



Chapter 25

Comparative study of methodologies for the determination of proteins and lipids in quinoa

  <https://doi.org/10.56238/methofocusinterv1-025>

Andréia Alves Rosa

Graduate Program in Agribusiness (PROPAGA), School of Agronomy and Veterinary Medicine, University of Brasilia, Campus Darcy Ribeiro, Brasília, DF.
arrosalves@gmail.com

Juliana Evangelista da Silva Rocha

Embrapa Products and Markets Researcher. Investment Attraction Supervision. Brasília, DF.
juliana.evangelista@embrapa.br

Artur Guerra Rosa

Graduate Program in Agribusiness (PROPAGA), School of Agronomy and Veterinary Medicine, University of Brasilia, Campus Darcy Ribeiro, Brasília, DF.
arturguerra921@hotmail.com

Carlos Roberto Spehar

Adjunct Professor, School of Agronomy and Veterinary Medicine, University of Brasília, Campus Darcy Ribeiro, Brasília, DF
spehar@unb.br

ABSTRACT

The centesimal analysis of grains is performed with the crushed sample as a way to minimize time and reduce costs with reagents. However, milling is an expensive task when there are a large number of samples. Thus, this work evaluated the need for grinding quinoa grains for the determination of protein and lipids by the semi-micro Kjeldahl method, using concentrated sulfuric acid and a temperature of 450 °C, and by the methodology using petroleum ether in an automatic extractor (lipids). There was no statistically significant difference between whole and ground grain samples. Thus, it is recommended that, for protein and lipid analysis with these methodologies, it is not necessary to grind the grains.

Keywords: quinoa, whole grain, ground grain, proteins, lipids

1 INTRODUCTION

In the methodology for analyzing the centesimal composition of grains, one of the first procedures adopted is sample crushing. The smaller the particle size and the greater the contact surface of the reagents with the matter to be analyzed, the faster and more efficient the analyzes are, and the less time is spent, as well as the reduction in the number of reagents to be used.

In the methodology for protein determination adopted by Silva (1981), the amount of sulfuric acid used depends on the amount of sample, the amount of nitrogen present in it, the heating speed, the temperature used, and the digestion time.

However, when working with many samples, milling can become an expensive activity.

In the case of the determination of lipids by the automatic extractor, there is no concern with the amount of reagent used, since the equipment, at the end of the extraction process, recovers up to 97% of the reagent used. However, filter bags are very expensive due to their high cost.

Thus, intending to find out whether quinoa grains require milling for the determination of proteins and lipids, the objective of this work was to compare the protein and lipid contents of analyzed whole and ground grains.

2 MATERIALS AND METHOD

The grains used in this work are of the Q 4.5 genotype belonging to the quinoa breeding program at the University of Brasilia. Analyzes were performed at the Plant Chemistry Laboratory at Embrapa Cerrados (Planaltina-DF) and the Food Analysis Laboratory at the Faculty of Agronomy and Veterinary Medicine at the University of Brasília.

Initially, the sample was divided into two, one of which remained with the grains intact, and the second was ground in a CETRO® CTO-60 mill. The evaluations followed the methodologies recommended by the Adolfo Lutz Institute (BRASIL, 2005). Three repetitions of each sample were performed for greater accuracy of results.

To evaluate the protein content, the digestion was carried out using a Tecnal® TE-40/25 digester and a Tecnal® TE-036/1 nitrogen distiller. After titration, conversion to protein was performed using factor 6.25 (FAO, 2001).

The evaluation of the lipid content was carried out using an ANKOM® XT15 automatic fat extractor, according to the methodology prescribed by the manufacturer.

Data were subjected to analysis of variance and comparison between treatments was performed using the Tukey test at 5% probability (SAS, 1999).

3 RESULTS AND DISCUSSION

According to the results in Table 1, it is observed that there is no significant difference at the 5% probability level, between the levels of both protein and samples of crushed or whole grain quinoa. Because the quinoa grain is small, 1000 seeds weigh 2.4g (SPEHAR, 2007), the reagent is concentrated sulfuric acid and the temperature is 450 °C, the grain is completely digested, the proteins are decomposed producing ammonium sulfate, which will later be converted to ammonium borate distillation and titrated with 0.1 N hydrochloric acid to quantify the nitrogen content of the sample.

Table 1: Results of protein and lipid analyzes of ground and whole quinoa grains.

Grain	Protein(%)	Grease(%)
Ground	14,43±0,12 ^a	11,27±0,05 ^a
Whole	14,25±0,28 ^a	11,09±0,08 ^a

Means followed by the same letter in the column do not differ statistically by Tukey's test at 5% probability.

Regarding the lipid content, also because the size of the quinoa is small, the samples are weighed in filter bags and placed in the automatic extractor, where the analysis is performed under high pressure

and temperature (90 °C), using filter bags ANKOM® XT4 and petroleum ether (PA) as a solvent, thus allowing the lossless extraction of the analyzed content during the extraction process.

Thus, it is not necessary to grind the sample before determination, thus reducing the analysis time.

4 CONCLUSION

For the analysis of protein contents using the semi-micro Kjeldahl method and the extraction of lipids through the automatic extractor, there is no need to grind the quinoa samples to obtain reliable results.

REFERENCES

- BRASIL, Ministério da Saúde. Agência de Vigilância Sanitária (ANVISA). Instituto Adolfo Lutz. **Métodos Físico-Químicos para Análise de Alimentos**. Brasil: Ministério da Saúde, p. 819-877, 2005.
- FAO. **Quinoa (*Chenopodium quinoa* Willd.): Ancestral Cultivo Andino, Alimento Del Presente y Futuro**. Editores: Angel Mujica S.; Sven-Erik Jacobsen; Juan Izquierdo; Jean Pierre Marathe. Santiago, Chile, 2001.
- SILVA, D. J. **Análise de Alimentos (Métodos Químicas e Biológicos)**. UFV, Viçosa, p. 166, 1981.
- SPEHAR, C. R. **Quinoa: alternativa para a diversificação agrícola e alimentar**. Planaltina, DF: Embrapa Cerrados, p. 103, 2007.
- STATISTICAL ANALYSIS SYSTEM – SAS. **User's guide: Statistics**. Version 8.0, Cary: 1999.