MILLING AND BAKING PROPERTIES OF SOME PAKISTANI NEW WHEAT VARIETIES

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Six new Pakistani wheat varieties namely Pak-81, Faisalabad-83, Punjab-85, Pasban-90, Rohtas-90 and Inqilab-91 were tested for milling and baking properties. The particle size index varied significantly from 43% (Inqilab-91) to 51% (Punjab-85) showing medium hard texture. Straight grade flour of wheat varieties varied significantly from 65.7% to 70.0%. Falling number values were found more than 400 seconds indicating lower alpha amylase activity in all wheat varieties. Bread baking quality of Inqilab-91 and Pak-81 was better with highest loaf volume and weight to volume ratio than other varieties. Cookies thickness varied from 66.1 to 80.9 mm and width of cookies ranged from 265.4 to 283.2 mm. The cookies of Faisalabad-83 were ranked the best. The wheat varieties producing cookies of good quality were also better for cake making purposes. The low amylase activity needs addition of malt in the flour to get optimum potential of bread. Inqilab-91 and Pak-81 are better for bread production whereas Faisalabad-83 is more suitable for cookies and cake manufacturing.

INTRODUCTION

Wheat is a staple food of Pakistani diet which contributes about 72% of the total calories and protein in the daily average diet. About 80% of the total wheat is consumed in the form of an unleavened flat bread locally known as "chapati" while the rest 20% goes for other bakery products such as bread, cookies, cakes and pastries. The composition and nutritive value of wheat flour vary widely due to inherent factors such as class, variety of wheat and environmental factors like climate, soil and cultural practices (Kent, 1983).

The higher the baking quality of wheat the better will be the baked goods resulting in increased bread consumption. Previously, wheat breeders paid less attention towards the improvement in quality characteristics of wheat but now the processors and end-users are becoming more quality conscious about their products due to hard market competition. Therefore, the present study was undertaken to evaluate the newly evolved wheat varieties for various baking products such as bread, cookies and cakes in order to find out their suitability for baking industry.

MATERIALS AND METHODS

Six wheat varieties such as Pak-81, Faisalabad-83, Punjab-85, Pasban-90, Rohtas-90 Inqilab-91 were selected for this study. The wheat varieties were grown under identical conditions during 1990-91 crop year at Wheat Research Institute, Faisalabad. The milling properties of wheat varieties were determined through the Brabender Quadrumate Senior Mill according to the instructions provided in AACC (1983). The particle size index, falling number and bread baking potentialities (by using straight dough method) were determined according

to their respective procedures reported in AACC (1983).

The instructions given by Blish *et al.* (1928) were followed to compute Baking Quality Score according to the following expression in which each character was assigned maximum then scores.

$$\text{Baking Quality Score} = \frac{\text{Loaf volume} - 200}{10} + (\text{Grain} + \text{Texture} + \text{Crumb colour} + \text{Loaf type} + \text{Crust colour})$$

The width, thickness and spread factor of cookies were determined according to AACC (1983). Organoleptic evaluation was done according to Larmond (1977). Cakes from the flour of each variety were prepared according to the procedure described in AACC (1983). The data obtained for each parameter were subjected to statistical analysis using the procedure described by Steel and Torrie (1980).

RESULTS AND DISCUSSION

Milling behaviour: The flour moisture content (14.5% mb) showed variation from 12.8% (Inqilab-91) to 13.9% (Rohtas-90) among varieties (Table 1). The variation in flour moisture may be due to genotype and or environmental conditions. Moisture content beyond 13% may result in deterioration of flour quality during storage in bags due to mould growth (Kent, 1983). In the present study only Pak-81 and Inqilab-91 exhibited the moisture content within the safe storage limit. Flour from Rohtas-90 showed the highest moisture content but the differences in moisture content between other varieties were non-significant.

The flour yield ranged from 65.7% to 70.0% for six new Pakistani wheat varieties. Inqilab-91, Pasban-90 and Pak-81 showed relatively high flour yield and fell statistically in the same group of straight grade flour (Table 1). Previous findings by Paliwal and Singh (1985) reported flour yield to be 55.48 to 72.56% for *aestivum* wheats of Uttar Pradesh.

Table 1. Flour yield, PSI and falling number of six new Pakistani wheat varieties

Variety	Straight grade flour (%)	Flour moisture (%)	PSI (%)	Falling number
Pak-81	68.00 b	13.00 b	49.33 ab	562 b
Faisalabad-83	70.00 a	13.30 b	45.00 bc	509 c
Punjab-85	66.50 c	13.30 b	51.00 a	646 a
Pasban-90	68.40 b	13.30 b	45.00 bc	569 b
Rohtas-90	65.70 c	13.90 a	47.00 abc	556 b
Inqilab-91	68.60 b	12.80 b	43.00 c	516 c
LSD value	1.397407	0.4813332	4.800939	16.818884

Means carrying the same letter(s) in each column are not significantly different from each other ($P<0.05$).

Table 2. Bread baking characteristics of six new Pakistani wheat varieties

Character	Pak-81	Faisalabad-83	Punjab-85	Pasban-90	Rohtas-90	Inqilab-91
Loaf volume (cc)	625	670	625	670	670	740
Loaf weight (g)	156	155	150	150	152	158
Weight to volume ratio	4.0	4.32	4.16	4.46	4.40	4.68
Loaf type*	10	6	8	8	8	8
Crust colour*	7	8	7	8	9	8
Grain*	9	7	8	8	8	8
Crumb colour*	10	9	8	8	8	8
Texture*	8.6	7.3	8.0	7.3	7.3	6.6
Bread baking quality score	87.1	84.3	81.5	86.3	86.3	90.6

*Each character was assigned maximum 10 scores.

Table 3. Physical and cookie baking characteristics of six new Pakistani wheat varieties

Character	Pak-81	Faisalabad-83	Punjab-85	Pasban-90	Rohtas-90	Inqilab-91
Width (mm)	270.5	265.4	283.2	278.4	269.0	280.4
Thickness (mm)	71.3	66.1	76.3	80.9	67.5	72.8
Spread factor (mm)	37.9	40.1	37.1	34.4	39.8	38.5
Colour*	7	7	7	6	5	7
Taste*	8	8	8	8	8	8
Flavour*	8	8	8	7	8	8
Texture*	7	9	8	6	6	7
Overall acceptability	30	32	31	27	27	30

*Each character was assigned 10 scores.

Particle size index (PSI): The PSI of Punjab-85, Rohtas-90 and Pak-81 was statistically similar but Punjab-85 had significantly higher PSI as compared to other wheat varieties (Table 1). Non-significant differences in PSI of Pak-81, Rohtas-90, Faisalabad-83 and Pasban-90 were observed. Inqilab-91 gave lower values for PSI. The PSI in the present study varied from 43.00% (Inqilab-91) to 51.00% (Punjab-85) as is evident from Table 1. These results are in accordance with the earlier findings reported by Anjum (1991). The PSI is an indirect measure of wheat hardness. The findings based on PSI values for different wheat varieties suggested that the texture of the tested new Pakistani wheat varieties fell into the category of medium hard wheats.

Bread baking quality: Weight to volume ratio was found to be higher in Inqilab-91 followed by Pasban-90 and Rohtas-90. The highest loaf volume was observed in bread of Inqilab-91. The loaf volumes of breads prepared from Faisalabad-83, Pasban-90

and Rohtas-90 were identical. The variation in loaf volume was observed which may be attributed to differences in protein content and quality of varieties and other non-genetic factors. Similar results were reported by Kent (1983) and Al-Khawani (1989). The highest Bread Quality Score was obtained in bread of Inqilab-91 followed by Pak-81, Pasban-90 and Rohtas-90 (Table 3). The results of the present study are in close agreement with the previous findings of Anjum (1991).

Cake baking quality: Though wide variation in opinion of judges was noticed regarding organoleptic evaluation of cakes, but on average the trend in scores assigned for each character remained similar as recorded for cookies. The judges could not discriminate differences in flavour and crust colour among cakes prepared from different wheats. Similar results were reported by Marshalkin and Vaskina (1979). However, the differences in crumb colour, grain and silkiness were more pronounced among cakes. On overall acceptability basis, the cakes prepared from Faisalabad-83, Punjab-85 and Inqilab-91 were given maximum scores by the panel of judges (Table 4).

Table 4. Cake baking characteristics of six new Pakistani wheat varieties

Character	Perfect score	Pak-81	Faisalabad-83	Punjab-85	Pasban-90	Rohtas-90	Inqilab-91
Crumb colour	15	9	11	12	10	10	11
Flavour	10	8	8	8	7	8	8
Symmetry	15	9	11	10	10	10	11
Crust	5	3	4	4	4	4	4
Tenderness	15	9	11	10	11	10	10
Grain	25	17	20	18	16	18	20
Silkiness	15	9	11	12	10	10	11
Overall acceptability	100	64	76	74	69	70	75

Cookie baking quality: The thickness of the cookies varied from 66.1 mm (Faisalabad-83) to 80.9 mm (Pasban-90) as shown in Table 4. The width of the cookies was the largest in Punjab-85 (283.2 mm) and lowest in Faisalabad-83 (265.4 mm). Faisalabad-83 showed the highest spread factor (40.1 mm), while Pasban-90 possessed the lowest spread factor (34.4 mm). The cookies prepared from Faisalabad-83 got maximum scores in respect of colour, flavour, taste and texture (Table 3). The variation in cookie quality characteristics of other wheat varieties was not so wide. Amongst all the wheats tested, Faisalabad-83 possessing weak gluten is more suitable for cookie manufacturing than other varieties.

This study suggested that better quality cookies and cakes can be prepared from Faisalabad-83. The production of better quality cakes and cookies from Faisalabad-83 and Punjab-85 are ascribed to their soft grain texture or poor quality of gluten strength. The findings of Abboud *et al.* (1985) have also indicated that soft wheat flour or flour with low protein content is more suitable for the production of cakes and cookies.

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