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 chapatties because finer the granulation, the more rapid is the process of fermentation (Garooni, 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.
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).

**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

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**Table 1. Physical characteristics of different wheat varieties**

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<tr>
<td>1000-kernel weight (g)</td>
<td>42.06±0.178b</td>
<td>40.39±0.457c</td>
<td>39.22±0.257d</td>
<td>43.16±0.283a</td>
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<tr>
<td>Test weight (Kg/hL)</td>
<td>77.35±0.397b</td>
<td>71.50±0.646c</td>
<td>71.28±0.460c</td>
<td>79.43±0.428a</td>
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**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-kernel weight and Test weight are widely used physical tests and simple criteria to judge the wheat quality regarding its density and soundness. 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.
Quality of flat bread (naan) from Pakistani wheat

Table 2. Proximate composition of different wheat varieties

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<tr>
<td>Moisture (%)</td>
<td>12.07±0.155a</td>
<td>11.83±0.185b</td>
<td>12.09±0.236a</td>
<td>11.78±0.151b</td>
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<tr>
<td>Protein (%)</td>
<td>11.95±0.127ab</td>
<td>11.77±0.125b</td>
<td>11.71±0.205b</td>
<td>12.05±0.191a</td>
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<tr>
<td>Fat (%)</td>
<td>1.33±0.070</td>
<td>1.35±0.133</td>
<td>1.29±0.101</td>
<td>1.40±0.060</td>
</tr>
<tr>
<td>Fiber (%)</td>
<td>0.44±0.049</td>
<td>0.41±0.020</td>
<td>0.40±0.025</td>
<td>0.40±0.040</td>
</tr>
<tr>
<td>Ash (%)</td>
<td>0.56±0.075</td>
<td>0.60±0.078</td>
<td>0.57±0.046</td>
<td>0.56±0.056</td>
</tr>
<tr>
<td>Nitrogen free extract (%)</td>
<td>73.66±0.295</td>
<td>74.04±0.101</td>
<td>73.94±0.114</td>
<td>73.83±0.061</td>
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Table 3. General Characteristics of different wheat varieties

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<tr>
<td>Particle size index</td>
<td>20.17±0.351</td>
<td>19.97±0.306</td>
<td>19.00±0.265</td>
<td>19.27±0.306</td>
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<tr>
<td>Falling No.</td>
<td>532.67±6.807a</td>
<td>514.33±6.028b</td>
<td>510.00±6.557b</td>
<td>490.67±4.509c</td>
</tr>
<tr>
<td>SDS-sedimentation (ml)</td>
<td>28.17±0.444c</td>
<td>26.39±0.445d</td>
<td>31.92±0.226b</td>
<td>34.04±0.306a</td>
</tr>
<tr>
<td>Pelshenke value (min.)</td>
<td>172.33±4.509c</td>
<td>180.33±1.528b</td>
<td>181.67±3.215b</td>
<td>186.00±3.606a</td>
</tr>
<tr>
<td>Wet gluten (%)</td>
<td>33.41±0.379a</td>
<td>29.45±0.487c</td>
<td>30.36±0.525b</td>
<td>33.56±0.423a</td>
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<tr>
<td>Dry gluten (%)</td>
<td>10.69±0.450a</td>
<td>8.72±0.851c</td>
<td>9.55±0.340b</td>
<td>9.85±0.221b</td>
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Table 4. Rheological characteristics of different wheat varieties

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<tr>
<td>Water absorption (%)</td>
<td>55.33±0.473ab</td>
<td>53.33±0.379c</td>
<td>54.47±0.351b</td>
<td>55.83±0.351a</td>
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<tr>
<td>Arrival time (min.)</td>
<td>2.47±0.153a</td>
<td>1.53±0.153c</td>
<td>1.47±0.153c</td>
<td>2.03±0.153b</td>
</tr>
<tr>
<td>Dough development time (min.)</td>
<td>4.63±0.153a</td>
<td>3.53±0.252c</td>
<td>4.43±0.208b</td>
<td>4.53±0.153b</td>
</tr>
<tr>
<td>Dough stability (min.)</td>
<td>6.67±0.153b</td>
<td>8.03±0.153a</td>
<td>8.13±0.153a</td>
<td>6.27±0.252b</td>
</tr>
<tr>
<td>Departure time (min.)</td>
<td>9.07±0.208b</td>
<td>9.43±0.208a</td>
<td>9.50±0.200a</td>
<td>8.17±0.153c</td>
</tr>
<tr>
<td>Tolerance index (BU)</td>
<td>39.67±2.517c</td>
<td>21.00±3.606d</td>
<td>51.00±3.606b</td>
<td>64.00±3.606a</td>
</tr>
<tr>
<td>Softening of dough (BU)</td>
<td>59.00±3.606c</td>
<td>78.81±3.512b</td>
<td>79.67±1.528b</td>
<td>80.33±2.517a</td>
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</table>

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
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).
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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).

REFERENCES