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Biochemical and anti-nutritional parameters studies among mungbean varieties grown under rainfed condition

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Abstract
The biochemical and anti-nutritional composition of mungbean 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 mungbean *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 mungbean 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 mungbean 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 mungbean 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 (Ayachit 2002). 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 (Kumar *et al.* 2011). The consumption of mungbean proteins can fulfil the need of essential amino acid requirement with the exception of the sulphur containing amino acids (Khalil 2006). 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 (Chavan & Patil 2003). Chemically mungbean seeds are mainly composed of protein, fat, fibre, ash, carbohydrate (Mandape *et al.* 2003). 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 (Lowry *et al.* 1951), total carbohydrate determined by Anthrone method (Hedge & Hofreiter 1962), fat content determined by the Soxhlet extraction procedure using petroleum ether of B.P. 60-80$^{o}_{C}$ (A.O.A.C. 1970), ash content (A.O.A.C. 1970), Phytic acid (Wheeler & Ferrel 1971) Poly phenol (Malick & Singh 1980) 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 *et al.* (2011) reported that in their study on proximate composition on green gram the protein content 21.57 g/100g. While Lal *et al.* (2003) 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 (2005) 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 (2013) reported the total carbohydrate content to be 61.39±2.74 in their investigation on chemical composition of starchy foods. Paul *et al.* (2011) and Habbibullah *et al.* (2007) reported total carbohydrate as 60.35% and 54.9-58.9%, 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%. 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 (2005) reported fat percent 1.85 and Moongngarm (2013) observed fat content was 1.55±0.06 and 1.79±0.02 fat percent was reported by Massod *et al.* (2014). It was evident from the table that ash content pooled mean of two years data ranged from 2.53 to 3.94%. 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 Bhatty *et al.* (2014) reported ash percent 4.63 per cent in their study on nutritional value of mungbean as effected by cooking and supplementation and Banusha & Vasantharuba (2013) found ash per cent 3.74±0.09 and Paul *et al.* (2011) were observed the variability in Ash 3.85±0.05 . While Habibullah *et al.* (2007) 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 *et al.* (2011) 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.* (2012)) 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. 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 *et al.* (2014) was found calorific valve which was 333.0±0.34 and Blessing & Gregoy (2010) 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.

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

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

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