

DETERMINATION OF THE MOISTURE CONTENT IN SAMPLES OF WHEAT FLOUR

DETERMINAÇÃO DO TEOR DE UMIDADE EM AMOSTRAS DE FARINHAS DE TRIGO

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Abstract: Introduction: Wheat flour (*Triticum spp.*) is an ancient input and is found until today on the consumer's table, whether western or eastern. Therefore, it is important to ensure the quality and food safety to the various consumers of this raw material. In view of this, this study analyzed the moisture content in wheat flours by the gravimetric method of moisture determination using heat. **Methodology:** Quantitative study that consisted in collecting samples of wheat flour of 7 brands commercialized in markets of the Recôncavo Baiano region. The result was obtained by the difference between wet and dry samples. The analyses were performed in triplicate. **Results:** The analyses performed on the wheat flours found the following moisture contents in the Confiare (13.76%), Brandini (13.39%), Finna (13.18%), Primor (13.12%), Sarandi (12.98%), Dona Benta (12.96%) and Rosa Branca (12.85%) brands. **Conclusion:** According to the Technical Regulation of Identity and Quality of Wheat Flour, made by the Ministry of Agriculture, Livestock and Supply, the maximum moisture content in wheat flour is 15%. There is no legislation that defines the minimum moisture content for this food. Therefore, as the analyzed brands obtained moisture contents between 12.85-13.76%, there is no infraction in these products, being suitable for consumption, because they are within the established limits.

Keywords: Nutrition Sciences; Flour; Nutrition; Food Technology; Moisture.

INTRODUCTION

Wheat flour (*Triticum* spp.) has been used since the dawn of humanity, present in many meals of various cultures, presented as the essential input in the preparation of many foods around the world⁽¹⁾. Because it is a frequently ingested food, it is important that the product has quality and is safe for consumption⁽²⁾.

One of the main factors to evaluate the quality of wheat flour is the determination of moisture. The moisture content is considered adequate if it is within the ranges recommended by the current legislation of the country that uses such flour. In Brazil, the maximum moisture content is 15% ⁽³⁾ and the body that dictates the *faixas* guidelines is the Ministry of Agriculture, Livestock and Supply (MAPA).

In other countries, the maximum moisture content provided for by law varies between 14 and 14.6%. In the United States and the European Union, the maximum content is 14% ⁽⁴⁻⁵⁾. In Russia, the values are 14 to 14.5% in extra-class flours or 14 to 14.6% in first-class flours⁽⁶⁾. This information easily suggests greater control of the quality of wheat flour in these countries; because the quantities "moisture content" and "quality" are inversely proportional; on the other hand, "moisture content" and "unwanted microorganisms" are directly proportional.

The analysis of the moisture content of wheat flour is important, because it verifies the stability in the conservation of the food, the delay in enzymatic chemical reactions⁽⁷⁾ and the prevention of the rapid proliferation of microorganisms interfering in the food, such as fungi⁽⁸⁾. Smaller studies, such as this one, bring security to the consumer of the region by making use of wheat flours marketed in the localities where these residents reside.

Therefore, in order for there to be vehemence of these statements and the quality control of the flour, it is necessary that this product is within the limits established for the moisture content. Considering this scenario, this study aimed to analyze the moisture content in industrial wheat flours, through the gravimetric method of moisture determination with the use of heat.

METHODOLOGY

Type of study and place of analysis

Quantitative experimental research. Carried out in the laboratory of bromatological analysis of the Adventist College of Bahia, located in the city of Cachoeira, belonging to the region of the Recôncavo Baiano, in Bahia.

Inclusion criteria and samples included

Samples of traditional flours, unleavened, of national manufacture, belonging to type 1, were included in the study. To this end, 7 (seven) brands that met the established criteria were selected, considering that they were brands of national scope, found in May 2021, in three cities in the Recôncavo Baiano. The selected brands, which met the inclusion criteria of this study, were: Brandini (A), Confiare (B), Dona Benta (C), Finna (D), Primor (E), Sarandi (F) and Rosa Branca (G). The samples were coded, for analytical purposes, identified sequentially from A to G, as already presented next to the name of each brand.

Procedures

21 porcelain crucibles weighing between 26-29g, desiccator, simple greenhouse, metal tweezers, petri plate and analytical scale.

The analysis was performed in triplicate(9). Initially, the homogenization was made in packaging. With the crucible previously dried and cooled, 1g of sample was weighed, heated in an oven and cooled in the desiccant. After each process, the samples were weighed until the humidity remained constant.

Statistical analysis

The data were tabulated and analyzed in the Excel 2016 program. From the data, the moisture content, the mean and the standard deviation of each triplicate were obtained. The approval of the quality of the flours was verified, in their respective moisture contents, through the percentiles within the limits of the current Brazilian legislation. The results were obtained by the difference between wet and dry samples.

RESULTS

A The analyses carried out on the wheat flour samples showed moisture contents between 13.18% - 14.04% (Table 1).

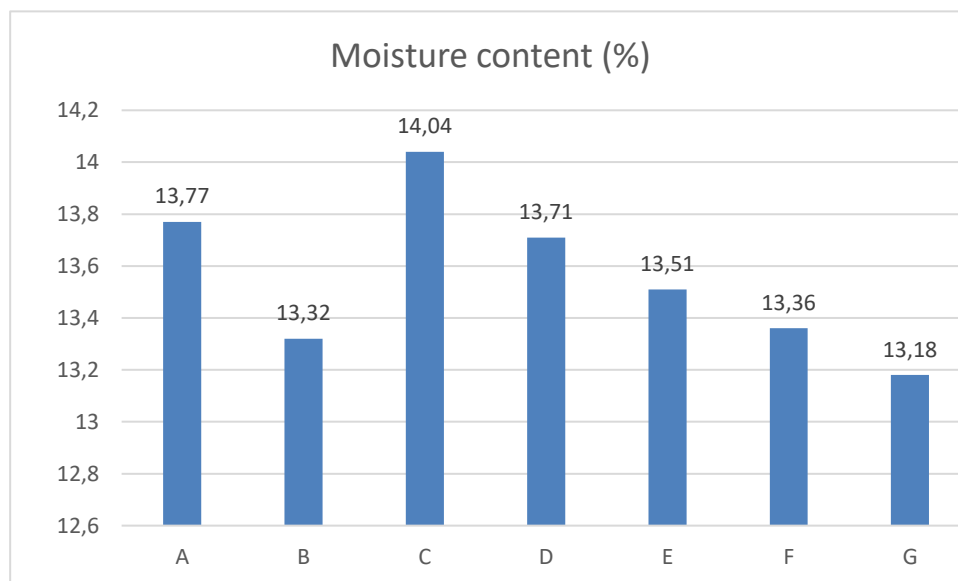
Table 1 – Data obtained from the analysis of wheat flour samples. Cachoeira, BA, Brazil, 2021.

Flour	Sample (g)	1 ^a weighing	2 ^a weighing	3 ^a weighing	Diference*	Medium** (DP)
A						
A1	1,0064	0,8699	0,8695	0,8677	0,1387	0.148(0.016)
A2	1,0019	0,8654	0,8662	0,8642	0,1377	
A3	1,0033	0,8683	0,8679	0,8665	0,1665	
B						
B1	1,0085	0,8760	0,8781	0,8745	0,1340	0.133(<0.001)
B2	1,0015	0,8704	0,8716	0,8690	0,1325	
B3	1,0013	0,8692	0,8711	0,8682	0,1331	
C						
C1	1,0011	0,8646	0,8652	0,8636	0,1375	0.140(0.002)
C2	1,0074	0,8663	0,8668	0,8653	0,1421	
C3	1,0000	0,8591	0,8586	0,8583	0,1417	
D						
D1	1,0069	0,8716	0,8728	0,8692	0,1340	0.135(0.001)
D2	1,0056	0,8713	0,8720	0,8689	0,1367	
D3	1,0059	0,8712	0,8717	0,8688	0,1371	
E						
E1	1,0041	0,8673	0,8690	0,8687	0,1354	0.135(<0.001)
E2	1,0035	0,8677	0,8689	0,8681	0,1354	
E3	1,0052	0,8695	0,8599	0,8697	0,1355	
F						
F1	1,0091	0,8749	0,8757	0,8745	0,1346	0.133(<0.001)
F2	1,0016	0,8683	0,8693	0,8681	0,1335	
F3	1,0008	0,8682	0,8692	0,8680	0,1328	
G						
G1	1,0023	0,8703	0,8733	0,8698	0,1325	0.131(<0.001)
G2	1,0010	0,8704	0,8721	0,8688	0,1322	
G3	1,0081	0,8790	0,8806	0,8773	0,1308	

*Difference between final and initial weighing ** mean difference between weighings and standard deviation.

Source: Study data.

Graphic 1 – Moisture content obtained in the analysis of wheat flour samples. Cachoeira, BA, Brasil, 2021.



Source: Study data.

DISCUSSION

This is the first publication of a study on wheat flours marketed in the Recôncavo region of Bahia. The data obtained in this research revealed that wheat flours presented indices of moisture contents within the recommended by Normative Instruction No. 8 of the MAPA, since values between 13.18 and 14.04% were detected.

The analyses carried out are compatible with the study carried out in Rio Grande do Sul, as it reported the variation between 12.98 and 13.9%⁽¹⁰⁾. In turn, the studies carried out in Rio de Janeiro and Tocantins⁽¹¹⁻¹²⁾ found values with contents between 11.6 to 12.7% and 11.73 to 12.74%, respectively. In addition, in the research carried out in Pernambuco⁽¹³⁾ the contents varied between 13.1 and 15%, slightly higher than those reported by the other studies.

The aforementioned researches contain moisture contents within the limits established by the legislation⁽³⁾. The differences may be related to several factors, such as: more sensitive methods, interference of external moisture, the non-performance of quartering, unequal batches of flour, action of microorganisms and degrading enzymes. Another fundamental aspect is the methodological criterion.

Each study chooses the method of analysis that it will perform, thus, in the studies were cited the methods standardized by the Adolfo Lutz Institute (IAL)⁽¹¹⁻¹²⁾, 44-15A of the American

Association for Clinical Chemistry (AACC (1995)⁽¹⁰⁾ and Term Balance Brabender 130 degrees celsius for 1 (one) hour⁽¹³⁾. Certainly, the differences between the methods can influence the values found of moisture content in the samples, given that, for example, the IAL presents three methods to determine the moisture in wheat flour. However, it was observed that there are studies ⁽¹¹⁻¹²⁾ that do not clarify which of the methods was followed. In addition to the difference between methods, there are also intra-method differences, that is, the way each process was performed. Whether the materials used were of high or low sensitivity. Added to this is the factor of processes not foreseen in any of the methods presented, such as the use of gloves and metal tweezers, so that the moisture of the researcher's hand was not transferred to the sample.

The Ministry of Agriculture of the United States of America recommends the use of the Near-infrared spectroscopy (NIR) method, that is, near-infrared spectroscopy, preferably Unity Spectra Star for the verification of the moisture content in wheat flour⁽¹⁴⁾. However, studies that make use of NIR do not use it to measure moisture content, but for other chemical analyses. Most international studies choose to use the AACC methods, as in the studies carried out in France and Turkey⁽¹⁵⁻¹⁶⁾, which used the 44-15A and 44-19 methods, provided for in the AACC, and found the moisture contents of 8.2-13.4% and 11.7-16.9%, respectively.

It is noteworthy that this study obtained some limitations that can impact the sensitive reality of its results, such as the lack of comparison in different batches of the flours analyzed and the use of a simple greenhouse, due to the lack of access to a greenhouse with forced and vacuum air circulation.

The study differed by analyzing samples of seven different brands of wheat flour, and it is common to use samples of three to six brands ⁽¹⁰⁻¹³⁾. The collection was carried out in 3 (three) different cities, and it was normal to collect it at different points of sale within the same municipality. In addition, the social relevance of this study is based on providing analyses that configure food safety for the local consumer.

CONCLUSION

This study evaluated the quality of wheat flour samples marketed in the Recôncavo Baiano, by determining the moisture content. All samples presented moisture contents in accordance with the provisions of the legislation. It is suggested to carry out studies that expand and develop perspectives outside the scope of this article.

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