

Original Research Article

Evaluation of Biochemical and Anti-Nutritional Traits of Mungbean Varieties Grown under Rainfed Condition of Chitrakoot, M.P.

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ABSTRACT

The biochemical and anti-nutritional composition of mung bean varieties vary significantly across varieties and environment. The biochemical and anti-nutritional parameters were carried out in eleven varieties during *Kharif* 2013 and 2014, under rainfed condition. The eleven varieties of mung bean viz. Pratap, K-851, PUSA-9531, PDM-54, Pant M5, SML-32, Pant-M1, JM 721, Sona, HUM 6 and Pant-M3 were studied for their biochemical and anti-nutritional parameters. The soluble protein content, carbohydrate content, fat content, ash content, phytic acid content, polyphenol content and calorific value in mung bean were ranged from 13.35 to 18.35 %, 56.92 to 64.49 %, 1.08 to 1.63 %, 2.53 to 3.94 %, 1.22 to 2.20 mg/g, 46.20 to 73.60 mg/100g and 283.74 to 357.96 K Cal/100g, respectively. The results of the present study revealed that mung bean varieties are a potential source of biochemical and important constituent, all of which nutrients are related to boost up human health. It is also helpful to find out suitable variety in this rain fed area in terms of their biochemical and anti-nutritional parameters to reflect quality of mung bean varieties.

Keywords

Soluble protein, carbohydrate, fat, ash, Phytic acid, Polyphenol and calorific value

Introduction

The mungbean (*Vigna radiata* (L.) R. Wilczek) is a legume cultivated for its edible seeds and sprouts across Asia. Pulses have been grown since millennia and have been a vital ingredient of the human diet in India. Even “balanced food” – as defined consisted of pulses, besides cereals, vegetables and fruits, and milk products (1). Mung bean has tremendous nutritional value and is therefore commonly referred to as ‘nutritional powerhouse’. It is an important legume crop of India and major component of many cropping systems, mungbean seeds are rich in

protein and amino acids, thus serve as valuable protein source for human consumption. Pods and sprouts of mungbean are also eaten as vegetable and are a source of vitamin and minerals. The dietary or nutritional value of mungbean has been very popular from the ancient times (2). The consumption of mungbean proteins can fulfil the need of essential amino acid requirement with the exception of the sulphur containing amino acids (3). Pulses have been shown to be rich in proteins. However, their contribution in a diet does depend on its quality as well. The quality of a protein is known to be affected by essential amino acids

composition, amino acid imbalance availability of essential amino acids, digestibility and interference in protein utilization by anti-nutritional factors. It is very useful in Sansarjana Karma after Panchkarma therapy. It is also used in fever, obesity and various diseases due to agnimandya. It is useful in weakness, heat disorders, and skin disorder, to treat heat rash, heat stroke, food poisoning and mumps. Consumption of mungbean sprouts also lower cholesterol level in the blood and provides protection against diabetes. It is also useful in weight control due to its low calories content. One of the benefits of mungbean is that they are nearly sodium free therefore decrease the risk of high blood pressure and good source of vitamin C which is an antioxidant reduce the incidence of cataracts and coronary heart disease(4).Chemically mungbean seeds are mainly composed of protein, fat, fibre, ash, carbohydrate(5). However, depending upon varieties and environment, these constituent varies significantly. Thus the present study was planned to find out suitable variety in this rain fed area in terms of their biochemical and anti-nutritional parameters which imitate quality of mungbean varieties.

Materials and Methods

Eleven varieties of mungbean were collected from Indian Institute of Pulses Research, Kalyanpur, Kanpur (U. P.), to analyze various biochemicals and anti-nutritional parameters. The experiments were carried out in the Biochemistry and Biotechnology Laboratory, Department of Crop Sciences, Faculty of Agriculture, M.G.C.G.V.V Chitrakoot during 2013-14 and 2014-15, respectively. The mungbean seed samples were analysed for various biochemical and anti-nutritional parameter *viz.* soluble protein (6), Total carbohydrate determined by Anthrone method (7), fat content determined by the Soxhlet extraction procedure using

petroleum ether of B.P. 60-80°C (8), ash content (8), Phytic acid (9) Poly phenol (10) calorific value of seed was evaluated using the Bomb calorimeter and result were analysed by SPAR 2.0, 2005 statistical Program.

Results and Discussion

The biochemical parameters *viz* soluble protein, carbohydrate, fat, ash content and calorific value and anti-nutritional parameters *viz.* phytic acid and polyphenol of different mungbean varieties are given in table. The overall mean of soluble protein are 16.21%, 16.28% and 16.25% during 2013-14, 2014-15 and pooled mean, respectively. The pooled mean of soluble protein per cent revealed that the maximum soluble protein per cent was recorded in SML-32(18.15%) which was at par with Pant-M1 (18.13%) and the minimum soluble protein per cent in the variety Pant M5 (13.35%). The results showed to close agreement with Paul (11) reported that in their study on proximate composition on green gram the protein content 21.57 g/100g. While Lal (12) reported the soluble protein ranged from 20,014.3±2012.4 mg/kg in control condition with effect of Light and Fungal Elicitor in seedling.

It was observed that the varieties highly significantly varied in respect of total carbohydrate content, the overall mean of total carbohydrate content were recorded 61.06%, 61.26% and 61.16% during 2013-14, 2014-15 and pooled mean, respectively The pooled data of carbohydrate per cent revealed that the maximum carbohydrate per cent was recorded in Pant-M1 (64.69%) followed by HUM 6 (63.57%),PUSA-9531(63.23%) and Sona (63.08%) and the minimum carbohydrate per cent in the variety SML-32 (56.92%). These findings are found in accordance with the result of Mubarak (13) reported the total carbohydrate content to be

62.3 per cent in his study on effect of some domestic and traditional process on nutritional composition in mungbean seeds, Moongngarm (14) reported the total carbohydrate content to be 61.39 ± 2.74 in their investigation on chemical composition of starchy foods. Paul (11) and Habbibullah *et al.*, (15) reported total carbohydrate as 60.35 per cent and 54.9-58.9 per cent respectively in mung bean seeds. The overall mean of fat content are 1.25%, 1.28% and 1.26% during 2013-14, 2014-15 and pooled mean, respectively. It was estimated that fat content pooled mean of two years data were ranged from 1.08 to 1.63 per cent. The maximum fat content was recorded in variety PUSA-9531 (1.63%) followed by Sona (1.52%), K-851 (1.53%) and lowest value were recorded in Pratap (1.08%) which was at par with Pant M5, SML 32, PDM-54 and HUM-6. The fat content showed highly significant among all the varieties studied in both years. The results were in agreement with the finding of Mubarak (13) reported fat percent 1.85 and Moongngarm (14) observed fat content was 1.55 ± 0.06 and 1.79 ± 0.02 fat percent was reported by Massod (16). It was evident from the table that ash content pooled mean of two years data ranged from 2.53 to 3.94 per cent. The overall mean of ash was 3.46%, 3.58% and 3.52% during 2013-14, 2014-15 and pooled mean, respectively. The pooled data of ash content revealed that the maximum ash content was recorded in SML-32(3.94%) which was at par with variety Sona (3.90), Pratap (3.87), HUM-6(3.80) JM-721 (3.69) and the minimum ash content in the variety Pant-M5 (2.53). These finding corroborated with the earlier findings of Bhaty (17) reported ash percent 4.63 per cent in their study on nutritional value of mungbean as effected by cooking and supplementation and Banusha and vananharuba (18) found ash per cent

3.74 ± 0.09 and Paul. (11) were observed the variability in Ash 3.85 ± 0.05 . While Habbibullah (15) reported that ash content ranged from 3.0 to 3.9%. The average phytic acid content between two years results were found in Pratap (1.22 mg/g) to Sona (2.20 mg/g) among mungbean varieties. The pooled data of phytic acid content revealed that the maximum phytic acid content was recorded in Sona (2.20 mg/g) followed by K-851 (1.84 mg/g), SML-32(1.81 mg/g) and JM-721 (1.77 mg/g), the minimum phytic acid content in the variety Pratap (1.22 mg/g). The overall mean of phytic acid are 1.61 mg/g, 1.66 mg/g and 1.64 mg/g during 2013-14, 2014-15 and pooled mean, respectively. Similar finding is reported by Tajoddin (19) in their study on *in vivo* reduction of phytic acid content in mungbean cultivars during germination; they found that phytate content ranged from 0.61 to 0.99 on dry weight basis which is consisted with the range of 0.40% to 2.06% reported in legume. It was evident from the table that polyphenol content pooled mean of two years data ranged from 46.20 to 73.60 mg/100g. The overall mean of polyphenol content were 58.77, 58.98 and 58.86 (mg/100g) during 2013-14, 2014-15 and pooled mean, respectively. The pooled data of polyphenol content revealed that the maximum polyphenol content was recorded in Pratap (73.60 mg/100g) followed by JM-721 (64.36 mg/100g), PDM-54(63.23 mg/100g) and K-851(63.01 mg/100g) the minimum polyphenol content in the variety Sona (46.20 mg/100g). The result were consonance with Kim *et al.*, (20)) with the range of polyphenol was recorded 97.8 ± 1.3 to 101.1 ± 1.0 , in their study on total polyphenol of different extract in mungbean seeds and sprouts. The overall mean of calorific value are 324.16, 323.06 and 323.61 Kcal/100g during 2013-14, 2014-15 and pooled mean, respectively.

Table.1 Mean performance of biochemical and anti-nutritional parameters among eleven varieties of mung bean

Varieties	Soluble protein (%)	Carbohydrate (%)	Fat (%)	Ash (%)	Phytic acid mg/g	Poly phenol mg/100g	Calorific value KCal / 100 g
	Pooled Mean	Pooled Mean	Pooled Mean	Pooled Mean	Pooled Mean	Pooled Mean	Pooled Mean
Pratap	14.84	58.50	1.08	3.87	1.22	73.60	335.23
K-851	13.87	59.73	1.53	3.49	1.84	63.01	326.68
PUSA-9531	17.84	63.17	1.63	3.59	1.54	61.00	289.91
PDM-54	14.76	61.74	1.10	3.49	1.47	63.23	319.16
Pant-M5	13.35	60.98	1.09	2.53	1.43	61.42	283.74
SML-32	18.15	56.92	1.10	3.94	1.81	46.41	288.92
Pant-M1	18.13	64.49	1.24	3.07	1.61	60.57	329.18
JM 721	17.32	58.03	1.24	3.69	1.77	64.36	357.96
Sona	16.01	63.04	1.52	3.90	2.20	46.20	356.14
HUM-6	17.45	63.65	1.08	3.80	1.57	47.90	319.19
Pant-M3	17.00	62.52	1.28	3.39	1.53	59.73	353.59
Max.	18.15	64.49	1.63	3.94	2.20	73.60	357.96
Min	13.35	56.92	1.08	2.53	1.22	46.20	283.74
Grand Mean	16.25	61.16	1.26	3.52	1.64	58.86	323.61
SE at M±	0.08	0.17	0.02	0.98	0.03	0.18	0.71
CD at 5%	0.23	0.50	0.07	0.29	0.09	0.54	2.10

The pooled data of calorific value revealed that the maximum calorific value was recorded in JM 721(357.96 Kcal/100g) which was at par with Sona (356.14 Kcal/100g) followed by Pant-M3 (353.59 Kcal/100g), Pratap (335.23 Kcal/100g) and Pant-M1 (329.18 Kcal/100g) the minimum calorific value in the variety Pant-M5 (283.74 Kcal/100g).

The finding was in accordance with the respect of calorific value viz. Massod (16) was found calorific value which was 333.0±0.34 and Blessing and Gregoy (21) reported energy value (calorific value) 336.65±0.00 in their study on effect of processing on the proximate composition of the dehulled and un dehulled mungbean flour. In conclusion, the result of present study

demonstrate that variety namely SML-32 are found suitable in respect of maximum parameters studied under rainfed condition.

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References

- Ayachit S M 2002. Kashyapiyakrishisukti (A Treatise on Agriculture by Kashyapa). Agri-History Bulletin No. 4. Asian Agri-History Foundation, Secunderabad, 158.
- Kumar B S Prakash M and Goulakrishan J 2011.Genetic role biochemical, biophysical

- and morpho-physiological character in enhancing the seed yield mungbean (*Vigna radiata* (L.) Wilczek). *Global Journal of Plant Ecophysiology*, 1(1):14-25.
- Khalil A A 2006. Nutritional improvement of Egyptian breed of mungbean by probiotic Lactobacilli. *Afr. J. Biotech*, 5: 206-212.
- Chavan S O and Patil Y R 2013. Ancient and modern review of nutritional value and therapeutical benefits of Mudga (Green-Gram). *Journal of Biological and scientific Opinion*, 1 (2):101-104.
- Mandape R C Fattepurkar S C Ghodeswar R C Kolhe C D and Bedse T J 2003. Evolution of proximate composition and limiting amino acids in grain of green gram. *Annals Pl. Physiol*, 17(1):70-74.
- Lowry O H Rosebrough N J Farr A L and Randall R J 1951. Protein measurement with folin phenol reagent. *Journal of Biological Chemistry*. 193-c 265.
- Hedge J E and Hofreiter B T 1962. In: Carbohydrate chemistry 17 (eds Whistler RL and Be Miller J N) Academic press New York.
- A. O. A. C. (1970). Official Methods of Analysis of the Association of Official Analytical Chemists, Washington D.C., 11th edition.
- Wheeler E L and Ferrel P E 1971. A method for phytic acid determination in wheat and wheat fractions. *Cereal Chemistry*, 48: 312-320.
- Malick C P and Singh M B 1980. In: Plant enzymology and histoenzymology, Kalyani Publisher, New Delhi, :286.
- Paul T Mozumder N H M Sayed M A and Akhtaruzzaman A 2011. Proximate composition, mineral content and determination of protease activity from green gram (*Vigna radiata* L. wilczek). *Bangladesh Research Publication Journal*, 5(3):207-213.
- Lal A Warber S Kirakosyan A Kaufman P B and Duke J A 2003. Upregulation of isoflavonoids and soluble proteins in edible legumes by light and fungal elicitor treatments. *The journal of alternative and complementary medicine*, 9 (3): 371-378.
- Mubarak A E 2005. Nutritional composition and antinutritional factors of mung bean seeds (*Phaseolus aureus*) as affected by some home traditional processes. *Food Chemistry*, 89: 489-495.
- Moongngarm A 2013. Chemical compositions and resistant starch content in starchy foods. *American Journal of Agricultural and Biological Sciences*, 8 (2): 107-113.
- Habibullah Abbas M and Shah H U 2007. Proximate and mineral composition of mung bean *Sarhad J. Agric*, 23 (2):463-466.
- Masood T Shah H U and Zeb A 2014. Effect of sprouting time on proximate composition and ascorbic acid level of mung bean (*vigna radiate* L.) and chickpea (*cicer arietinum* L.) seeds. *The Journal of animal & plant Sciences*, 24(3): 850-859.
- Bhatty N Gilani A H and Nagra S A 2014. Nutritional value of mung bean (*Vigna radiata*) as effected by cooking and supplementation. *Archivos Latinoamericanos de Nutrición*, 50 (4):1-9.
- Banusha S and Vasantharuba S 2013. Effect of malting on nutritional contents of finger millet and mungbean. *American-Eurasian J. Agric. & Environ. Sci*, 13 (12): 1642-1646.
- Tajoddin M D Shinde M and Lalitha J 2011. *In vivo* reduction the phytic acid content of mungbean (*Phaseolus aureus* L) cultivars during germination. *American- Eurasian J. Agric. & Environ. Sci*, 10(1): 127-132.
- Kim D K Jeong S C Gorinstein S and Chon S U 2012. Total polyphenols, antioxidant and antiproliferative activities of different extracts in mungbean seeds and sprouts. *Plant Foods Hum Nutr*, 67:71-75.
- Blessing I A and Gregory I O 2010. Effect of processing on the proximate composition of the dehulled and undehulled mungbean (*Vigna radiata* (L.) Wilczek) flours. *Pakistan Journal of Nutrition*, 9 (10): 1006-1016.