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Physico-biochemical evaluation of certain promising varieties of chickpea (*Cicer arietinum* L.) grown along the banks of Ganga River in Uttar Pradesh

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Abstract

An experiment was conducted during *Rabi* season of 2015-16 at Oilseed Research Farm, Kalyanpur, C.S.A University of Agriculture and Technology, Kanpur to study the biochemical aspects of certain promising varieties of chickpea. Results revealed that the dahl protein content varied from 21-24.1 per cent in different varieties of chickpea. Significantly highest protein content in dahl was obtained in chickpea variety KWR-108 compared to rest varieties of chickpea. The recovery in whole grain in different varieties of chickpea ranged from 68-87 per cent. The chickpea variety Pragati recorded maximum dahl recovery of 87 per cent in whole grain followed by Radhey, KPG-59, Avarodhi, RSG-963, KWR-108 and BG-372. Different varieties of chickpea showed variation in husk per cent from 11.42-16.42 per cent. The variety Pragati gave lower mean value for husk than the other varieties of chickpea. Broken dahl recovery ranged from 0.49-5.28 per cent and highest per cent obtained in variety Pusa-256, whereas, the variety Avarodhi recorded least value of broken dahl per cent. The lowest percent loss was obtained in KPG-59 (1.76%), whereas, highest per cent loss was recorded in the chickpea variety Pusa-256 (13.82%). On the basis of above results it can be concluded that KWR-108 possess highest value of protein content in dahl of chickpea variety

Keywords: dhal protein, husk percentage, protein content, broken dhal percentage

Introduction

Role of pulses in Indian Agriculture needs hardly any emphasis. India is a premier pulse growing country. Pulses are major source of vegetable protein containing essential amino acids, (methionine, cysteine and cystine) required to the proper growth and development of human body. These are the cheapest and best source of protein, constituting about 18-25 per cent of total dietary protein in our country. Besides a rich source of protein in the daily diet menu, the pulses have also been proved worthy and important for sustainable Agriculture as they enhanced physical, chemical and biological properties of soil and function as mini nitrogen factory. Pulses residues are nutritious feed for livestock and also provide added advantage to the poor farmer families. Henceforth, Indian Council of Medical Research (ICMR) has recommended pulse intake of 80 gm/capita/day. Grain legume is beneficial to mankind primarily as a cheapest source of protein in human diet and secondarily in enriching soil fertility by fixing atmospheric nitrogen under poor soil condition. In many Agricultural systems, throughout the world, pulses have been traditionally used for nutritional supplement not only for protein, minerals but also for vitamins of the B-complex. (F.A.O., 1982). Chickpea commonly known as gram or Bengal gram (*Cicer arietinum* L.), a member of family Leguminaceae and subfamily Papilinoceae, is an important self-pollinated leguminous crop, diploid annual ($2n = 16$ chromosomes). It is the most important crop of India grown during *Rabi* season. Among the pulses Chickpea is grown since 7000 BC, in different areas of the world but its cultivation is mainly concentrated in semi-arid environments. It is grown in India, Pakistan, Iran, Burma, Turkey, Spain, Portugal, Morocco, Ethiopia, Tanzania, Chile, Mexico, USA and other parts of the world. India ranks first in the world in respect of production as well as acreage of chickpea crop followed by Pakistan. In India, pulses occupy an area of about 25.45 million hectare with production 17.38 million tones and average yield is 789 kg/hectare. Chickpea finds a pride place among the pulse grown in our country. It occupies about 37 per

cent of the area under pulses and it contributes about 43 per cent of the total pulses production of India. In India Chickpea occupying an area of 9.98 million hectare with 7.59 million tones production and average yield is 958 kg/hectare. In India Uttar Pradesh ranks first in gram/chickpea production (596.7 lakh tones), with an area of 589 lakh hectare and average yield 1013 kg/hectare. Gram is used for human consumption as well as for feeding to animals. It is used as flour, whole gram, roasted or cocked. Salted Dahl or sweet preparations and green foliage and grain as vegetable are the important form consumed by people. Sixty percent of pulses are grown in the season of *Rabi* and forty percent in the *Kharif* season. The country needs at least 23 million tons of pulses by 2005 AD and 30 million tons by 2020 AD.

Material method

The present investigation was conducted in the laboratory of the Department of Agricultural Biochemistry, C.S. Azad University of Agriculture and Technology, Kanpur. The materials used and the methods adopted for attainment of various objectives of the investigation entitled "Physico-Biochemical Evaluation of certain promising varieties/Genotypes of chickpea (*Cicer arietinum* L.)," embodies the comparative studies on the biochemical evaluation of certain nutritional and processing characteristics of certain promising varieties of Chickpea.

The seed of ten different varieties of chickpea was taken from the different varietal trials of chickpea, conducted during *rabi* 2014-15, at the Oilseed Research Farm, Kalyanpur, C.S. Azad University of Agriculture and Technology, Kanpur.

Methods of analysis

(A) Preparation of samples: All the sample of chickpea were oven dried at 70 °C overnight, cooled at room temperature and were ground by domestic grinder and passed through 20 mesh sieve to make dahl and flour samples. The samples were defatted using petrolium ether (40-60 °C). The flour was stored in screw capped vials in a dessicator at a room temperature and was subsequently used for biochemical analysis.

Protein content: Protein content of the sample was determined by biuret method as described by (Williams 1961). It was standardized by determining nitrogen content in chickpea varieties by the modified Micro- Kjeldahl method, AOAC (1965). The nitrogen (%) was then multiplied by the factor 6.25 (Pellett. L.P. and Young, V.R. 1980) for obtaining the protein content.

(B) Processing characteristics

Dahl, broken dahl, husk recovery and percentage loss in processing: Dahl was prepared by soaking 50 gm of seed in 100 ml of water for one hour. Water was drained off. "Moist seed were kept at room temperature for 24 hours and then dried in electronic oven for 4 hours at 70 °C. A light roller/hand chakki was applied for splitting the grains into dahl and husk. The husk was separated mechanically and weighed. The broken dahl was passed through one mm sieve to separate it from whole dahl. The whole dahl fraction and broken dahl fraction were weighed separately and their percentage calculated. Combined weights of dahl and husk were deducted from weight of seed to obtain the percentage loss in processing.

(C) Physical characteristics

Test weight: To observe the extent of grain filling 100 seed of each replication were weight out. The result were however, reported 1000 grains weight by multiplying ten times.

(D) Statistical analysis

The observed data of the experiment were analyzed by the model using Completely Randomized Design (CRD)

Result and Discussion

The experimental findings obtained on the processing, physical and nutritional characteristics of varieties of chickpea are described in the following section:

Processing and nutritional characteristics in chickpea variety

Dahl recovery (%): The whole grain of chickpea varieties were dehusked to yield dahl which were separated from husk and broken dhal to calculate dahl recovery percent. Data on dahl recovery percent in whole grain as influenced by different varieties of chickpea have been presented in Table-1 and graphically depicted in Fig.1

It is evident from the data that the dahl recovery in whole grain of chickpea was significantly influenced by different varieties of chickpea. The dahl recovery in whole grain in different varieties of chickpea was ranged from 68 to 87%. In chickpea variety Pragati recorded maximum dahl recovery of 87% in whole grain followed by Radhey (78.8%), KPG-59 (78%), Avrodhi (75), RSG-963 (75%), KWR-108 (74%), BG-372 (72.8), KGD-1168 (72%), JG-315 (70%), Pusa-256 (68%). The minimum dahl recovery (68%) in whole grain was obtained in Pusa-256. Higher dahl recovery (87%) in whole grain was obtained in chickpea variety Pragati which was statistically significantly higher than rest of the varieties of chickpea. The chickpea variety Radhey and KPG-59 also proved significantly superior and gave higher dahl recovery percentage than rest of the varieties of chickpea. Significantly lesser dahl recovery (68%) in whole grain was recorded in chickpea variety Pusa-256 as compared to other varieties.

Husk (%): The varieties of chickpea showed variation in husk% from 11.42-16.42%. The variety Pragati (11.42%) gave lower mean value for husk than other while KPG-59 (16.42%) gave higher mean value.

Significantly higher husk percent (16.42%) was recorded in chickpea variety KPG-59 as compared to rest of the varieties of chickpeas (Table 1) and graphically depicted in fig.1. Chickpea variety RSG-963 ranked second best variety for recovery of husk (16.24%) followed by KWR-108 (16%), JG-315 (15%), KGD-1168 (14.14), BG-372(14.06), Avrodhi (13.94%), Radhey (13.18%) and Pusa-256 (12.09%). The significantly minimum husk recovery (11.42%) was obtained in Pragati.

Broken dahl (%): Broken dahl percentage was recorded from whole dahl sample by passing through sieve. The broken dahl recovery ranged from 0.49-5.28% and highest percent of broken dahl was obtained in variety Pusa-256 (5.28%), where 0.49 percent in Avrodhi (Table 1) and graphically depicted in fig.1. Significantly higher broken dahl (5.28%) was recorded in Pusa-256, as compared to rest of the varieties of chickpea. The significantly minimum broken dahl (0.49%) was recorded in Avrodhi.

Percentage loss in processing: The percentage loss in dahl processing was ranged from 1.76-13.82% and lowest percentage loss was obtained from KPG-59 (1.76%) where as highest % loss was recorded in Pusa-256 (13.82%). Processing characteristics of selected variety of chickpea are tabulated in (Table 1) and graphically depicted in fig.1

Protein content: Protein content in dhal of chickpea was significantly influenced by different varieties of chickpea and ranged from 21-24.10 per cent. Maximum protein content in dahl was obtained in KWR-108 (24.10%) which was closely followed by RSG-963 (24%), JG-315 (23.70%), BG-372(23.60%), KGD-1168 (23%), Pusa-256 (22.60%), KPG-59 (22.40%), Avrodhi (21.90%) and Radhey (21.50%). The minimum protein in dahl was recorded in Pragati (21%). The

results obtained are tabulated in (Table 3) and graphically depicted in fig.2.

Test weight: Data pertaining to test weight of chickpea as influenced by different varieties of chickpea have been presented in table -5 and graphically depicted in fig. 2. It is evident from table-5 that the test weight of chickpea with different varieties was ranged from 11.87 to 22.08 gm. Significantly higher test weight (22.08 gm) of chickpea was recorded with Pusa-256 as compared to rest of the varieties of chickpea. Pragati variety of chickpea was second best in seed weight (21.68gm) followed by JG-315 (20.16 gm), Avrodhi (19.22 gm), RSG-963 (17.12 gm), KWR-108 (17.00 gm), KPG-59 (16.40 gm), KGD-1168 (15.48 gm), and Radhey (13.74 gm). The minimum seed weight (11.87 gm) was recorded with variety BG-372.

Table 1: Milling properties of different cultivars of chickpea.

Varieties	Husk %	Dhal recovery %	Broken Dhal %	Loss in processing
Avrodhi	13.94	75	0.49	10.57
KPG-59	16.42	78	3.82	1.76
KGD-1168	14.14	72	1.66	12.2
Radhey	13.18	78.8	0.89	6.51
BG-372	14.06	72.8	2.34	10.08
RSG-963	16.24	75	1.28	7.48
Pragati	11.42	87	2.28	5.03
Pusa-256	12.09	68	5.28	13.82
JG-315	15	70	2.22	12.72
KWR-108	16	74	2	8

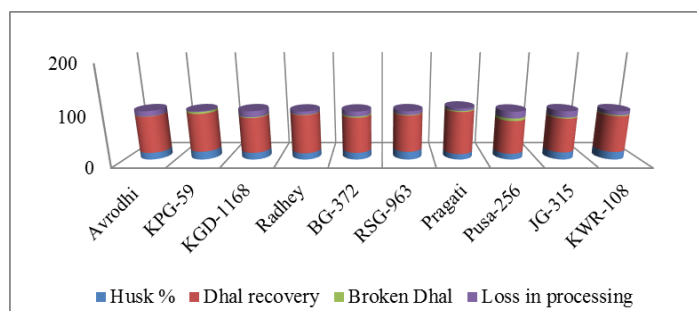


Fig 1: Milling properties of different cultivars of chickpea.

Table 2: Range and best varieties for processing characteristics of chickpea cultivars

Parameters	No. of Samples	Range of Variation (%)	Best Varieties
Processing Characteristics			
Dhal recovery (%)	10	68-87	Pragati, Radhey
Husk recovery (%)	10	11.42-16.42	Pragati, Pusa-256
Loss in processing (%)	10	1.76-13.82	KPG-59, Pragati
Broken dhal recovery (%)	10	0.49-5.28	Avrodhi, Radhey

Table 3: Protein content in dhal in different varieties of chickpea

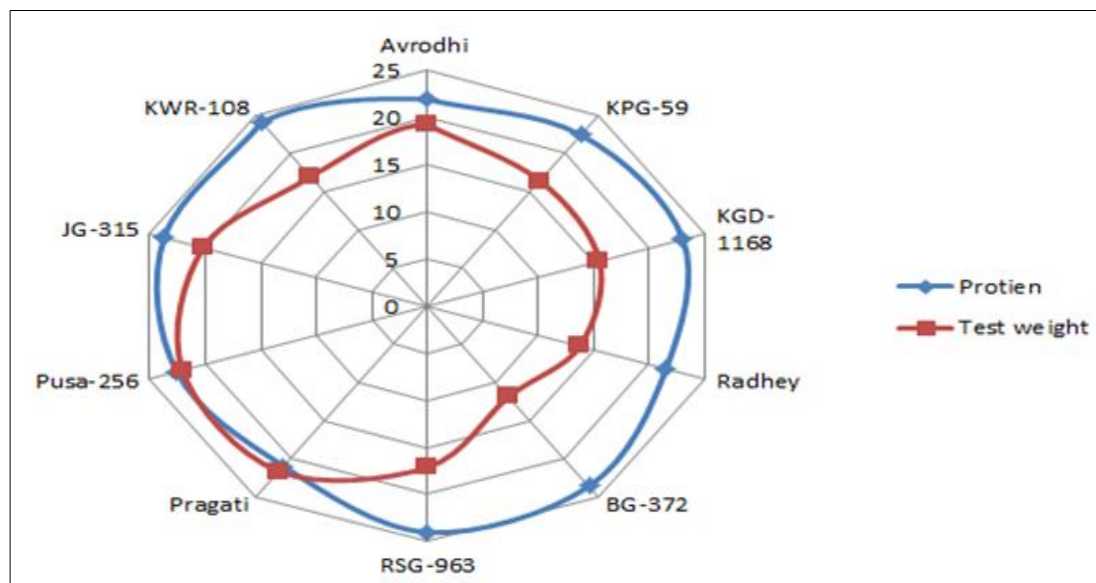
Treatments	Protein %
Chickpea Varieties	
Avrodhi	21.90
KPG-59	22.40
KGD-1168	23.00
Radhey	21.50
BG-372	23.60
RSG-963	24.00
Pragati	21.00
Pusa-256	22.60
JG-315	23.70
KWR-108	24.10
S.E.(d)	0.4760
C.D. at 5%	0.6382

Table 4: Range and best varieties in respect of protein content in dhal of chickpea cultivars

Parameter	No. of samples	Range of variation (%)	Best varieties
Protein content dhal (%)	10	21-24.10	KWR-108, PSG-963

Table 5: Seed weight of chickpea in different varieties of chickpea

Sl. No.	Varieties	Test Weight (gm/100 seeds)
1	Avrodhi	19.22
2	KPG-59	16.40
3	KGD-1168	15.48
4	Radhey	13.74
5	BG-372	11.87
6	RSG-963	17.12
7	Pragati	21.68
8	Pusa-256	22.08
9	JG-315	20.16
10	KWR-108	17.00
	S.E.(d)	0.2633
	C.D. at 5%	0.5505

**Fig 2:** Radar diagram of protein content and test weight to indicate relation between them

Conclusion

It is evident from the data that the protein in dahl varied from different varieties of chickpea. The highest protein content in dahl was obtained variety of KWR-108 than the rest varieties. The range of variation for dahl recovery in different varieties of chickpea from 68 to 87 per cent. The variety Pragati was identified to have the highest dahl recovery. The varieties Pusa-256 were identified to have lowest broken dahl recovery among different varieties of chickpea. The range of variation for broken dahl recovery was from 0.49-5.28 per cent. The husk percentage of whole grain varied from 11.42-16.42 per cent. The lowest husk recovery was obtained in variety of pragati (11.42%) than the rest of the varieties. The range of variation for loss of processing in dahl varied from 1.76-13.8 per cent. The variety, KPG-59 has lowest of processing in dahl due to different varieties of chickpea were significant. The test weight in whole grains in different varieties of chickpea ranged from 11.87- 22.08 gm. Chickpea variety Pusa-256 recorded maximum test weight in whole grain.

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