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DETERMINATION OF FLOUR CHARACTERISTICS FOR KADAYIF PRODUCTION

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Abstract

Kadayıf is a traditional Turkish dessert that is prepared by pouring wheat flour slurry onto a cycling hot plate from a nozzle followed by baking and adding syrup. Recently, demand for specific properties of flours in the bakery industry has increased. In this study, physical, chemical, technological and rheological properties of Kadayıf flours obtained from both Kadayıf producers and flour factories were investigated and a quality profile of flour for Kadayıf production was propounded. It was determined that 43.32 – 59.05% of Kadayıf flours were under 80 µm indicating that flour with fine particles were desired. Ash, protein, sedimentation value, gluten and gluten index changed between 0.53 – 0.70%, 8.10 – 10.77%, 11.2 – 29.2 mL, 19.0 – 27.7% and 50.7 – 97.6% with average values of 0.57%, 9.36%, 19.7mL, 22.1% and 81.1%, respectively. Damaged starch (3.50 – 4.90%) and water absorbtion % (49.5 – 54.3%) were low. As a result, in Kadayıf production special purpose flour with low protein, low gluten content and gluten index, low sedimentation value and water absorbtion capacity is appreciated. Low protein soft wheats with poor technological properties would be appropriate for this purpose.

Key words: Kadayıf, special purpose flour, technological properties, Turkish dessert.

INTRODUCTION

Kadayıf is a semi-finished product obtained by pouring and mixing the liquid dough prepared by adding drinking water to the sifted wheat flour according to its technique and frying it when necessary (TSE, 2010). Kadayıf is presented to the market in two types, as not fried or fried. Kadayıf, which was produced in small enterprises until recently, has been fabricated in large enterprises (Pekak, 2006).

Typically, Kadayıf is produced by pouring water – flour slurry onto a rotating hot metal plate from a couple of nozzles in order to obtain dried Kadayıf filaments. Rotating hot plate ensures sudden evaporation of water from the slurry.

Kadayıf production consists of 4 stages as dough kneading, dough forging, shaping and baking. In the Kadayıf production, flour is mixed into the slurry by kneading with the addition of an average of 80% water, and then the gluten structure is destroyed. This process, called dough forging, is carried out with the help of pallets. It comes to a container with nozzles, which becomes liquified by degrading its gluten structure. The flow rate of the dough from the nozzles is important at this stage. The dough is poured on the sheet rotating at 250 °C. When the metal sheet is turned one full turn, the Kadayıf, which is called raw Kadayıf, is obtained. From here, raw Kadayıf is taken onto a belt conveyor. Cooling takes place as Kadayıf moves on belt conveyor. Raw Kadayıf is rested for about an hour, then placed in the container in which it is shaped and pressed. After pressing, Kadayıf takes its final shape before frying. It is fried at 235 °C (Anon., 2010). It is consumed after syrup is added. The important quality properties of Kadayıf are being not broken up after frying. Kadayıf should not loose brittleness when the syrup is given.

The properties of flour used in Kadayıf production are quite different from other special purpose flour. In the production of Kadayıf, flour with low gluten and gluten index (60%), low protein content is preferred. The slurry should pass through the nozzles without blocking where it will pour onto a hot rotating metal plate (Anon., 2009a). While milling, it is desired that the flour yield in the milling system is high and the semolina yield is as low as possible (Pekak, 2006).

In production of Kadayıf flour, low sedimentation value, low gluten content, low protein soft wheat are preferred (Anon., 2009b). Wheat varieties required for Kadayıf flour are

especially among soft wheats with low protein quality and quantity. Hard wheat with high protein content will result in increased starch damage during milling process. In case of flours with high protein content and high starch damage, more water must be added to obtain the flour - water slurry, and blockages may be observed when flowing through the nozzles due to the excess amount of protein (Pekak, 2006). Evaporation of water is also delayed due to higher amount of water in the slurry. An economically important factor in this situation is that the product stays on the sheet longer for the evaporation of the excess water added and as a result an additional energy cost occurs.

Kadayıf flour production requires a separate mill diagram and great attention. It differs from other special purpose flours in terms of production technique. By using a short diagram and grinding with low tonnage in the mill, using larger mesh size during sieving, by keeping larger gap between rollers in accordance with other special purpose flours, low starch damage is ensured. While 80 micron sieve is used as the smallest sieve in baklava, pie and pastry varieties production, sieves smaller than 132 micron are not used in Kadayıf flour production. In case of using smaller mesh sizes, the flour can become non-sievable by sticking to the sieves due to the low granulation of the Kadayıf flour (Anon., 2009c).

During the interviews with the Kadayıf producers, it was stated that the water absorption of Kadayıf flour, damaged starch ratio, ash and protein content should be low and the particle size of the flour should be also low. In the production of Kadayıf, the paste, which is turned into a slurry with the addition of an average of 80% water, flows from nozzle and is poured on a hot, rotating high temperature sheet, and the cooking process is completed by taking it on the belt conveyor after 1 full turn.

Studies to determine the quality characteristics of Kadayıf flour are very limited. Pekak (2006) studied the effect of 3 different protein ratios (11.1%, 11.6 and 12.2) in 4 different yields (60, 65, 70 and 77%) in a commercial flour mill and he determined physical, chemical and rheological properties of flours and some physical and sensory properties of Kadayıf desserts obtained from these flours. Flours produced from high protein blend had high protein, Zeleny sedimentation and ash values. The highest Kadayıf yield and syrup absorption were obtained from low protein blend flour.

Çakmakçı and Aydın (2001) examined the microbiological and sensory properties of fresh and stored wire Kadayıf produced with whey supplementation. Use of whey at different levels instead of water increased the nutritional value of Kadayıf. The frying time was shortened, and the sense of sugarness increased. Thus, it has been determined that time, electricity and sugar can be saved. As a result of the research findings, it has been determined that 50% whey supplementation provided the best sensory properties Kadayıf dessert.

Özen (2006) utilized Type 550, Type 650 and Kadayıf flour for the production of tulumba dessert in which he studied the effects of different flour type on the quality of tulumba dessert. When the effects of flour type on tulumba dessert quality were examined, it was determined that the desserts produced using Kadayıf flour were harder than other flours and softening was higher than other flours with the increase in time.

In this study, some physical and chemical properties of Kadayıf flour obtained from both flour manufacturers and Kadayıf producers were determined. A range of color profile, protein, ash, gluten quantity, sedimentation value and farinograph quality parameters were propounded for Kadayıf flour.

MATERIALS AND METHODS

Materials

Flour for Kadayıf production was obtained from Ova Flour Factory, On-el Flour Factory (Konya, Turkey), Emek Flour Factory, Ankara Flour Factory (Ankara, Turkey), Tellioğlu Flour Factory, Özdamarlar Flour Factory (Balıkesir, Turkey) Tezcan Flour Factory (İzmir, Turkey) in two replications. 5 kg of Kadayıf flour samples were stored at 15°C in plastic jars and used for analysis.

Methods

100 grams of flour sample was sieved for 5 minutes from 180, 150, 132, 118 and 80 micron sieves. and the percentage of flour remaining on each sieve and under 80 µm sieve was expressed in %. Analysis was carried out in two parallels.

L *, a*, b * and L * - b * values of flour samples were determined according to Ekinci (2001) using Minolta Chromameter CR-310 (Osaka, Japan). Flour samples were filled in petri dishes, their surfaces were smoothed and color values were recorded. Measurements were carried out in 5 parallels.

Moisture content of the samples was determined according to ICC Standard No: 110/1 (ICC, 1982). Ash content was determined according to ICC Standard No: 104/1 (ICC, 1990). Protein content was determined according to ICC Standard No: 105/2 (ICC, 1994). Protein content was calculated by multiplying the total amount of nitrogen by 5.7. The analysis was carried out in three parallels.

Zeleny Sedimentation and modified sedimentation tests were carried out according to ICC Standard No: 116/1 (ICC, 1994) and Pinckney et al. (1957), respectively. Analyzes were carried out in three parallels. gluten and gluten index ratio of the samples were carried out in parallel with ICC Standard No: 155 (ICC, 1994). Falling number of samples were determined according to ICC Standard No: 107/1 (ICC, 1995). The analysis was carried out in three parallels.

Damaged starch percentage of the samples was determined according to AACC Method 76.33.01 based on the principle of iodine absorption using the Chopin SD-Matic device (AACC, 2006). Analysis was carried out in two parallels.

The study was planned as completely randomized design. Data were analyzed by Statistical Analysis System (S.A.S., 2001). Duncan test and one way ANOVA was used to determine differences between results.

RESULTS AND DISCUSSION

Physical Properties of Flours for Kadayıf Production

Particle size distribution of flours for Kadayıf production are given in Table 1. The total flour rate of Kadayıf flour samples under 118 µ was determined as 85.48%. More than 80% of the particle size distribution of flour samples was collected under 118 and 80 µ sieves.

The flour color desired in the production of Kadayıf is white. Therefore, flour is rested for about three weeks in order to allow carotenoid oxidation. As a result, the flour turns creamy white (Elgün, 1995).

Table 1. Particle size distribution of Kadayıf flours

	150 - 132 µ (%)	132 - 118 µ (%)	118 - 80 µ (%)	<80µ (%)
Min.	3.07	4.21	24.30	43.32
Max.	12.83	9.04	44.95	59.05
Mean	4.87	5.76	33.93	51.55
St.D.	2.06	1.10	5.72	4.89
LSD	4.25	2.34	5.85	3.80

Table 2 shows the color profile of flours for Kadayıf production. Average L *, a *, b * and L * - b * values are 95.1, -5.55, 13.31 and 81.78, respectively. For L * value, LSD is 0.83 and samples are statistically different in terms of L * value ($p < 0.01$). The effect of a* on samples is significant while the effect of b * on samples is not statistically significant ($p > 0.05$).

Table 2. L*, a*, b* and L*-b* values of flours for Kadayıf production

	L*	a*	b*	L* - b*
Min.	92.40	-4.90	12.00	73.15
Max.	96.20	-6.00	19.25	84.20
Mean	95.1	-5.55	13.31	81.78
St. D.	0.80	0.29	1.40	2.10
LSD	0.83	0.36	2.64	3.43

Chemical And Technological Properties of Flours for Kadayıf Production

Chemical and technological properties of Kadayıf flour samples were shown in Table 3. Ash content of flour samples ranged between 0.52 – 0.70% with an average of 0.57%. The effect of the ash content on the samples was found significant ($p < 0.01$). Pekak (2006) investigated effect of 3 different protein ratios (11.1%, 11.6 and 12.2) in 4 different yields (60, 65, 70 and 77) in a commercial flour mill and examined the physical, chemical and rheological properties of the Kadayıf flour obtained. In the study, ash content of Kadayıflık flour samples varied between 0.47 and 0.53%. Özen (2006) reported that the ash content of Kadayıf flour was 0.565% (dry matter). Our results were in accordance with Özen (2006) but higher than Pekak (2006).

Production of flour with low yield and low ash content is essential in Kadayıf production. In TSE (10344) Tel Kadayıf Standard (TSE, 2010), the maximum ash content of the Kadayıf is

limited to 0.65%. As a result of interviews with Kadayıf producers, it was determined that the ash content increased by 0.07% during cooking of Kadayıf. Considering the increase in ash content during cooking, it is desired that the average ash content of Kadayıf flour is 0.52% (Anon., 2010). It is known that high ash promotes browning reactions in product color (Pomeranz, 1987). The ash content is desired to be low in Kadayıflık flour. It has been reported that Kadayıf made using flours with an ash content of 0.50 - 0.60% and flour yield of 60 - 70% is appreciated (Pekak, 2006).

Table 3. Some Chemical and Technological Properties of Flours for Kadayıf Production

	Ash (%DM)	Protein (%DM)	Sedimentation (mL)	Modified Sed. (mL)
Min.	0.52	8.11	11.2	9.9
Max.	0.70	10.77	29.2	35.2
Mean	0.57	9.36	19.7	17.8
St.D.	0.05	0.96	5.22	9.15
LSD	0.046	1.40	9.77	13.43

Protein content changed between 8.11 – 10.77% dry matter with an average of 9.36%. Kadayıf flour samples did not change in terms of protein content significantly ($p>0.05$). Pekak (2006) reported that the protein content of Kadayıflık flour samples ranged from 8.11% to 9.41%, while Özen (2006) found that the average protein content of Kadayıflık flour was 9.41%. Our results are consistent with the results of Pekak (2006) and Özen (2006). It is desired that the protein content and quality of the flour should be low in order for the slurry to flow easily from the nozzles onto the sheet and to prevent clogging. High protein content negatively affects the consistency of the dough slurry, causing clogging in the nozzles where the dough is poured onto the sheet, causing problems during Kadayıf production. The average protein content of the flours used in the production of Kadayıf is around 9% (Anon., 2009a).

LSD values for sedimentation and modified sedimentation values were 9.77 and 13.43, respectively, and the effect of both quality parameters on samples was not significant ($p> 0.05$). Low sedimentation and modified sedimentation valus are desirable feature in Kadayıf flour (Anon., 2009b). Similar to the results of the present research, Pekak (2006) stated that the sedimentation values of Kadayıf flour samples ranged between 15.6 - 23.9 mL and modified sedimentation values between 16.5 - 23.3 mL. Özen (2006) reported that Zeleny sedimentation value of Kadayıflık flour was 25 mL. In general, modified sedimentation values decreased compared to Zeleny sedimentation value. This is due to the use of wheat with poor protein and gluten quality in Kadayıf production.

Table 4. shows some technological properties of flours for Kadayıf production. The average gluten content of the samples was 22.1%. The least significant difference between the samples was 3.3 and the effect of gluten on the samples was not statistically significant ($p> 0.05$). Gluten index values ranged from 50.7% to 96.7% with an average of 81.1%. The least significant difference between the samples was 13.4 and the effect of gluten index value on the samples was statistically significant ($p <0.01$).

Table 4. Some Technological Properties of Flours for Kadayıf Production

	Gluten (%)	G.index (%)	Falling Number(sn)	Damaged Starch(%)
Min.	19.0	50.7	280.0	3.50
Max.	27.7	96.7	402.5	4.90
Mean	22.1	81.1	359.7	4.11
St.D.	1.0	15.3	29.8	0.33
LSD	3.3	13.4	71.4	0.79

Pekak (2006) reported that gluten content of Kadayıf flours ranged between 19.8% - 23.6% and gluten index content between 68% - 70%. Özen (2006) reported that the gluten content of Kadayıf flour was 23.6% and the gluten index was 53.0%. During the interviews with flour factories, it has been determined that the gluten index of flours for Kadayıf production was an average of 60% (Anon., 2009a).

The falling number values of Kadayıflık flour samples varied between 280 - 402.5 seconds with an average of 359.7 seconds. The LSD value for the falling number was 71.4. The samples did not differ in terms of falling number ($p> 0.05$). Öztürk et al (2008) reported that the falling number of biscuit flours varied in a wide range such as 350 - 628 seconds.

The LSD value for damaged starch is 0.79 and the effect of the damaged starch ratio on the samples is statistically important ($p <0.01$). Pekak (2006) reported damaged starch ratio of Kadayıf flour samples between 5.8 - 6.3% while

Öztürk et al. (2008) stated that it varied between 4.5 and 6.6%. High starch damage is an undesired feature in Kadayıf flours, since it increases water absorption. As a matter of fact, it has been determined that the damaged starch ratios of Kadayıf flours investigated in the present study were lower than other special purpose flours. Flours with low water absorption is requested for Kadayıf production in order to dry in a short time. Since the damaged starch will absorp more water; it will increase drying time. Therefore, Kadayıf producers prefer flours with a low rate of damaged starch (Pekak, 2006).

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CONCLUSIONS

Kadayıf is a traditional dessert for Turkish people. Determination of its physical, chemical and technological properties may set light to Kadayıf producers and flour factories for appropriate flour properties. As a result, in Kadayıf production special purpose flour with low protein, low gluten content and gluten index, low sedimentation value and water absorbtion capacity is appreciated. Low protein soft wheats with poor technological properties would be appropriate for this purpose

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