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Nutritional characterization of Indian traditional Puranpoli

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Abstract- The effort has been made to prepare the puranpoli by using traditional method and to analyze its nutritional composition. The main ingredients of puranpoli are wheat flour, maida and Bengal gram flour. These unique combinations of cereals and legume fulfill the nutritional requirement of essential amino acids like Methionine and lysine as well as have good nutritive values and were quite rich in carbohydrates accompanied by enough protein, ash, crude fibers, fat, and minerals like calcium and iron.

Keywords- Puranpoli, cereals, bengal gram, amino acid, crude fibers, minerals, methionine

INTRODUCTION-

Indian cuisine is distinguished by its sophisticated use of spices and herbs and the influence of the longstanding and widespread practice of vegetarianism in Indian society. The most popular dessert of Maharashtra is Puranpoli and is made in each and every house during the festivals. Puranpoli is types of Chapati i.e. pan baked bread. The Shelf-life of freshly baked chapatti is 24-36 hrs and becomes unfit for consumption due to development of mold growth, ropiness and texture deterioration depending upon storage conditions. Puranpoli is a marathi dish, which is a dessert, considered as a rich food and traditionally made only during auspicious occasions and during important Indian festivals. Puranpoli is called by different names in different languages like Poli in Tamil, Lanchipoli in Malayalam, Bobbatlu in Andhra Pradesh and Vermi/wermi in Gujrati, Bakshalu in Telugu, and Holige in Karnataka. **[1].**The general appearance of puranpoli is like classical chapatti. **[2].**Human body requires various macro and micronutrients such as protein, carbohydrate, fat or lipid as macronutrients and vitamins, minerals, water and fiber as micronutrients. Likewise, human beings require a number of complex organic compounds as added caloric requirements to meet the need for their muscular activities **[3].**

MATERIAL AND METHODS-

Raw materials-Puranpoli is a legume based sweet product prepared from Bengal gram dal, wheat flour, maida, sugar, salt and spices in proper proportion. The raw materials required for preparation of Puran was evaluated for its physiochemical characteristics and its nutritive value.

Recipe for the Puranpoli-

Table 1. Recipe for preparation of puranpoli

Materials	**Quantity (g)**	**Materials**	**Quantity (g)**
Wheat flour	175	Bengal gram dal	500
Maida	325	Sugar	385
Spices	10		

Method of preparation of Puran traditionally

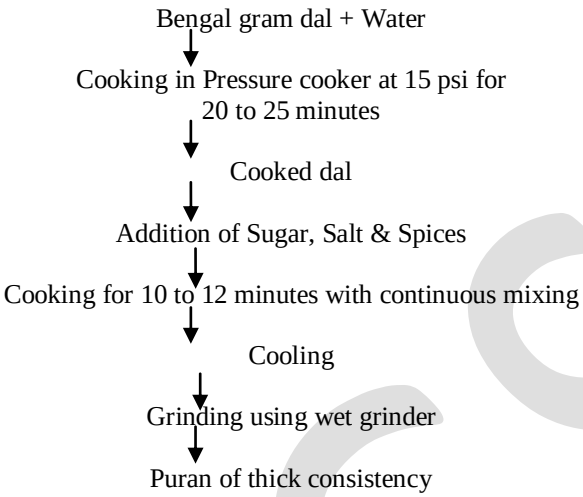


Fig.1 Flow chart preparation of Puran traditionally

Method of preparation of dough from wheat flour and Maida

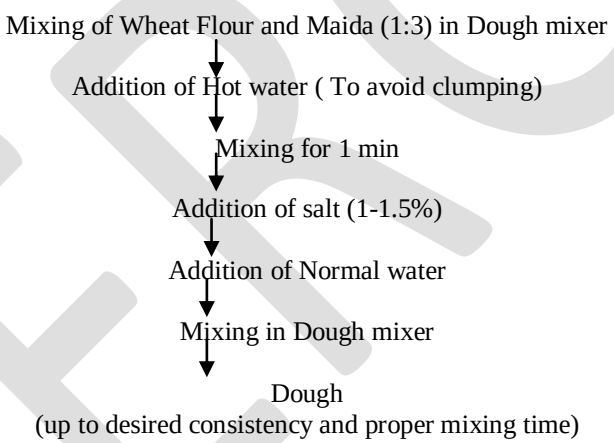


Fig.2 Flow chart preparation of dough from wheat flour and Maida

Method of preparation of puranpoli

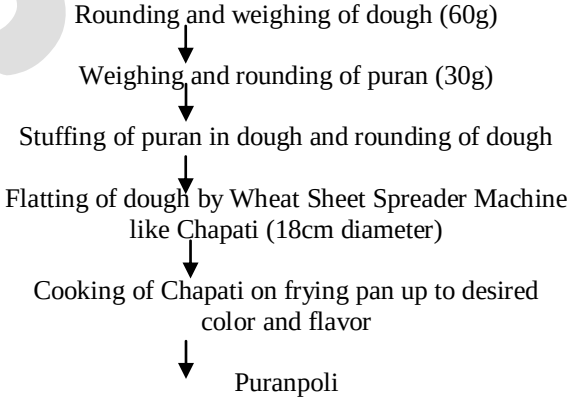


Fig.3 Flow chart preparation of Puranpoli

ANALYTICAL METHODS-

Moisture content [4]-

About 5g of sample was weighed accurately on the balance, and then it was spread uniformly into a Petri-dish and put in a hot oven at 105+1˚C for 3-4 hrs. After drying; the covered dish was transferred to the desiccators and weighed soon after it reached the room temperature. The procedure was repeated till constant weight of dried matter was obtained. The loss in moisture was recorded as the moisture content

$$\% \text{ Moisture content} = \frac{\text{Weight loss}}{\text{Weight of sample}} * 100$$

Fat content-

The sample was transferred to a thimble paper and the top of the thimble was plugged with cotton. The thimble was next placed in the fat extraction chamber of the Soxhlet apparatus. A previously weighed flask was filled with solvent that is petroleum ether and was attached to the extraction chamber. The condenser was attached to the assembly. Extraction was carried out at proper temperature that is about 40-60˚C (for 6hrs).). The excess Petroleum ether was recovered by boiling it further. Then the flask was dried and the weight was recorded. The fat percentage was calculated by estimating the amount of fat per g of sample.

$$\% \text{ Crude fat} = \frac{\text{Weight of dried ether soluble materisl}}{\text{Weight of sample}} * 100$$

Protein content [5]

Protein in the sample is determined by estimating the percentage nitrogen by Kjeldahl's method and further calculating the protein content. Exactly 1-2 g of defatted sample was weighed in the Kjeldahl's flask.10g K_2SO_4 and 0.5g $CuSO_4$ was added followed by 20ml conc. H_2SO_4 that raises the boiling point of mixture and ensures complete reaction. The flask was gently heated on a digestion stand in inclined position until frothing ceases and then it was boiled strongly until the liquid was clear.2-3 glass beads were added to avoid bumping during boiling. Along with experimental digestion, the blank determination was done by digesting 0.5g of soluble starch instead of sample in exactly similar manner and diluted to 250ml in volumetric flask. About 20ml of the diluted sample was taken in the semi-micro-distillation unit followed by rapid addition of 10ml of 50%NaOH. The stopcock was closed and steam distillation was allowed to proceed for about 20min.The tip of the delivery tube was dipped in a flask containing known volume of 0.1N H_2SO_4 .The same procedure was repeated for blank. The unutilized H_2SO_4 was then titrated with 0.05N NaOH. The percentage nitrogen was calculated as:

$$\% \, Nitrogen = \frac{\text{Ts} - \text{Tb x Normality of acid molecular weight } N_2}{Weight\ of\ sample\ in\ grams}$$

Protein= 6.25 x$\% \, Nitrogen$

Ash content by AOAC method-

5 g finely ground sample was weighed in silica crucible and ignited on low flame. Then it was transferred to muffle furnace and heated at 550˚C for 5 to 6 hr for complete oxidation of organic matter. Then transferred to desiccators and weight is taken.

$$\% \text{ Ash content} = \frac{AW}{IW} \times 100$$

Where,

AW = Weight of ash

IW = Initial weight of dry matter

Sugar Content by Lane Eynon's Method [6]-

A. Reagents

1. Fehling A Solution: 69.28 g of $CuSO_4.5H_2O$ was dissolved in water and diluted to 1000 ml water, filtered through filter paper. 2. Fehling B Solution: 346 g of sodium potassium tartarate and 100 g of NaOH mixed in 1000 ml water and filtered through the filter paper. 3. Standard Glucose solution: 0.4 g of glucose or sugar was dissolved in distilled water and made up the volume to 100 ml. 4. Methylene blue Indicator: 1g of methylene blue was dissolved in 100 ml of water.

B.Standardization of Fehling Solution-

10 ml of Fehling solution (5 ml each Fehling A and B solution) was taken in a conical flask & few glass beads were added in a conical flask to avoid bumping. Approximately 20-25 ml of distilled water was added. The mixture was boiled for 2 minutes without removing the flame. The sugar solution from burette was added and a 1-2 drop of methylene blue indicator was added. The titration was completed approximately within 3 minutes. After complete reduction of copper, methylene blue was turned to colorless & formed a red precipitate. Burette reading was noted. The titration was repeated for consecutive readings. The titration should be completed within total of three minutes.

$$\text{Dextrose factor} = \frac{\text{Wt of dextrose x B R}}{\text{Volume made up}}$$

Determination of Reducing Sugar-

Sample Preparation

50 g of sample was taken in 500 ml beaker and 400 ml of water was added. The solution was neutralized with 1N NaOH using phenolphthalein indicator. Then it was boiled gently for 1hr with occasional stirring. Boiling water was added to maintain the original level. It was then cooled and transferred to a 500 ml volumetric flask. Volume was made up and filtered through whatman paper No. 4. 100 ml aliquot of neutral lead acetate solution was pipette out and mixed with 200 ml of water. Then it was allowed to stand for 10 min., & then precipitate the excess of lead with potassium oxalate solution. Make up to n mark and filter.

$$\textbf{Reducing sugar (\%)} = \frac{\text{Vol. made up x glucose equivalent x100}}{\text{Burette reading x Wt. of sample}}$$

Determination of Total sugar-

Sample Preparation

20 ml of clarified sample solution was taken into a 250 ml conical flask. 10 ml of 10% HCl was added. This solution was boiled gently for 10 min. to complete the inversion of sucrose, and then cooled. It was then transferred to 250 ml volumetric flask and neutralized with 1N NaOH using phenolphthalein as indicator. Volume was made up.

$$\textbf{Total invert sugar} (\%) = \frac{\text{Vol. made up x glucose equivalent x100}}{\text{Titre x Wt. of sample}}$$

Sucrose (%) = (Total **invert sugar** (%) - Reducing sugar (%)) x 0.95

Total sugar (%) = Reducing sugar (%) + Sucrose (%)

Preparation of ash solution for the determination of minerals-

The ash solution was prepared form the sample by wet digestion method of Jackson (1967) to determine the content of trace elements and total phosphorus.

Estimation of Total Iron content [7]-

Iron in reduced condition reacts with oxidizing agents like orthophenanthrolene at pH of 4.5 to give reduction that is proportional to concentration of Iron present.

Reagents-

1. Standard Iron solution: 0.3512gm of ferrous ammonium sulphate was dissolved in water, few drops of HCl was added and diluted to 100ml and diluted 5ml of this solution to 250ml with water in a volumetric
flask, so that the final concentration was 0.01mg iron per ml. 2. Hydroxylamine hydrochloride solution: A weighed amount of 10 g of hydroxylamine hydrochloride was dissolved in glass distilled water and diluted to 100 ml. 3.Acetate buffer solution: Accurately 8.3 g of anhydrous sodium acetate (previously dried at 100˚C) was weighed and dissolved in glass distilled water. After transferring 12 ml of glacial acetic acid, the solution was diluted to 100 ml with glass distilled water. 4. Orthophenanthrolene: 0.1gm of orthophenanthrolene was dissolved in near about 80ml of hot distilled water (80˚C). Then cooled and diluted to 100ml and stored in refrigerator.

Preparation of standard iron curve for the estimation of total iron content-

A set of different amount of standard Iron solution was prepared by taking 1 to 5ml in each test tube. A blank was also prepared without iron solution. To each test tube 0.5ml of hydroxylamine hydrochloride solution was added. Also 2.5ml Acetate buffer was added followed by 0.5ml orthophenanthrolene solution. The blank was prepared in the same fashion as without sample. Mixed well and readings were noted by using spectrophotometer at 530nm. Standard graph was plotted by taking the optical density values against the concentration of iron on a graph paper.

Estimation of calcium content-

Calcium was precipitated as calcium oxalate. The precipitate was dissolved in hot dilute sulphuric acid and titrated with standard potassium permanganate.

Reagents-

1. Ammonium oxalate solution: Saturated solution 2. Methyl red indicator: 0.5gm of methyl red indicator was dissolved in 100ml of 95% alcohol. 3. Dil. Ammonium Hydroxide (1:4) 4. Dil. Acetic acid (1:4) 5. Dil. H_2SO_4 (1:4): Acid was slowly added with constant stirring. 6.0.1N Potassium permanganate: 3.35 gm of dry $KMnO_4$ weighed accurately and dissolved in water and diluted to 1litre volumetric flask. 7. 0.01N Potassium Permanganate (Working standard): 10ml 0.1 N Potassium Permanganate solution was diluted to 100ml with water. Fresh solution was prepared before using. (1ml of $KMnO_4$ solution = 0.2mg of calcium)

Calcium estimation-

An aliquot (20ml) of the ash solution obtained by dry mixing was taken in 250ml beaker. 10ml saturated Ammonium oxalate solution was added and 2 drops of methyl red indicator solution was made slightly alkaline by the addition of dilute ammonia and then slightly acidic with few drops of acetic acid until the color was faint pink (pH 5.0). The solution was heated to the boiling point and allowed to stand at RT for overnight. Solution was filtered through Whatman paper no. 42 and washed with water till the filtrate was chloride free (the filtrate was tested by silver nitrate). The point of filter was broken with platinum wire or pointed glass rod. The precipitate was washed first using hot dil. H_2SO_4 and then with hot water and titration was carried out still hot (Temperature 70-80˚C) with 0.01N $KMnO_4$to the first permanent pink color. Finally, filter paper was added to that solution and titration completed.

$$\text{Calcium (\%)} = \frac{\text{Titre value x N of } KMnO_4 \text{ x Total Vol. of ash solution x 100}}{\text{Vol. taken for estimation x Wt. of sample}}$$

RESULTS AND DISCUSSION-

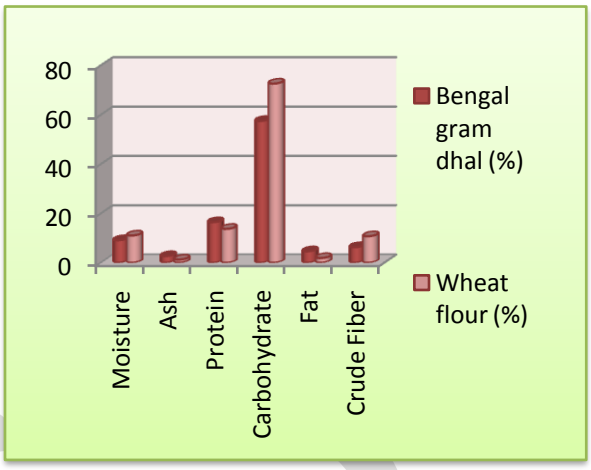
Proximate analyses of raw materials

Proximate analyses of raw materials were done using standard analytical methods. Proximate analyses include estimation of Moisture content, Proteins, Carbohydrates, Fat, Ash content, etc. The traditional puranpoli was prepared with basic ingredients like Bengal gram dhal with sugar. An effort in the research project has been made to nutritional status of the traditional puranpoli by use of wheat flour and Bengal gram dal. The proximate analysis report of Bengal gram dal and Wheat Flour represented in Table 5.1 and respective Figure 5.1, shows that the Bengal gram dal contains 9.10% moisture content with 16.40% protein content, 4.60% fat content and 57.42% carbohydrates by difference and 6.28% crude fibers. It indicated that legumes has good amount of proteins and carbohydrates.

Table 2. Proximate analyses of raw materials

Parameters	Bengal gram dhal (%)	Wheat flour (%)
Moisture	9.10	11.00
Ash	2.65	1.25
Protein	16.40	13.70
Carbohydrate	57.42	72.57
Fat	4.60	1.87
Crude Fiber	6.28	10.70

Fig.4 Proximate analyses of raw materials



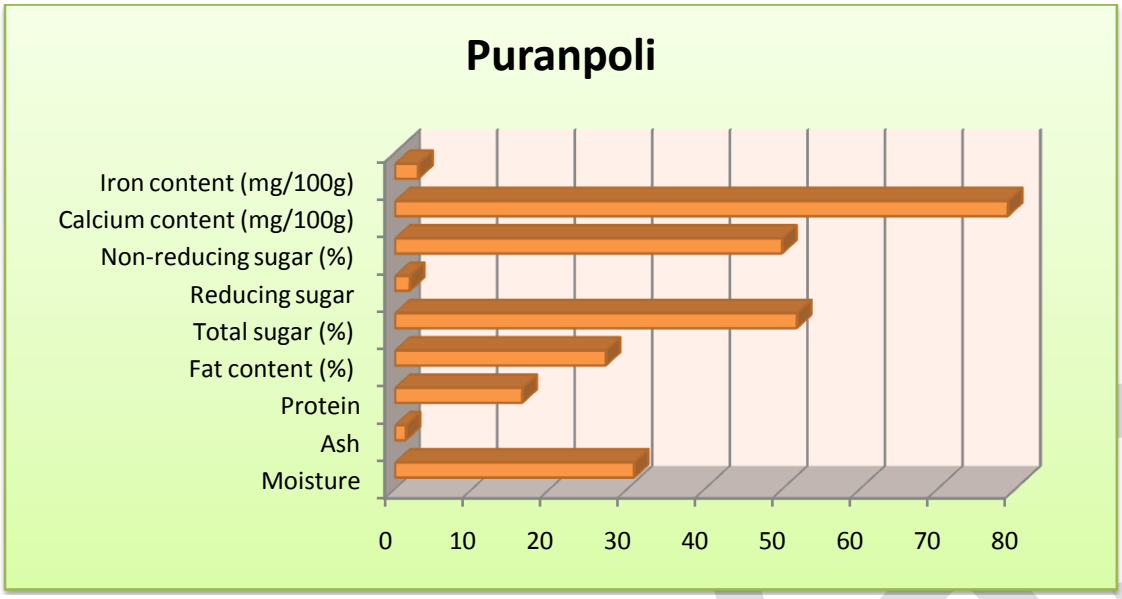
The above table and figure shows that wheat flour contains 11.00% moisture content, 1.25% ash content, 13.70% protein content, 72.57% carbohydrates, 1.87% fat content and 10.70% crude fiber content. It shows that the wheat flour contains more amounts of carbohydrates

Proximate analysis of puranpoli-

Table 3. Proximate analysis of puranpoli

Constituents	Puranpoli
Moisture	30.80
Ash	1.38
Protein	16.40
Fat content (%)	27.17
Total sugar (%)	51.80
Reducing sugar	1.90
Non-reducing sugar (%)	49.90
Calcium content (mg/100g)	79
Iron content (mg/100g)	2.98

Fig 5. Proximate analysis of puranpoli



Puranpoli contains 30.80% moisture content with 16.40% protein content, 27.17% fat content and 51.80% total sugar, and contain high amount of non-reducing sugar was about 49.90%. Puranpoli contain less or negligible amount of reducing sugar that is about 1.90%.

CONCLUSION-From the obtained results it was concluded that the puranpoli have good nutritional value because it contain cereal flour, pulses flour, sugar and spices like cardamom. So puranpoli contains good amount of carbohydrate, fat, essential amino acid like Methionine and lysine, minerals like calcium and iron. So, it can fulfill the nutritional requirement of a person.

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