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Biochemical Investigation on Certain Promising Genotypes of Mungbean (*Vigna radiata* (L.) R. Wilczek)

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Abstract

Numerous studies have been conducted on the mung bean (Vigna radiata (L.) R. Wilczek), and there are a variety of data points accessible. To evaluate the crop's potential as food, information on the entire mung bean grains' physical, processing, and nutritional attributes was gathered. A study of the biochemical analysis on various potential genotypes of mung bean [Vigna radiata (L)] was undertaken in the laboratory of Agricultural Biochemistry and farm trial was conducted during the rabi season of 2018-19 at pulse research farm kalyanpur, C.S.A University of Agriculture and Technology, Kanpur. In mung bean varieties according to genotypes, the nutritional quality of flour and characteristics such as the overall range of variability of test weight, grain yield quintal/ha, dhal percent, percentages of husk, broken dhal, percentage loss in processing, protein, content, were found to be 26.99-60.84g, 7-13 q ha-1, 64.29-76.92 percent, 5.41-12.83 percent, 7.65-11.91 percent, 4.96-14.15 percent, and 21 The varietal trail genotypes PDM-139, KM-2320, PDM-11, and K-851 were shown to have lower husk percentages, broken percentages, and processing losses in addition to higher levels of protein and other nutritive factors. The research mentioned above demonstrates how we identify the ideal genotype for farmers in terms of nutrition and for industrialists in terms of processing. This is essential for increasing the output of nutritious crops.

Keywords: *Nutritional quality, protein, husk, broken dhal*

Introduction

Mungbean is a member of the Fabaceae family and the Papilionaceae subfamily. In India, mungbean [*Vigna radiata* (L.)] is also known as moong or green gramme. Mungbean is an important Kharif crop in Uttar Pradesh, with 0.49 lakh hectares under cultivation and a total yield of 0.14 lakh tonnes, and a seed need of 8.92 thousand quintals. [DES Normal 2020 (Average: 2014-15 to 2018-19)] Mung (green gramme) is a great source of high-quality protein. It has a protein content of roughly 25%. The protein content in raw mungbean powder was reduced on boiling but increased in sprouted bean powder [6].

Mungbean seed flour is used for making sweets, soups bread, and noodles. Mungbean exhibits hepato-protective activities by increasing the level of α-aminobutyric acid and antioxidants in the liver [1]. This crop is an excellent source of quickly digestible protein, and it plays an essential part in providing India's protein nutritional needs. Research on nutrient digestibility, food processing properties, and bioavailability is needed. Furthermore, the effects of storage and processing on nutrients and food processing properties are required to enable the optimization of processing steps for better mungbean food quality and process efficiency [7]. These processing procedures cause biochemical changes,

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which affect the quantities of nutrients in mungbean, grains. However, the magnitude of the rise or decrease in certain nutrients has not been properly examined, and more research is needed. With this background, doing research on the grains of mungbean cultivars in terms of particular nutritional components as impacted by dhal processing treatment would be quite valuable.

Food is a pre-requisite of nutrition since it contains various nutrients that allow the body to grow and sustain energy, complete important living activities, and offer material for tissue upkeep. For thousands of years, members of the Leguminosae family have been consumed as food. They provide a lot of protein and are simple to digest [4] etc. Studied shows that legume composition, Protein extraction and functional properties. Because of their high Protein content and beneficial nutritional value, legumes (lentil, peas, beans, and soybeans) play an important role in the human diet. Legumes provide energy, dietary fibre, protein, minerals, and vitamins required for human health and endue well-balanced [12] etc. Pulses are known as the poor man's meat and are grown for human consumption all over the world due to their great nutritional value and inexpensive cost, assisting in the prevention of protein malnutrition in underdeveloped nations such as India [13]. India is the world's leading producer, consumer, and importer of pulses. Pulses, on average, contain 20-30% protein, which is 2 to 2.5 times higher than grains [17]. Total food grain production forecasts for 2019-20 are at a new high of 291.95 million tonnes, up 6.74 million tonnes from the previous high of 285.21 million tonnes in 2018-19 [2]. Pulses play an important role in the cropping system as a principal catch cover, green manure, and intercrop. Pulses are an important part of the Indian diet, as they are one of the most effective sources of protein. Pulses should be consumed at a rate of 80 gm per capita per day, according to WHO recommendations.

Material and Methods

To prepare dhal and flour samples, all mungbean samples were oven dried at 70°C overnight, chilled at room temperature, then ground in a household grinder and sieved through a 20 mesh sieve. Petroleum ether (40-60 °C) was used to defeat the samples. The flour was kept at room temperature in screw-capped vials in a desiccator before being utilized for biochemical analysis. The model used a Completely Randomized Design to assess the experiment's observed data (CRD). The modified Micro-Kjeldhal [11] method was used to find nitrogen levels in mungbean cultivars [3]. To calculate the protein content, multiply the nitrogen (percent) by the factor of 6.25.

Dhal was made by soaking 50 gm of seed in 100 milliliters of water for an hour. The water was drained. Seeds were kept moist for 24 hours at room temperature before being dried in an electric oven at 70°C for 4 hours. The grains were broken into dhal and husk using a light roller/hand chakki. The husk was mechanically removed and weighed. To separate the broken dhal from the intact dhal, a one-millimeter sieve was used. The percentages of the complete dhal fraction and the broken dhal fraction were calculated separately. To calculate the percentage loss in processing, the combined weights of dhal and husk were subtracted from the weight of the seed.100 seed from each replication were weighted to determine the extent of grain filling. However, by multiplying ten times the weight of 1000 grains, the result was reported.

Result and Discussion

The following section describes the experimental findings on the processing, physical, and nutritional features of mungbean varieties:

Test weight- Data on mungbean test weight as impacted by different genotypes/varieties are reported in Table -1. The test weight of mungbean cultivars ranged from 26.99 to 60.84 gm. In comparison to the rest of the mungbean varieties, PDM-139 had a much greater test weight while variety KM-2348 had the lowest test weight. KM-2268 had a statistically significant 59.14 g test weight. Similar results were also reported by [14], with the test weight ranging from 41.04-50.9 g. The test weight of 100 seeds ranged from 2.89-4.93 g, according to [8] etc. The test weight was 44.33g, according to [10]. The test weight ranged from 31.93 to 45.84 g, according to [5].

Grain yield(t/ha)- The variability in grain yield from numerous prospective mungbean cultivars revealed that grain yield content ranged from 0.7-1.3 t/ha, as shown in Table 1. In comparison to the rest of the mungbean variations, the variety PDM-139 had the highest grain yield and the mungbean variety KM-2348 had the lowest grain output.

Husk (percentage)- The data in Table -2 on husk percentage showed that husk percentage varied from 5.41 to 12.83 % depending on the mungbean variety. The PDM-139 variety had a lower husk mean value than the others. KM-2364, on the other hand, had a much greater mean value of husk than the other

TABLE 1- *Physical and Nutritional characteristics of mungbean varieties/genotypes*

Sr.no.	Varieties/ genotypes	Test weight (g)	Grain yield (t/ha)	Protein (%)
1	T-44	49.41	1.1	24.71
2	K-851	34.56	0.8	25.82
3	KM-2241	39.20	0.95	23.95
4	KM-2195	43.27	1	22.65
5	KM-2328	45.03	1	24.35
6	PDM-139	60.84	1.3	22.97
7	PDM-11	42.10	1.05	23.03
8	IPM-02-3	54.35	1.2	22.78
9	IPM-205-7	45.05	1.05	23.42
10	KM-2252	37.23	0.90	23.32
11	KM-2260	41.43	1.05	22.55
12	KM-2268	59.14	1.25	21.63
13	KM-2272	50.99	1.15	22.85
14	KM-2280	42.64	1.05	23.17
15	KM-2320	33.70	0.90	23.43
16	KM-2342	37.39	0.90	24.05
17	KM-2348	26.99	0.70	21.62
18	KM-2355	38.03	0.90	24.65
19	KM-2362	45.03	1.05	23.47
20	KM-2364	33.52	0.80	22.35
	Mean	2.99	1.05	23.33
	C.D. at 5 %	2.61	0.60	1.39

TABLE 2- *Milling properties of different cultivars of mungbean*

S.N	Varieties	Dhal %	Husk %	Broken Dhal recovery%	% loss in processing
1	T-44	73.40	7.53	10.65	8.42
2	K-851	70.46	8.32	10.02	11.20
3	KM-2241	73.80	8.65	8.73	8.82
4	KM-2195	74.44	5.54	11.07	8.95
5	KM-2328	75.12	5.85	8.86	10.17
6	PDM-139	73.61	5.41	11.91	9.07
7	PDM-11	76.92	7.13	10.99	4.96
8	IPM-02-3	68.45	5.70	11.70	14.15
9	IPM-205-7	68.98	11.26	10.28	9.48
10	KM-2252	73.16	9.29	10.48	7.16
11	KM-2260	70.82	8.00	10.17	11.01
12	KM-2268	67.17	12.32	8.23	12.28
13	KM-2272	66.82	8.56	10.76	13.86
14	KM-2280	68.35	9.83	11.69	10.13
15	KM-2320	72.89	9.78	7.65	9.68
16	KM-2342	72.93	10.54	8.74	7.79
17	KM-2348	70.98	12.77	10.78	5.47
18	KM-2355	71.61	7.52	7.72	13.15
19	KM-2362	67.66	12.24	8.57	11.53
20	KM-2364	64.29	12.83	9.68	13.20
	Mean	70.97	9.07	9.93	10.02
	C.D. at 5%	4.25	0.55	0.59	0.61

mungbean types.

Broken dhal (percentage)- According to the data in Table 2, broken dhal was recorded from a full dhal sample after passing through a sieve. The broken dhal recovery ranged statistically from 7.65 to 11.91 %, with the highest percentage of broken dhal recorded in variety PDM-139 and the lowest percentage of broken dhal recorded in variety KM-2320.

Percentage loss in processing (in flour)- The percentage loss in dhal processing ranged between 4.96 and 14.15 %. PDM-11 had the lowest percentage loss, while IPM-02-3 had the largest percentage loss, with an overall mean value of 10.02 percent as shown in Table-2.

Protein variability in dhal samples from mungbean variations: The dhal samples from mungbean varieties were pulverized using a grinder. The protein content of these dhal samples was determined, and the results are listed in Table 1. The protein content of several mungbean kinds' dhal ranged from 21.62 to 25.82 percent. The highest protein content in dhal was found in variation K-851, followed by T-44, and the lowest protein level in dhal was found in variation KM-2348. [19] discovered that the crude protein content of various mungbean types ranged from 20.97 to 31.32 percent. [15] reported 24.89% protein in mungbean seeds. Total protein content in mungbean ranged from 20.0 to 24.3% [16]. 23.6 to 30.1% [18]. The results of the present study were comparable to the report of [9] who reported 23.9% of the protein in raw mungbean seeds which was found the protein content ranged from 14.6-32.6% also reported similar values of protein content in different varieties of mungbean.

Conclusion

Based on the results of this study, it can be concluded that K-851 had the highest protein content in dhal out of the 20 genotypes/varieties of mungbean examined. Similar to this, PDM-11 and PDM-139 had the most dhal recovery and the lowest husk recovery, respectively, when compared to the other mungbean genotypes/varieties, whereas KM-2320 had the considerably lowest broken dhal recovery.

PDM-11 also had the lowest percentage loss in processing (in flour). The genotype/variety with the highest test weight and grain yield was PDM-139. In terms of maximum protein content, dhal recovery, and lowest husk percentage, genotype/variety KM-2328 is superior.

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References

[1.] Mohd Ali, Norlaily, Hamidah Mohd Yusof, Kamariah Long, Swee Keong Yeap, Wan Yong Ho, Boon Kee Beh, Soo Peng Koh, Mohd Puad Abdullah, and Noorjahan Banu Alitheen. "Antioxidant and hepatoprotective effect of aqueous extract of germinated and fermented mung bean on ethanol-mediated liver damage." BioMed Research International 2013 (2013).

[2.] Kumar, V., Khan, M. R., & Walia, R. K. (2020). Crop loss estimations due to plant-parasitic nematodes in major crops in India. National Academy Science Letters, 43(5), 409-412.

[3.] Nakai, S., & Groat, G. M. (1970). Detection of Soybean Protein in Cow's Milk by Ultraviolet Differential Spectrophotometry and Gel-Electrophoresis. Canadian Institute of Food Technology Journal, 3(2), 36-38.

[4.] Asif, M., Rooney, L. W., Ali, R., & Riaz, M. N. (2013). Application and opportunities of pulses in food system: a review. Critical reviews in food science and nutrition, 53(11), 1168-1179.

[5.] Kosev, V., & Vasileva, V. (2019). Comparative biological characteristic of white lupin (Lupinus albus L.) varieties. Genetika, 51(1), 275-285.

[6.] Chandrasiri, S. D., Liyanage, R., Vidanarachchi, J. K., Weththasinghe, P., & Jayawardana, B. C. (2016). Does processing have a considerable effect on the nutritional and functional properties of Mung bean (Vigna radiata)?. Procedia food science, 6, 352-355.

[7.] Dahiya, P. K., Linnemann, A. R., Van Boekel, M. A. J. S., Khetarpaul, N., Grewal, R. B., & Nout, M. J. R. (2015). Mung bean: Technological and nutritional potential. Critical reviews in food science and nutrition, 55(5), 670-688.

[8.] Ebert, A. W., Chang, C. H., Yan, M. R., & Yang, R. Y. (2017). Nutritional composition of mungbean and soybean sprouts compared to their adult growth stage. Food Chemistry, 237, 15-22.

[9.] Ganesan, K., & Xu, B. (2018). A critical review on phytochemical profile and health promoting effects of mung bean (Vigna radiata). Food Science and Human Wellness, 7(1), 11-33.

[10.] Ghilotia, Y. K., Meena, R. N., & Lakhapati, S. (2015). Pearlmillet and mungbean intercropping as influenced by various row ratios under custard apple orchard of vindhyan region. The Bioscan, 10(1), 87-91.

[11.] Kjeldahl, J. G. C. T. (1883). Neue methode zur bestimmung des stickstoffs in organischen körpern. Zeitschrift für analytische Chemie, 22(1), 366-382.

[12.] Klupšaitė, D., & Juodeikienė, G. (2015). Legume: Composition, protein extraction and functional properties. A review. Chemical Technology, 66(1), 5-12. DOI: 66.10.5755/ j01.ct. 66.1.12355.

[13.] Maphosa, Y., & Jideani, V. A. (2017). The role of legumes in human nutrition. Functional food-improve health through adequate food, 1, 13.

[14.] Misiak, Kamil, Barbara Gorna, Ewelina Krol, and Roman HOŁUBOWICZ. "Yield and quality of mung Bean (Vigna radiata (l.) R. Wilczek) seeds produced in Poland." Bulletin UASVM Horticulture 74, no. 2 (2017): 149-155.

[15.] Padmashree, A., Semwal, A. D., Khan, M. A., Govindaraj, T., & Sharma, G. K. (2016). Effect of infrared processing on functional, nutritional, antinutritional and rheological properties of mung bean (Phaseolus aereus) seeds. Int J Adv Res, 4, 606-613.

[16.] Shi, Z., Yao, Y., Zhu, Y., & Ren, G. (2016). Nutritional composition and antioxidant activity of twenty mung bean cultivars in China. The Crop Journal, 4(5), 398-406.

[17.] Singh, A. K., & Srivastava, A. (2014). Effect of boron application on seed yield and protein content of mungbean (Vigna radiata L.). Current Advances in Agricultural Sciences (An International Journal), 6(1), 67-68.

[18.] Skylas, D. J., Molloy, M. P., Willows, R. D., Salman, H., Blanchard, C. L., & Quail, K. J. (2018). Effect of processing on Mungbean (Vigna radiata) flour nutritional properties and protein composition. J Agric Sci, 10(11), 16-28.

[19.] Yi-Shen, Z., Shuai, S., & FitzGerald, R. (2018). Mung bean proteins and peptides: Nutritional, functional and bioactive properties. Food & nutrition research, 62.doi: 10.29219/fnr.v62.1290. PMID: 29545737; PMCID: PMC5846210.