in the Laboratories of NIRS in the Directorate of Research, C.S. Azad University of Agriculture and Technology, Kanpur (U.P.). The grain seeds were collected from legume section of Azad university of Agriculture and Technology, Kanpur. After cleaning and grinding the seed samples were determined using NIRS-2500. For analysis we should used three replication for each sample and used the average value for the spectrum calibration. We take 130 gm samples to analyze the sample it works from 400-2500 nm wavelength.

It is an instrument through which Near Infrared (NIR) analysis a spectroscopic technique that makes use of the naturally occurring electromagnetic spectrum. This works in the region of the spectrum defined by wavelengths between 700 nm and 2500 nm.

It is suited for quantitative determination of the major constituents in most types of food and agricultural products. Principle Near Infrared light is directed into a sample.

- The light is modified according to the composition of the sample and this modified light is detected.
- The spectral modifications are converted to information regarding the composition of the sample
- These conversion algorithms are called “calibrations”.

Transmission and reflectance

Infrared spectrum was got by using infrared light which passes through the sample by follow the transmission. The light was reflected by the sample and follow the absorption properties which can be extracted from the reflectance. This spectroscopy can be analyzed the sample by transmittance is good for measuring cheese to obtain a representative measurement throughout the sample. Oplinger *et al*. (1990) for homogenous samples such as milk powder, reflectance is ideal.

For both methods, the NIR wavelength range is an important consideration (Fig 1). For instance, a Short Wave NIR range (850-1050 nm) gives good sample penetration with NIR transmission.

RESULTS AND DISCUSSION

The biochemical constituents are unevenly distributed in the different parts of the grain. The major chemical components of moong bean dry matter are amino acids, while micronutrients include minerals and vitamins. The minimum and maximum reported values along with calculated average value of each chemical constituent are given for each parameter in the respective tables.

The crude protein content of mung bean shows large variations, which may be due to differences between varieties (Sahay and Singh, 2006).

Proximate composition and amino acid profile Proximate composition plays an important role in determining the overall nutritional quality, as well as the potential use of a food commodity. As shown in Table 1, moong bean were found which are similar to the previous findings obtained.

• In amino acid profile histidine amino acid was varied from 8.41% to 4.98% with a mean value of 6.43. In arginine amino acid was varied from 3.27% to 1.77% with a mean value of 2.05. In valine the ranged was varied from 7.64% to 3.21% with a mean value of 4.92.

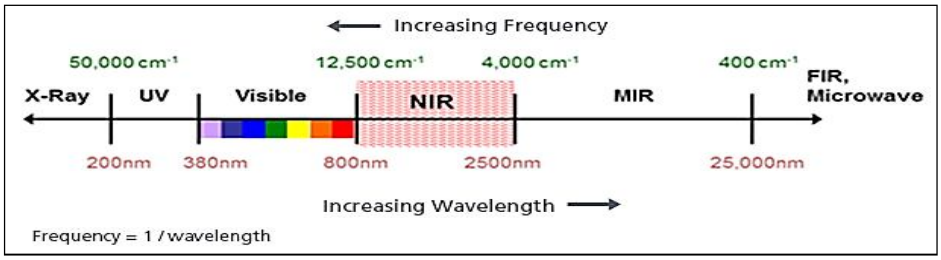

Fig 1: NIR wavelength analysis.

Table 1: To study the amino acid profile of the different variety of the moong bean.

Sample number	Histidine (%)	Arginine (%)	Valine (%)	Phenylalanine (%)	Isoleucine (%)	Methionine (%)	Leucine (%)	Tryptophan (%)	Lysine (%)	Threonine (%)
2241 Shweta	4.98	1.77	6.59	8.85	10.12	0.75	8.75	0.93	2.28	4.31
K-851	6.58	2.66	5.23	12.66	10.22	0.23	6.89	0.77	2.21	3.97
2195 Swati	7.05	2.91	4.73	13.00	10.17	0.44	6.65	0.71	2.17	4.16
T-44	6.11	2.29	5.12	9.81	9.76	0.25	8.13	0.78	2.21	4.44
KM-2328	8.02	3.01	3.95	14.73	10.51	0.93	5.95	0.53	2.09	4.49
KM-2325	1.78	1.94	7.64	10.89	8.44	1.29	5.16	1.30	2.95	0.79
KM-2326	6.54	2.25	4.99	12.51	10.31	0.16	6.97	0.68	2.23	4.08
KM-2327	5.90	1.88	5.30	11.86	10.35	0.04	7.13	0.72	2.30	4.02
KM-2329	6.40	2.36	4.96	11.76	10.08	0.09	7.14	0.72	2.24	4.07
KM-2330	6.33	2.20	5.09	12.18	10.22	0.11	7.06	0.71	2.26	3.99
KM-2331	7.22	2.89	4.50	13.78	10.16	0.63	6.28	0.67	2.19	3.94
KM-2332	7.87	3.22	3.91	14.40	10.12	0.98	5.92	0.57	2.13	4.29
KM-2333	6.75	2.45	4.85	12.89	10.19	0.37	6.77	0.69	2.22	4.01
KM-2334	7.72	3.00	4.02	14.20	10.18	0.86	6.06	0.55	2.15	4.32
KM-2335	5.84	2.52	5.02	10.07	9.59	0.12	7.65	0.83	2.29	3.93
KM-2336	7.44	3.08	4.43	13.31	10.11	0.60	6.51	0.66	2.14	4.22
KM-2337	8.41	3.15	3.46	14.96	10.41	1.14	5.75	0.43	2.07	4.83
KM-2338	5.20	1.90	5.75	10.82	10.01	0.22	7.40	0.83	2.36	3.80
KM-2339	6.28	2.16	5.05	12.36	10.33	0.19	6.92	0.68	2.26	4.24
KM-2340	6.11	2.57	5.15	12.58	9.87	0.40	6.49	0.75	2.32	3.70
KM-2341	5.79	2.23	5.05	10.84	9.71	0.02	7.29	0.75	2.33	3.89
KM-2342	7.48	2.53	4.00	12.86	10.27	0.55	6.70	0.53	2.14	4.52
KM-2343	5.80	2.00	5.39	11.76	10.24	0.00	7.15	0.76	2.31	3.93
KM-2344	6.23	2.37	5.28	12.44	10.16	0.17	6.89	0.75	2.27	3.89
KM-2345	7.69	3.27	4.14	14.48	10.08	0.93	5.87	0.68	2.16	3.56
KM-2346	7.03	2.57	4.54	12.83	10.22	0.40	6.77	0.64	2.19	4.21
Mean	6.43	2.05	4.92	12.41	9.67	0.46	6.77	0.73	2.24	3.98

• The phenylalanine was varied from 14.96% to 8.00% with a mean value of 12.41. The isoleucine was varied from 10.35% to 8.44% with a mean value of 9.67. The methionine was varied from 1.29% to 0.11% with a mean value of 0.46. The leusine was varied from 5.16% to 1.30% with a mean value of 6.71. The tryptophan was varied from 0.43% to 2.95% with a mean value of 0.73. The lysine was varied from 2.95% to 2.07% with a mean value of 2.24. The threonine was varied from 4.52% to 3.79% with a mean value of 3.98. The highest values of amino acids in moong bean are reported for phenylalanine (14.96%) and isoleucine (10.41%).

• Sekhonetal (1980) reported a correlation of protein in moong bean with lysine and threonine, whereas a positive correlation of the amino acids it has been found, that an increase in the methionine content in mung bean is always accompanied by a decrease of the total protein content in moong bean. Isoleucine, leucine, phenylalanine, tyrosine and valine were found to be higher in the globulin fraction of the protein, whereas lysine, methionine, threonine and tryptophan were higher in the albumin fraction (Bhatty, 1982).

• Mubarak (2005) reported a chemical score of the presence of 76% amino acids, which was calculated using the FAO/WHO (1973) reference pattern, whereas Tsou *et al.* (1979) reported that the chemical score of moong bean proteins is about 32% of egg protein (FAO, 1970) or 40% of the FAO provisional pattern. Moong bean grains are adequate in most essential amino acids with the exception of the sulfur-containing amino acids methionine and cystine, which can be compensated by consuming moong bean in combination with cereals. Cereals are rich in sulfur-containing amino acids and the deûciency of lysine in cereals gets compensated by its presence in moong bean.

CONCLUSION AND SUMMARY

The histidine amino acid was maximum present in KM-2337 KM-2328 and minimum in KM-2340, KM-2343, T-44. The arginine amino acid was maximum in KM-2337, KM-2332 and minimum in 2241-shweta, KM-2327. The valine was maximum present in 2241-Shweta, KM-2325 and minimum in KM-2332, KM-2337. The phenylalanine was maximum present in KM-2328, KM-2334 and minimum in 2241-Shweta, T-44 . The isoleucine was maximum present in KM-2328, KM-2337 and minimum in KM-2325, KM-2335. The methionine was maximum present in KM-2325, KM-2337 and minimum was present in KM-2330 and KM-2335. The leucine was maximally present in 2241-Shweta,T-44 and

minimum present in KM-2332, KM-2325. The tryptophan was highest in KM-2225, 2241-Shweta and minimum present in KM-2334, KM-2328. The lysine was maximally present in KM-2325, KM-2338 and minimum present in KM-2326, KM-2332. The threonine was maximally present in KM-2328, T-44 and minimally present in KM-2325, KM-2335.

• On the basis of evaluation the nutritional value of moong bean studied by date. In the research differences are present which is due to several factors such as place of origin, mainly responsible for difference in the properties. According to him moong bean varieties from the Philippines and India and found that Philippine varieties are higher in protein content (23.4%) and 1000 seed weight (59.1 g) than Indian varieties with an average 19.8% protein and a 1000 grain weight of 27.3 g. On the basis of genetically properties the moong bean has difference in their properties. Physical feature such as color of the grains is a function of genetic makeup of the variety and thus varies among varieties. Difference between the properties of moong bean varieties were also seen. Such as lysine, valine, isoleucine, leucine, phenylalanine and tyrosine than wild varieties in central India.

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