

# Rheological and Functional Properties of New Spring Wheats Grown in Punjab and Sind for the Production of Pizza

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## ABSTRACT

Seven Pakistani wheat varieties namely Inqulab-91, Chenab-2000, Iqbal-2000, Auqab-2000 and T-95713 were collected from Punjab and V-7002 and V-7003 were collected from Sind. These varieties were evaluated for rheological, functional and baking properties. Physical dough properties assessed through Farinograph and Mixograph were affected significantly by the wheat varieties. Sensory parameters of pizza before and after baking revealed that Auqab-2000, Iqbal-2000 and Chenab-2000 exhibited longer shelf life for pizza dough-base as well as overall acceptability of pizza. Results suggested that wheat varieties grown in Punjab were relatively better for pizza production than wheat varieties grown in Sind.

**Key Words:** Pizza; Wheat; Farinograph; Mixograph

## INTRODUCTION

Pizza is a type of flat bread, leavened chemically or by yeast and it contains different types of toppings, essentially comprising of cheese, chicken and tomato sauce with some other variables depending on the choice of the consumers. About 40% of the weight of the pizza is dough base or shell and remaining 60% consists of topping (Spooner, 1993). Rheological and functional properties of dough play an important role in governing the quality of baked products. Therefore, numerous equipments have been devised to obtain objective data about technological/functional properties of dough in order to assess the behavior in various bakery products (Blokma & Bushuk, 1988). The suitability of a wheat flour for making products like bread, cakes, biscuits, chapaties and pizzas depend primarily on the particular rheological properties of the dough such as water absorption, stability, strength, extensibility, elasticity, etc. Several dough-testing equipments, such as alveograph, mixograph, farinograph, extensograph, amylograph, etc. are now available to measure the physical dough properties (Austin & Ram, 1971).

Earlier work carried out by Islam *et al.* (1998) has identified one Pakistani wheat variety suitable for pizza production. The MCR private Ltd., a franchisee of Pizza Hut, is using the local wheat variety since 1998 for the production of pizza. The development of a new variety is a regular feature of the wheat breeders because no variety can stay for ever in the field with same yield potential due to changes in patterns of rust races, other diseases and insect/pests. The average life of a wheat variety ranges from 4 to 6 years in Pakistan. As a result of concerned efforts of wheat scientists, a large number of wheat varieties have been developed and released to the farmers for cultivation during recent years in Pakistan. This study has been designed to evaluate the new wheat varieties for various rheological and functional parameters in order to identify a

wheat variety which can meet the standard specification required for the production of pizza in Pakistan.

The mandate of the present project was to achieve the following objectives.

1. To characterize new spring wheat varieties commercially grown in Punjab and Sind for various rheological and functional properties, in order to assess their suitability for the production of pizza.
2. To study the shelf life of pizza dough in terms of its gas retention in a retarder maintaining a temperature of 1-2°C.
3. To assess the suitability of the pizza prepared from the flour of different wheat varieties based on sensory parameters.

## MATERIALS AND METHODS

Seven wheat varieties were collected from two provinces i.e., Punjab and Sind of Pakistan (Table I).

**Table I. List of wheat varieties collected from different research institutes**

| Variety     | Research Institute                                    | Province |
|-------------|---|----------|
| Inqulab-91  | Wheat Research Institute, Faisalabad.                 | Punjab   |
| Chenab-2000 | Wheat Research Institute, Faisalabad.                 | Punjab   |
| Iqbal-2000  | Wheat Research Institute, Faisalabad.                 | Punjab   |
| Auqab-2000  | Wheat Research Institute, Faisalabad.                 | Punjab   |
| T-95713     | Wheat Research Institute, Faisalabad.                 | Punjab   |
| V-7002      | Atomic Energy Agricultural Research Centre, Tandojam. | Sind     |
| V-7003      | Atomic Energy Agricultural Research Centre, Tandojam. | Sind     |

The grains of each wheat variety were milled through Quadrumate Senior Mill according to the procedure outlined in AACC (2000). Physical dough characteristics (Farinographic and Mixographic) were determined by following methods of AACC (2000). Pizza from the flour of each wheat variety was prepared by following the recipe of

Pizza Hut International. The pizzas prepared from all wheat varieties were evaluated for various pre-baked parameters such as clean-up stage, color of the dough, proofing time, surface smoothness of the dough, shelf life of pizza dough base and evenness of holes at bottom. Baked pizzas prepared from flour of different wheat varieties were evaluated by a panel of judges for sensory characteristics like color, flavor, aroma, texture, taste and over all acceptability as described by Larmond (1977). Finally, the data obtained for each parameter were subjected to statistical analysis by using the techniques of Steel *et al.* (1996).

## RESULTS AND DISCUSSION

The farinographic characteristics such as water absorption, arrival time, dough development time, departure time, dough stability, mixing tolerance index and softening of dough differed significantly due to differences in wheat varieties (Table II).

**Table II. Farinographic characteristics of different wheat varieties**

| Variety     | WA (%) | AT (Min) | DT (Min) | DDT (Min) | DS (Min) | MTI (B.U.) | SOD (B.U.) |
|-------------|--------|----------|----------|-----------|----------|------------|------------|
| Inqulab 91  | 62.1   | 3.35     | 17.90    | 8.00      | 14.55    | 490        | 460        |
| Chenab 2000 | 59.4   | 2.19     | 9.25     | 6.25      | 6.99     | 440        | 365        |
| Iqbal 2000  | 60.4   | 5.85     | 15.00    | 9.10      | 9.15     | 470        | 440        |
| Auqab 2000  | 57.5   | 2.29     | 19.00    | 8.30      | 16.71    | 505        | 465        |
| T-95713     | 55.6   | 2.12     | 7.00     | 4.70      | 2.30     | 405        | 330        |
| V-7002      | 61.6   | 2.50     | 14.14    | 8.00      | 11.64    | 480        | 420        |
| V-7003      | 60.1   | 3.25     | 16.50    | 7.94      | 13.25    | 510        | 460        |

Where, WA = Water Absorption, AT = Arrival Time, DT = Departure Time, DDT = Dough Development Time, DS = Dough Stability, MTI = Mixing Tolerance Index, SOD = Softening of Dough

The water absorption ranged from 55.6 to 62.1% among different wheat varieties. The highest water absorption was recorded in the flour of Inqulab-91 and the lowest in the flour of T-95713. Arrival time varied from 2.12 to 5.85 min. The highest arrival time was recorded in the flour of Iqbal-2000 (5.85 min). Maximum dough development time was observed in the flour of Iqbal-2000 (9.1 min) followed by Auqab-2000 (8.30 min), Inqulab-91 and V-7002 (8.00 min). The lowest dough development time was exhibited by the flour of T-95713. The dough development time ranged from 4.7 to 9.1 min. The highest departure time was observed in the flour of Auqab-2000 and the lowest was obtained from the flour of T-95713. The departure time ranged from 7 to 19 min among different wheat varieties. The dough stability varied from 2.30 to 16.71 min. The highest dough stability was exhibited by the farinogram of Auqab-2000 while the lowest in T-95713. The highest mixing tolerance index was found in the flour

of V-7003 followed by Auqab-2000, Inqulab-91, V-7002, Iqbal-2000, Chenab-2000 and T-95713. The mixing tolerance index ranged from 440 to 510 brabender units (B.U.). The dough softening varied from 330 to 465 B.U. The wheat varieties Auqab-2000 followed by Inqulab-91, V-7003, Iqbal-2000, V-7002, Chenab-2000 and T-95713 fell in a descending order with respect to dough softening.

The guide lines given by Williams *et al.* (1986) indicated that the wheat varieties such as T-95713 and Chenab-2000 fell in the category of medium strong gluten on the basis of dough development time which ranged from 4.70 to 6.25 min among these two wheat varieties. On the basis of dough stability, the wheat varieties Chenab-2000 and Iqbal-2000 can be categorized as medium strong gluten group because their dough stability falls in 6 to 10 min. The wheat varieties such as Auqab-2000, Inqulab-91, V-7003 and V-7002 fell under the category of strong group of gluten because all these wheat varieties exhibited dough stability above 11 min. The results pertaining to the physical dough properties obtained from farinograms of different wheat varieties are comparable with the early findings of Ahmad (1993), Islam *et al.* (1998), Anjum and Walker (2000) and Butt *et al.* (2001).

The mixographic characteristics of different wheat varieties were significantly differed due to different wheat varieties (Table III). The highest mixing time was obtained from Auqab-2000 and the lowest was given by T-95713. The mixing time ranged from 2.5 to 5.5 min. The wheat varieties such as Auqab-2000, V-7003, V-7002, Inqulab-91, Chenab-2000, Iqbal-2000 and T-95713 showed a descending order with respect to mixing time. The peak height ranged from 23 to 40%. The peak height was recorded to be the highest in Iqbal-2000 and Inqulab-91 (both exhibited the identical peak height). The mixogram obtained from the flour of T-95713 yielded the lowest peak height. The guide lines given by Williams *et al.* (1986) showed that mixing time of the tested wheat varieties fell under the category of medium to strong gluten strength.

The results regarding the mixograms obtained in the present studies are similar with the early findings of many research workers like Farooq (1995), Gill (1996), Ahmad (1993), Butt (1996), Islam *et al.* (1998), Anjum and Walker (2000) and Butt *et al.* (2001). The dough characteristics of pizza such as clean-up stage, color of the dough, proofing time, surface smoothness of the dough, shelf life of pizza dough base and evenness of holes at bottom of the dough

**Table III. Mixographic characteristics of different wheat varieties**

| Variety     | Mixing Time (Min.) | Peak height (%) |
|-------------|--------------------|-----------------|
| Inqulab-91  | 4.1                | 40              |
| Chenab-2000 | 3.9                | 30              |
| Iqbal-2000  | 3.5                | 40              |
| Auqab-2000  | 5.5                | 30              |
| T-95713     | 2.5                | 23              |
| V-7002      | 4.7                | 37              |
| V-7003      | 5.0                | 30              |

differed significantly due to the differences in flour of different wheat varieties. The dough base of wheat varieties such as Auqab-2000, Iqbal-2000, Chenab-2000 and Inqulab-91 yielded maximum shelf life (Table IV). The sensory characteristics of baked pizza varied significantly due to different wheat varieties (Table V). Sensory characteristic of pizza such as color, aroma, flavor, texture, taste and overall acceptability were found to be affected significantly due to different wheat varieties. The mean scores for sensory evaluation of pre-baked pizza ranged from 6.99 to 8.00, 6.57 to 8.14, 6.89 to 7.88, 7.11 to 7.91, 6.42 to 7.97 and 5.40 to 8.53 for color, aroma, flavor, texture, taste and over all acceptability, respectively (Table V), among different wheat varieties. The proofed dough base of Auqab-2000, Iqbal-2000 and Chenab-2000 yielded maximum shelf 8.00, 7.75 and 7.31 h, respectively. Shelf life of pizza dough base is a very important factor which determines the suitability of a wheat variety for pizza production. The results regarding sensory evaluation of baked pizza prepared from different wheat varieties suggested that variation existed in the quality of baked pizza due to the wheat varieties. However, on the basis of scores assigned by the panel of trained judges to different sensory attributes of pizza, it may be concluded that wheat varieties Auqab-2000, Iqbal-2000 and Chenab-2000 may be suitable for the production of pizza in Pakistan and should be tested on commercial scale.

It may be concluded that the flour of wheat varieties grown in Punjab was relatively better for pizza production as compared to the wheats grown in Sind province.

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**Table IV. Mean values for different parameters of pre-baked pizza**

| Variety     | Clean-up stage (Min.) | Color   | Proofing time (Min.) | Shelf-life (hours) | Surface smoothness | Evenness of holes |
|-------------|-----------------------|---------|----------------------|--------------------|--------------------|-------------------|
| Inqulab-91  | 2.50 e                | 7.73 cd | 76.00 bc             | 6.59 c             | 7.21 c             | 7.78 a            |
| Chenab-2000 | 2.99 c                | 8.10 bc | 80.00 b              | 7.31 b             | 7.31 c             | 7.21 c            |
| Iqbal-2000  | 3.27 b                | 8.53 ab | 85.00 a              | 7.75 a             | 8.03 b             | 7.45 b            |
| Auqab-2000  | 3.66 a                | 8.93 a  | 88.00 a              | 8.00 a             | 8.67 a             | 7.95 a            |
| T-95713     | 2.06 f                | 6.70 e  | 73.00 cd             | 3.01 f             | 6.40 e             | 4.47 f            |
| V-7002      | 2.75 d                | 7.20 de | 70.00 d              | 4.07 e             | 6.84 d             | 6.27 e            |
| V-7003      | 3.01 c                | 7.40 d  | 75.00 bcd            | 5.30 d             | 7.11 cd            | 6.88 d            |

Note: Mean values carrying same letters in each column are not significantly different from each other

**Table V. Mean values for different parameters of baked pizza**

| Variety     | Color   | Aroma  | Flavor | Texture | Taste  | Overall Acceptability |
|-------------|---------|--------|--------|---------|--------|-----------------------|
| Inqulab-91  | 6.99 c  | 7.10 c | 7.41 b | 7.41 b  | 7.42 b | 7.35 c                |
| Chenab-2000 | 7.61 ab | 7.71 b | 7.47 b | 7.42 b  | 7.61 b | 7.70 bc               |
| Iqbal-2000  | 7.62 ab | 7.27 c | 7.51 b | 7.41 b  | 7.48 b | 7.82 b                |
| Auqab-2000  | 8.00 a  | 8.14 a | 7.88 a | 7.91 a  | 7.97 a | 8.53 a                |
| T-95713     | 7.03 c  | 6.57 d | 6.89 c | 7.11 d  | 6.42 c | 5.40 e                |
| V-7002      | 7.03 c  | 7.12 c | 7.02 c | 7.23 c  | 6.50 c | 6.37 d                |
| V-7003      | 7.38 bc | 7.76 b | 6.89 c | 7.20 c  | 6.53 c | 6.75 d                |

Note: Mean values carrying same letters in each column are not significantly different from each other