COMPARISON OF THE EFFECTS OF TWO WHEAT CULTIVARS ON THE QUALITY OF HIGH FIBER BRAN-COOKIES

YÜKSEK LİFLİ KEPEKLİ-BİSKÜVİLERİN KALİTESİ ÜZERİNE İKİ BUĞDAY ÇEŞİDİNİN ETKİLERİNİN KARŞILAŞTIRILMASI

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ABSTRACT: In this, study the performance of two wheat cultivars which are widely grown in Turkey (Bezostaya and Gerek) were investigated in terms of cookie quality, first when supplemented with their fine and coarse brans and also when formulated as whole wheat products. Fine and coarse bran supplemented Gerek samples had better cookie quality characteristics then Bezostaya samples. Similar results were also obtained from whole wheat formulated cookies. The results demonstrate that the effects of variety, bran type and bran addition levels must be considered when formulating high fiber cookies because of their obvious differences in terms of affecting cookie quality.

ÖZET: Bu çalışmada Türkiye'de yaygın olarak yetiştirilen iki buğday çeşidinden (Bezostaya ve Gerek) elde edilen ince ve kalın kepekler ile, tam buğday unu formülasyonlarının bisküvi kalitesi üzerine etkileri incelenmiştir. Buna göre Gerek çeşidi hem ince ve kalın kepek içeren bisküvilerde, hem de tam buğday unu formülasyonlarında Bezostaya çeşidine göre daha olumlu sonuç vermiştir. Sonuçlar bisküvi kalitesi üzerinde farklı etkileri görülen, buğday çeşidi, kepek tipi ve kepek ilave oranlarının, yüksek lif içerikli bisküvilerin formülasyonunda gözönünde bulundurulması gerektiğini göstermiştir.

INDRODUCTION

The importance of dietary fiber in food was reviewed by many researchers. The role of wheat bran in the etiology of certain diseases was discussed critically by BRODRIBB and GROVES (1978), DINTZIS et al (1985), EASTWOOD et al (1973), EASTWOOD et al (1974), FINDLAY et al (1974), HELLER et al (1980), KIRWAN et al (1974) and ANDERSON et al (1990). Since bread has been considered the most common vehicle for fibre incorporation into diet, many articles have been published on fiber types and their effects on bread functionality. Most commonly discussed topic has been the effect of wheat bran on bread quality (POMERANZ et al 1976, POMERANZ et al 1977, SHOGREN et al 1981). However some work has been done on layer cakes and cookies. Cellulose products and wheat brans have been incorporated successfully in layer cakes (ZABIK et al 1977, SPRINGSTEEN et al 1977) and cookies (VRATANINA and ZABIK 1978, GOREYZCA and ZABIK 1979).

The aims of this study were to investigate the performance of two Turkish wheat cultuvars in terms of cookie quality, first when supplemented with their fine and coarse brans and also when formulated as whole wheat products.

MATERIALS AND METHODS

Flours and fine and coarse brans were obtained by using a Bühler Laboratory Mill from samples of Bezostaya (hard red winter) and Gerek (soft white winter) wheat cultivars. Bezostaya (13,4 % protein and 1,51 % ash contents) and Gerek (11,4 % protein and 1,22 % ash contents) were chosen to represent varieties that possess strong and weak physical dough properties, respectively. These varieties are widely grown in the Central Anatolia, Turkey. The flour yields of these varieties are 69,1 %for Bezostaya and 72,9 % for Gerek. The brans were added to the respective flour samples at the levels of 4%, 8%, 12%, 16%, 20%.

The whole wheat flour samples were prepared based on their exact flour yields. The fine bran and ground coarse bran were combined into flour in different proportions in order to obtain samples containing brans with the 1/4, 2/4, 3/4 and 4/4 of the quantities existing in the original whole wheat composition (according to

the milling data). This was accomplished by combining fine bran and ground coarse bran at the given proportions and increasing the amount of flour in the total composition. The proportions of fine bran, ground coarse bran and flour in these preparations are given in Table 1.

Table 1. The composition of flour preparations

Variety	Total Bran	Fine Bran (%)	Ground Course Bran (%)	Flour (%)
Bezostaya	(1/4)	3.4	6.8	89.9
	(2/4)	6.0	12.3	81.7
	(3/4)	8.3	16.8	74.8
	(4/4)	10.2	20.7	69.1
Gerek	(1/4)	2.4	6.1	91.4
	(2/4)	4.3	11.4	84.3
	(3/4)	6.0	15.9	78.2
	(4/4)	7.4	19.7	72.9

Analytical Procedures

Moisture, protein, ash, wet gluten, dry gluten and crude fiber contents and falling number values of the samples were determined by using AACC Standard Methods (ANONYMOUS 1990).

Cookie Formulation and Evaluation

Cookie quality of bran supplemented flours and whole wheat flours were determined by AACC Method No. 10.50D (ANONYMOUS 1990). Six cookies were prepared per baking. The formula for baking cookies is shown in Table 2.

Table 2. Formulation of Cookies

Ingredients	Weight(g)
Shortening	64.0
Sugar	130.0
Salt	2.1
Bicarbonate of soda	2.5
Dextrose solution (*)	33.0
Distilled water	16.0
Flour 14%m.b.	225.0

(*) 8.9 g dextrose hydrous in 150 ml water

This method determines cookie width (W), thickness (T) and cookie spread factor of flours using standard equipment (National Mfg. Co. mixer and Despatch rotary oven), prescribed ingredients, and procedures. Spread factor is the ratio of cookie width to the height for each bake (W/T).

Data were analyzed for variance using MSTAT Statistical package. When significant differences were found LSD (Least Significant Difference) test was used to determine the differences among means.

RESULTS AND DISCUSSION

Crude fiber, dry and wet gluten, protein and ash contents of the flour samples, Bezostaya coarse bran (BCB), Bezostaya fine bran (BFB), Gerek coarse bran (GCB), and Gerek fine bran (GFB) samples and falling number values of the flour samples are given in Table 3.

Table 3. Various Properties of Flour and Bran Samples

Sample	Crude Fiber (1) (%)	Wet Gluten (2) (9)	Dry Gluten (2) (%)	Protein content (1) Nx5.7 (%)	Ash content (1) (%)	Falling Number (sec)
Bezostaya						
Flour	0.12	31.1	10.5	11.9	0.42	641
Coarse Bran	8.20	–	–	16.7	5.02	–
Fine Bran	3.20	–	–	13.7	2.55	–
Gerek						
Flour	0.25	29.0	9.3	9.9	0.37	413
Coarse Bran	9.80	–	–	17.1	3.47	–
Fine Bran	4.20	–	–	17.0	2.39	–

1) Dry basis 2) 14 % moisture basis

These results indicate that both of the selected samples are typical specimens of their respective varieties and are considered as sound.

Cookie Quality

The width, thickness, and spread ratio values of flours supplemented with their corresponding fine and coarse brans at 4, 8, 12, 16, 20 % levels are presented in Table 4 and compared as photographs in Figure 1.

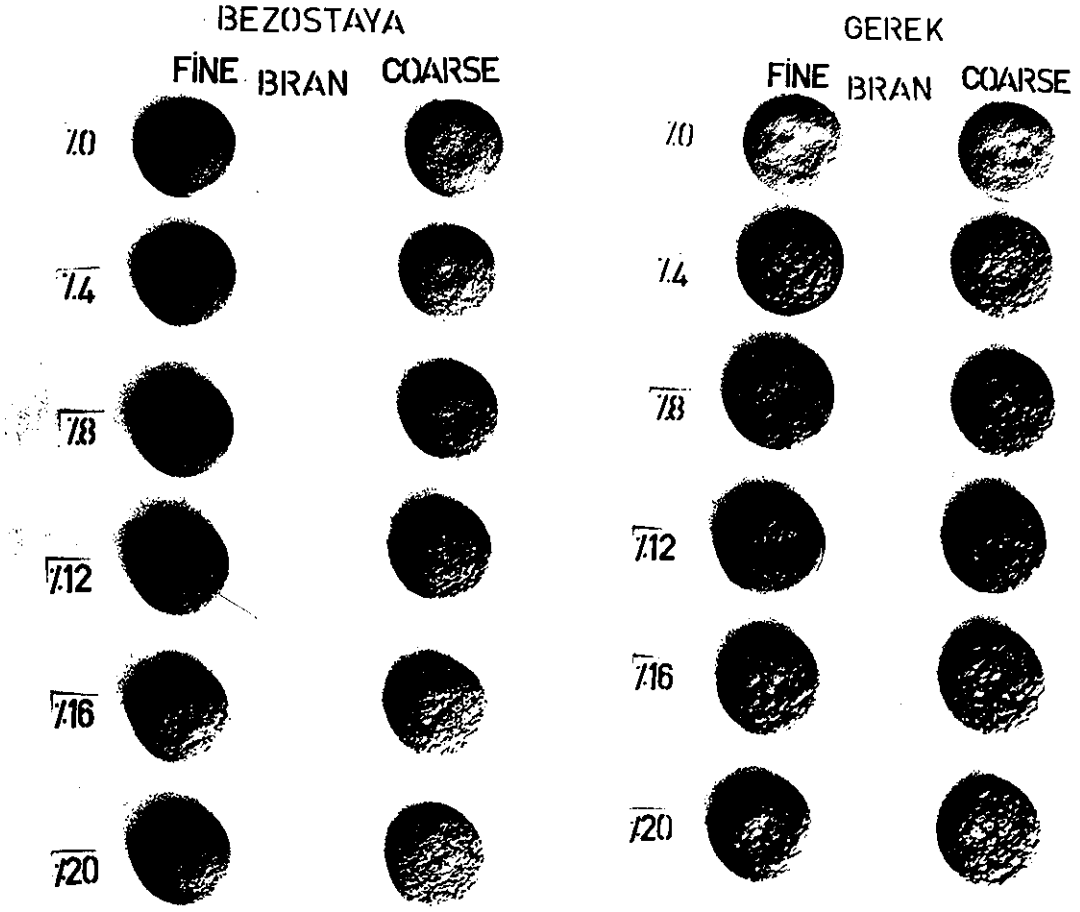

Figure 1. Fine and Coarse Bran Supplemented High Fiber Cookies of Bezostaya and gerek Cultivars

In general bran addition caused deleterious effects on cookie quality characteristics as expected. Bran supplemented cookies generally had inferior spread ratio values compared to their corresponding control samples with no bran addition, except GFB. A significant improving effect was observed from GFB at lower addition levels (upto 8 %). However an obvious deterioration was observed above this level. Most of the Gerek samples had acceptable cookie quality properties as indicated by their high spread ratio values and photographs. But Bezostaya samples had much lower cookie spread ratio values, even including the control sample (Table 4). There was great difference between corresponding fine and coarse brans of Bezostaya and Gerek samples in terms of affecting spread ratio values. In order to facilitate the comparison of two varieties, their spread ratio values are normalized and presented in Table 4. In normalization the spread ratio of the control of each variety was accepted as 100.

Table 4. Width, Thickness and Spread Ratios of the Cookies Supplemented With Different Brans

Bran Type	Addition Level (%)	Width (cm)	Thickness (mm)	Spread Ratio	
				(W/T)	Normalized
GFB	0	7.92	1.05	7.54 B	100.0
	4	7.80	1.03	7.57 B	100.4
	8	8.05	1.01	7.97 A	105.7
	12	7.72	1.14	6.77 C	89.8
	16	7.60	1.13	6.73 C	89.3
	20	7.60	1.18	6.44 D	85.4
	LSD (P<0.05)			0.215	
GCB	0	7.92	1.05	7.54 A	100.0
	4	7.72	1.05	7.35 AB	97.5
	8	7.70	1.07	7.20 B	95.5
	12	7.80	1.08	7.22 B	95.8
	16	7.80	1.08	7.22 B	95.8
	20	7.73	1.13	6.84 C	90.7
	LSD (P<0.05)			0.257	
BFB	0	7.03	1.15	6.11 A	100.0
	4	7.20	1.21	5.95 A	97.4
	8	6.92	1.27	5.45 B	89.2
	12	6.93	1.29	5.37 BC	87.9
	16	6.83	1.29	5.30 BC	86.7
	20	6.92	1.34	5.16C	84.5
	LSD (P<0.05)			0.282	
BCB	0	7.03	1.15	6.11 A	100.0
	4	6.90	1.29	5.35 B	87.6
	8	6.95	1.30	5.35 B	87.6
	12	6.97	1.34	5.20 BC	85.1
	16	7.05	1.36	5.18 BC	84.8
	20	7.02	1.39	5.05 C	82.7
	LSD (P<0.05)			0.244	

For each variety, means with the same letter within a column are not significantly different (P<0.05) by least significant difference analysis.

Both real and normalized spread ratio values of the bran supplemented cookies were evaluated in order to compare fine and coarse brans of each variety. Fine bran supplemented cookies of Gerek have given better spread ratio values than coarse bran supplemented ones at lower addition levels, but inferior spread ratio values at higher addition levels. However fine bran supplemented cookies of Bezostaya have given better spread ratio values than coarse bran supplemented ones at lower addition levels, but inferior spread ratio values at higher addition levels. However fine bran supplemented cookies of Bezostaya have given better spread ratio values than coarse bran supplemented ones at all addition levels.

Whole Wheat Cookies

The fine bran, ground coarse bran and flour were combined together to obtain whole wheat flour (WWF) and other high bran formulations containing 1/4, 2/4 and 3/4 of WWF. In general, the two varieties have shown dissimilar cookie quality properties according to both real and normalized spread ratio values (Table 5).

Table 5. Spread Ratio Values of the Whole- Wheat Cookies

	Bezostaya		Gerek	
	(W/T)	Normalized	(W/T)	Normalized
Flour (Control)	6.14 A	100.0	7.44 A	100.0
WWF (1/4)	5.45 B	88.8	7.26 A	97.6
WWF (2/4)	5.47 B	89.1	6.91 B	92.9
WWF (3/4)	5.14 C	83.7	6.69 B	89.9
WWF (4/4)	5.20 C	84.7	6.12 C	82.3
LSD (P<0.05)	0.232		0.270	

For each variety, means with the same letter are not significantly different (P<0.05) by least significant difference analysis.

Most of the Gerek samples had acceptable cookie quality characteristics as indicated by their higher spread ratio values and photographs. However, Bezostaya samples had much lower spread ratio values even including the control sample, similar to the bran supplemented cookies (Table 4). Spread ratios of the Gerek samples decreased to a large extent after WWF (3/4) level, while in Bezostaya samples, such an important deterioration was evident at a lower level (after WW 2/4). The photographs are given spread in Figure 2.

CONCLUSION

In this study, significant differences were observed between varieties, bran type and bran addition levels in terms of affecting cookie quality. Therefore it can be concluded that effects of variety, bran type and bran level must be considered when formulating high fiber cookies because of their obviously different effects on cookie properties.

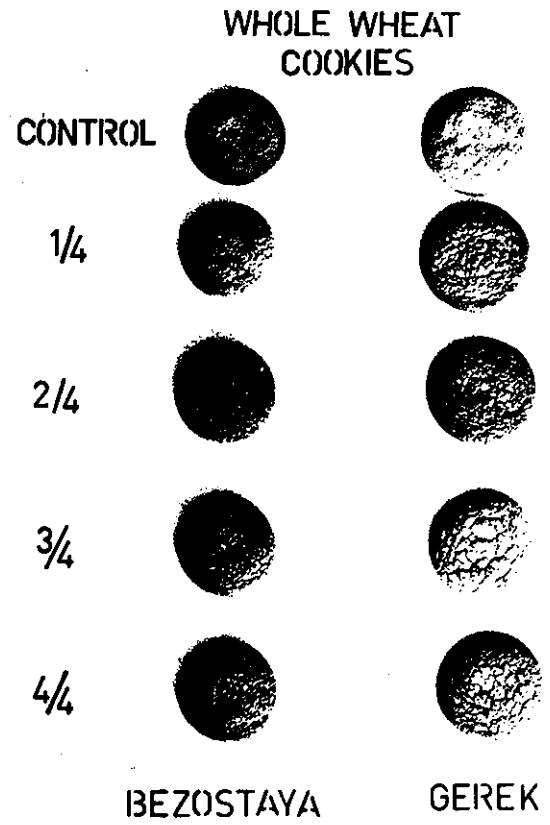

Figure 2. Whole Wheat and High Fiber Cookies of Bezostaya and Gerek Cultivars

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