Pak J Sci Ind Res 2000 43 (3) 177-179

Evaluation of Five Pakistani Wheat Cultivars For Biscuit Making Quality

Sarfraz Hussain, Munawar Ahmad and Muhammad Asif*

Department of Food Technology, University of Agriculture, Faisalabad-38040, Pakistan

(Received 3 April 1997; accepted 14 December 1999)

Five wheat cultivars Pak-81, Barani-83, Kohinoor-83, Faisalabad-85 and Chakwal-86 were evaluated for grain/flour characteristics and their biscuits making quality. Flours were subjected to proximate analyses, Farinograph absorption, alkaline water retention capacity (AWRC) and gluten content. The results showed a superior performance of Pak-81 for biscuit making compared with the remainder cultivars.

Key words: Wheat varieties, Biscuits, Flour analysis

Introduction

Biscuit is convenient snack product consumed by all classes of the society. Biscuits are generally prepared by using soft wheat flour which is also low in protein (max 8%) (Tahir 1974; Rehman *et al* 1988). Several processsing factors can effect biscuits quality, yet wheat flour is one of the major factors contributing to the end-use quality. In Pakistan numerous wheat cultivars are being grown which find their way to the flour mill and finally the bakeries regardless of their impact on quality.

It is well known that constant and uniform quality of biscuits cannot be maintained using any flour for biscuit making. Kernel hardness, protein quality and rate of dough development are necessary to know in order to assess biscuit baking quality of cultivars. (Fowler and Rocher 1975; Smith 1963). Determination of water absorption is essential to produce fully developed dough for processing purposes. It is well documented that the water absorption increases with an increase in protein and gluten content (Matz 1972). This study was under taken to select Pakistani cultivars most appropriate for biscuit-baking. The results of this study would provide guidelines for bakers to produce end-use product (s) of superior quality.

Experimental

Grain samples. Grain samples used to make flour for experimental studies were milled from five cultivars grown in Ayub Agricultural Research Station Experimental area in Faisalabad, Pakistan. Five cultivars *viz* Pak-81, Barani-83, Faisalabad-85 and Chackwal-86 were selected on the basis of yield, agronomic performance and adaptability of various cultivation areas in Pakistan. Extraneous materials from the grain samples were removed by using a laboratory seed cleaner. Broken and under developed kernels were hand picked to create a clean sample.

Physical tests. Each sample was tested for grain width, length and thousand unbroken kernel weight according to the standard methods (AACC 1983).

Tempering. Prior to milling, wheat samples were tempered by the addition of appropriate amount of water to raise moisture contents to 14%. Tempering was carried out in 4 kg batches by placing the samples in airtight glass jars for over night to allow maximum penetration of moisture and to reach equilibrium.

Milling. Grain samples for chemical analysis were milled with the help of Udycyclone mill. Wheat samples were separately milled in Quadrumate Senior mill to obtain high-grade flour, low grade flour, short and bran. High grade flour was used to conduct Farinographic studies, alkaline water retention capacity (AWRC), gluten test and preparation of biscuits.

Proximate composition analysis. Grain samples were subjected to analysis for moisture, crude protein, crude fiber, crude fat and total ash according to the standard methods (AACC 1983).

Farinographic studies. Farinographic studies were carried out to determine the behaviour of flour due to water absorption, dough development time, dough stability, dough resistance, softening and tolerance index were interpreted from Farinogram (AACC 1983)

Alkaline water retention capacity (AWRC) and gluten test. Alkaline water retention capacity at 14% moisture basis was determined according to the method of AACC (1983). Traditionally this parameter is used to predict biscuit making quality. Flour samples were also tested to determine the wet and dry gluten content (AACC 1983).

* Author for correspondence

Preparation of biscuits. Dough for biscuit was prepared according to the method using following formulation (Rehman *et al* 1988).

Formula for Biscuits	
Flour (14% moisture basis)	250g
Sugar	125g
Vegetable oil hydrogenated	125g
Eggs (50-55g)	4 No.
Baking Powder	4 g

Physio-chemical and sensory evaluation of biscuits. Biscuits were evaluated for width, thickness and spread ratio. Proximate analyses of the finished products was performed to determine moisture, protein, fat, fiber and ash content (AACC 1983).

Sensory evaluation. Evaluation for consumer acceptance of biscuits made for five flours for colour, taste, flavour, texture and acceptability was carried out by a panel of six semi-trained judges using 9-point Hedonic scale with 5 as the limit of acceptance (Larmond 1977).

Statistical analysis. Data was analyzed for statistical significance using Duncan's Multiple Range Test (Steel and Torrie 1980).

Results and Discussion

Physical evaluation of wheat grains. Physical tests of wheat varieties revealed that 1000 kernel weight varied from 42 to 30 g for Faisalabad -85 and Barani-83 varieties (Table 1). Kohinoor-83 showed maximum grain length (7.4mm) while Chakwal-86 ranked lowest (6.2mm). Duncan's multiple range test showed that Pak-81, Chakwal-86 and Kohinoor-83 have non-significant difference in length of grains. Faisalabad-85 had highest width of grain (3.3mm) among the five varieties. Faisalabad-85 had highest test weight mean value (79.7 kg hl^{-1} while Barani-83 had the lowest (69.3 kg hl^{-1}).

Milling performance. Milling data is useful in predicting the suitability of particular variety for a specific end use quality. Varieties low in protein are usually considered to be suitable for manufacturing of biscuits. Pak-81 had highest bran (17.5%) and flour yield (73.4%) (Table 2) while crude protein contents were also high (13.6) than other tested varieties/cultivars (Table 3). Proteins content was highest (6.3%) in proximate analysis of biscuits (Table 4).

The variety Chakwal-86 was ranked lowest because of poor flour yield (70.5%). While it is ranked superior for certain parameters associated with biscuits ranking quality. Biscuits made from all five flours were rated acceptable (Table 5).

Farinographic studies. Farinographic studies (Table 6) gives a clear indication of water absorption capacity and time

Table 1
Physical evaluation of wheat grains

Variety	1000 kernel weight of grains (g)	Length of grains (mm)	Width of grains (mm)	Test weight (kg hl^{-1})
P-81	30.6 B	7.3 A	3.2 *	70.3 CD
B-83	30.3 B	7.2 C	3.3 *	69.3 D
K-83	30.1 B	7.4 B	2.1 *	71.3 C
F-85	42.4 A	6.3 CD	3.3 *	79.7 A
C-86	41.3 A	6.2 D	3.1 *	75.0 B

*Mean values show non significant results by DMR tests mean values of the same column having alphabetic letter show significant level ($p<0.05$) according to Duncan's multiple range test.

Table 2
Milling data of different wheat varieties (%)

Variety	Shorts	Bran	Reduction flour	Break flour	Total flour
P-81	6.5	17.5	4.1	69.2	73.3
B-83	3.9	17.3	4.2	65.8	70.3
K-83	4.9	15.1	4.8	67.9	72.7
F-85	5.4	17.1	4.8	65.8	70.7
C-86	3.7	13.4	3.8	66.7	70.5

Table 3
Proximate analysis of whole wheat flour

Variety	Moisture	Crude protein	Crude fibre	Crude fat	Total ash
P-81	8.7 B	13.6 A	2.6 A	2.4 N.S	1.6 N.S
B-83	9.7 A	12.7 B	2.5 AB	2.3 N.S	1.2 N.S
K-83	9.4 A	13.5 A	2.6 A	2.1 N.S	1.4 N.S
F-85	9.4 A	13.2 A	2.3 B	2.3 N.S	1.3 N.S
C-86	9.5 A	12.8 B	2.2 B	2.4 N.S	1.3 N.S

Table 4
Proximate analysis of biscuits

Variety	Moisture	Crude Protein	Crude fibre	Crude fat	Total ash
P-81	2.1 A	3.4 A	0.5 AB	20.1 N.S	0.5 N.S
B-83	1.5 B	6.3 B	0.7 A	20.1 N.S	0.5 N.S
K-83	1.5 B	6.2 AB	0.7 A	20.2 N.S	0.4 N.S
F-85	1.4 B	6.0 B	0.5 B	20.1 N.S	0.4 N.S
C-86	0.7 C	6.2 A	0.5 A	20.2 N.S	0.5 N.S

Table 5
Average quality score for sensory evalution of biscuits

Variety	Color	Taste	Flavor	Texture	Over all acceptability
P-81	6.0 N.S	4.8 N.S	3.5 C	6.3 N.S	6.0 N.S
B-83	7.0 N.S	6.0 N.S	7.7 AB	6.8 N.S	6.8 N.S
K-83	7.5 N.S	7.1 N.S	6.8 AB	6.6 N.S	7.0 N.S
F-85	6.1 N.S	6.8 N.S	7.3 A	6.0 N.S	6.5 N.S
C-86	6.5 N.S	5.5 N.S	5.3 B	5.8 N.S	5.8 N.S

Table 6
Farinographic data of different wheat flours

Variety	Shorts ABS%	Dough devp. (min)	Dough stab (min)	Resistance to dough (min)	Softening of dough (B.U)	Tolerance index (B.U)
P-81	62.8	4.5	7.5	10.5	60	70
B-83	64.0	2.5	3.5	5.0	60	80
K-83	64.2	2.8	10.8	12.3	30	50
F-85	62.2	4.5	4.5	7.5	60	80
C-86	62.0	2.5	3.0	4.5	120	100

Table 7
Alkaline water retention capacity and gluten percentage of wheat flour

Variety	Water gluten (%)	Dry gluten (%)	AWRC (%)
P-81	40.5 B	11.8 A	09 4
B-83	38.5 D	10.0 D	12.1
K-83	39.3 C	10.4 C	19.3
F-85	40.3 B	10.6 C	20.5
C-86	41.2 A	11.1 B	28.5

required for dough development. Cultivar Kohinoor-83 showed maximum water absorption capacity. Barani-83 also has similar qualities but Chakwal-86 has very poor water absorption quality and possess very low dough development time (2.5 min). Based on farinographic studies, Chackwal-86 could be suitable variety for biscuit making.

Alkaline Water Retention (AWRC). Chackwal-86 had maximum (28.5%) AWRC., While Pak-81 has the minimum (9.4%) (Table 7). Chakwal-86 has maximum (41.2%) wet gluten while Barani-83 has minimum (38.5%) wet gluten. Besides, Pak-81 has maximum (11.8%) content of dry gluten while Barani-83 has minimum (10.0%) value (Chaloner 1975).

Sensory evaluation of biscuits. Sensory evaluation of biscuits (Table 5) showed no significant difference between cultivars. The results regarding colour and flavour of biscuits made from Faisalabad-85 were excellent than others.

References

AACC 1983 *Approved Mehods of Analysis.* The American Association of Cereal Chemists Inc. Minnesota.

Chaloner C 1975 Profitability and moisture control. *Baker and Miller J* **78** (8) 26-27.

Fowler D E, Rocher I A 1975 Wheat quality evaluation. *Canadian J Plant Sci* **55** (1) 251-262.

Larmond E 1977 *Laboratory Methods for Sensory Evaluation of Foods.* Canadian Dept Agri Pub 1637.

Matz S A 1972 *Bakery Technology and Engineering.* The AVI Publishing Co. Inc., Westport Connecticut. 2nd ed.

Rehman S S, Siddique M I, Gallani S A H 1988 Rheological and baking properties of wheat in relation of dough improving agents. *Sarhad J Agri* **4** (5) 619-631.

Smith W H 1963 *Biscuits, Crackers and Cookies.* Applied Sci Pub Ltd London.

Steel R G D, Torrie J H 1980 *Principles and Procedures of Statistics.* McGraw Hill Book Co. Inc New York.

Tahir M M 1974 The effect of rate of extraction on the nutritive quality of wheat. M Sc thesis, Dept. of Food Technol. Univ. of Agri. Faisalabad.