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The Determination of Some Qualities Parameters and Use of Strip Loin Beef (*M. Longissimus dorsi*) Powder in Bread Enrichment

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Abstract. In this study, the protein content of the bread, that is also known as rich in carbohydrate content, is enriched by using strip loin beef *(M. longissimus dorsi)* powder as the additive. In order to meet the daily protein needs of individuals, bread was prepared with the addition of certain amounts (3%, 5%, 7%, and 10%) of beef minced powder to the wheat flour. The protein content of the bread samples with the addition of strip loin beef *(M. longissimus dorsi)* powder were increased from 14.41%, 16.03%, 17.43% and 20.33% for enriched bread, respectively. The total colour darkness of the interior of the bread was increasing with the increasing level of strip loin beef *(M. longissimus dorsi)* powder. Extensograph analysis, amylograph analysis, gluten, gluten index, sedimentation, delayed sedimentation, moisture (%) and ash (%) analysis were performed in enriched bread flours. As a result of physico-chemical, rheological and microbiological analysis, it has been determined that protein content increases due to the enrichment rate of meat powdered bread. Sensory analysis questionnaire was conducted to determine the acceptability of the breads by consumers. According to the survey; Questions were asked about the external properties of the bread (crust texture, crust color, form in general), and internal properties (texture, color, chewability, pore structure, taste and odor). The aim of this research is to increase the protein content of bread and to develop an alternative new product that can be consumed by consumers.

***Keywords*:** Bread, strip loin beef, microbial quality, protein.

Ekmek Zenginleştirmede Dana Kontrfile (*M. Longissimus dorsi*) Tozunun Kullanımı ve Bazı Kalite Parametrelerinin Belirlenmesi

Özet. Bu çalışmada, karbonhidrat içeriği bakımından zengin olarak bilinen ekmeğin protein içeriği, katkı maddesi olarak kıyma haline getirilmiş kontrfile (*M. longissimus dorsi*) tozu kullanılarak zenginleştirilmiştir. Bireylerin günlük protein ihtiyacını karşılamak için, buğday ununa belirli miktarlarda (%3, %5, %7 ve %10) kıyma tozu ilavesiyle ekmek hazırlanmıştır. Dana kontrfile (*M. longissimus dorsi*) tozu ilavesi ile ekmek numunelerinin protein içeriği, sırasıyla %14.41, %16.03, %17.43 ve %20.33 arttırılmıştır. Ekmeğin iç kısmındaki toplam renk koyuluğu, dana kontrfile kıyma (*M. longissimus dorsi*) tozu ile artmıştır. Ekstensograf analizi, amylograph analizi, glüten, glüten indeks, sedimantasyon, gecikmeli sedimantasyon, nem (%) ve kül (%) analizleri zenginleştirilmiş ekmek unlarında yapılmıştır. Fiziko-kimyasal, reolojik ve mikrobiyolojik analizler neticesinde kıyma tozlu ekmeğin, zenginleşme oranına bağlı olarak protein içeriğinin arttığı belirlenmiştir. Üretilen ekmeklerin, tüketiciler tarafından kabul edilebilirliğini tesbit etmek amacıyla duyusal analiz anketi yapılmıştır. Ankete göre; ekmeğin dış özellikleri (kabuk tekstürü, kabuk rengi, genel olarak şekli), ve iç özellikleri (tekstür, renk, çiğnenebilirlik, gözenek yapısı, tat ve koku) ile ilgili sorular sorulmuştur. Bu araştırma ile ekmeğin protein oranı arttırılarak, tüketiciler tarafından tüketilebilecek alternatif bir yeni ürün geliştirilmesi amaçlanmıştır.

***Anahtar Kelimeler*:** Ekmek, kontrfile, mikrobiyolojik kalite, protein.

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1. INTRODUCTION

Nutrient intake of the individual is influenced by the nutrient consumption that is used in connection with the habit of eating, economic reasons, mental state, cultural structure, climate condition, appetite and diseases [1]. Nutrition is very important for the individual's body, soul and mental health to be good and to maintain this condition. A balanced diet is known as the consumption of food components by the appropriate amount and type. People are required to take the basic compounds they need regularly with their food. Otherwise, the human body has to meet the missing compounds from the stores in the body. Nutrients must be consumed in a sufficient and balanced way with the basic condition of healthy living. This will reduce disability, premature death and diseases that may occur with nutritional deficiencies [2.3].

All of the countries in the world consume nutrients of vegetable origin more than the animal origin for calorie consumption. In developed countries, nutrients from animal origin are consumed more to meet protein needs. In our country, a large part of the daily energy need is obtained by bread consumption [4].

In bread making, wheat flour, yeast, salt and water in a certain ratio are mixed, kneaded and the resulting dough is cooked after fermentation [5]. The bread has nutritious and satisfying properties as well as being easily supplied and cheap. In addition, the fact that the bread has a unique neutral flavor allows it to be consumed together with other foodstuffs [3].

Bread with a high energy level and carbohydrate content cannot meet the body's need for vitamins, proteins and minerals. However, cereals are not sufficient in terms of essential amino acids, compared to animal nutrients [6].

Meat proteins with more nutritive value than vegetable proteins contain a balanced and sufficient amount of exogenous amino acids that the organism cannot synthesize and must be taken with foodstuffs. It also contains mineral substances such as vitamin B12, phosphorus, sodium, potassium, iron, magnesium and zinc. In terms of healthy nutrition, it is important to provide at least 40-50% of the daily protein requirement with animal proteins [7].

In this study, it is aimed to increase the protein content of the bread that can be consumed every meal and investigate some chemical and microbiological properties of bread produced using wheat flour and strip loin beef powder. In addition, the effects of strip loin beef powder, which is used at different rates during bread production, on the quality changes caused by the storage period were also investigated. In the literature, bread experiments were made by using different the enrichment components [8-16]. However, there is no study on using strip loin beef in the enrichment bread.

2. MATERIALS AND METHODS

2.1. Materials

In this study, the sample of beef loin meat obtained from butchers and grocery stores in Giresun province was brought to the laboratory by protecting the cold chain. After the meat sample was minced in a meat grinder, the beef loin sample was dried at 150 °C in the drying cabinet for 2 hours. The dried minced meat samples were powdered by blender. In the study, the reason for the use of beef loin is to minimize the fat content and to minimize the quality losses of the minced meat. In addition, wheat flour obtained from Ulusoy Un A.Ş. (Samsun) and instant dry yeast, salt, sugar, oil (riviera olive oil), water (packaged) are used in bread production. No additives were used in bread production. Fakir Pane Deluxe bread baking machine, 500 g program and dark color setting were used for bread baking experiments.

Table 1. Dough formulations prepared for bread production

Enrichment Rate	Flour (g)	Water (ml)	Salt (g)	Yeast (g)	Sugar (g)	Oil (ml)	Strip Loin Beef Powder (%)
0%	463	330	6	3	28	10	0
3%	448	330	6	3	28	10	15
5%	438	330	6	3	28	10	25
7%	428	330	6	3	28	10	35
10%	413	330	6	3	28	10	50

2.2. Methods

The ash [17] and moisture [18], gluten [19], gluten index [20], sedimentation [21] value of flour samples were determined according to ICC Standard Methods. The amylograph [22] and extensograph [23] analysis were conducted to examine the rheological properties of dough.

The protein content of the whole bread samples was measured according to the AACC method [24].

Bread made from bread-baking machine, was analyzed in terms of pH [6], water activity (a_w) (Aqua Lab Dew Point Water Aktivity Meter, 4TE,USA), moisture [6], protein [6], color (HunterLab, Reston, Virginia, USA) and microbiological (yeast-mold) [25] qualities. After being divided into slices (2 cm thickness), the bread was packed in a room conditions (+18ºC-(+24 ºC) for 3 days. Bread was analyzed on the 1st, 2nd, 3rd, and 4th days of the preservation and quality changes were examined day by day. The study was carried out in three parallel with two replications.

2.3. Sensory analyses

Control and meat powdered bread were scored on the first day of production by 9 different panelists according to sensory ratio scale. In the questionnaire, control group and meat powdered bread; questions were asked about crust texture, crust color, general form and inner texture, inner color, chewability, pore structure, taste, odor and overall acceptability. Survey of the questionnaire is numbered as 1 (poor), 4 (excellent). The survey panel group consisted of 9 randomly selected participants.

2.4. Statistical analysis

Data were analyzed using One way ANOVA and Duncan's post hoc tests by using IBM SPSS 24 software (SPSS Inc., Chicago, IL, USA) with a significance level of 5%.

3. RESULT AND DISCUSSION

3.1. Results

Table 2. Analysis results of wheat flour enriched with strip loin beef powder

Strip Loin Beef Powder Additive Rates	Gluten	Gluten Index	Sedimentation	Moisture (%)	Ash (%)
0%	28,96±0,58^{a}	88 ±1	42 ±2^{a}	13,45±0,24^{a}	0,54±0,05^{a}
3%	30,75±0,96^{ab}	90 ±2	38 ±2^{ab}	13,11±0,17^{ab}	0,61±0,03^{ab}
5%	31,12±1,6^{ab}	93 ±5	36 ±1^{bc}	13,07±0,16^{abc}	0,68±0,04^{bc}
7%	33,63±1,78^{b}	93 ±1	33 ±1^{c}	12,80±0,22^{bc}	0,72±0,04^{cd}
10%	34,55±2,61^{b}	94 ±4	32 ±1^{d}	12,59±0,05^{c}	0,80±0,09^{d}
P	0,013	0,196	0,000	0,002	0,000

*: The difference between the averages (±; standard deviation) is significant indicated in different letters in the same column ($p<0.05$).

Table 3. The results of extensograph analysis of wheat flour enriched with strip loin beef powder

Mincer Powder Additive Rates	Energy (cm^2)	Elongation Resistance (BU)	Elongation (mm)	Max. Resistance (BU)	Ratio	Max. Ratio
0%	109,±3^{a}	571,±34^{a}	134,±9	666,50±15,5^{ab}	4,45±0,35	5,20±0,2
3%	107,50±2,5^{a}	521,±47^{a}	128,50±1,5	651,±19^{a}	3,90±0,6	4,90±0,5
5%	100,50±5,5^{b}	501,±9^{ab}	128,50±6,5	611,±9^{bc}	3,95±0,25	4,75±0,15
7%	94,50±2,5^{b}	478,±14^{b}	128,±1	592,50±25,5^{c}	3,85±0,15	4,75±0,25
10%	94,±6^{ab}	472,50±38,5^{ab}	125,50±1,5	585,±37^{abc}	3,70±0,3	4,55±0,35
P	0.003	0.022	0.397	0,005	0,197	0,214

* The difference between the averages (±; standard deviation) is significant indicated in different letters in the same column ($p<0.05$).

Table 4. Results of amylograph trials of strip loin beef powder additional wheat flour

	0%	3%	5%	7%	10%	P
Max. gelatinization (AU)	906±11^{a}	775±2.5^{b}	706±3^{c}	666±12.5^{d}	608±3.5^{e}	0.000

*: The difference between the averages (±; standard deviation) is significant indicated in different letters in the same row ($p<0.05$).

Table 5. Ash and protein content of bread enriched with strip loin beef powder at different rates

Addition Rate (%)	Ash content (%)	Protein content (%)
0%	0,69 ± 0,015^{a}	13,87 ± 0,05^{a}
3%	0,83 ± 0,003^{b}	14,41 ± 0,41^{a}
5%	0,88 ± 0,007^{c}	16,03 ± 0,15^{b}
7%	0,92 ± 0,009 ^{c}	17,43 ± 0,15^{c}
10%	1,06 ± 0,030 ^{d}	20,33 ± 0,25^{d}

a, b, c, d : The difference between the averages (±; standard deviation) is significant indicated in different letters in the same column ($p<0.05$).

Table 6. pH, moisture and a_w values of bread enriched with different addition rate

Property	Storage Period (days)	Rate 0%	Rate 3%	Rate 5%	Rate 7%	Rate 10%
pH	0	4,59 ± 0,03^{a}	4,63 ± 0,02^{ab}	4,67 ± 0,07^{bc}	4,80 ± 0,08^{c}	4,83 ±0,02^{c}
	1	4,50 ± 0,10^{a}	4,74 ± 0,05^{b}	4,73 ± 0,11^{b}	4,81 ± 0,04^{b}	4,79 ± 0,05^{b}
	2	4,52 ± 0,41^{a}	4,81 ± 0,11^{b}	4,81 ± 0,10^{b}	4,81 ± 0,03^{b}	4,89 ± 0,05^{b}
	3	4,12 ± 0,05^{a}	4,62 ± 0,16^{b}	4,91 ± 0,08^{b}	4,74 ± 0,07^{bc}	4,92 ± 0,05^{c}
Moisture	0	36,57±0,36^{Aa}	37,80±0,30^{Ab}	39,52±0,36^{Ac}	40,32±0,16^{Ad}	40,99±0,12^{Ad}
	1	37,45±0,24^{Ba}	38,80±0,23^{Bb}	39,39±0,21^{Ac}	40,97±0,15^{Bd}	41,28±0,21^{Ad}
	2	38,52±0,36^{Ca}	39,25±0,15^{Bb}	40,39±0,22^{Bc}	41,77±0,21^{Cd}	42,81± 017^{Be}
	3	40,50±0,04^{Da}	41,51±0,47^{Cb}	42,37±0,23^{Cc}	43,67±0,19^{Dd}	45,30±0,21^{Ce}
a_w	0	0,96 ± 0,002	0,97 ± 0,003	0,97 ± 0,005	0,98 ± 0,003	0,98 ± 0,002
	1	0,98 ± 0,004	0,98 ± 0,005	0,99 ± 0,004	0,98 ± 0,005	0,99 ± 0,010
	2	0,98 ± 0,008	0,98 ± 0,002	0,99 ± 0,003	0,99 ± 0,005	0,99 ± 0,005
	3	0,998 ± 0,001	0,998 ± 0,001	0,998 ± 0,001	0,998 ± 0,001	0,998 ± 0,001

A, B, C, D; The difference between the averages (±; standard deviation) is significant indicated in different letters in the same column ($P<0.05$).
a, b, c, d, e; The difference between the averages (±; standard deviation) is significant indicated in different letters in the same row ($P<0.05$).

Table 7. L *, a *, b * values of the inside of bread enriched with different addition rate

Property	Storage Period (days)	Rate 0%	Rate 3%	Rate 5%	Rate 7%	Rate 10%
L*	0	77,44 ±0,75^{Aa}	70,58±0,07^{Ab}	68,64 ±0,40^{Ac}	66,18±1,96^{Ad}	67,53±0,33^{Ae}
	1	75,67 ±1,09^{Ba}	69,32±2,40^{Bb}	65,71 ±0,52^{Bc}	63,14±1,87^{Bd}	62,79 ±1,80^{Be}
	2	72,26 ±0,18^{Ca}	67,20±2,04^{Ca}	64,38±0,51^{Bb}	62,62 ±2,31^{Cc}	62,44±1,70^{Bd}
	3	70,22 ±1,47^{Da}	67,48±2,47^{Db}	65,53 ±0,71^{Cc}	64,31±2,17^{Dd}	60,27 ±2,21^{Ce}
a*	0	2,02 ± 0,31^{Aa}	3,54 ± 0,16^{Ab}	4,36 ± 0,07^{Ac}	5,49 ± 0,08^{Ad}	6,67 ± 0,19^{Ae}
	1	1,62 ± 0,57^{Aa}	3,24 ± 0,55^{Ab}	3,88 ±0,29^{ABc}	5,23 ± 0,33^{Ad}	6,19 ± 0,23^{Ae}
	2	1,70 ± 0,15^{Aa}	2,55 ± 0,12^{Bb}	3,69 ± 0,32^{Bc}	5,02 ± 0,39^{Bd}	6,03 ± 0,26^{Ae}
	3	1,53 ± 0,16^{Ba}	2,56 ± 0,07^{Cb}	3,63 ± 0,10^{Cc}	4,96 ± 0,57^{Cd}	6,05 ± 0,56^{Be}
b*	0	22,18 ±0,48^{Aa}	24,39±0,54^{Ab}	25,50 ±0,55^{Ac}	25,94 ±0,80^{Ac}	25,65±0,29^{Ad}
	1	21,22 ±1,90^{Ba}	23,03±1,74^{Bb}	23,72 ±0,27^{Bc}	23,27±1,33^{Ad}	24,44 ±1,24^{Be}
	2	21,66 ±2,25^{Ca}	23,18±1,66^{Bb}	23,53 ±1,08^{Bc}	23,69 ±0,58^{Bc}	24,10±0,21^{Bd}
	3	20,96 ±0,12^{Da}	22,29±0,81^{Cb}	23,09 ±0,30^{Cc}	23,10 ±0,29^{Cc}	24,35±0,77^{Cd}

A, B, C, D; The difference between the averages (±; standard deviation) is significant indicated in different letters in the same column ($P<0.05$).
a, b, c, d, e; The difference between the averages (±; standard deviation) is significant indicated in different letters in the same row ($P<0.05$).
b * values with the increase of the enrichment rate of bread samples.

Table 8. Yeast-mold values of bread enriched with different addition rate (cfu/gr)

Property	Storage Period (days)	Rate				
		0%	3%	5%	7%	10%
Yeast - Mold	0	NG	NG	NG	NG	NG
	1	NG	NG	2,49 ±0,07^{Ab}	2,42±0,05^{Ac}	3,11±0,03^{Ad}
	2	2,13 ±0,05^{Aa}	2,99 ±0,06^{Ab}	3,12 ± 0,07^{Bc}	3,56 ±0,02^{Bc}	3,69 ±0,09^{Bc}
	3	3,32 ± 0,05^{B}	4,35 ± 0,07^{B}	4,45 ± 0,05^{C}	4,46 ± 0,03^{C}	4,72 ± 0,07^{C}

A, B, C, D; The difference between the averages (±; standard deviation) is significant indicated in different letters in the same column (P<0.05).
a, b, c, d, e; The difference between the averages (±; standard deviation) is significant indicated in different letters in the same row (P<0.05).
NG; Not Growing

Table 9. Sensory properties of bread samples

Sensorial Properties	Additional Rate				
	0%	3%	5%	7%	10%
Crust texture	3,11 ± 0,6^{a}	3,56 ± 0,53^{ab}	3,78 ± 0,44^{b}	3,33 ± 0,5^{ab}	3,44 ± 0,53^{ab}
Crust color	3,22 ± 0,67^{a}	3,44 ± 0,53^{a}	3,56 ± 0,73^{a}	3,11 ± 0,78^{a}	3,56 ± 0,53^{a}
General form	3,56 ± 0,53^{ab}	3,89 ± 0,33^{b}	3,67 ± 0,5^{b}	3,33 ± 0,5^{ab}	3 ± 0,5^{a}
Inner texture	3,44 ± 0,53^{a}	3,56 ± 0,53^{a}	3,56 ± 0,53^{a}	3 ± 1,12^{a}	2,89 ± 0,6^{a}
Inner color	3,67 ± 0,5^{a}	3,89 ± 0,33^{a}	3,78 ± 0,44^{a}	3,67 ± 0,5^{a}	2,44 ± 0,53^{b}
Chewability	3,67 ± 0,5^{a}	3,67 ± 0,5^{a}	3,33 ± 0,5^{a}	3 ± 0,5^{ab}	2,33 ± 0,5^{b}
Pore structure	3,67 ± 0,5^{a}	3,44 ± 0,53^{a}	3,11 ± 0,93^{ab}	3,33 ± 0,5^{ab}	2,56 ± 0,53^{b}
Taste and odor	3,56 ± 0,53^{a}	3,44 ± 0,53^{a}	2,89 ± 0,6^{ab}	3,11 ± 1,17^{ab}	2,67 ± 0,5^{b}
Overall acceptability	3,78 ± 0,44^{a}	3,56 ± 0,53^{ab}	3,33 ± 0,5^{bc}	3 ± 0^{c}	2 ± 0,5^{d}

a, b, c, d, e; The difference between the averages (±; standard deviation) is significant indicated in different letters in the same row (P<0.05).

3.2. Discussion

As a result of gluten index analysis, it was observed that gluten content increased as the percentage of minced meat increased. This can be explained by the fact that powder particles are large enough to pass through the gluten sieves during analysis. However, if only the gluten content was increased due to this situation, the gluten of 3% strip loin beef powder dough should be 30.75. As a result of the analysis, a high result such as 34.55 can be explained by the possibility that the meat proteins cannot dissolve in salt water and even increase the rate of gluten by binding to water, or another component that is insoluble in salt water. This result may also be due to the fact that the minced meat pieces absorb water due to having very low moisture content.

Extensograph results showed that there was a decrease of 1% in dough samples in water lifting capacity. According to the result of the analysis, the excess of water that was bound by gluten during the washing was not shown here. This may be due to the fact that the minced meat used in the enrichment can remove as much water as the water removed by the flour it replaces. In addition, although the protein content has increased, it is possible to say that the loss of starch may be caused by such a loss.

In addition, according to the extensograph results, it can be stated that the rheological quality of the dough decreases as the rate of fortification increases. In all of the dough with strip loin beef powder, extensibility is lower than the extensibility of the control group dough. Thus, it was observed that resistance, elasticity and total energy have decreased gradually.

When the amylograph results of the enriched dough samples were examined, it was observed that the maximum level was gradually decreasing, which could be explained not by the increase of alpha amylase enzyme, but by the decrease of the starch ratio as the rate of minced meat increased. In addition, it was observed that the peak levels decreased as the starch ratio decreased. Viscosity increases were determined before gelling in 10% minced meat dough sample.

In the dough samples, the moisture content has decreased as the percentage of the enrichment

increases, which can be explained by the fact that the dried minced meat sample has very low moisture content.

The amount of ash increased as the percentage of additives increased, which could be related to the fact that the presence of mineral material in the wheat flour with dried strip loin beef powder was higher than the content of wheat flour.

As the fortification percentage increased, the sedimentation values gradually decreased. It can be stated that the worsening of the rheological properties due to the enrichment rate in the extensograph analysis is also confirmed by the sedimentation.

As the amount of the strip loin beef powder added increased, protein content of the enrichment bread increased. The protein ratio of the bread in the control group (0%) was 13,87%, while the protein content of the bread with 10% strip loin beef powder was increased to the highest value with 20,33%. These results show parallelism with Dursun et al. [26] that uses mined fish as additive.

Mohammed et al. [27] determined that the increase in the amount of ash in the samples of the additive bread depending on the addition rate.

In addition, Mohammed et al. [27] found an increase in the amount of protein depending on the rate of addition. These results are in parallel with our study.

Dursun et al. [28] stated that the amount of protein increased due to the rate of minced fish addition bread. Çakmak et al. [29] stated that the amount of protein increased due to the contribution rate of white and whole wheat bread with chicken meat added. Accordingly, the increase in protein value of bread as a result of the addition of animal protein shows parallelism with our results.

Çakmak et al. [29] observed that the increase in the amount of moisture content and water activity of both bread varieties increased as the amount of wheat and whole wheat flour breads increased in different ratios. The results of our study are in parallel with the results of the researchers.

Found values in Dursun [30] for the simple bread study shows parallelism with the control group of our study for the protein content, but the ash ratio and pH value were found lower as a result of our analysis.

Mohammed et al. [30] stated that the L* color of the chickpea flour bread decreased due to the increasing contribution rates, the product got a darker color and the a* and b* values increased. The results obtained by the researchers are in parallel with our study.

Dursun [26] stated that L* value decreased and the inner color was darker than the control bread with the increase of the substitution rate of the inner color of the bread samples enriched with fish meal. It can be stated that there is a decrease in L *, a * according to the addition ratio and that yeast-mold growth was not detected in all bread samples on the first day of bread production (first day of storage, 0^{th} day).While the number of yeast-molds was not determined on the 1st day 0% and 3% added bread, an increase was observed depending on the enrichment rate and storage time. According to Turkish Food Codex Microbiological Criteria Regulation [31] 0% and 3% dough bread 0., 1. and on the second day yeast-mold value was found to be suitable for consumption. According to the same regulation, 5% and 7% enriched bread was suitable for consumption in terms of yeast and mold values on day 0 and day 1, while bread with 10% added was found to be suitable for consumption only on day 0. On other days of storage, bread cannot be consumed in terms of yeast and mold. This case may be related to the use of strip loin beef powder as an enriching agent. In the questionnaire, control group and meat powdered bread; questions were asked about crust texture, crust color, general form and inner texture, inner color, chewability, pore structure, taste, odor and overall acceptability. Survey of the questionnaire is numbered as 1 (poor), 4 (excellent). The sensory parameter scores are shown in Table 9. Significant differences were observed between bread samples in terms of sensory properties ($P < 0.05$). The most admired by the panelists was bread with 3% meat powdered and the least liked bread with 10% meat powdered. It is more appreciated than additive-free bread. This can be explained by the fact that as the meat additives rate increases, the taste of

minced meat is more perceived as a result of the loss of traditional taste.

4. CONCLUSION

It can be stated that the addition of strip loin beef powder with the wheat flour does not improve the rheological properties of the dough as desired and the dough lost their processing properties as the fortification rate increases. If different methods can be used to bring the dough rheology to the appropriate condition in the bread to be used as the additive, the negative factors resulting from the fortification can be prevented and thus the high dough quality can be ensured. However, different amounts of strip loin beef powder added to the bread dough provided the production of bread with high protein content. It can be stated that the nutritional value of bread will increase with increasing protein content. These properties must be further improved for consumer acceptability. An alternative product rich in protein content has emerged by using red meat and wheat flour which has a very important place for human nutrition. Strip loin beef powder bread can be used as an alternative product that provides the protein and energy requirements of the individual by closing inadequate protein deficit of wheat flour with red meat that has high protein value and utilization rate.

The literature on using this study is limited and further research is needed. This study will contribute to further studies on this subject.

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