

UDC (UDK) 664.12(497.6Mostar)

*Hanadija OMANOVIĆ, Aida ŠUKALIĆ, Alma MIČIJEVIĆ<sup>1</sup>***CHEMICAL PROPERTIES OF FLOUR TYPE 500  
IN THE CITY OF MOSTAR, BOSNIA AND HERZEGOVINA****SUMMARY**

Particular attention needs to be paid to research on the quality of flour because it is the main component of food grains and cereal products.

Research on the quality of flour type 500 in the municipality of Mostar began with an analysis of the basic raw material - wheat flour - and a comparative analysis of the type 500 flour used in facilities for the production and processing of flour and in the flour products produced by Žitopromet and Klas.

Flour sold in the marketplace meets customer standards, but we rarely ask ourselves whether such flour is fit for human consumption. To be sold for human consumption, a foodstuff has to meet prescribed standards. The economic and social situation in Bosnia and Herzegovina does not allow for a reflection on the true values of a healthy diet meeting health standards.

With respect to storage conditions, the quality of flour, in common with other foodstuffs, can be adversely affected by excessive exposure to sunlight, moisture and other variables. In this study, we investigated all of the chemical properties in flour T-500 produced by Klas and Žitopromet, as well as flour randomly selected from a number of stores. We compared the results with the guidelines in Bosnia and Herzegovina, i.e. the *Rulebook on the quality of the grain, products of the milling and baking industry and quick-frozen dough* (Official Gazette of SFRY No. 38/77 and 11/80) and the *Rulebook on the MRLs for contaminant in certain foodstuffs* (Official Gazette of FBiH 37/09).

**Key words:** Flour T-500, Klas, Žitopromet, chemical properties

**INTRODUCTION**

Malnutrition and famine are key economic and political problems in many areas of the world today. Moreover, the total human population is increasing, on average, every day by 400,000, with resulting pressure on food and water supplies.

According to data from the UN Food and Agriculture Organization, at the beginning of this century and the millennium, about 1.1 billion people in the world lived in extreme poverty, with an income of less than one US dollar per day. Poverty causes famine, and famine causes disease, death even. Famine causes unrest and wars.

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Starting from the definition of nutrition and what a proper diet means for humans, our aim is to determine the chemical properties of the flour type T-500 in the city of Mostar and to ascertain whether and how these influence the resulting quality of the flour. Flour, as the main foodstuff, has an important nutritive value and is irreplaceable in nutrition.

Commercial milling industry products must have a characteristic aroma, colour and taste; must be free from any strange odour or taste; and must not contain living or dead pests, parts or hair of rodents or sand in an amount over 0.05%. The water content in milling industry products must not exceed 15%.

## MATERIAL AND METHODS

### *Wheat flour*

The colour of flour depends on plant pigments and its granulometric composition. T-500 has a light yellowish colour, whereas T-800 and T-1100 have a more intense yellowish colour. Based on the type, flour has a distinct odour and taste. Dark flours have an odour and taste reminiscent of bran. Factors influencing the chemical and physical properties of flour are: wheat variety, agro-technical measures applied, climatic conditions, wheat storage conditions, technical equipment used in the mill, preparation of the wheat for grinding, technological grinding process and the conditions in which the flour is stored.

The endosperm of a wheat grain, as well as in the whole wheat grain, and the distribution and share of specific components are not the same in all layers. Therefore, in terms of the structure of the endosperm, flour can be viewed as a raw material with a heterogeneous composition. The central part of the endosperm of the wheat grain contains the lowest concentration of proteins and mineral substances and the highest content of starch. The content of ash, protein, lipids, crude fibre, vitamins and enzymes is associated with the flour extraction rate. These components rise in accordance with an increase in the extraction rate, whereas the starch content decreases.

According to Pelschenke, wheat flours, depending on the flour extraction rate, have the average chemical composition presented in Table 1:

Table 1: Chemical composition of flour (in % - flour extraction rate)

	50	70	80	94-100
Ash	0.46	0.62	0.80	1.7
Proteins	10.7	12.2	13.0	13.5
Fat	1.1	1.5	1.8	2.3
Crude fibre	0.1	0.2	0.3	2.1
Starch and sugar	84	81	81	

\* (Kaluderski G, Filipović N, Beograd, 1990)

The content of crude fibre also increases because it is cellulosic insoluble, whereas the starch content decreases. In addition, the content of enzymes and vitamin increases.

Flours with a lower ash content are technologically more suitable and have a more pleasing appearance; they also have superior gluten properties.

### Chemical composition of flour

In terms of its chemical composition, flour contains a number of valuable nutrients, and it is rich in hydrocarbons (65–75%), plant proteins, fats, vitamins, minerals and fibres. Mixing flours from other foodstuffs (soy and various grains, e.g. cotton and sesame) may significantly improve its structure. Flour T-500 (white flour) is rich in starch and proteins. To enrich the nutritive composition, iron (26–33 mg/kg), vitamin niacin (32–40 mg/kg) and other nutrients may be added to the white flour during production.

Depending on the properties of the source material (wheat), flours differ by composition and technological properties. The most common composition of wheat bread flours has ranges within the following approximate values:

- wet gluten.....	20–35%
- proteins .....	9–15%
- starch.....	64–74%
- soluble sugar .....	2–4%
- cellulose .....	0.1–2%
- fats.....	1–2%
- lipoids .....	3–5%
- ash (mineral salts) .....	0.4–1.7%
- moisture .....	13–14%
- vitamins: .....	B <sub>1</sub> , B <sub>2</sub> , E, provitamin A, PP
- enzymes: .....	diastase, protease, lipase, oxidase and other

### Chemical composition standards of flour produced by Klas and Žitopromet

Wheat flour obtained by wheat processing has to meet the parameters shown in Table 2 and Table 3 in facilities for the production and processing of milling industry products by Klas and Žitopromet, respectively.

Table 2. Quality of flour T-500 internal standard „Klas“

Properties	Internal standard Klas
% moisture max.	15
% ash	0.46-0.55
Acidity level max.	3
Wet gluten % min.	20

Table 3. Quality of flour T-500 internal standard „Žitopromet“

Properties	Internal standard Žitopromet
% moisture max.	15
% ash	0.46-0.55
Acidity level max.	3
Wet gluten % min.	20

## RESULTS AND DISCUSSION

*Results of the analysis of the chemical properties of flour T-500 produced by Klas and samples from the market from the city of Mostar*

Samples of T-500 flour produced by Klas were randomly selected from the market of the city of Mostar, and the chemical properties of the samples were compared with guidelines for flour T-500. Table 4 shows the values of the analysed samples.

Table 4. Laboratory analyses of the properties of flour T-500 produced by Klas

Properties	Sample analysed	Internal standard
% moisture max.	14.53	15
% ash	0.52	0.46-0.55
Acidity level max.	2	3
Wet gluten % min.	20.2	20

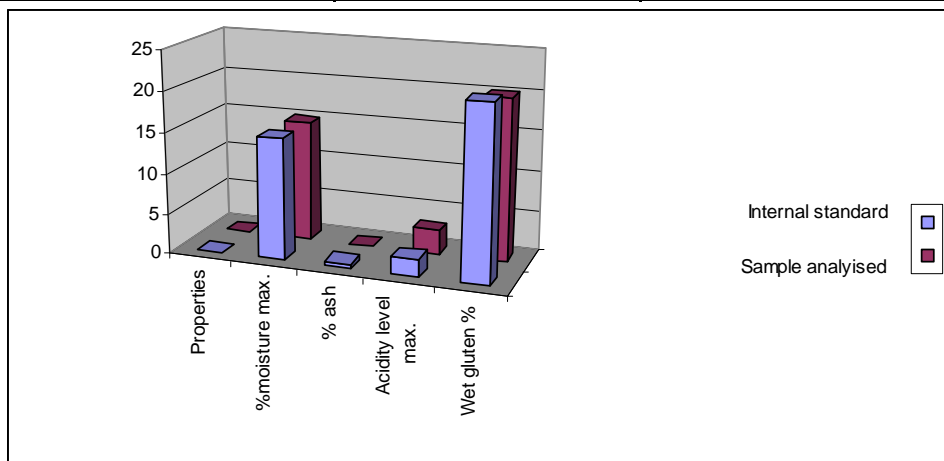


Figure 1. Overview of the values of the Klas samples analysed compared with the standards for flour

The table 4 and the figure 1 show that the samples analysed did not deviate from the guidelines of the Rulebook, thereby meeting all of the conditions for the selling of a foodstuff for human consumption.

The chemical analyses of the samples from the market were performed at the Federal Institute for Agriculture in Sarajevo in accordance with the guidelines on the quality of grains, milling and baking industry products, pasta and fast-frozen dough (Official Gazette of SFRY No. 38/77 and 11/80) and those on MRLs for certain contaminants in food (Official Gazette 37/09).

The results of the analyses are shown in Table 5 and Figure 2.

Table 5. Chemical composition of samples of Klas flour T-500 from the market

Sample	% water	% ash	Acidity level
1/1 Klas	12.75	0.51	1.00
1/2 Klas	12.92	0.52	1.00
1/3 Klas	13.06	0.52	1.00
Analysed sample of Klas	14.53	0.52	2
Internal standard of Klas	15	0.55	3

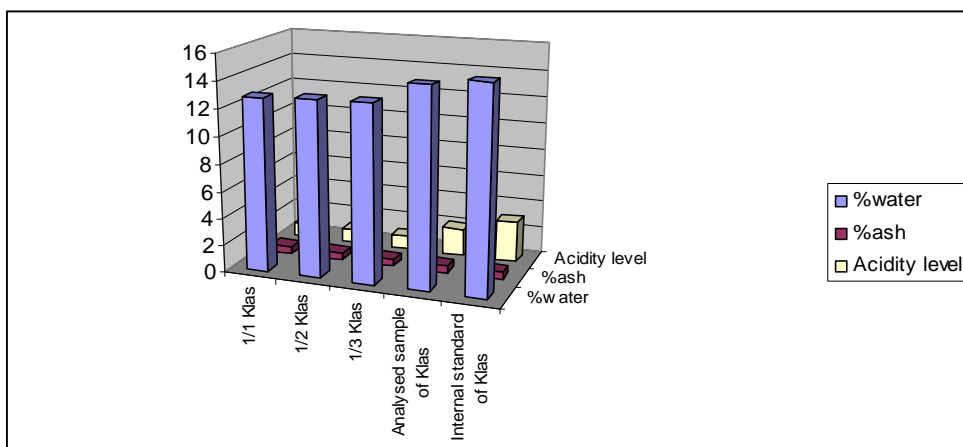


Figure 2. Chemical composition of samples of Klas flour T-500 from the market

Table 5 and Figure 2 show that the flour samples from the market of the municipality of Mostar and the Klas sample analysed in the laboratory showed no deviation with regard to the content of water ash and the acidity level and that they comply with both the internal standards of Klas and the guidelines on the quality of grains, milling and baking industry products, pasta and fast-frozen dough (Official Gazette of SFRY No. 38/77 and 11/80).

*Results of testing the chemical properties of flour T-500 produced by Žitopromet and Žitopromet samples from the market of the city of Mostar*

Chemical properties of the sample analysed and the internal standards applied at Žitopromet are showed in the Table 6.

Table 6. Properties of flour T-500 analysed in the laboratory in Žitopromet

Properties	Sample analysed	Internal standard
% moisture max.	15	15
% ash	0.54	0.46-0.55
Acidity level max.	2.2	3
Wet gluten % min.	21.3	20

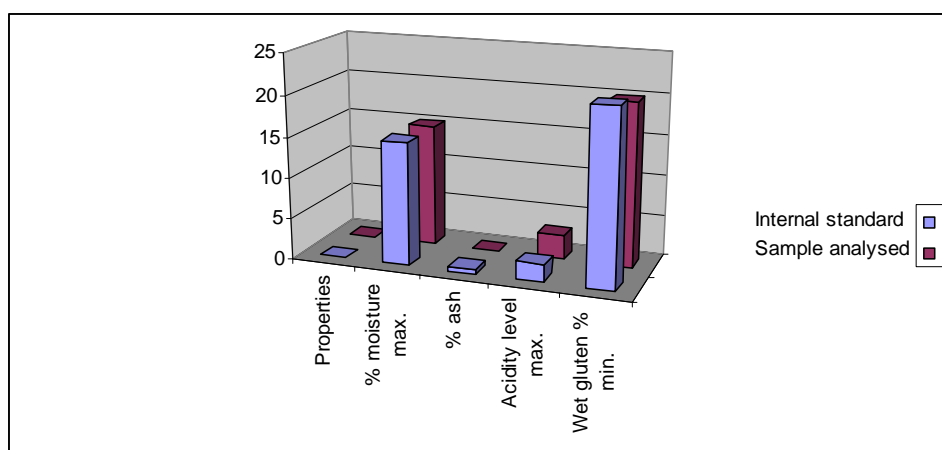


Figure 3. Overview of the values of the samples analysed and the internal flour standards applied at Žitopromet

Table 7. Chemical composition of samples of Žitopromet flour T-500

Sample	% water	% ash	Acidity level
2/1 Žitop.	12.65	0.51	2.00
2/2 Žitop.	12.85	0.53	2.00
2/3 Žitop.	12.93	0.52	2.00
Sample from Žitoprom. Lab	15	0.54	2.2
Internal standard Žitopromet	15	0,55	3

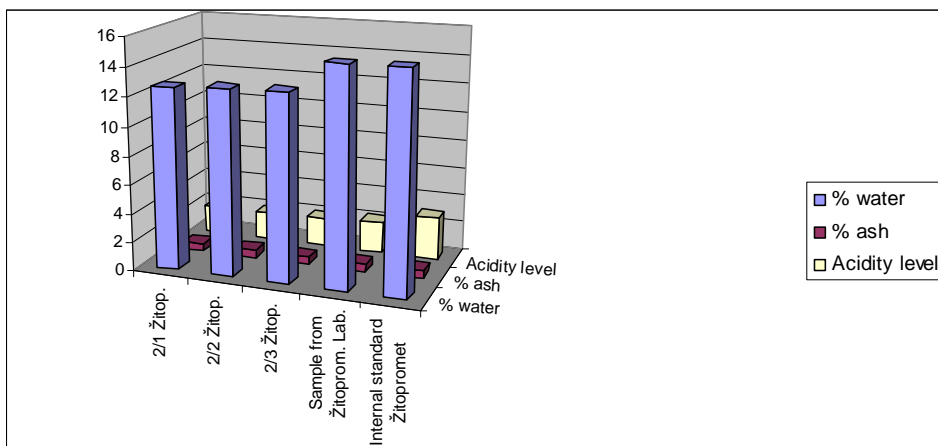


Figure 4. Chemical composition of samples of Žitopromet flour T-500 from the market

Table 6 and Figure 3 show that the flour samples from the market of the municipality of Mostar and the samples analysed in the laboratory of Žitopromet showed no deviation with regard to the content of water and ash and the acidity level and that they complied with both the internal standards of the Company and the guidelines on the quality of grains, milling and baking industry products, pasta and fast-frozen dough (Official Gazette of SFRY No. 38/77 and 11/80).

#### *Comparative chemical analyses of all samples*

The internal standards for the chemical parameters for the production of flour T-500 in both industrial complexes are the same, so a comparative analysis of the results was undertaken.

Table 8. Chemical composition of all of the flour samples analysed

Sample	% water	% ash	Acidity level
1/1Klas	12.75	0.51	1.00
1/2 Klas	12.92	0.52	1.00
1/3 Klas	13.06	0.52	1.00
Analysed sample Klas	14.53	0.52	2.00
Internal standard Klas	15.00	0.55	3.00
2/1Žitop.	12.65	0.51	2.00
2/2Žitop.	12.85	0.53	2.00
2/3Žitop.	12.93	0.52	2.00
Analysed sample Žitopromet	15.00	0.54	2.20
Internal standard Žitopromet	15.00	0.55	3.00
Rulebook	15.00	0.46-0.55	3.00

Table 8 shows that the highest water content was in the sample “Analysed standard Žitopromet” (15%) and that the lowest was in the sample identified as “1/1Klas” (12.75%).

The highest ash content (%) was in the sample identified as “Analysed sample Žitopromet” (0.54%) and “Analysed sample Klas” (0.52), and the lowest ash content (%) was in samples “1/1 Klas, Mercator” 0.51% and “2/1 Žitopromet, Mercator” 0.51%.

The acidity level in samples 1/1, 1/2 and 1/3 (Klas) was 1. In samples 2/1, 2/2, 2/3 and “Analysed sample Klas” the acidity level was 2, followed by sample analysed Žitopromet 2.2. In internal standard Klas and internal standard Žitopromet, the activity level is 3.

### CONCLUSION

The health and safety and the quality of foodstuffs delivered to the market should be the joint responsibility of producers of raw materials, production facilities and companies that distribute them on the market. Given the number of products that depend entirely on wheat, the quality of flour is of paramount importance.

This detailed analysis of the chemical composition of flour demonstrates that the samples studied comply with all of the prescribed standards, as well as with the guidelines on the quality of grains, milling and baking industry products, pasta and fast-frozen dough (Official Gazette of SFRY No. 38/77 and 11/80). Given that they showed no major deviation from these standards and guidelines, the flour produced can be considered safe and fit for human consumption.

This research offers a starting point for future studies of flour quality. To enhance the credibility of the findings, additional samples would need to be analysed over a period of time. For the moment, it can be concluded that flours used on a daily basis as the basic raw material in the territory of the municipality of Mostar are fit for human consumption.

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## HEMIJSKE OSOBINE BRAŠNA TIP 500 NA TRŽIŠTU GRADA MOSTARA, BOSNA I HERCEGOVINA

### SAŽETAK

S obzirom da u tehnologiji proizvodnje hrane žitarice i proizvodi od žitarica zauzimaju značajno mjesto, istraživanju o kvaliteti brašna kao glavnoj prehrambenoj namirnici treba posvetiti posebnu pažnju.

Istraživanje o stanju kvaliteta brašna tipa 500 na području opštine Mostar započelo je analizom osnovne sirovine – pšenice i uporednom analizom brašna tipa 500 koje se koristi u pogonima za proizvodnju i preradu brašna i proizvoda od brašna „Žitopromet“ i „Klas“.

Brašna plasirana na tržištu zadovoljavaju standarde kupaca, ali rijetko se zapitamo da li su zdravstveno ispravni za konzumaciju. Postoje propisani standardi koje jedna namirnica mora imati da bi bila plasirana na tržište i dostupna krajnjim konzumentima. Ekonomska i društvena situacija kakva je sada u našoj zemlji ne dopušta razmišljanje o pravim vrijednostima zdrave i ispravne ishrane.

S obzirom na uslove skladištenja, predugog izlaganja suncu, vlazi i slično brašno kao i većina drugih namirnica mogu umanjiti svoja kvalitetna svojstva. Stoga, namjera je da se ovim istraživanjem ispitaju sve hemijske osobine brašna T-500 u „Klas“-u i „Žitopromet“-u (na licu mjesta gdje se proizvodi) i brašna na tržištu (metodom slučajnog odabira trgovina) i da se uporede dobiveni rezultati, te da li su u skladu sa propisanim pravnicima u našoj zemlji, tj. Pravilnikom o kvalitetu žita, mlinskih i pekarskih proizvoda i brzo smrznutih tijesta (Sl.list SFRJ br.38/77 i 11/80) i Pravilnikom o MDK za određene kontaminante u hrani (Sl.glasnik FBiH 37/09).

**Ključne riječi:** brašno tip 500 «Klas», «Žitopromet», hemijske osobine