

# Nutritive Analysis of Cicer Arietinum Via Colorimetry

D. Geetha, M. S. Revathy, Gangadhara Angajala, P. Manorama, L. Sudha

**Abstract:** The seeds of cicerarietinum were made into flour, cooked in a different methods and analyzed for Phosphorous, Phytin, Ionisable Iron, Niacin and Thiamin by standard methods. Nutritious values of cicerarietinum varies significantly when they cooked. Mode of cooking play a vital role in the determination of nutrition in food. Gram flour has significant amounts of niacin and thiamin and ionisable iron in its uncooked flour form. This flour have 280 mg/100g phosphorous, 1.6 mg/100g ionisable iron, 0.357 mg/100g thiamin and 4.7 mg/100g niacin. Thus, the flour may be used as value addition food which in turn increased nutrition in low cost.

**Keywords :** Microwave cooking; Thiamin; Niacin

## I. INTRODUCTION

*CicerArietinum* (Bengal gram, chickpea) is one among the important pulse crops grown and used as important food across the world. It has significant nutrients like carbohydrates and protein, vitamins and mineral. *CicerArietinum* is the principal food legume in India. Generally vegetable proteins especially from pulses are considered to be of an inferior quality as compared to that of the animal proteins due to the deficiency of two essential amino acids, viz., methionine and tryptophan [1,2]. Though the protein quality in bengal gram is considered to be better than other pulses, the reason for low consumption of *CicerArietinum* is given below in Figure 1 [1]. In addition to that the polyphenols present in pulses interfere with the assimilation of proteins [1]. Even though India is the largest producer of chickpea, it still imports chickpea from other countries because, of the food value. Keeping in view, the ever-increasing demand for this legume crops, it is essential to improve the production and analyze the nutritional values under different cooking pattern. The nutritive sources, minerals are essential for fighting malnutrition which have been the biggest challenge of the developing countries. To fight with the protein deficiency diseases such as Kwashiorkor, imbalance diet, proteins from

pulses are essential. The continuous researches on Bengal gram revealed that, it contains total carbohydrates 52.4 to 70.9% [1], having good nutritive values viz ash content, moisture content, total carbohydrate, calcium, protein and other essential amino acids. In developing countries like India, cultivation of pulses like Bengal gram is the quickest way to augment the production of food proteins [1,2-6].

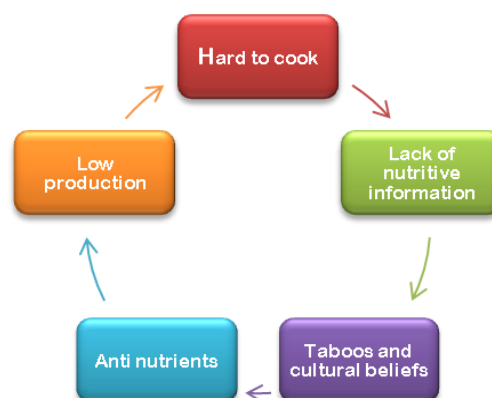


Fig. 1. Reason for lower consumption of Cicer Arietinum



Fig. 2. Cicer Arietinum plant, raw seeds and broken pulses

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The purpose of the present investigation is to study the nutritional quality of *Cicer Arietinum* in terms of phosphorous, ionisable iron, phosphorous in phytinform, vitamin B1 and vitamin B6.

II. MATERIALS AND METHODS

The seeds of *CicerArietinum* varieties were procured from local shops in Krishnan Koil. Samples for the present analysis were prepared as follows [3]: *CicerArietinum* seeds soaked in distilled water (1:10, w/v) for 8hrs, at room temperature (~ 25 °C). The soaked seeds were drained and divided into three parts for cooking according to Alajaji and EL-Adawy (2006) and Helmy (2003b).

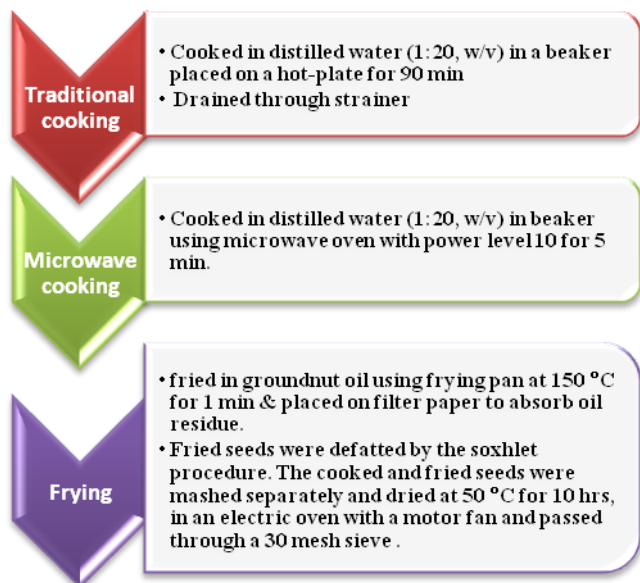


Fig. 3. Methodologies adopted for cooking Bengal gram

Minerals determination: Mineral contents, i.e. phosphorous (P), ionisable iron (Fe), phytin phosphorous, niacin and thiamin were determined according to the prescribed methods using colorimeter as follows:

• Estimation of Phosphorous

The solution of Bengal gram flour is treated with an acid molybdenate reagent, which reacts with inorganic phosphate to form phosphor-molybdic acid. The hexavalent molybdenum of the phosphor-molybdic acid is reduced to give a blue compound which is estimated colorimetrically.

• Estimation of Ionisable Iron

The sample of Bengal gram (5g) was taken into a boiling test tube and mixed with 50ml of water, boiled for half-an-hour in a boiling water bath, centrifuged and added 10 ml of 10% trichloro acetic acid to the supernatant. Centrifuged and filtered. This is the experimental solution. Then pipette out standard iron solution ranging from 0.1 ml to 0.5 ml with their corresponding r values of 10 to 50 r into a series of test tubes. Added 0.3 ml of concentrated sulphuric acid, 0.4 ml of standard potassium persulphate and 1.6 ml of 3N potassium thiocyanate. Made up the volume to 10ml with water. Taken 5.0 ml of the test solution and treated similarly. The color developed was read at 540 m.µ within 20 minutes.

• Estimation of Phytin phosphorous

Phytin phosphorous was estimated by thiocyanate method. The added ferric chloride forms a complex of phytic acid –ferric ion which is insoluble. The excess ferric ion remaining in the solution is estimated by thiocyanide method.

• Estimation of Niacin

Niacin present in Bengal gram reacts with cyanogens bromide to give a pyridinium compound which undergoes rearrangement yielding a derivative that will couple with aromatic amines giving colored compounds under proper condition, the intensity of the color produced is proportional to the amount of niacin present and can be measured colorimetrically.

• Estimation of Thiamin

Thiamin is estimated using ferri-cyanide solution for that 5.0 gm of the powdered sample taken in two conical flasks. Added 50 ml of 2% acetic acid to each of the flask. Congo red was used as an indicator.

III. RESULTS AND DISCUSSION

Data showed that major minerals phosphorous, phytin phosphorous and minor elements ionisable iron were detected in raw Bengal gram flour at higher levels as compared to that of the cooked flours. As per the results given in Table I, the cooking treatments caused a decrease in phosphorous, ionisable iron, phytin phosphorous, vitamins like thiamin and niacin might be attributed to their diffusion into cooking water. These results are in agreement with those obtained by Esmat et al., (2010). The main objective of this work is to compare the nutritional values of raw pulse flour with those of differently cooked flours. The results of this work suggested that raw Bengal gram flour have good source vitamins (B1 and B3) and minerals (phosphorous, ionisable iron). Moreover, new methods have been analyzed for the determination of vitamins and minerals work well and the results correlate well with that of AOCS methods of analysis of food [7-9].

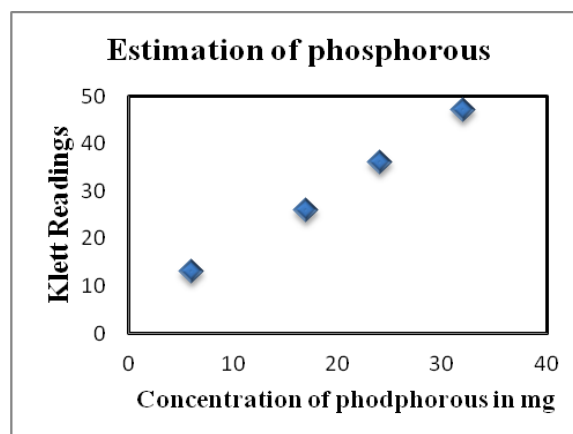


Fig. 4. Calibration graph for the colorimetric estimation of phosphorous.

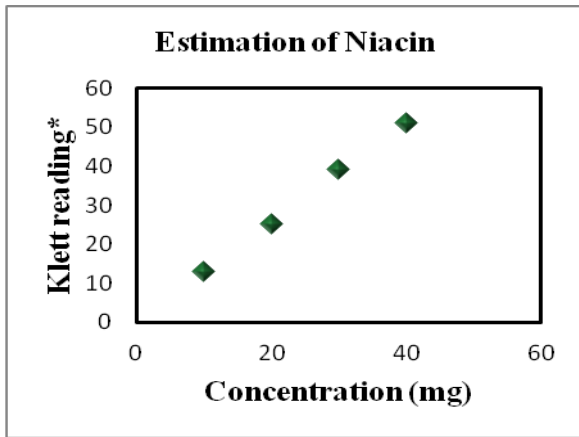


Fig. 5. Calibration graph for the colorimetric estimation of niacin \* Klett reading corresponds to 23  $\mu$ .gm of niacin.

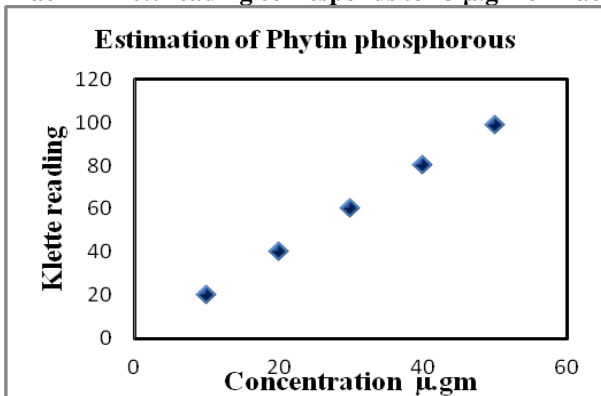


Fig. 6. Calibration graph for the colorimetric estimation of phytin phosphorous.

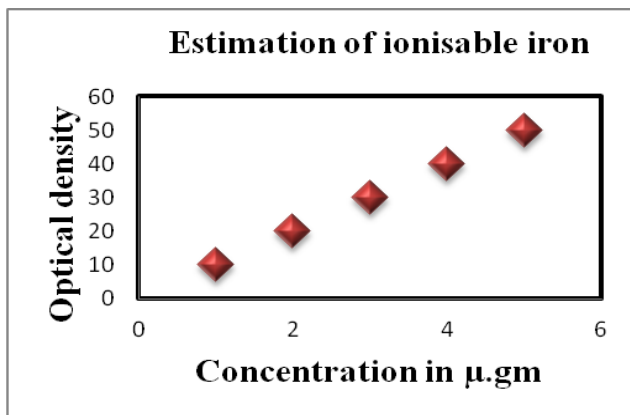


Fig. 7. Calibration graph for the colorimetric estimation of ionisable iron.

Table I: Nutritive analysis report

Nutrients Minerals/ Vitamins	Gram flour			
	Raw	Cooke d (Traditio nally)	Cooke d (Microwa ve)	Fried
Phytin (mg/100 g)	125	103	113	97
Phosphorous (mg/100 g)	280.2	209.20	230.58	188.42
Ionisable Iron (mg/100 g)	1.60	-	1.20	-
Thiamin (mg/100 g)	0.357	-	-	-
Niacin (mg/100 g)	4.7	2.1	2.9	-

#### IV. CONCLUSION

The colorimetric estimation acts as a very good tool in determining the minerals and vitamins of the pulses. The nutritive values viz. phosphorous, ionisable iron, niacin and thiamin of *Cicer Arietinum* highly affected by various cooking methods. All the values of functional properties for microwave cooking flour were high compared with those of other cooking methods through colorimetric method of analysis.

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