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Physico-chemical and Milling Properties of New Spring Wheats Grown in Punjab and Sind for the Production of Pizza

M. ATIF RANDHAWA, FAQIR M. ANJUM AND MASOOD S. BUTT
Department of Food Technology, University of Agriculture, Faisalabad–38040, Pakistan

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 subjected to physico-chemical analyses and milling performance. The physical and chemical characteristics of whole wheat flour, wet and dry gluten content, SDS-sedimentation value and pelshenke value differed significantly among different wheat varieties. It was concluded that wheat varieties having higher values for protein content, gluten contents, pelshenke value and SDS-sedimentation value are better for production of pizza. Moreover, the wheat varieties grown in Punjab were relatively better in the studied parameters than wheat varieties grown in Sind province.

Key Words: Physico-chemical; Milling; New Spring Wheat; Punjab; Sind; Pizza

INTRODUCTION

Wheat (*Tritricum aestivum*) occupies unique position in human diet since ancient times. It is consumed in various forms in almost all parts of the world. It ranks number one position in area and production amongst the food grain crops on global basis. Wheat holds a distinct position in Pakistani diet by contributing more than 60% of the total protein and calorie requirements in the daily diet. Wheat is grown in Pakistan in all provinces and mainly used for the production of unleavened flat bread locally known as "Chapati". The chapati requires, medium hard texture of wheat containing 10.5% protein content (Moss, 1973). Some of the wheat is also used for the production of other bakery products such as bread, cookie, cakes and pizzas.

The wheat flour is one of the major ingredients of pizza which has a great impact on its crust and crispiness. Wheat gluten possesses unique characteristics, to form visco-elastic and cohesive dough. The wheat gluten can retain gas and form an aerated product. Earlier work carried out by Islam *et al.* (1998) has found one Pakistani wheat variety suitable for pizza production. The MCR private Ltd., a franchisee of Pizza Hut, is using the identified local wheat variety since 1998 for the production of pizza in Pakistan. It is an established fact that a variety can not stay for ever in the field and the evolution of new wheat varieties is a regular feature. The average life of a wheat variety in Pakistan ranges from 5-6 years. It is also an imperative that the manufactures of Pizza should not depend on a single variety but must have an alternative variety.

This study was designed to evaluate the new wheat varieties for various physico-chemical parameters in order to identify wheat variety which can meet the standard specification required for the production of pizza in Pakistan. The mandate of the present project was to characterize new spring wheat varieties commercially grown in Punjab and Sind for various physico-chemical and milling properties in order to assess their suitability for the production of pizza.

MATERIALS AND METHODS

Seven wheat varieties were collected from two different provinces i.e. Punjab and Sind of Pakistan (Table I). Physical characteristics like thousand kernel weight and test weight were determined according to the methods described in AACC (2000). Chemical characteristics such as moisture, ash, protein, wet and dry gluten contents and pelshenke values of whole wheat flour were determined according to the procedures given in AACC (2000). SDS sedimentation values of whole wheat flour were determined by following the method outlined by Williams *et al.* (1986). The grains of each wheat variety were milled through Quadrumate Senior Mill according to the procedure described in AACC (2000). The data obtained for each parameter was subjected to statistical analysis by using the techniques of Steel *et al.* (1996).

RESULTS AND DISCUSSION

The physical characteristics such as 1000 kernel weight and test weight showed significant variation among different wheat varieties (Table II). Thousand kernel weight and test weight ranged from 36.29 to 42.56 g and 69.67 to 77.33 kg hl^{-1} among different wheat varieties, respectively (Table II). Significantly the highest 1000-kernel weight was observed in V-7003 and the lowest in Inqulab-91. The highest test weight was recorded in T-95713 and the lowest in the grains of Inqulab-91 and Chenab-2000 but both of these possessed non-significant differences among each other. The significant differences observed in test weight and 1000-kernel weight among wheat varieties may be due to the differences in the genetic make up of the varieties. However, these differences may be partly attributed due to different growing and environmental conditions prevailed during growing periods. The results are comparable with early findings of Finney *et al.* (1973), Slaughter *et al.* (1992), Islam *et al.* (1998), Anjum and Walker (2000) and Butt *et al.* (2001).

The chemical composition of whole wheat flour such as moisture content, ash content and crude protein content were significantly affected by the wheat varieties (Table III). The moisture content, ash content and crude protein content ranged from 7.68 to 9.32%, 1.32 to 1.72% and 11.82 to 14.10%, respectively (Table III). Significantly the highest protein content was observed in Iqbal-2000 followed by Auqab-2000. The results of this investigation are comparable with early findings of Davis *et al.* (1981), Tanija *et al.* (1983), Khan *et al.* (1987) and Islam *et al.* (1998) who also reported chemical characteristics within these ranges. The wet and dry gluten contents significantly varied due to differences in wheat varieties. The wet and dry gluten contents ranged from 26.40 to 38.41% and 8.40 to 13.11%, respectively. Significantly the highest wet gluten content was observed in Auqab-2000 followed by Iqbal-2000.The differences in protein and gluten content may be ascribed to the differences in parents of wheat varieties tested, variation in climatic conditions and differences in cultural practices. The wheat varieties with higher protein and gluten content are better for pizza production. The results are comparable with early findings of Huebner (1970), Ahmad (1993) and Islam *et al.* (1998) who also reported chemical characteristics within these ranges.

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

Table II. 1000 kernel weight and Test weight of different wheat varieties

Variety	1000 kernel weight (g)	Test weight (kg/hl)
Inqulab-91	36.29 e	69.83 c
Chenab-2000	40.89 b	69.83 c
Iqbal-2000	37.79 d	70.00 c
Auqab-2000	39.66 c	69.67 c
T-95713	42.33 a	77.33 a
V-7002	41.38 b	75.50 b
V-7003	42.56 a	76.33 b

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

The pelshenke as well as SDS sedimentation value were also affected significantly due to wheat varieties (Table III). The pelshenke value ranged from 108 to 185 minutes. Highest SDS sedimentation value was observed in Auqab-2000 followed by Iqbal-2000. The sedimentation value varied from 18.17 to 28.33 ml. Inqulab-91, Auqab-2000 and Iqbal-2000 gave significantly the highest values for pelshenke test where as significantly the highest SDS sedimentation value was recorded in Auqab-2000 and Iqbal-2000. The wheat varieties which showed higher pelshenke and SDS sedimentation values were grouped as wheats with strong gluten and may be used for yeast leavened products. Therefore, the existence of significant variation in SDS sedimentation value and pelshenke value within the tested wheat varieties suggest that these wheats may have differences in their gluten quality which may be attributed to variation in their genetic make up. The results regarding pelshenke and SDS sedimentation value are comparable with early findings of Butt (1996) and Islam *et al.* (1998)

Table III. Chemical analysis of whole wheat flour of different wheat varieties

Variety	Moisture (%)	Ash (%)	Protein (%)	Wet gluten (%)	Dry gluten (%)	Pelshenke value (Min.)	SDS sedimentation value (mL)
Inqulab-91	9.32 a	1.71 a	12.92 c	37.42 b	13.11 a	185 a	25.00 b
Chenab-2000	9.03 ab	1.67 a	12.76 d	30.67 c	10.16 d	142 d	21.67 d
Iqbal-2000	9.03 ab	1.70 a	14.10 a	37.82 b	12.48 b	162 c	28.17 a
Auqab-2000	7.68 d	1.61 a	13.53 b	38.41 a	12.81 a	170 b	28.33 a
T-95713	9.06 ab	1.32 b	11.82 g	26.40 e	8.40 e	108 f	18.17 e
V-7002	8.17 c	1.72 a	12.59 e	30.56 c	10.53 c	137 e	22.33 c
V-7003	8.87 b	1.66 a	12.18 f	28.94 d	10.04 d	135 e	22.17 c

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

who also reported chemical characteristics within these ranges. The straight grade flour yield (blend of reduction flour and break flour) ranged from 52.79 to 70.01% (Table IV). Maximum straight grade flour yield was recorded in Chenab-2000 followed by Inqulab-91, T-95713 and Iqbal-2000. Auqab-2000 contained the lowest percent of straight grade flour. The reduction flour yield ranged from 40.88 to 54.21%. The reduction flour yield was found to be the highest in Chenab-2000 and the lowest in Auqab-2000. The maximum break flour yield was recorded from grains of Iqbal-2000 and the minimum from V-7002. The amount of break flour yield varied from 11.41 to 19.72% among different wheat varieties.

Table IV. Milling fractions of different wheat varieties

Variety	R. Flour (%)	B. Flour (%)	SGF (%)	Shorts (%)	Bran (%)
Inqulab-91	51.00	16.00	67.00	5.20	31.00
Chenab-2000	54.21	15.80	70.01	4.64	28.48
Iqbal-2000	44.40	19.72	64.12	4.00	38.41
Auqab-2000	40.88	11.91	52.79	3.70	47.45
T-95713	53.00	12.80	65.80	3.06	37.65
V-7002	47.94	11.41	59.41	5.89	37.69
V-7003	47.55	15.00	62.55	3.01	36.24

Where, R. Flour = Reduction Flour, B. flour = Break, Flour, SGF = Straight Grade Flour

The shorts were found in the highest amount from V-7002 while V-7003 gave the lowest yield of shorts. The shorts ranged from 3.01 to 5.89% among wheat varieties. The bran percent varied from 28.48 to 47.45% among different wheat varieties. Auqab-2000 had the highest while lowest amount of bran was possessed by Chenab-2000.

The percentage of flour extraction may be influenced by the percentage volume of starchy endosperm, which, in turn is affected by size and shape of grain, thickness of bran and size of germ. It has always been reported that the grain size, shape and growing conditions influence the recovery of flour yield. Therefore, the variation in flour yield exhibited by different wheat varieties may be attributed due to the differences observed in the kernel weight and test weight as reported in earlier sections. The flour yield of different wheat varieties in the present study is in consistence with the earlier findings of Mussarat and Kausar (1978), Butt (1996) and Islam *et al.* (1998).

On the basis of various physico-chemical tests conducted for different wheat varieties it may be concluded that wheat varieties of Punjab may be better for pizza production than wheat varieties grown in Sind. The wheat varieties of Punjab (Auqab-2000 & Iqbal-2000) may be suitable for pizza production because these wheat varieties possessed higher quantity as well as better quality protein and gluten that is essentially required for pizza making.

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