

PRODUCTION OF PASTA WITH ADDITION OF NUSPRODUCT FOOD INDUSTRY

PROIZVODNJA TJESTENINE UZ DODATAK NUSPRODUKATA PREHRAMBENE INDUSTRIJE

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Abstract: *The possibility of production of pasta with the addition of some by-products from the food industry is examined. The beet pulp and brewer's grains are by-products that still contain a large amount of nutritionally important ingredients that can enrich pasta and other food products. Pasta is a long-lasting product, which is normally made from wheat semolina and has high nutritional value. A part of wheat flour is replaced by extruded mixture of maize semolina and brewers' grains, or beet pulp. Finished products are organoleptically evaluated, and the cooking test was performed. It is possible to obtain high quality products, by the addition of by-products from the food industry in the appropriate quantity.*

Key words: *extruded maize semolina, beet pulp, brewers' grains, pasta*

Sažetak: *Ispitana je mogućnost proizvodnje tjestenine uz dodatak nekih od nusproizvoda prehrambene industrije. Repini rezanci i pivski trop predstavljaju nusprodukte koji još uvijek sadrže veliku količinu nutritivno važnih sastojaka koji mogu obogatiti tjesteninu i druge prehrambene proizvode. Tjestenina je trajni proizvod koji se inače pravi od pšenične krupice i nema veliku nutritivnu vrijednost. Dio pšeničnog brašna je zamijenjen ekstrudiranom mješavinom kukuruzne krupice i pivskog tropa, odnosno repinih rezanaca. Gotovi proizvodi su organoleptički ocijenjeni i urađen je test kuhanja. Moguće je dobiti kvalitetne proizvode dodatkom nusproizvoda prehrambene indutrije u odgovarajućoj količini*

Ključne riječi: *ekstrudirana kukuruzna krupica, repini rezanci, pivski trop, tjestenina*



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1. Introduction

Pasta is long-lasting product, made from wheat flour by mixing, shaping in different forms and drying. It can be made only from wheat flour and water, or ingredients can be added to improve the nutritional value of the product [1].

According to the Italian language, pasta is a product that is made from wheat flour or semolina and water, with the possibility of addition of potato flour in the production of gnocchi, or corn flour in the production of gluten-free products [2]. The main raw material for the production of pasta is wheat semolina from durum wheat and it gives the best product when it comes to quality. However, in the absence of wheat semolina, wheat flour can be used with the addition of some materials that will improve the quality, or reduce the negative impact of flour. Thus, for example, to improve the color and obtain a yellowish hues, the eggs may be used if semolina of durum wheat was not used, and some other raw materials of vegetable or animal origin may be used too [1]. The use of eggs should be emphasized in the declaration. Cysteine hydrochloride is a supplement that is also often used if the flour has inadequate quality. Wheat semolina itself, or flour, do not have special nutritional composition. Therefore, in order to enrich pasta, flours of some other cereals can be added, or other components that will increase the amount of vitamins, minerals and other nutritionally important ingredients. Pasta can be used as fresh, made at home or restaurants, but is more often used as dried, chilled, frozen or canned. [3]

Wheat as cereal began to cultivate and breed relatively early. Since then, work continuously go towards improvement, when it comes to growing and development of new wheat cultivars of desired properties. Today there is a very large number of different wheat cultivars, and a constant development of new ones, with composition and properties aimed for production of precisely certain products [4].

Basic stages of pasta manufacturing are [5]:

- Preparation of raw materials, may include delivery and storage of raw materials
- Mixing of raw materials and shaping
- Drying
- Packaging, storage and delivery of finished product.

Drying is one of the most important stages, because the quality of the finished product largely depends on it. Even if everything is done properly, and drying is not carried out in an appropriate manner, at the end we will get a product of inadequate quality. By-products of food industry, such as brewers' grains, apple trope, beet pulp, etc. are the raw materials that can be added in the production of various food products. Namely, all of those are very rich in nutritionally important ingredients like polyphenols, dietary fibers, vitamins, minerals, etc. Their addition could significantly enrich the different products that are made only of white wheat flour or grits, and organoleptic characteristics of these products (color, appearance, taste, smell, consistency, etc.) could be improved at the same time. Brewers' grain is the most important by-product of beer, produced in large quantities. Due to rich composition, especially high content of fibers, β -glucans and other ingredients, it can be used in biotechnology [6], and in the food industry for the production. Brewers' grain in the

form of flour [7], or crushed, is used for bread production [8]. Beet pulp can also be used for production of various food products and functional products [9], biscuits and fat biscuit dough [10], cookies [11] and various baked goods such as rusks [12]. Beet pulp are rich in carbohydrates [13], lignin [14], fiber [15], and polyphenolic substances are potential in the use in functional foods [16]. Brewers' grain the lignocellulosic material, rich in protein and dietary fiber (60-71%) and cellulose and hemicellulose together make up 50% (w / w) of the total composition of the brewery. The main components of fibrous tissue are arabinoxylans, lignin and cellulose. There is also a large amount of vitamins, minerals, amino acids, polyphenolic substances which makes it suitable material for use in the production of food products [17]. Extrusion is a newer and very promising way of heat treatment of cereals, flour, legumes and other raw materials under pressure [18]. This results in a change mainly on starch and proteins, which become easier to digest. Thus processed raw materials are used as intermediates in the production of baby food and many other food products. By extrusion of mixture of maize semolina and some of these raw materials, a very good supplement to food products is obtained.

2. Experimental part

The aim of this study was to produce pasta from wheat flour, and then to replace part of wheat flour with extruded mixture of maize semolina and brewers' grains, and corn grits and beet pulp in different proportions. Analysis of basic parameters in raw materials was also made. The finished products are evaluated organoleptically and the test of cooking is made.

Pasta was made of the following samples of flour and extruded mixtures:

Extruded mixture of maize semolina and beet pulp, in the ratio 85:15 ES 1 (MS BP)

Extruded mixture of maize semolina and beet pulp, in the ratio 90:10 ES 2 (MS BP)

Extruded mixture of maize semolina and beet pulp, in the ratio 95:5 ES 3 (MS BP)

Extruded mixture of maize semolina and brewers' grains, in the ratio 85:15 ES 1 (MS BG)

Extruded mixture of maize semolina and brewers' grains, in the ratio 90:10 ES 2 (MS BG)

Extruded mixture of maize semolina and brewers' grains, in the ratio 95:5 ES 3 (MS BG)

Sample 1 – Flour T-500

Sample 2 – Sample 1 + EM 1 (MS+BP) (70:30)

Sample 3 – Sample 1 + EM 2 (MS+BP) (70:30)

Sample 4 – Sample 1 + EM 3 (MS+BP) (70:30)

Sample 5 – Sample 1 + EM 1 (MS+BG) (70:30)

Sample 6 – Sample 1 + EM 2 (MS+BG) (70:30)

Sample 7 – Sample 1 + EM 3 (MS+BG) (70:30)

Sample 8 – Sample 1 + EM 2 (MS+BG) (80:20)

Sample 9 – Sample 1 + EM 2 (MS+BG) (90:10)

The following methods of analysis and sample preparation were applied:

- Dry matter determination – drying in the dryer at 130 ° C to constant weight [19]
- Determination of ash content – burning on a hot plate, and then in a furnace at 800 ° C until a white ash appears after burning [19]
- Determination of acidity – extraction of flour by 67% ethanol, filtering and titrating by NaOH, with phenolphthalein as an indicator [19]
- Determination of water absorption - flour is kneaded with a little water and water absorption is determined from the difference in weight between the dough and water [19]
- Pasta manufacturing
- Test of cooking [20]
- Organoleptic evaluation of finished pasta [19]

3. Results

After performed analysis the results are obtained, which are shown in the table.

Sample	The quantity of ash (%)	The quantity of water (%)	Degree of acidity	Water absorption (%)
Sample 1	0,60	12,20	2	53,32
Sample 2	0,58	10,91	1,4	52,00
Sample 3	0,50	10,09	2	52,00
Sample 4	0,47	10,75	2	51,00
Sample 5	0,56	11,85	2	51,28
Sample 6	0,52	11,85	2	52,63
Sample 7	0,49	11,82	1,8	51,28
Sample 8	0,58	11,88	1,8	54,52
Sample 9	0,56	12,62	1,8	53,41

Table 1. The results of analysis of basic quality parameters of raw materials for pasta manufacturing

Table 1 shows that the results of analysis of basic parameters of samples made of flour and mixtures correspond to the literature data.

When it comes to organoleptic assessment, it can be seen from Table 2, 3 and 4 that all samples with the addition of extruded mixtures got a total higher ranking than pasta made only from wheat flour.

Properties	Sample 1	Sample 2	Sample 3	Sample 4	Maximum points
External shape	4,8	4,8	4,1	4,9	5
Appearance	9,4	9,8	8,8	9,9	10
Elasticity	4,5	4,9	4,2	5,0	5
Test of cooking	36	40	40	40	40
Smell	9,2	10,0	9,2	10,0	10

Properties	Sample 1	Sample 2	Sample 3	Sample 4	Maximum points
Stickiness / separation	8,7	10,0	8,7	9,7	10
Consistency	8,9	10,0	9,0	9,8	10
Taste	9,0	10,0	9,1	9,9	10
Total	90,5	99,5	93,1	99,2	100

Table 2. The results of organoleptic evaluation of pasta with addition of 30% of extruded mixture of maize semolina and beet pulp with different proportions

Properties	Sample 1	Sample 5	Sample 6	Sample 7	Maximum points
External shape	4,8	4,7	4,7	4,6	5
Appearance	9,4	9,5	9,6	9,5	10
Elasticity	4,5	4,6	4,6	4,4	5
Test of cooking	36	40	40	40	40
Smell	9,2	9,6	9,6	9,7	10
Stickiness / separation	8,7	9,5	9,6	9,7	10
Consistency	8,9	9,7	9,7	9,6	10
Taste	9,0	9,7	9,8	9,8	10
Total	90,5	97,3	97,6	97,3	100

Table 3. The results of organoleptic evaluation of pasta with addition of 30% of extruded mixture of maize semolina and brewers' grains with different proportions

As for individual properties, pasta made only from wheat flour received better ratings in some cases.

Properties	Sample 1	Sample 8	Sample 9	Sample 6	Maximum points
External shape	4,8	5,0	3,0	4,7	5
Appearance	9,4	10,0	7,0	9,6	10
Elasticity	4,5	5,0	5,0	4,6	5
Test of cooking	36	40	40	40	40
Smell	9,2	10,0	10,0	9,6	10
Stickiness / separation	8,7	9,0	8,0	9,6	10
Consistency	8,9	9,0	7,0	9,7	10
Taste	9,0	10,0	10,0	9,8	10
Total	90,5	99,5	93,1	97,6	100

Tabela 4. Comparison of results of organoleptic assessment of pasta made from different fractions of wheat flour T-500 and extruded mixture of maize semolina and brewers' grains (90:10)

For the external shape, the maximum rating of 5.0 got a sample 8, and right behind it are samples 4 (4.9) and 2 (4.8). The least evaluated for this property is sample 9 with a rating of 3.0.

Appearance is the best rated again at the sample 8, with 10.0, and the least at sample 9 (7.0).

For the elasticity, the maximum ratings got samples 4, 8 and 9, and the lowest rating is assigned to sample 3 (4.2).

At test of cooking all samples got maximum ratings (40), except for sample 1 to which is assigned 36 points.

The maximum rating for the smell got samples 2, 4, 8 and 9, and the minimum ratings are assigned to samples 1 and 3 (9.2).

Stickiness / separation was rated with maximum points (10.0) for sample 2, and minimum points (8.0) for sample 9.

The best rating for consistency is given to sample 2, and the worst (7.0) to sample 9.

For the taste, the highest ratings got samples 2, 8 and 9, and the lowest (9.0) sample 1.

Finally, total maximum points of 99.5 got samples 2 and 8, i.e. pasta made from a mixture of wheat flour T-500 in amount of 70% and 30% extruded maize semolina, and a mixture of beet pulp in a ratio 85:15 and pasta made from wheat flour T-500 in the amount of 90% and 10% extruded mixture of maize semolina and brewers' grains in a ratio 90:10.

4. Conclusion

Based on the results, one can draw several conclusions. The usage of brewers' grains and beet pulp as by-products is possible at food industry. Extruded mixtures with maize semolina in different proportions, added in the production of pasta give very good results. All organoleptic properties are improved, compared to pasta made from wheat flour. It should take into account the amount of these supplements in relation to wheat flour. In fact, since these are new flavours that are not accustomed to our area, excessive amounts may encounter rejection when it comes to consumption.

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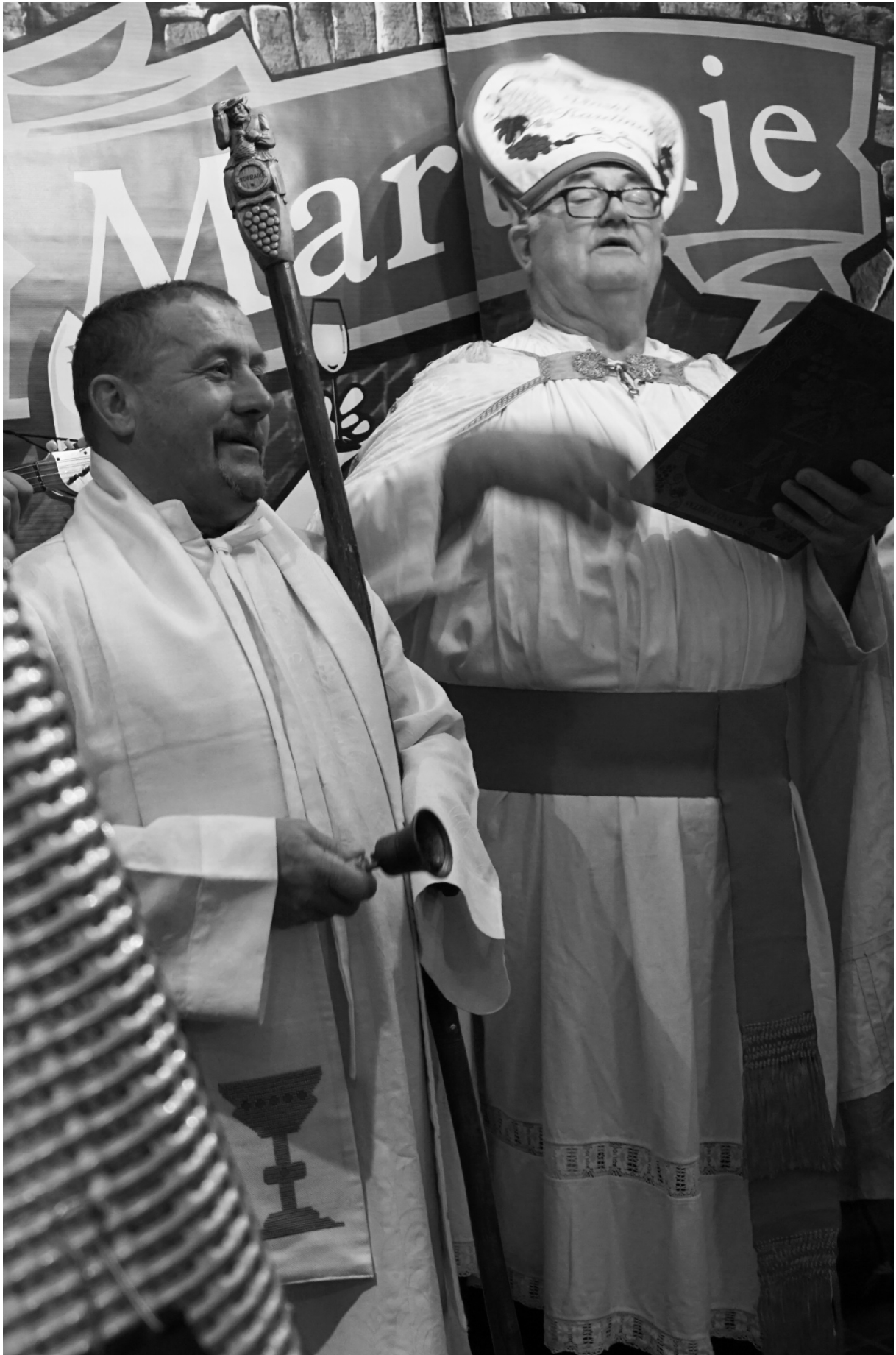


Photo 039. The baptism of must / Martinje