

## TECHNOLOGICAL VALUE OF SOME PAKISTANI COMMERCIAL WHEAT VARIETIES

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**ABSTRACT :** The physical grain quality and rheological characteristics of flour of 17 commercial wheat varieties grown in Pakistan were determined. The test weight (kg/hl) ranged from 69.0 ('Barani-83') to 78.9 ('Sind-81'). 'Sonalika' had the hardest wheat kernels as shown by Particle Size Index (PSI) values. The flour yield varied from 63.3 ('Punjab-83') to 80.4 percent ('Lyp-73'). Almost all wheat varieties exhibited hard kernel properties but resultant flours had weak ('BWP-79', 'Sonalika', 'Pak-81', 'Sarhad-82', 'Faisalabad-83', and 'Punjab-81', 'Pavon' and 'Indus-79') and strong ('Barani-83', 'Yecora', 'Sandal' and 'Sind-81') characteristics as revealed by wheat meal fermentation time and the farinograph tests. The protein content (N x 5.7) ranged from 11.2 ('Pavon') to 14.3 percent ('Barani-83'). A significant positive correlation ( $r = 0.73$ ) between protein content and dough development time was observed. It was concluded that Pakistani commercial wheat varieties should be classified on the basis of their flour characteristics and not on the hardness or softness of kernels.

*Key Words: Wheats; Chemicophysical Properties; Quality; Flours; Rheological Properties; Pakistan.*

### INTRODUCTION

Wheat in the form of bread is the daily staple of the people of Pakistan. Khan and Ullah (1984) reported that it contributes 83 percent of the total cereal intake and provides over 50 percent of the total calorie and 60 percent of the total protein consumed by the population as a whole. After the green revolution the old traditional varieties were replaced by high yielding new varieties. No serious attempt has been made to investigate and classify the commercial varieties on the basis of their quality characteristics. Khan and Eggum (1979) and Khan et al. (1986) have reported some work on the nutritional quality of Pakistani wheat varieties but there is meagre information on the technological value of these varieties. Most of the major wheat producing countries have classified wheat on the basis of physical, milling qualities and rheological properties of flour (Miller and Johnson, 1954; Miller et al., 1982). The classification of wheat and/or flour on the

basis of its "strength" helps to establish an understanding of its baking quality. The present study was undertaken to investigate the quality of commercial wheat varieties grown in Pakistan in terms of rheological characteristics of their resultant flours.

### MATERIALS AND METHODS

Seventeen wheat varieties commonly grown in Pakistan were procured from the coordinated Wheat Programme of National Agricultural Research Centre. These varieties were evaluated for grain colour and size. The test weight (kg/hl) was determined by test weight balance. The 1000-kernel weight was determined by an electric seed counter. Particle Size Index (PSI) was determined by using Cyclotec grinder, 200 mesh screen and Rotap sieve shaker. The flour yield was studied by milling tempered wheat (15 - 16 percent moisture) on a Qd. Junior Mill. Protein was determined by NIR spectrophotometer standardized against standard Kjeldahl method. The Brabender farinograph tests were conducted according to standard procedure (AACC, 1982).

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## RESULTS AND DISCUSSION

The physical and milling characteristics data of various wheat varieties revealed that most of them had amber-coloured, medium size grains (Table 1). Amber or light creamy wheats are preferred for the production of unleavened *chapati* and other flat breads consumed in Pakistan and neighbouring countries as reported by Chaudhri and Muller (1970). The light colour of bran helps to get a higher extraction of flour without impairing the general appearance and colour of the resultant flour. The test weight (kg/hl) ranged from 69.0 'Barani-83' to 78.9 'Sind-81'. The 1000-kernel weight of samples ranged from 29.0 in 'Punjab-83' and 'Faisalabad-83' to 45.0g in 'Sonalika'. 'Sonalika' had the largest size of kernels which contributed to its high kernel weight. The PSI percent or hardness

values indicated that all wheats had hard and vitreous kernels. This is typical of Pakistani wheats since they are harvested during dry season and probably diversity in origin and genetic make up also contributes to their hardness. Data for milling test showed that flour yields ranged from 63.3 'Punjab-83' to 80.4 percent 'Lyp-73'. All wheat varieties except 'Sandal' and 'Punjab-83' had flour yield over 70 percent. This was relatively better than those found by Kattchadourian et al. (1985) for wheat varieties grown under dry conditions in Saudi Arabia.

The protein content and rheological characteristics are presented in Table 2. The typical farinograph curves of Pakistani commercial wheat varieties indicating dough development time, dough stability and mixing tolerance are given in Figure 1. The water absorption ranged from 59 to 65

Table 1. Physical and milling characteristics of Pakistani commercial wheat varieties

Variety	Colour	Size	Test wt. (kg/hl)	1000-kernel wt. (g)	WMFT* (min)	Flour yield (%)	PSI value
'Barani-83'	Amber	++	69.0	40.9	252	77.4	40
'Lyp-73'	Amber	++	76.7	35.6	205	80.4	43
'Bwp-79'	Amber	++	77.4	33.7	66	77.7	42
'Yecora'	Amber	++	77.4	37.4	227	79.3	43
'Sind-81'	Amber	++	78.9	37.3	209	78.2	40
'Sonalika'	Amber	+++	74.9	45.0	71	76.6	48
'Punjab-83'	Amber	++	75.4	29.0	71	63.3	41
'Pak-81'	Amber	+	76.2	37.0	181	76.5	43
'Pavon'	Amber	+	78.8	34.1	79	77.5	38
'Arz'	Amber	++	77.4	34.0	86	77.0	40
'Indus-79'	Amber	++	78.8	38.8	177	76.4	39
'Sarhad-82'	Amber	+	77.5	36.0	171	77.7	41
'Zamindar'	Creamy white	++	77.1	41.6	116	80.0	43
'Zargoan'	Amber	+	75.5	38.4	198	78.5	43
'Faisalabad-83'	Amber	++	78.5	29.0	60	78.2	41
'Sandal'	Creamy white	++	78.8	37.3	140	64.8	44
'Punjab-81'	Amber	++	78.4	41.1	68	76.5	38

\* Wheat Meal Fermentation Time.

percent. 'Sarhad-82' had the weakest flour with least tolerance to mixing, i.e., MTI value of 135 B.U. 'Faisalabad-83' and 'Sonalika' also had MTI values, above 100 showing the weakness of their glutes. 'Sonalika', 'Punjab-81', 'Pavon' and 'Faisalabad-83' had dough development time below three minutes whereas 'Barani-83' revealed the longest dough development time of 9.0 min. The dough stability of 'Yecora', 'Sandal' and 'Barani-83' were significantly higher than all other wheats. These three wheat varieties had strong flours as also evident from their MTI value of 25 B.U. or below. Almost all other wheats had weak to medium strong flours. Rashid (1974) investigated that medium strong flours are regarded best for the production of flat breads such as *chapati*. The protein content ( $N \times 5.7$ ) ranged from 11.2 ('Pavon') to 14.3 ('Barani-83'). Statis-

tical analysis revealed significant ( $P < 0.5$ ) positive correlation ( $r = 0.73$ ) between protein content and dough development time.

The strong flour, more suitable for the production of bread, may be diluted with weak flour by blending during milling process. The present study indicated that wheat varieties grown in Pakistan had weak to strong characteristics. They could be utilised for the production of almost all type of bakery products, e.g., pan breads requiring strong flours and cakes needing weak flours. However, no marketing on the basis of wheat flour quality in terms of strength, protein, etc., is practiced in Pakistan. This practice creates problems for the bakers to select suitable raw material for the production of various bakery items. The present study or similar investigations will assist in classification of Pakistani wheats on the basis of

Table 2. Farinograph data for commercial wheat varieties analysed

Variety	Protein* (%)	W. Abs. (%)	Dough development time (min)	Stability (min)	MTI value (B.U.)
'Barani-83'	14.3	62.5	9.0	12.5	25
'Lyp-73'	12.7	59.0	5.0	7.0	45
'Bwp-79'	11.4	63.5	3.0	3.6	90
'Yecora'	13.5	60.0	7.8	13.2	20
'Sind-81'	12.2	63.0	4.5	9.7	35
'Sonalika'	13.3	62.2	2.5	2.7	125
'Punjab-83'	11.7	60.0	3.6	6.4	60
'Pak-81'	11.4	63.5	3.0	3.6	90
'Pavon'	11.2	62.5	2.9	4.2	65
'Arz'	13.6	64.5	4.8	8.6	40
'Indus-79'	11.5	63.0	3.4	5.0	70
'Sarhad-82'	12.5	63.0	4.5	4.2	135
'Zamindar'	13.7	64.2	4.6	6.2	55
'Zargoon'	13.6	64.0	4.9	5.8	60
'Faisalabad-83'	13.0	65.0	2.8	3.1	110
'Sandal'	12.8	59.0	5.2	12.8	20
'Punjab-81'	12.5	64.5	2.6	3.4	80

\*Protein ( $N \times 5.7$ ) on dry matter basis, MTI=Mixing Tolerance index.

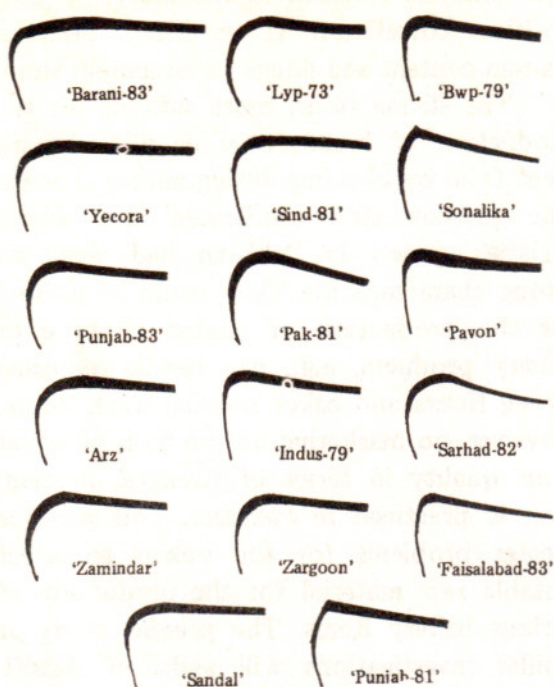


Figure 1. Farinograms of Commercial Wheat Varieties

quality. The classification of Pakistani wheats should base upon flour quality (strength) rather than hardness or softness of kernels.

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