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QUALITY OF FLAT BREAD (NAAN) FROM PAKISTANI WHEAT VARIETIES

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Four different Pakistani wheat varieties namely; Inqulab-91, Auqab-2000, Iqbal 2000, and AS-2002 were evaluated for physico-chemical, rheological and sensory characteristics to determine their suitability for the production of flat bread (naan). Among the physico-chemical characteristics, 1000-kernel weight, test weight, moisture, protein, falling number, SDS-sedimentation, Pelshenke value and gluten content varied significantly. All the wheat varieties also have significant influence on rheological characteristics (water absorption, arrival time, dough development time, dough stability, departure time, tolerance index and softening of dough) and sensory perception. On the basis of physico-chemical, rheological and sensory characteristics, the wheat variety; AS-2002 was found the most suitable for the production of flat breads (naan).
Keywords: Wheat variety, flat bread (naan), physico-chemical, rheological characteristics, sensory evaluation

INTRODUCTION

Wheat (*Triticum estivum*) is the leading food grain and staple diet of people of Pakistan. Wheat foods are major source of nutrients in many regions. Although seen mainly as a source of carbohydrates; these foods are also a substantive source of protein, vitamins, and minerals, when consumed as a major component of diet. Wheat is one of the cereals used extensively in many parts of the world for the preparation of bread and many bakery products (Fincher and Stone, 1986; Hoseney *et al.*, 1988). The unique bread making properties of wheat flour can be attributed mainly to the ability of its gluten proteins to form a viscoelastic network when mixed with water.

Nowadays there is an increased interest in the production of cereal based foods, especially various types of flat breads. Flat breads are probably the oldest, most diverse and popular products in the world. The principal grains used in such breads are corn, barley and wheat. In Pakistan, 80% of the total wheat produced is used for making flat bread like chapattis, rotis, and naan. These are primary and the cheapest source of protein and calories (Anjum & Walker, 1991). Naan is generally consumed as a staple food by the people of Afghanistan, Iran, India and Pakistan. This is a flat leavened bread prepared from essential ingredients that is flour, water, salt and yeast (Aidoo *et al.*, 2006). For making naan, fermented dough is used. Therefore, naan is made from finer granulation flour than that used for chapaties because finer the granulation, the more rapid is the process of fermentation (Qarooni, 1996). Naan is a kind of tanoor bread; several names like tanoori, tandour, khubz and naan are given to essentially the same product in various parts of the world.

Naan is the usual commercial bread of Pakistan where it is baked mostly in the so-called country restaurants. The flat bread dough is plastered on the inside surface of a deep-dug earthen oven, called a "tanoor". This oven is internally heated by burning firewood. It is relatively more nutritious than chapatti and roti, as it is prepared from fermented dough.

Naan has better digestibility and greater storage life. No other class of food of the normal diet in Pakistan so cheaply provides as many calories per unit weight and no other food stuff can even partially replace bread and roti as a major item in the foreseeable future. It is mostly consumed at breakfast, while it is also available at lunch and dinner with specific dishes (Farooq *et al.*, 2001).

However, there is no information regarding the flour quality requirements for flat bread (naan) and no specific information is available on the method of naan preparation. So present study was planned to determine the suitability of different wheat varieties for naan production and develop a reference preparation methodology for naan of desired quality parameters.

MATERIALS AND METHODS

Raw material

Wheat varieties; Inqulab-91, Auqab-2000, Iqbal 2000, and AS-2002 were procured from Wheat Research Station, Ayub Agriculture Research Institute, Faisalabad-Pakistan. The varieties were tested for 1000-kernel weight and Test weight following the standard procedures (AACC, 2000 method No. 55-10).

Wheat milling

Wheat grains were tempered to 15% moisture content and then milling was done with Quadrumate Senior Mill (AACC, 2000 method No. 26-50). Four products were

obtained namely reduction flour, break flour, shorts and bran. Reduction flour and break flour were mixed to get straight grade flour for further studies.

Physical characteristics

Wheat flours were tested for wet and dry gluten content (AACC method 38-10), particle size index (AACC method 55-30), falling number (AACC method 56-81B), SDS-sedimentation (AACC method 56-60) and Pelshenke value (AACC method 56-50) (AACC, 2000).

Chemical composition

Moisture (AACC method 44-15A), crude protein (AACC method 44-13), crude fat (AACC method 30-25), crude fiber (AACC method 32-10), ash (AACC method 08-01) and nitrogen free extract were determined according to AACC (2000).

Farinographic studies

The constant flour method (AACC, 2000) was followed on Barbender farinograph (Barbender OHG D-4100 Duiseberg Germany) with 300 g bowl and water absorption, arrival time, dough development time, dough stability, departure time, mixing tolerance index and softening of dough were determined.

Preparation of flat bread (naan)

Flat bread (naan) was prepared by taking 250g straight grade flour, mixed with 50g yoghurt and desired water for 10 minutes. It was kept in an incubator at 35°C overnight covered with wet cloth. It was then mixed with 750g flour, 15g sugar, 5g salt, 5g sodium bicarbonate and water as determined by farinograph water absorption to prepare the dough. Dough balls of 100 gram each were made and sheeted into a disk of 7 inch diameter with rolling pins. The disk was pressed with fingertips in the centre and allowed to proof for 30 minute before it was baked in an oven at 315°C for 3 minutes to obtain a naan with pleasing appearance, spongy texture and desired chewing characteristics.

Sensory evaluation of naan

Naan were evaluated for sensory characteristics at room temperature in sensory evaluation laboratory by a panel of five judges on 9-point Hedonic Scale (Land & Shepherd, 1988).

Statistical analysis

Statistical analysis was carried out using statistical software, Minitab (V.13.1, Minitab Inc., PA 16801-3008, USA). Duncan's multiple range tests were applied to arrange the significant values (Steel *et al.*, 1997).

RESULTS AND DISCUSSION

Physical characteristics

1000-kerenl weight and Test weight are widely used physical tests and simple criteria to judge the wheat quality regarding its density and soundness. The 1000-kernel weight and Test weight was found significantly different in different wheat varieties as they ranged from 39.22 to 43.16g and 71.28 to 79.43 Kg/hL respectively (Table 1). 1000-kernel weight and size are not only genetically controlled, but also affected by growing conditions (Williams *et al.*, 1986). Rehman *et al.* (2001) also found the significant effect of Pakistani wheat varieties on 1000-kernel weight and Test weight.

Table 1. Physical characteristics of different wheat varieties

Characteristics	Inqulab-91	Auqab-2000	Iqbal-2000	AS-2002
1000-kernel weight (g)	42.06±0.178b	40.39±0.457c	39.22±0.257d	43.16±0.283a
Test weight (Kg/hL)	77.35±0.397b	71.50±0.646c	71.28±0.460c	79.43±0.428a

Proximate composition

Flour is commonly analyzed for moisture, protein, fat, fiber and ash content to evaluate its quality. Moisture has significant effect on keeping quality of wheat flour while protein is the best single test that can be applied to evaluate the quality of flour, because there is a relation between protein content and baking quality (Matz, 1996). Analysis of moisture and protein showed significant differences among wheat varieties as moisture content ranged from 11.78 to 12.09% and protein from 11.71 to 12.05% (Table 2). Rehman *et al.* (2001) and Anjum *et al.* (2002) also reported that Pakistani wheat varieties significantly differ in moisture and protein content. Protein is more affected by edaphic factors like soil, climatic conditions, locations and fertilizers than heredity (Kent & Evers, 1994).

General characteristics

Wheat varieties were also found to have significantly different Falling No. (ranging from 490.67 to 532.67), SDS-sedimentation (26.39 to 34.04 ml), Pelshenke value (172.33 to 186.0 minutes) and wet and dry gluten content (29.45 to 33.56% and 8.72 to 10.69%, respectively) (Table 3). These results are in range with

Table 2. Proximate composition of different wheat varieties

Characteristics	Inqulab-91	Auqab-2000	Iqbal-2000	AS-2002
Moisture (%)	12.07±0.155a	11.83±0.185b	12.09±0.236a	11.78±0.151b
Protein (%)	11.95±0.127ab	11.77±0.125b	11.71±0.205b	12.05±0.191a
Fat (%)	1.33±0.070	1.35±0.133	1.29±0.101	1.40±0.060
Fiber (%)	0.44±0.049	0.41±0.020	0.40±0.025	0.40±0.040
Ash (%)	0.56±0.075	0.60±0.078	0.57±0.046	0.56±0.056
Nitrogen free extract (%)	73.66±0.295	74.04±0.101	73.94±0.114	73.83±0.061

Table 3. General Characteristics of different wheat varieties

Characteristics	Inqulab-91	Auqab-2000	Iqbal-2000	AS-2002
Particle size index	20.17±0.351	19.97±0.306	19.00±0.265	19.27±0.306
Falling No.	532.67±6.807a	514.33±6.028b	510.00±6.557b	490.67±4.509c
SDS-sedimentation (ml)	28.17±0.444c	26.39±0.445d	31.92±0.226b	34.04±0.306a
Pelshenke value (min.)	172.33±4.509c	180.33±1.528b	181.67±3.215b	186.00±3.606a
Wet gluten (%)	33.41±0.379a	29.45±0.487c	30.36±0.525b	33.56±0.423a
Dry gluten (%)	10.69±0.450a	8.72±0.851c	9.55±0.340b	9.85±0.221b

Table 4. Rheological characteristics of different wheat varieties

Characteristics	Inqulab-91	Auqab-2000	Iqbal-2000	AS-2002
Water absorption (%)	55.33±0.473ab	53.33±0.379c	54.47±0.351b	55.83±0.351a
Arrival time (min.)	2.47±0.153a	1.53±0.153c	1.47±0.153c	2.03±0.153b
Dough develop. time (min.)	4.63±0.153a	3.53±0.252c	4.43±0.208b	4.53±0.153ab
Dough stability (min.)	6.67±0.153b	8.03±0.153a	8.13±0.153a	6.27±0.252b
Departure time (min.)	9.07±0.208b	9.43±0.208a	9.50±0.200a	8.17±0.153c
Tolerance index (BU)	39.67±2.517c	21.00±3.606d	51.00±3.606b	64.00±3.606a
Softening of dough (BU)	59.00±3.606c	78.81±3.512b	79.67±1.528b	80.33±2.517a

the findings of Farooq *et al.* (2001) who also noted significant effect of varieties and lines on chemical characteristics of wheat. The differences in Falling No., SDS-sedimentation, Pelshenke value and wet and dry gluten content of different wheat varieties are reflected by the variation in moisture and protein content (Corbellini *et al.*, 1999). There are many genetic and non-genetic factors which may alter the composition and characteristics of wheat grains and flours like environmental and storage conditions, location, soil and use of fertilizers (Mariani *et al.*, 1995; Anjum & Walker, 2000 and Butt *et al.*, 2001).

Rheological characteristics

Rheometry evaluates important functional properties of flour viscosity, elasticity and plasticity relate to dough behaviour during processing and end product quality (Bloksma & Bushuk, 1988). Water absorption, arrival time, dough development time, dough stability, departure time, tolerance index and softening of dough are selected as key factors in rheological properties (Sollars & Rubenthaler, 1975). Analyses of farinogram profiles (Fig. 1) can give information on wheat flour and dough development properties. Significant variation was found among different wheat varieties for all the characteristics as flour water absorption varied from 53.33 to 55.83%, arrival time from 1.47 to 2.47 min., dough development time from 3.53 to 4.63 min., dough stability from 6.27 to 8.13 min., departure time from 8.17 to 9.50 min., tolerance index from 21.00 to 64.00 BU and softening of dough from 59.00 to 80.33 BU (Table 4). Farooq *et al.* (2001) also found highly significant difference among various farinographic characteristics of different wheat flours. Variation in

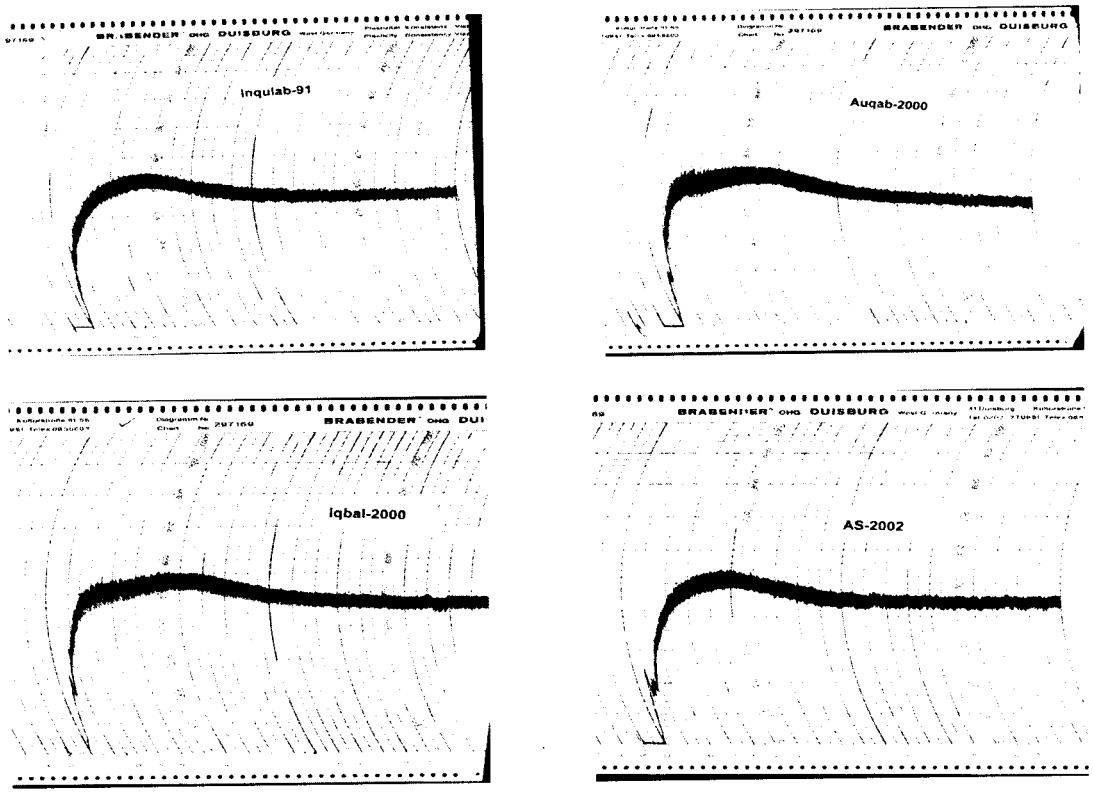

Fig. 1. Farinograms of Pakistani wheat varieties

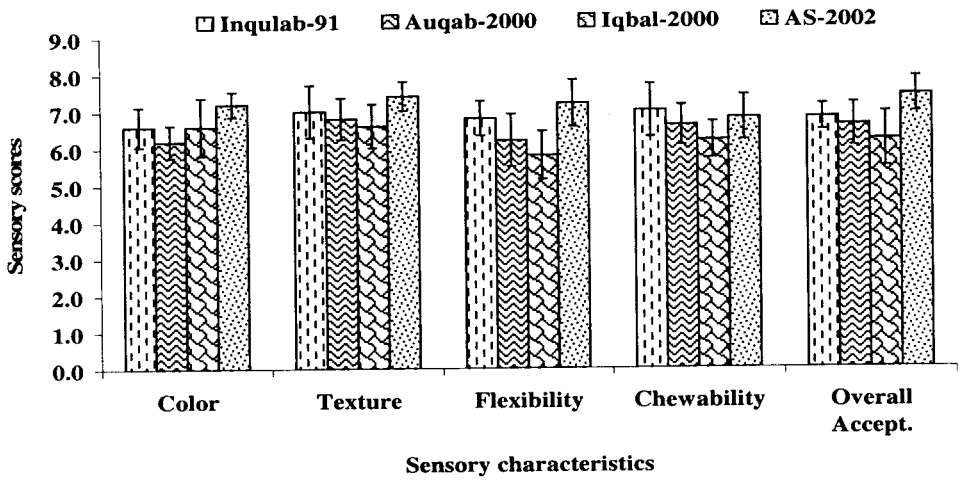

Fig. 2: Sensory scores for flat breads prepared from different wheat varieties

water absorption and arrival time depends upon protein quality and damaged starch content (Anjum & Walker, 1991). Dough development time associates with farinographic stability and degree of softening (Borghi *et al.*, 1996) and as the dough development time, dough stability and tolerance index increases, softening of dough decreases (Anjum & Walker, 2000).

Sensory evaluation

The flat breads (naan) are generally consumed fresh (within an hour) and have a creamy color and should retain their soft and pliable structure. The naan from all the wheat varieties were prepared and evaluated for sensory parameters such as color, texture, flexibility, chewability and overall acceptability. The results exhibited significant variation among flat breads prepared from different wheat varieties for their sensory attributes. The variety AS-2002 ranked the highest for color, texture, flexibility and overall acceptability (Fig. 2). The difference in sensory acceptability of all the flat breads may be due to the difference in the hardness of wheat grains and several factors like wheat varieties and milling characteristics (Farooq *et al.*, 2001).

CONCLUSION

On the basis of physico-chemical, rheological and sensory characteristics, the wheat variety; AS-2002 was found the most suitable for the production of flat breads (naan).

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