**National Journal of Advanced Research**
**ISSN: 2455-216X**
**Impact Factor: RJIF 5.12**
**www.allnationaljournal.com**
**Volume 4; Issue 1; January 2018; Page No. 23-27**

# Evaluating the nutritional quality of chapatti from wheat grown under organic and conventional farming system

**[*1] Saira Memon, [2] Aijaz Hussain Soomro, [3] Faraz Ahmed Pathan, [4] Riaz Hussain Mari, [5] Aneela, [6] Sajjad Ahmed**
[1, 2, 3, 4, 5] Institute of Food Sciences and Technology, Sindh Agriculture University Tandojam, Pakistan
[6] Department of Farm Power and Machinery, Sindh Agriculture University, Tandojam, Pakistan

**Abstract**
The present study was carried out to evaluate nutritional quality of chapatti from wheat grown under organic and conventional farming system during the year 2015-16 in the laboratory of the Institute of Food Science and Technology, Sindh Agriculture University, Tandojam. Chapatti prepared from flour of wheat variety $TD_{1,}$ grown under different treatments (farming systems) such as poultry manure (T1), farm yard manure (T2), urea fertilizer (T3) and without treatment (control as T4) using randomized complete block design (RCBD) with three repeats. In addition to determine the physicochemical analysis of wheat chapatti the sensorial properties of wheat chapatti were also studied. The result of the present study showed that the highest moisture (%), ash (%), fat (%), protein (%), crude fiber (%), total carbohydrate (%), zinc and iron (mg $kg^{-1}$) in chapatti prepared from Poultry manure treated wheat field. Statistical analysis revealed that the score of color observed significantly higher (8.83) in poultry manure than farmyard manure (7.78) followed by Urea (7.05), respectively. Similarly, maximum taste score (8.49) was perceived in poultry manure followed by farm yard manure (7.44) T2 and Urea (6.84), respectively. Same trend for score of aroma from highest to lowest was illustrated by poultry manure (8.47), farmyard manure (7.43) and urea (7.02). As previously observed, the same trend in score of texture in poultry manure (8.61), farm yard manures (7.56) and urea (7.08) was recorded. The maximum overall acceptability score (8.99) was observed in poultry manure, followed by farmyard manure (7.90) and urea (7.23) in chapatti prepared respectively farming systems. The moisture, ash, fat, protein, fiber, carbohydrate, mineral and sensory characteristics were observed highest in chapatti prepared from wheat flour treated with poultry manure. Hence, the poultry manure farming system for growing wheat variety is best for getting maximum harvest and nutritional quality.

**Keywords:** wheat flour, chapatti, nutritional value, production

## Introduction
Wheat (*Triticum aestivum*) is most important and major cereal crop of the world. Many products such as leavened and unleavened products are made because of viscoelastic property of dough. India delivers wheat at about 72 million metric tons and 75% is used for the preparation of chapatti, which is formulated from the flour of whole wheat. The distinctive attributives of chapattis are chiefly control by wheat quality used and also the circumstances of processing applied for changing it into flour. Dough improvers are essential to enhance the product quality. Baking industries have been amending chemically to increasing the characteristics trait of baked products.

The wheat flour chapatti is the main diet of people of Sindh province it dates back from old tradition of Mohen-jo-Daro. In Pakistan most of the varieties of wheat have greater protein content. The flour of hard wheat is used in processing of various numbers of products such as noodles, bread, pasta, naan and homemade chapatti. Therefore, the products of hard wheat is achieved by a system, many extruded products of bakery are dependent primarily on the flour and quantity of water dough mix, which shows same characteristics during heating (Anjum *et al.*, 2000) [4].

The adequate quality of wheat grain flour is measured by its starch, protein and lipids. The glutenin protein plays an essential role in elasticity and consistency during the mixing of dough and preparation of chapatti. At the twentieth century, seed of wheat proteins were graded based on the properties of solubility they are divided into four classes namely globulin, albumin, gliadin and gluten. The choice of alteration for the management of wheat flour gluten protein by various agents is gluten-modifying agents like reducing agents and oxidizing are used to regulating the rheological properties of wheat flour chapatti. The reducing agents cleave intermolecular bonds of disulfide bonds in the gluten protein of wheat flour chapptti. The results of cleavage decrease the protein molecular weight and also upgrade the extensibility of the dough. The mixing of reducing agents like as reduced the water absorption capacity (WAC), Lcysteine hydrochloride (L-cysteine HCl) and stability of medium-strong wheat flour chapatti (Ravi *et al.*, 2000) [17].

Wheat is a considerable cereal crop and it is used for the preparation of many products, including chapatti and other bakery products like biscuits, bread, and cakes all over the world. Therefore, in Pakistan about 75% of the wheat flour is used for the preparation of unleavened flat bread, chapatti from whole wheat flour. Chapatti is the main traditional wheat based food, consumed by majority of the population, it is delicious and very easy to digest (Eleny *et al.*, 2004) [8]. Wheat chapatti contained desired sensory characteristics such as

greater palpability, soft texture, slight chewiness, n light creamy brown colour and taste. Fibres content in wheat chapatti inhibits the constipation. The wheat chapatti is good source of vitamins such as (B1, B2, B6, B3, B9) and minerals like, zinc, iron, phosphorus, potassium, calcium. Research proved that the wheat chapatti is extremely beneficial for healthy living.

Carbohydrate is the main component present in whole wheat flour and among the carbohydrates, starch is the major component and arabinoxylans is the minor component (Eleny *et al*., 2004) [8]. Considering the importance of chapatti in the of daily diet. Therefore the present study was designed to prepare and determine the nutritional and sensorial properties of chapatti mad from wheat flour.

**Materials and methods**

The study was carried out during 2015-16 to evaluate the nutritional quality of wheat chapatti grown under organic and conventional farming system. Wheat flour was obtained from wheat grain grown under organic and conventional farming system at Latif farm, Sindh Agriculture University Tandojam. The experiments were conducted in the Institute of Food Sciences and Technology, Sindh Agriculture University, Tandojam.

**Preparation of wheat chapatti**

The flour was mixed with hot water and dough was kneaded nicely to make soft and of uniform consistency. The 100g of wheat flour was taken for preparation of chapatti.

**Nutritional analysis of wheat flour chapatti**

The proximate composition of pulses include moisture, ash, fat, protein were analyzed by AOAC (2012) [6] and total carbohydrate was calculated by difference.

**Determination of mineral elements**

**Sample preparation / digestion**

0.5 gram of wheat chapatti sample was taken in conical flask then 10 ml of nitric acid ($HNO_3$) added. The mixture has been heated on hot plate at$70^0$C for half hour then. After that, the flask was removed and allowed to cool for half an hour. About 02 ml nitric acid and 03 ml of hydrogen peroxide ($H_2O_2$) were added to flask and heated. Then filter the sample and make up 25ml in volumetric flask. By adding of the (0.1N) nitric acid solution. It was followed by the procedure of Ecrement and Burell (1973) [7] with the help of atomic absorption spectrophotometry.

**Analysis through atomic absorption spectrophotometer**

The digested sample of wheat chapatti were scrutinized through air acetylene flame with single element hollow cathode lamps into an atomic absorption spectrophotometer (Hitachi model A-1800) Then instrument was calibrated repeatedly intermittently during operation. Mineral content were calculated through assessment of their standard solutions.

**Sensory evaluation**

Sensory analysis was performed by the staff members of Institute of Food Sciences and Technology, Sindh Agriculture University, Tandojam. The score cards (Based on nine point hedonic scale) were presented to panel of judges along with the wheat chapatti to assess the sensorial attributes such as color, taste, aroma, texture and overall acceptability of the products. (Representing as 9=Like Extremely, 8=Like Very Much, 7=Like Moderately, 6=Like Slightly, 5=Neither Like no-Dislike, 4=Dislike Slightly, 3=Dislike Moderately, 2=Dislike Very Much, 1=Dislike Extremely) as described by Iwe, (2002) [15].

**Statistical analysis**

The data obtained was tabulated and analyzed according to statistical process of analysis of variance (ANOVA) and significant differences of the mean were more computed using least significant difference (LSD) test at 0.05% level of probability through computerized statistical package i.e. Student Edition of Statistix, Version 8.1 (Statistix, 2006) [19]. The LSD test was applied to evaluate treatments superiority, where it's important

**Results**

The study was carried out on the evaluating nutritional quality of chapatti wheat grown under organic and conventional farming system. In order to compare the quality characteristics for their Physicochemical and sensorial composition during the year of 2015-17 in Institute of Food Sciences and Technology, Sindh Agriculture University, Tandojam. Wheat variety TD-1 was planted at the NIA experimental field and after physiological maturity of the crop, the grain samples were brought to the Institute of Food Science and Technology laboratory for comparison of the grain physicochemical properties obtained from the crop grown under different soil nutrient management. Four treatments based on different crop nutrient management practices were formed which included two organic nutrient sources such as: poultry manure ($T_1$) and farmyard manure ($T_2$). The grain obtained from these two treatments was compared for physic-chemical properties with conventional nutrient source where the crop was fertilized with recommended dose of urea ($T_3$); while all these three treatments were compared with a control ($T_4$) where the experimental crop left untreated of nutrients. The results obtained of physicochemical and sensorial characteristics of wheat chapatti, such as moisture content (%) ash content (%), fat (%), protein (%) crude fiber (%), total carbohydrates and minerals. The results are present in (Tables 1-7) and results interpretation in view of the analysis of variance (Appendix I-VII).

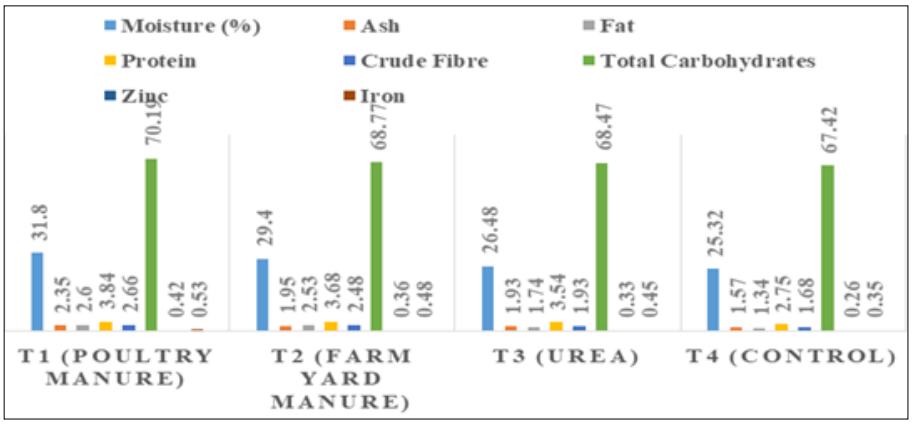
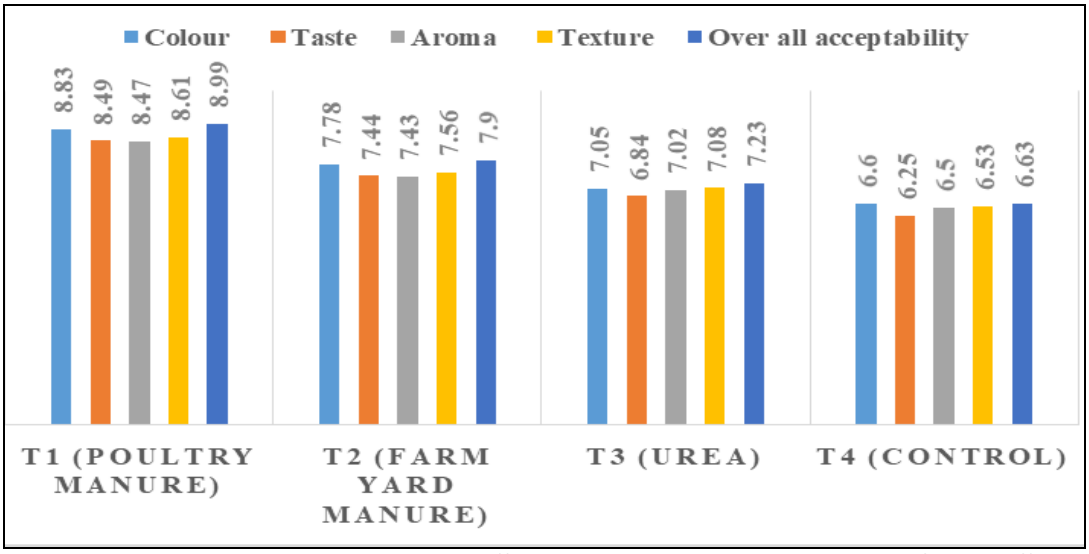



**Fig 1:** Physicochemical Analysis

**Sensory Evaluation**

The wheat chapattis of sensory attributes such as color, taste, aroma, texture and overall acceptability. The results regarding sensory attributes the wheat chapattis are mentioned in Table No.8-12. The analysis of variance for color which was sensed by trained panel of (six judges) in three experimental batches to score the parameters out of total 9 marks. The sensory evaluation was conduct in (NIA) Nuclear Institute of Agriculture, Tandojam.




Values are expressed as mean (n=5); Values with different subscripts increase the rows are significantly different from each other at p<0.05 DMRT.

**Fig 2:** Sensory Evaluation

**Discussion**

Wheat (*Triticum aestivum*) is most important and major cereal crop of the world. Wheat is most common cereal crop mostly used to produce various products including chapatti and used as food by the local communities of the different areas of Pakistan. Hardeep and Cristina (2000) [11] chapatti of wheat flour is different from wheat chapatti

Moisture content in wheat chapatti was not significantly affected by the source of nutrients in wheat it was relatively highest (31.80%) when crop was fertilized with poultry manure, followed 29.40 and 26.48% when fertilized with farmyard manure and urea, respectively. However, fertilization of the crop regardless the source of fertilization improved the moisture content in wheat grain. Poultry manure relatively showed more positive impact on wheat chapatti moisture content as compared to other treatments. (Alozie *et al*., 2009) [3] found that wheat varieties identified as conventional are developed under abundant of soluble nutrients, and their root system is not followed insufficiency of nutrients. However, under high nutrients application and organic nutrients the grain moisture was higher than those of inorganic nutrients.

Ash content in wheat chapatti was maximum (2.35 %) in crop fertilized with poultry manure, followed by 1.95% (farmyard manure) and crop fertilized with urea (1.93%). The context of the experimental results reflects that the poultry manure showed its more impact on ash content as compared to farmyard manure; but similarity (P>0.05) between farmyard manure and urea was recorded for ash content; while the differences were significant (P<0.05) when poultry manure and urea fertilization were compared with poultry manure and control. (Ade-omowave *et al*., 2008) reported that 60 t $ha^{-1}$

manure in addition to 200 kg $ha^{-1}$ N improved technological properties of flour in comparison with control.

The results regarding the fat content indicated that wheat chapatti grown under various organic and inorganic nutrient sources fluctuated significantly and highest fat level in grain (2.60%) was recorded in poultry manure fertilized plots, followed by farmyard manure and conventional source (urea) with grain fat of 2.53% and 1.74%, respectively. The poultry manure is a rich nutrient source that produces grain with remarkably high fat contents. The higher grain fat content is mainly associated with the residual effects of feeding high energy feeds to poultry and poultry manure used as fertilizer is its best utilization. The differences in fat content under farmyard manure treatment and urea were non-significant and significant when these treatments were compared with poultry manure and control (untreated). There was similarity in effectiveness of urea and control for fat content in grain. This further suggested that urea increased the grain quantity but did not improve grain quality; while organic manures have proved their efficacy to improve the fat content which is a sign of quality in grain. (Noor Aziah *et al*., 2012) [16] reported that organic farming has become highly significant aspect to develop wheat varieties particularly suitable for improved characteristics related to gluten free wheat production is the matter of high consideration.

Protein content in wheat chapatti under different organic and inorganic nutrient sources was fluctuated significantly ($P<0.05$) and crop fertilized with poultry manure contained the maximum protein level (3.84%), followed by 3.68% (farmyard manure and conventional fertilization (urea) (3.54%). Poultry manure has proved as a rich nutrient source that produced high protein grain. It is to mention that modern farming, the poultry birds are fed high protein ration as well as growth promoters and poultry dropping might be an effective nutrient source to produce high protein wheat grain. There was similarity ($P>0.05$) in protein content of grain collected from the conventionally fertilized (urea) plots and control (untreated). This further suggested that urea can increase the grain quantity and not grain quality; while organic manures have proved their efficacy to improve the protein content in grain. (Ali, 2009) assessed the impact of integration of organic and inorganic nutrients on wheat growth and grain yield. It showed that protein is most common nutrient analyzed in wheat and protein content was found to different significant by variety (Chand Rasekar and Mulk, 1970 Gomez, 2013).

The crude fiber were significantly high (2.66) in T1 (poultry treatment) of wheat chapatti the crude fiber content (2.48) was observed in T2 (farmyard treatment) of wheat chapatti and least fat content (1.93) was recorded in T3 (urea treatment) of wheat chapatti. Crude fiber reduce the constipation, (Akhtar *et al.*, 2008; maneju *et al.*, 2011) [2].

The total carbohydrates were significantly ($P>0.05$) high in (70.19) was in T1 (poultry treatment) of wheat chapatti the carbohydrate content (68.77) was observed in T2 (farmyard treatment) of wheat chapatti and least carbohydrate content (68.47) was recorded in T3 (urea) treatment of wheat chapatti. Carbohydrates are good source of energy and rice varieties content (70.14-75.15) the carbohydrates (Sivasankar, 2002) [18].

Similarly, the zinc in wheat chapatti varied significantly when the crop was fertilized with various nutrient sources and crop fertilized with poultry manure resulted in maximum grain Zn (0.42%), followed by 0.36 and 0.33% grain Zn determined in samples collected from the plots fertilized with farmyard manure and urea. The crop fertilized with poultry manure produced grain higher in zinc concentration as compared to rest of the sources of nutrients. The higher Zn content in wheat grain produced by poultry manure was mainly associated probably with the higher Zn concentration in the poultry manure or efficiency of poultry manure to convert soil available zinc into grain zinc content. However, differences in grain Zn content in plots given farmyard manure and conventional nutrient supply (urea) were non-significant ($P>0.05$). Hence, farmyard manure and urea showed similarity for producing wheat grain with similar amounts of zinc. Harmel *et al.* (2008) reported that the grain quality was better when organic sources were applied which also include higher contents of minerals including zinc. Linda *et al.* (2014) concluded that the Zn concentration negatively associated with yield and positively correlated with protein in grain.

Iron is essentially required by the body and Fe deficient food items are not recommended by the nutritionists for human consumption. Under varied organic and inorganic nutrients the wheat chapatti Fe was significantly affected and grain Fe was highest (0.53%) when poultry manure was given to wheat, followed by 0.48% grain Fe in farmyard manure and urea supplied crops and least in control (0.45%). Poultry manure resulted in a remarkable positive impact on grain Fe content, suggested that modern poultry farming is based on highly nutritious feed containing minerals, vitamins, growth promoters and many other elements that fasten the birds' growth. Under such circumstances, the poultry manure which is the organic waste material from poultry comprised of animal feces and urine contained the residues of minerals, vitamins and growth hormones. On the other side, the farmyard contained low level of Fe because the ruminants are generally not fed on highly nutritious feeds. Almost equal grain Fe content was recorded in wheat crop fertilized with urea (conventional) and control. Shah *et al.* (2010) showed that integrated use in different proportion of organic and inorganic nutrients increased the percent minerals contents in grain. Sancar *et al.* (2013) reported that NP (in organic source) resulted in highest agronomic values and improved the grain quality parameters including Fe in grain under cattle manure treatment.

## Conclusions

It was concluded from this study that nutritive value of wheat chapatti made from wheat grown under organic farming system was higher as compared to other treatments and control. It was further observed that the nutritional and sensorial properties of wheat chapatti were higher in the wheat grown under poultry manure system.

## Suggestion

The use of poultry manure may be increased for growing the cereal crops to improve the nutritional quality.

Further study should be conducted on micronutrient of wheat chapatti.

**References**


1. Ade-Omowaye BIO, Akinwande BA, Bolarinwa IF, Adebiyi AO. Evaluation of tigernut Cyperus esculentus wheat composite flour and bread. Afr. J Food Sci., 2:87-91.
2. Akhtar S, Anjum F, Rehman S, Sheikh M, Farzena K. Effect of fortification on the physicochemical and microbiological stability of whole wheat flour. Food Chem., 2008; 112:156-163.
3. Alozie YE, Iyam MA, Lawal O, Udofia U, Ani IF. Utilization of bambara groundnut flour blends in bread production. Journal of Food Technology. 2009; 7(4):111-114.
4. Anjum FM, Walker CE. Flour and bread-making properties of eight Pakistani hard white spring wheat cultivars grown at three different locations for 2 years. International J Food Sci. and Technol., 2000; 35:407-416.
5. Anwar SA, Iqbal M, Hassan A, Ullah E. Growth and yield of rice-wheat in response to integrated use of organic and inorganic N sources. Soil Environ. 2015; 34(2):136-141.
6. AOAC. Approved Methods of the Association of American Cereal Chemists.10th Ed., Minnesota, USA, 2012.
7. Ecrements F, Burell FP. Emission spectroscopy and atomic absorption of major and trace elements in plants. Italy, 1973.
8. Eleny C, Arnand R, Martin LM. Rheological properties of soft wheat flour dough: Effect of salt and triglycerides. Cereal Chem. 2004; 81(4):459-468.
9. Hammad HM, Ahmad A, Abbas F, Farhad W. Optimizing water and nitrogen use for maize production under semiarid conditions. Turk. J Agri. For. 2012; 36:519-532.
10. Hammad HM, Khaliq A, Ahmad A, Aslam M, Malik AH, Farhad W, Laghari KQ. Influence of different organic manures on wheat productivity. Int. J Agric. Biol. 2011; 13(1):137-140.
11. Hardeep, Cristina. Effect of composite flours and additives on the texture of chapatti. J Food Engin. 2000; 2(55):173-179.
12. Hossain I, Epplin FM, Krenzer EG. Planting date influence on dual-purpose winter wheat forage yield, grain yield, and test weight. Agron. J, 2003; 1:179-188.
13. Jamil MM, Qasim M, Umar. Impact of organic wastes sewage sludge on the yield of wheat *Triticum aestivum* L. in a Calcareous soil. Int. J Agric. Bio. 2004; 6(3):465-467.
14. Karasahin M. The effects of poultry manure and inorganic fertilizer applications on nitrogen and irrigation water use efficiency in forage corn cultivars. Journal of Agricultural Faculty of Gaziosmanpasa University. 2015; 32(1):104-111.
15. MO. Iwe Handbook of Sensory Methods and Analysis Rejoint Communication Service Ltd., Enugu, 2002, 7-12.
16. Noor Aziah AA, Mohamad N, AY LH. Ho. Physicochemical and organoleptic properties of cookies incorporated with legume flour. International Food Research Journal. 2012; 19(4):1539-1543.
17. Ravi R, Monohar RS, Rao PH. Influence of additives on the rheological characteristics and baking quality of wheat flours. European Food Res., 2000.
18. Sivasankar B. Food Quality, in Food Processing and Preservation. Prentice-Hall of India Private Limited, New Delhi, 2002, 345.
19. Student, Edition of statistix version 8.1, Statistix, 2006.