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Biochemical evaluation of nutritional characterstics of chickpea [*Cicer arietinum* L] varieties/genotypes grown in Uttar Pradesh

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Abstract
Laboratory experiment were conducted on seeds of chickpea genotypes/varieties that were taken from legume Breeder, Department of Genetics and Plant breeding, CSAUAT, Kanpur for investigation biochemical aspects on certain promising genotypes/varieties of chickpea [*Cicer arietinum* (L)]. The nutritional quality flour was in overall range of variability of Protein content, Methionine content, Tryptophan content was 22.20-25.05%, 0.62-1.42 g/16 gN and 1.0.65-1.35 g/16 gN respectively in chickpea varieties/ genotypes. While KWR-108 had the highest methionine content, the chickpea genotype KGD-93 had the highest tryptophan content (1.35 g/16 g N) in dhal. Chickpea genotype KGD-1918 (25.05%) had the highest protein content in dhal.

Keywords: Methionine content, protein content, treatment, tryptophan content, varieties/genotypes

Introduction
Chickpea, an important pulse crop, offers healthy food to the world. It is good source of protein and also provides energy, dietary fibres, vitamins, dietary certain dietary minerals and phytochemicals for good health (Wood and Grusak, 2007) [1]. Chickpea is cultivated throughout the world in around 57 countries under highly diverse environmental conditions (Merga & Haji 2019) [2]. India is the largest chickpea producer in the world with 7,818,984 tonnes production volume per year. Globally, India is alone major producer of chickpea, contributing for 70% of the total chickpea production (FAO, 2020) [3]. Chickpea (*Cicer arietinum* L.) is an important food crop both for human food as well as animal feed. It is the world's second largest grown pulse crop after beans. Chickpea is a cheap source of protein and ranked the fifth most valuable legume. Other major chickpea producing countries are Australia, Pakistan, Myanmar, Ethiopia, Mexico, Canada, USA, Tanzania and Malawi (Gaur *et al*., 2016) [4]. Year 2016 was declared as the international year of pulses by the United Nations General Assembly. Chickpea is valued for its nutritive seeds with high protein content, 25.3-28.9% (Hulse, 1991) [5]. Chickpea seed has 38-59% carbohydrates, 3%crude fiber, 4.8-5.5% crude fat, 3% ash, 0.2% calcium and 0.3% phosphorus. Digestibility of proteins and carbohydrates varies from 76-78% and 57-60%, respectively (Huisman & Van Der Poel, 1994) [6]. Chickpea is a nutritionally enriched food legume having good quality proteins, carbohydrates, antioxidants, vitamins and minerals. The seeds contain moderately high protein ranging from 18% to 28% [7].

Materials and Methods
The experiment utilised seeds from fifteen different genotypes and varieties of chickpea (Cicer arietinum (L.)) and was carried out in a Complete-Randomized Design (CRD) with three replications under uniform agronomic conditions. The seeds were obtained from the legume department of Chandra Shekhar Azad University of Agriculture and Technology, Kanpur. All of the seed grain samples were oven dried at 70 °C for an entire night, allowed to cool at room temperature, then ground in a kitchen grinder and put through a 20 mesh sieve. Petroleum ether was used to defattify flour samples as and when necessary (40-60 °C). The flour was used for biochemical analysis after being kept in screw-capped vials in desiccators at room temperature. All the chemicals used in present study were of analytical grade.

1. Protein content: Protein content of the sample was determined by biuret method as described by (Williams, 1961) [8]. It was standardized by determining nitrogen content in 15 mung bean genotypes by the modified micro Kjeldhal method. The nitrogen (%) was then multiplied by the factor 6.25 for obtaining the protein content. These samples were also run along with rest of the samples during biuret method.

2. Methionine content: Methionine content of the sample was determined by colorimetric method as reported by (Horn *et al*., 1946) [9]. Sulphur containing essential amino acid methionine is a first limiting amino acid of legume grains. Inadequate levels of methionine quantitative affect the nutritive value of legume protein. Therefore, quantitative estimation of methionine in the grains of different varieties of legumes is important in assessing its protein quality form the point of view of selecting out nutritionally superior varieties.

3. Tryptophan content: Tryptophan content of the sample was determined by the method given by (Spies and Chambers 1949) [10]. Like methionine tryptophan is also a limiting amino acid of most of the legume grains, the inadequate presence of which affect the quality of an important step in evaluating quality of legume protein.

Results and Discussion

1. Protein content: The whole grain of chickpea varieties/genotypes were dehusked for yield of dhal sample then grind with the help of grinder. The flour of dhals were subjected to protein determination and the results obtained are tabulated in (Table-1) and graphically depicted in fig.1. It is evident that the protein content in dhal of chickpea was significantly influenced by different varieties/genotypes of chickpea. The protein content in dhal of different varieties/genotypes of chickpea was ranged from 22.20% to 25.05% with a mean value of 23.6%. Maximum protein content in dhal was obtained in chickpea genotype KGD-1918 (25.05%) followed by KGD- 1913 (25.04%) and GNG-2144 (24.84%). The minimum protein in dhal was recorded in chickpea genotype KGD-1250 (22.20%).

2. Methionine content: The data of the performance of dhal sample in respect of methionine content is presented in table-1 and graphically illustrated in fig- 2. A perusal of data revealed that methionine content of dhal sample of promising varieties/genotypes chickpea ranged from 0.62-1.42 g/16 g N with a mean value of 0.9. It was observed that the varieties KWR-108 (1.42 g/16 g N) had highest methionine content followed by KGD-2011 (1.11) and K-3256 (1.05). Significantly the less methionine content was obtained (0.62 g/16 g N) in genotype KGD-1913 than the other varieties/ genotypes of chickpea.

3. Tryptophan content: The data of the performance of dhal sample in respect of tryptophan content is presented in table-1 and graphically illustrated in fig 3. A perusal of data revealed that tryptophan content of dhal sample of promising varieties/genotypes of chickpea ranged from 0.65-1.35 g/16 g N. It was evident that the significantly highest tryptophan content (1.35 g/16 g N) in dhal was obtained in chickpea genotype KGD-93 as compared to rest of the varieties. Chickpea variety KGD-2011 ranked second best variety for recording maximum tryptophan content (1.00 g/16 g N) followed by K-3256 (0.98). The chickpea genotype KGD-1250 had lower content of tryptophan (0.65 g/16 gN).

Table 1: Nutritional characteristics in dhal of certain genotypes /varieties of chickpea

Sr. No.	Varieties	Protein %	Methionine content in dhal(g/16 g N)	Tryptophan content in dhal (g/16 g N)
1	K-3256	24.61	1.05	0.98
2	KWR-108	22.22	1.42	0.70
3	KGD-1145	22.54	1.03	0.76
4	KPG-59	22.25	1.01	0.73
5	KGD-1250	22.20	0.92	0.65
6	Avrodhi	22.17	1.04	0.71
7	Radhey	22.34	0.91	0.79
8	KGD-1918	25.05	0.64	0.95
9	KGD-93	24.49	0.71	1.35
10	IPC-71	24.16	0.64	0.91
11	IPC-310	24.33	0.70	0.90
12	GNG-2144	24.84	1.01	0.86
13	GNG-2171	24.62	0.69	0.95
14	KGD 2011	24.76	1.11	1.00
15	KGD-1913	25.04	0.62	0.96
	S.E.(d)	0.508	0.067	0.079
	C.D. at 5%	1.043	0.137	0.162

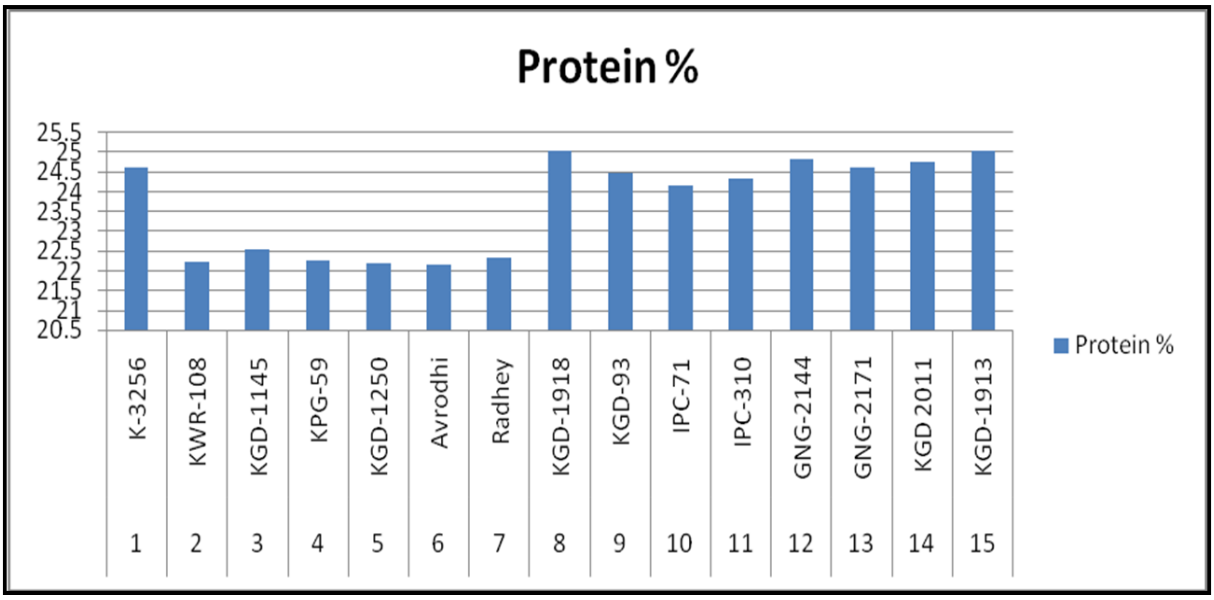

Fig 1: Protein content of important varieties/genotypes of chickpea (*Cicer arietinum* L.)

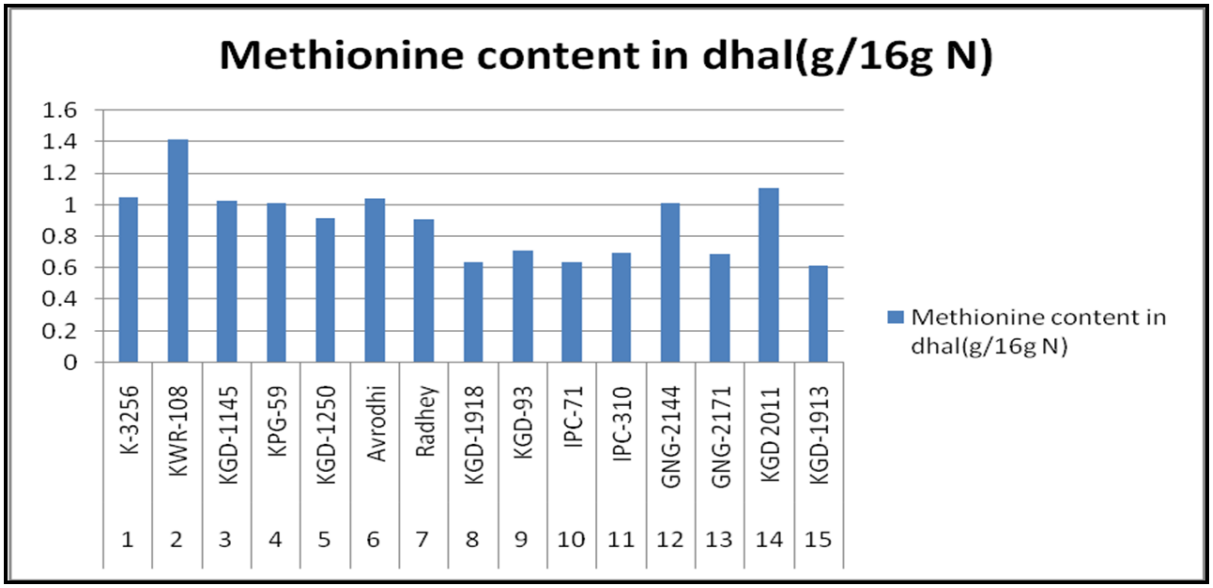

Fig 2: Methionine content of important varieties/genotypes of chickpea (*Cicer arietinum* L.)

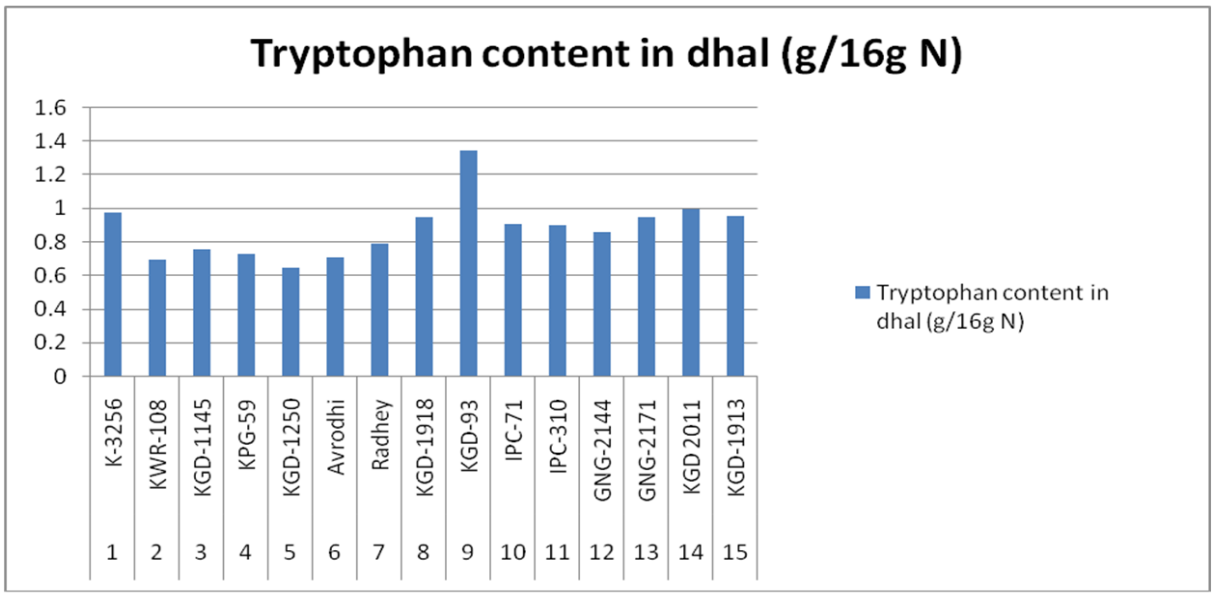

Fig 3: Tryptophan content of important varieties/genotypes of chickpea (*Cicer arietinum* L.)

Conclusion

On the basis of results obtained in the present investigation, it may be concluded that out of the 15 varieties/genotypes of chickpea. From study of nutritional biochemical characteristics KGD-93 is the best variety/genotype. KWR-108 showed highest value of methionine content and KGD-93 showed highest value of tryptophan content in dhal. Among the varieties KGD-93 showed that second highest of protein, optimum level of methionine, highest tryphtophan in respect of nutritional characterstics, variety/genotype KGD-93 is superior.

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