

## An evaluation on the protein content found in some types of wheat flour sold in the Albanian market

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### Abstract

The protein is the main component in the food products and dietetic supplement. The product analyzation for determination of protein content in food (wheat flour in our study), as full packaged product offered to the consumers, is important to assure the quality of trade products. In this study, to determine the protein content, 15 wheat flour types from the Albanian market are selected. Some of the criteria for choosing the samples are the type of the grain, weak or strong one, type of flour, like T 00, T0, all-purpose usage, integral etc, production company, from Albanian companies and abroad. Also, we have taken into consideration some grain samples from the Genetic Bank of Albania, in order to see the difference in the protein content between the packaged flour and the simple grain. To determine the protein content in flour wheat, an efficient method was used. NIR (near infrared) is one of the latest methods to determine the protein content in food, avoiding the Kjeldahl method. Compared to the last one, this new method has some advantages. It is a fast and efficient method, and moreover, it is ecologically friendly, because it doesn't need chemical use. NIR Reflective Spectroscopy is based on NIR energy absorption on the specific wavelength of peptide bonds amid molecular protein amino acids. Mathematical processing of spectrum data and calibration against a reference to the method, appropriately enables the definition of protein content. The protein level found in our samples was from 8 to 15%. The result gives us a good overview of the protein content in the flour, which helps us to specify its usage.

**Keywords:** wheat flour, protein content, NIR..

### 1. Introduction

Bread and bakery products are the main and most used products in Albania, supplying us with the main source of carbohydrates, proteins, and vitamins, mainly with vitamin B. These products are mostly produced from wheat flour. Flour from wheat consists mainly of starch (70–75%), water (14%) and proteins (10–12%). In addition, non-starch polysaccharides (2–3%), in particular, arabinoxylans (AX) and lipids (2%) are important minor flour constituents relevant for bread production and quality. Wheat flour is special in its kind, compared to other cereal flour, therefore it is widely used in flour-based products such as bread, biscuits, pasta, sweets, etc. It gives a viscoelastic dough, which no other flour can form, thanks to its structure made up of its particular protein composition. The scheme established by Osborne (1907) is most commonly used for the groups of proteins in wheat which comprise:

- Albumins, soluble in distilled water.
- Globulins, soluble dilute salt solutions.
- Prolamines, soluble in 70% aqueous ethanol
- Glutelins, soluble in dilute acid.

In the manufacture of bread and fermented products, it is the proteins which are of greatest concern as they have the ability to form a gluten network capable of trapping the carbon dioxide gas generated by bakers' yeast fermentation; both the quantity and the quality impact on the dough gas retention and processing properties. But what is gluten? According to Codex Alimentarius "gluten is a protein fraction of wheat, rye, barley or their crossed varieties and derivates thereof, being insoluble in water and NaCl, 0.5 mol/l. Gluten proteins determining bread-making quality are influenced by a number of environmental and genetic factors. The properties that are

attributed to the gluten are essential for the production of bread products, and other flour-based products. The two most important groups of protein for bread and fermented goods are the prolamines and the glutelins. The most functional proteins for breadmaking are those largely found in the endosperm of the grain. The quality of raw material for the production of these products is essential to produce quality products. The quality of the raw material depends on many factors such as individual genetic predisposition of grain, the effect of the environment where the plant is cultivated etc. The genome has an effect on grain strength, quality and amount of protein, starch properties, and so on. Bread and other fermented product volumes are directly related to the quantity of protein present; the higher the protein content of the flour, the greater the product volume. This positive relationship has been reported by a large number of observers for many different breadmaking processes and products. In this study, to determine the protein content, 13 wheat flour types from the Albanian market are selected. Some of the criteria for choosing the samples are the type of the grain, weak or strong one, type of flour, like T 00, T0, all-purpose usage, integral etc, production company, from Albanian companies and abroad. Also, we have taken into consideration some grain samples from the Genetic Bank of Albania, in order to see the difference in the protein content between the packaged flour and the simple grain.

## 2. Material and Methods

In this study, we have used 13 types of flour that are traded in the Albanian market. Also, we have made the determination of protein in the wheat grain, to see if there are any differences from the flour wheat packed and traded in the Albanian market, and the plain wheat grain. In the table below are listed all the types of flour and the coded with a character and their specifics.

**Table 1.** Description of the samples used in the study.

| No | Code | Type of Flour    | Color             | Others                              |
|----|------|------------------|-------------------|-------------------------------------|
| 1  | F1   | Type O Manitoba  | White, fine       | Packed in 1 kg, imported            |
| 2  | A1   | All pourpose     | White, fine       | Packed in 1 kg, produced in Albania |
| 3  | A2   | Type OO          | White, fine       | Packed in 1 kg, produced in Albania |
| 4  | F2   | Flour for Cookes | White, fine       | Packed in 1 kg, imported            |
| 5  | A3   | flour for pie    | White, fine       | Packed in 1 kg, produced in Albania |
| 6  | A4   | Type OO          | White, fine       | Packed in 1 kg, produced in Albania |
| 7  | F3   | Type O           | White, fine       | Packed in 1 kg, imported            |
| 8  | F4   | Integral Flour   | Pale brown, rough | Packed in 1 kg, imported            |
| 9  | F5   | Integral Flour   | Pale brown, rough | Packed in 1 kg, imported            |
| 10 | F6   | Type OO          | White, fine       | Packed in 1 kg, imported            |
| 11 | F7   | Type OO          | White, fine       | Packed in 1 kg, imported            |
| 12 | F8   | Type OO cookies  | White, fine       | Packed in 1 kg, imported            |
| 13 | F9   | Type O Manitoba  | White, fine       | Packed in 1 kg, imported            |
| 14 | G1   | Soft wheat       | Soft wheat        | Albanian cultivar                   |
| 15 | G2   | Soft wheat       | Soft wheat        | Albanian cultivar                   |

The purpose of this study was to determine the total quantity of protein found in the wheat flour that is sold in the Albanian market. All the samples were purchased in the most known supermarkets in Albania, and in different places. For the determination of the protein and gluten, the NIR method was used. This technique allows various constituents to be determined simultaneously and preserves the sample after the measurement for further analysis. The NIR method, in comparison with the chemical method, like the Keidahl one, has a lot of advantages. It doesn't require any chemical, so is enviromental friendly, it doesn't require any sample preparation, and it can be carried out in the production line because the analysis is very simple and very fast. It has been widely used to

predict the concentration of various constituents in food, wheat flour quality parameters including proteins, gluten and rheological properties of the dough.

2.1. Determination of protein and gluten.

Wheat flour was scanned on a NIR Flour ANALYZER DA-9000 scanning spectrophotometer in reflectance mode. Spectra were recorded at 2 nm intervals from 1100-2500 nm of the wave. The analysis was carried out using small ring cup cells with a spinning sample cell holder.

3. Results and Discussion

All the wheat flour samples were used to measure the protein and wet gluten concentration found in the flour. The results are summarized in the table below.

Table 2. Protein and gluten concentration found in wheat flour and plain wheat grain.

| Code | Protein (%) |                 | Gluten (%) |
|------|-------------|-----------------|------------|
|      | NIR results | Label reference |            |
| F1   | 12.5        | -               | 22.1       |
| A1   | 11.7        | 12              | 23         |
| A2   | 11.4        | 13              | 22.7       |
| F2   | 10.8        | 13              | 18.4       |
| A3   | 11.6        | 12              | 23.7       |
| A4   | 12.7        | 13.5            | 26.2       |
| F3   | 16.6        | 13              | 35.7       |
| F4   | 9.9         | 12              | 23.6       |
| F5   | 12.5        | 11              | 29         |
| F6   | 11.6        | 9.5             | 23.1       |
| F7   | 10.8        | 10              | 18.4       |
| F8   | 9.6         | 10              | 18         |
| F9   | 15.2        | 15.3            | 29.6       |
| G1   | 13.29       | -               | 24.9       |
| G2   | 16.64       | -               | 33.2       |

The result of the table are presented in the graphic below.

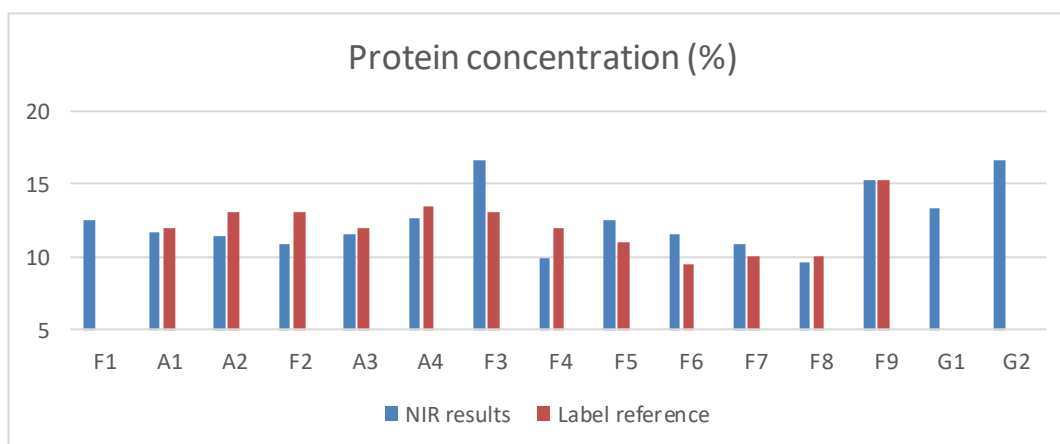
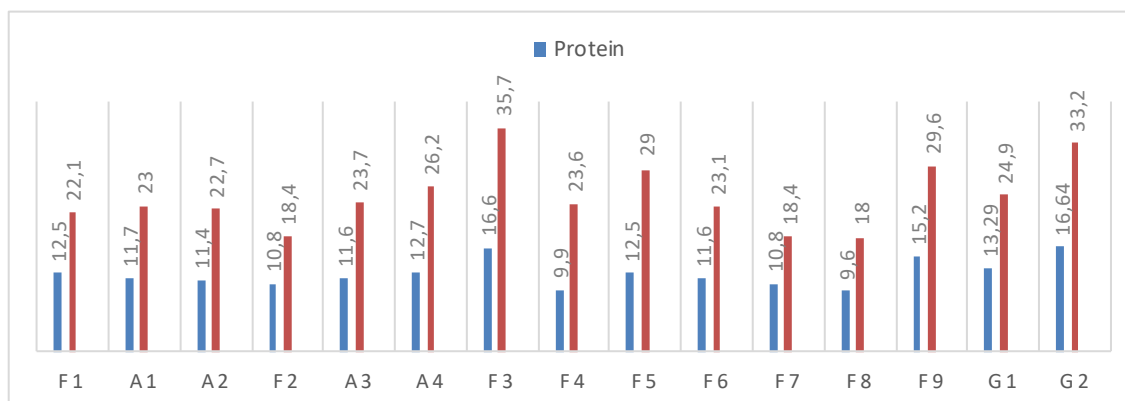


Figure 1. Protein concentration found in wheat flour

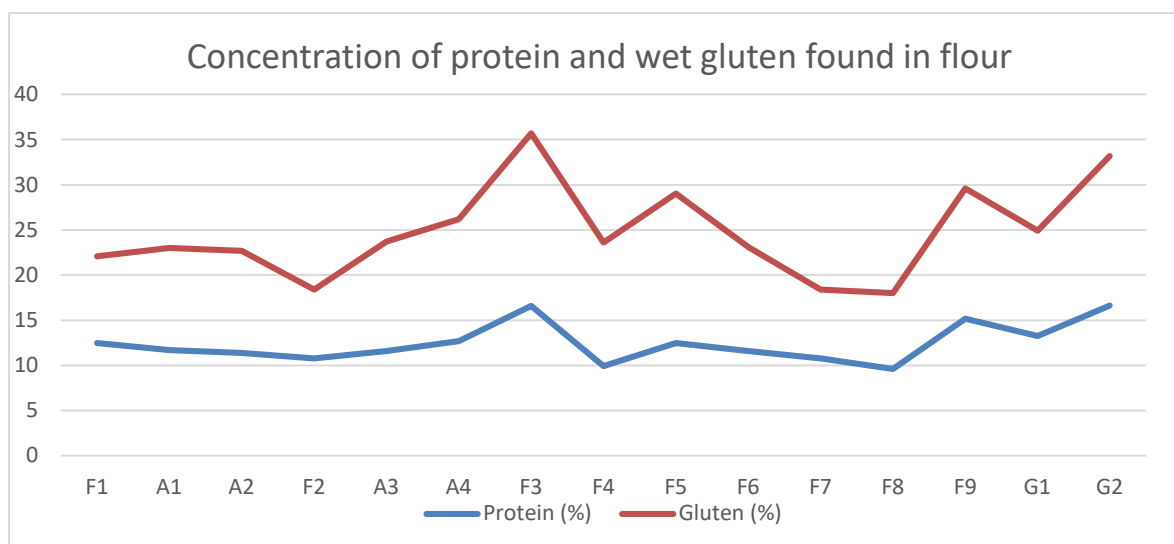
As we can see from the graph above, the flour that is found in the Albanian market has a big range of the protein concentration that varies from 9.6% at F8 to 16.6 at F3. The maximum level found in the Albanian flour is at A4 sample, where the concentration is 12.7%. There is no correlation between the protein found in flour and the

labeling of the package. As you can see, in seven samples the quantity shown in the label was bigger than the result of the analysis. Only one sample was in the same quantity. The protein found in the wheat grain, Albanian cultivar, had a higher quantity of the protein found in most of the flour samples.



**Figure 2.** Wet gluten concentration found in wheat flour

The range of the wet gluten found in flour is from 18-35.7%. To see a relation between the quantity of the protein and the quantity of the wet gluten the graph below is used.



**Figure 3.** Wet gluten concentration found in wheat flour

As we can see, more the quantity of the protein, more the quantity of the wet gluten concentration found in wheat flour.

#### 4. Conclusions

This study was conducted to make an analysis of the amount of protein found in the flour that is sold in the Albanian market. The analysis method is NIR analysis, as one of the most efficient and most used in recent years, due to the speed and the precise results it provides. In analyzed samples, the protein content ranges from 9.6 to 16.5%. There was no connection between the quantity of protein declared in labeling and what was really found in flour. It would be good for companies to declare the exact amount of protein as it is an element on which the quality of flour is based. The flour produced in the Albanian companies has a protein level of 11.4-12.7%, the value indicating its good quality. Of course, based on the protein level will be judged over the destination of use, biscuits, bread or pasta. The presence of wet gluten implies another parameter indicating flour quality, ranging from 18-35.7%.

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