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PROXIMATE AND MINERAL COMPOSITION OF MUNG BEAN

Habibullah*, Muhammad Abbas** and Hamid Ullah Shah*

ABSTRACT

Two local varieties, *M1* and *NM-92*, of mung bean were analyzed for their proximate and mineral composition using standard methods. In the proximate composition, the moisture, ash, protein, fat, fiber and carbohydrate contents of M1 were found to be 9.4%, 3.9%, 23.7%, 1.9%, 6.8% and 54.9%, respectively while in NM-92 this composition was found to be 8.3%, 3.0%, 20.8%, 2.2%, 7.1% and 58.9%, respectively. The data revealed that M1 had relatively higher values of moisture, ash and protein while NM-92 was found to be a bit superior in fat, fiber and carbohydrates content. The food energy value of M1 (340 kcal/100g) and NM-92 (347 kcal/100g) was almost equal. The results of mineral analysis showed that M1 contained relatively higher content of Na (22 mg/100g), K (1443 mg/100g), Ca (216 mg/100g), Mg (204 mg/100g), P (374 mg/100g), Fe (11.34 mg/100g), Zn (1.88 mg/100g) as compared to NM-92. However, NM-92 was rich in Cu (1.92 mg/100g), Mn (1.49 mg/100g) and Pb (2.64 mg/100g) in comparison to M1. It was also observed that the results of this study were in good comparison with the findings of other researchers. It was concluded that both varieties could play a significant nutritional role in human health.

INTRODUCTION

Food legumes like beans, peas, lentils, and ground nuts belong to the family "*Leguminosae*", also called "*Fabaceae*". They are mainly grown for their edible seeds, and thus also named as grain legumes. They play an important role in human nutrition because they are rich source of protein, calories, certain minerals and vitamins (Deshpande, 1992). The dehulled seeds of legumes used as human food are known as Pulses. Since animal proteins are more expensive and scarce than protein from plant sources, so pulses are commonly used by vegetarians as a substitute for meat. The major pulses grown in Pakistan are: Gram (chickpea), Field pea (Mutter) and Lentil (Masur) as winter legumes; and Mung (Green-gram), Pigeon pea (Red-gram), Arhar and Mash (Black-gram) as summer legumes.

Mung bean (*Vigna radiata*), also called green gram is a tropical legume, widely grown in Asia, particularly in Thailand, India and Pakistan. In the North West Frontier Province (NWFP) of Pakistan, it is mainly grown in Malakand, Kohat, Bannu, Karak and D.I.Khan districts.

Mung bean is primarily used for food purpose. It is a rich source of protein and amino acid especially lysine and thus can supplement cereal-based human diets. It is low in saturated fat and sodium, and very low in cholesterol. It is also a good source of thiamin, niacin, vitamin B_6, pantothenic acid, iron, magnesium, phosphorus and potassium, and a very good source of dietary fiber, vitamin C, vitamin K, riboflavin, folate, copper and manganese (Khalil and khan, 1994; Mohan and Janardhanan, 1993).

The whole or spit seed is usually cooked as dhal or boiled with rice. The seeds may be milled and ground into flour for making noodles, breads and soups. The spiced roasted seeds of mung bean are sometimes eaten as snake food. In rural areas, the immature green pods are also used as vegetable. Mung bean stalks, leaves and husks constitute a significant proportion of livestock feed. After picking of the pods, the whole plant may be ploughed in the soil to improve fertility.

The proximate and mineral composition of mung bean has been studied by a number of workers. Since the composition is influenced by genetic and environmental factors. It is, therefore, important to evaluate the local grown cultivars in order to assess their nutritional quality. The present work was undertaken to determine the proximate and mineral composition of the two local varieties of mung bean, M1 and NM-92. It is anticipated that this work will provide useful information for researchers in food and nutrition.

MATERIALS AND METHODS

Two local varieties, M1 and NM-92, of mung bean were analyzed for their proximate and mineral composition. All the work pertaining to this investigation was done in the laboratories of Agricultural Chemistry department, NWFP Agricultural University, Peshawar, Pakistan during 2004-2005.

PROXIMATE ANALYSIS

The dried powdered sample of the two varieties of

* Department of Agricultural chemistry, NWFP Agricultural University, Peshawar. Pakistan.
**Department of Human Nutrition, NWFP, Agricultural University, Peshawar. Pakistan.

mung bean were homogenized and stored in deep freezer (-18^{o}C) and used for analysis. Moisture, crude protein, crude fat, crude fiber and ash were determined according to the standard methods of A.O.A.C (1990). All the analysis was performed in triplicate.

Nitrogen free extract (NFE) was determined by difference and the food energy was calculated from the proximate analysis data by multiplying protein, fat and carbohydrates by 4.1, 9.3 and 4.1, respectively.

Mineral Analysis

The dried powdered samples were first digested with nitric acid and perchloric acid and then the aliquots were used for the determination of sodium, potassium, calcium, magnesium, phosphorus, iron, copper, zinc, lead and manganese content. Phosphorous was determined by spectrophotometer while sodium and potassium were determined by flame photometer (Khalil and Mannan, 1990). Iron, copper, zinc, manganese, calcium, lead and magnesium by atomic absorption spectrophotometer (A.O.A.C., 1990).

Preparation of Acid Digest

For the analysis of minerals, 1 g powdered sample was taken in a 100 ml digestion flask. 10 ml of nitric acid (HNO_3) was added to it and the flask was placed in dark overnight. On next day, 5 ml of the perchloric acid ($HCLO_4$) was added to it. The mixture was then placed on a hot plate at 50 °C for 15 minutes and then the temperature was raised slowly up to 200 °C. Heating was continued till the white dense fumes of perchloric acid were disappeared. After digestion, the contents were cooled and filtered through Wattman filter paper (# 2). Then it was transferred to a 50 ml volumetric flask and diluted with deionized water up to the mark.

INSTRUMENTS AND REAGENTS

Atomic Absorption spectrophotometer

A beck-mann Atomic Absorption Spectrophotometer model 1233 equipped with hollow cathode lamp was used for the analysis of calcium, magnesium, iron, copper, zinc, manganese and lead. The instrumental parameters were adjusted according to manufacturer's instructions, the hollow cathode lamps for selected minerals with wavelengths as Ca 0.7nm, Mg 0.7nm, Fe 0.2nm, Cu 0.7nm, Zn 0.7nm, Mn 0.2nm, Pb 0.7nm, were used as a light source. The lamp currents were set at 30 mA for Fe, 10mA for Pb and Ca, 20mA for Cu, Mn and Zn and 6mA for Mg. The gas used was acetylene with 20 Pa pressure and air 45 Pa Pressure. The instrument was calibrated with standard solutions and the samples were introduced to it by means of capillary tube. The concentration reading appeared on the display unit was noted.

UV Spectrophotometer and Flame photometer

Phosphorous was analyzed by UV spectrophotometer model (Optima SP3000+) employing the ascorbic acid-ammonium molybdate blue color method at 880nm (Jackson, 1962). Sodium and Potassium were determined by flame photometer (Jenway PFP7). All the reagents used were of analytical grade, glass wares were acid washed and the water was distilled.

RESULTS AND DISCUSSION

Proximate Analysis

The results of proximate composition of two locally produced varieties of mung bean, M1 and NM-92 are presented in Table I. It was found that moisture content of the varieties ranged from 8.3 - 9.4 %, ash 3.0 - 3.9 %, protein content 20.8 - 23.7 %, crude fat 1.9 - 2.2 %, crude fiber 6.8 - 7.1 % and carbohydrates 54.9 - 58.9 %. The caloric value furnished by these varieties ranged from 340 - 347 kcal $100g^{-1}$.

Table I ***Proximate composition of the two varieties of mung bean***

Name of varieties	Moisture %	Ash %	Protein %	Fat %	Fiber %	NFE %	Energy kcal/100g
M1	9.4	3.9	23.7	1.9	6.8	54.9	340
NM-92	8.3	3.0	20.8	2.2	7.1	58.9	347

When compared with other commonly consumed pulses such as black gram, pigeon pea and chick pea, the crude protein contents of M1 and NM-92 investigated in the present study appear to be closer to their levels (Gupta and Wagle, 1978; Jambunathan and Singh, 1981; Sotelo, et al. 1987). The crude fat of both varieties are higher when compared with the other Vigna species such as V. calaratus, V. sublobata and V. glabrescens (Rajaram and Janardhanan, 1992). The crude fiber content of NM-92 is found to be higher when compared with the other commonly cultivated pulses such as chick pea, horse gram, red gram and black gram (Premakumare et al., 1984). The ash content of M1 and NM-92 is more or less equal to that of V. unguiculata (Johnson and Raymond, 1964; Kachare *et al*., 1988) and Phaseolus vulgaris (Tezoto and Sgarbieri, 1990). The contents of the total carbohydrate and caloric values of the samples investigated in this study seem to be more or less equal to the most common pulses.

A slight difference was also observed between the macronutrient contents and caloric value of the two varieties. M1 had higher content of protein (23.7%) while NM-92 had higher fat (2.2%), carbohydrate (58.9%) and energy (347 kcal.) values. However, due to this difference they cannot be prioritized. Since both M1 and NM-92 have approximately equal values as compared to other studies, so they can be used for food purpose.

Minerals Analysis

The results of mineral analysis of both varieties are presented in Table II. Both varieties contained appreciable quantities of minerals. It was found that M1 had relatively higher concentration of Na (22 mg $100g^{-1}$), K (1443 mg $100g^{-1}$), Ca (216 mg $100g^{-1}$), Mg (204 mg 100g), P (374 mg 100g), Fe (11.34 mg $100g^{-1}$) Zn (1.88 mg $100g^{-1}$) as compared to the concentration of these minerals in NM-92. While NM-92 had somewhat higher values of Cu (1.92 mg $100g^{-1}$), Mn (1.49 mg $100g^{-1}$) and Pb (2.64 mg $100g^{-1}$).

Table II ***Mineral composition of the two varieties of mung bean***

Name of Variety	Mineral content (mg.$100g^{-1}$)									
	Na	K	Ca	Mg	P	Fe	Cu	Zn	Mn	Pb
M1	22	1443	216	204	374	11.34	1.27	1.88	1.23	2.12
NM-92	18	1298	122	174	321	9.10	1.92	1.54	1.49	2.64

The mineral contents of both varieties were in good comparison with that of USDA (2005) and Mohan and Janardhanan (1993). The data on mineral analysis revealed that the investigated varieties appear to be a rich source of potassium, magnesium, iron, copper, manganese, and lead. Both varieties can effectively contribute towards the daily recommended dietary allowances (RDA, 1980) for all groups. It was also observed that generally mung bean is used for protein source but it can fulfill the micro nutrients deficiency as well.

CONCLUSION

It was concluded that both varieties MI and NM-92 contain an appreciable amount of macro- and micro-nutrients which could be included in the daily dietary pattern of every household. This will help to minimize the risk of nutrients deficiency in the consumers. Moreover, mung bean is palatable, less expensive and abundantly available in the market.

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