# BIOFORTIFIED COWPEA BEANS CULTIVARS: CENTESIMAL COMPOSITION: A PRELIMINARY STUDY.

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## ABSTRACT

Food enrichment is of great importance, not only for the industry, where you can develop new products or optimize existing ones, but also for improving the population's diet, helping to control diseases caused by nutritional deficiencies. The objective of this work was to evaluate the proximate composition of the grains of biofortified cowpea (*Vigna unguiculata*) cultivars in order to produce flour for acarajé preparations. Three biofortified cultivars (BRS Xiquexique, BRS Tumucumaque and BRS Aracê) and a commercial sample were evaluated. The samples centesimal composition was determined and the carbohydrates were obtained by difference (NIFEXT). The biofortified cowpea cultivars BRS Tumucumaque and BRS Aracê had the highest protein contents; the three biofortified cultivars showed higher lipid contents compared to the commercial sample. On the other hand, the lowest fiber content was obtained in the Xiquexique cultivar. It is concluded that the biofortification of cowpea can be an option to improve the nutritional properties of preparations such as acarajé, which is well accepted in the developing regions of Brazil.

## INTRODUCTION

Cowpea (*Vigna unguiculata* L.Walp) is from African origin, introduced in Brazil in the second half of the 16th century by Portuguese settlers in Bahia State. Belongs to Dicotyledoneae plants, Fabales order, Fabaceae family, genus *Vigna*, subgenus *Vigna*, species *Vigna unguiculata* (L.) Walp (FREIRE FILHO, 1988). Cowpea has several popular names and the most used in Brazil are macassa and “feijão-caupi”, in the Northeast region. The cowpea beans are preferably used to prepare akara, a typical food from Bahia state, known throughout Brazil (FREIRE FILHO, 1983).
Plant-food origin with high levels of protein are an option to compose the diet, especially for the less favored classes, and the choice of cowpea as a food base in these populations is an excellent alternative due to its composition. Regarding macronutrients, it is a rich source of proteins (about 25%) and carbohydrates, combined with a low lipid content (FREIRE FILHO *et al.*, 2011).

Currently, the practicality has been considered an important factor to favor the consumption of some product. In this context, the use of cowpea flour has been an option to make the acarajé preparation more functional, reducing the time of the process

and the need for labor, but still aiming to maintain the nutritional quality of the final product (PATTERSON, 2004).

In order to be successful, three factors are essential: the combination of high nutrient density with high productivity and high profitability for the farmer, proof of effectiveness, which must be demonstrated through the assessment of the micronutrient needs of the target audience. With the consumption of biofortified cultivars, malnutrition can be minimized and, finally, the approval of the biofortified culture must occur by farmers and consumers in target regions where individuals suffer from malnutrition of these micronutrients (BOUIS and WELCH, 2010).

## OBJECTIVES

The aim of the study was to determine the proximate composition of biofortified cowpea (*Vigna unguiculata*) cultivars (BRS Aracê, BRS Tumucumaque, BRS Xiquexique and a commercial sample) in order to produce flours for acarajé/akara preparation and be able to indicate the most suitable formulation for consumption.

## METHODS

The samples of three biofortified cultivars of cowpea (BRS Xiquexique, BRS Tumucumaque and BRS Aracê) cultivated at Embrapa - Meio – Norte. Teresina, Piauí, Brazil and a commercial sample as a control. The analyses of moisture, proteins, lipids, ashes, and fibers were carried out by AOAC (2005) and carbohydrates by difference (NIFEXT). All analyses were conducted in triplicates.

## RESULTS AND DISCUSSION

The results of the centesimal composition of biofortified cultivars and the control sample revealed that BRS Aracê presented the highest content of moisture (11.21±0.12), proteins (25.14±1.23), lipids (1.40±0.03), ashes (3.3±0.05), fibers (27.45±1.24) and carbohydrates (31,5) g.100g-1 followed by BRS Tumucumaque cultivar: moisture (11.58±0.09), proteins (23.86±0.32), lipids (1.40±0.03), ash (3.33±0.06), fiber (25.58±079) and carbohydrates by difference (34.28) g.100 g-1. The BRS Xiquexique cultivar revealed good contents of protein, ash and lipids.

On table 1 the results of centesimal composition (moisture, ashes, proteins, lipids and carbohydrates) and fibers are showed.

Table 1. Centesimal composition (%) of the cowpea cultivars biofortified and comercial sample.

| Cultivars | Moisture (%) | Ash (%) | Proteins (%) | Lipids (%) | Carbohydrates (%) | Fibers (%) |
|---|---|---|---|---|---|---|
| Aracê | 11.21 ±0.12 | 3.37 ±0.05 | 25.14 ±1.23 | 1.40 ±0.03 | 58.88 ±2.67 | 27.45 ±1.24 |
| Tumucumaque | 11.58 ±0.09 | 3.33 ±0.06 | 23.86 ±0.32 | 1.40 ±0.13 | 59.83 ±1.60 | 25.78 ±0.79 |
| Xiquexique | 15.67 ±0.05 | 3.09 ±0.03 | 20.71 ±0.03 | 1.29 ±0.01 | 59.24 ±0.52 | 11.62 ±0.23 |
| Comercial | 11.05 ±0.11 | 3.34 ±0.03 | 21.88 ±0.08 | 0.87 ±0.02 | 62.86 ±2.39 | 31.35 ±2.41 |

Values expressed as mean and standard deviation of 3 determinations.

The cultivar BRS Xiquexique had the highest moisture content (15.67%), while the others had similar values, ranging from 11.05% to 11.58%. This result may show a greater susceptibility to deterioration when compared to other cultivars. The Technical Regulation for common bean, Article 10. Sole paragraph, recommends that beans with moisture above 14% may be marketed. as long as it is not causing risk factors to human health (BRAZIL, 2008).

As for the ash content, the average value of the biofortified cultivars was higher compared to those reported in the literature for green cowpea (1.63g/100g) (SALGADO et al., 2005) and BRS Milenio (2.6g/100g) (FROTA *et al*., 2008) and lower average values compared to other analyzed cowpea varieties (3.3% to 4.6%) (CARVALHO *et al.*, 2012), these variations can probably occur due to the difference in cultivar and growing conditions, cultivation.

Protein contents ranged between 20.71% and 25.14%, with the cultivar BRS Aracê having the highest value and BRS Xiquexique the lowest, even in relation to the commercial sample. According to Carvalho *et al.* (2012) the total protein content of Brazilian cowpea genotypes varies from 20 to 30%, corroborating the results obtained in the present study.

Regarding the percentage of carbohydrates in raw grains, the commercial sample had the highest content (62.86%), followed by BRS Tumucumaque with 59.83%, BRS Xiquexique (59.24%) and BRS Aracê (58.88%).

Cowpea has a high carbohydrate content and the results presented corroborate this finding, since it has an average content of 64% in raw beans (ROCHA, 2009). The results obtained in this study are similar to those reported by Barros (2014) analyzing the same biofortified cowpea cultivars. After cooking, the carbohydrate content tends to decrease, but remains expressive, still being considered a good energy food source.

Cowpea can be considered a food with high protein content since it has values above 12 g / 100 g or 100 mL, according to the Technical Regulation on Complementary Nutritional Information (BRAZIL, 2012). The nutritional value of cowpea can be influenced by factors such as digestibility, essential amino acids, anti-nutritional factors and processing (DAMODARAN *et al*., 2010). The differences observed in the protein content of the grains obtained by conventional genetic improvement suggest that the technique produces changes in the nutritional quality and can interfere in the technological quality of the beans, such as: the genotype and the conditions of the plant development environment (CASTELLÓN *et al*., 2003).

The cultivar BRS Xiquexique had the lowest fiber content (11.62%) compared to the other biofortified cultivars (25.58% and 27.45%), BRS Tumucumaque and BRS Aracê, respectively, and the commercial sample (31.35%). According to ANVISA (BRASIL. 2012), a food can be considered a source of fiber if it has a minimum of 3 g of fiber/100g in solid foods, being considered as high in fiber if it has a minimum of 6g of fiber/100g in foods solids. Even considering the losses that can occur after cooking, the results showed that the content of total dietary fiber in biofortified cowpea cultivars is high, which could imply the ability to prevent the risk of chronic diseases such as cancer, cardiovascular disease and diabetes mellitus.

In relation to lipid levels, the four samples showed little variation of this macronutrient, with commercial cowpea having the lowest value, 0.87%. compared to BRS Xiquexique (1.29%) and BRS Aracê and BRS Tumucumaque. both with 1.40%. Carvalho et al. (2012) reported a variation of 1.0% to 1.4% in 30 evaluated cowpea genotypes characterizing cowpea as a low lipid food.

## CONCLUSIONS:

The biofortified cultivars presented high values for proteins, high fiber contents, being a viable option to improve the nutritional quality of preparations such as acarajé which has cowpea as its base food in its formulation, with the advantage of also being used in other food preparations. However, it is suggested that further studies should be carried out in order to select the best cultivar taking into account the moisture and ash contents to produce a paste with acceptable sensory characteristics for acarajé.

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