DETERMINATION OF CALCIUM CONTENT FROM ORIGINAL ALMOND MILK AND ALMOND MILK WITH OLIVE OIL BY FLAME ATOMIC ABSORPTION

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Abstract.

Flame atomic absorption spectrophotometry was used for the determination of calcium from two kind of samples of almond milk: original almond milk and almond milk with olive oil. The sample were atomized in an air-acetylene flame. The absorbance was measured at a wavelength of 422.7 nm. Matrix interferences were eliminated by the addition of lanthanum. The preparation cure was prepared between 0 ppm and 4 ppm. The results showed that calcium values were higher in almond milk with olive oil samples than it were in original almond milk values.

Key words: almond milk, atomic absorption spectrophotometry, calcium

INTRODUCTION

For people who have trouble in tolerating animal milk, almond milk can be an excellent substitute. Several researchers had confirmed the benefits of almond consumption (Chen et al, 2006). Some of this benefits are due to the high amount of minerals. One of the minerals with a very important role in a healthy human diet is calcium.

Calcium is essential for living organisms. Almost 99 percent of the body's calcium is store in bones and teeth. Humans absorb about 30 % of the calcium in foods, but this depends on the type of food consumed(National Academy Press, 2010).

Inadequate intakes of dietary calcium from food can produce hypocalcemia. Symptoms of hypocalcemia include numbness and tingling in the fingers, muscle cramps, convulsions, poor appetite and abnormal heart rhythms(Dawson-H.B et al, 2009).

Research studies showed that many people are lactose intolerant. This type of persons, are at risk of calcium inadequacy , because they avoid dairy products (Suchy FJ et al, 2009,Wilt TJ et al,2010).

To ensure adequate calcium intakes, lactose-intolerant individuals can choose nondairy food sources.Almond milk is considered a nondairy food and some researchers showed its value regarding to this aspect (Salpietro CD,2005, Iaconoa *G*,*2008*).

In order to establish calcium content from original almond milk and calcium content from almond milk with olive oil, flame atomic absorption spectrophotometry was employed.

Calcium is the most common elements determined by atomic absorption , being also the more interesting because to several types of interferences and because of the sensitivity of the method. Calcium forms a refractory compound Ca-Al-O that does not completely decomposed in the normal observation region of air-acetylene flame in the presence of aluminum. One of the method used for overcoming this interferences is the addition of lanthanum, which forms a La-Al-O compound, releasing the calcium(Greenlief, 2004). The sample is atomized at a very high temperature (2500-3000° C) and the atoms absorb radiation from a hollow cathode lamp. The evaluation of AAS measurements is based on Beer's Law, which says that the absorption of light is directly proportional to the number of atoms absorbing it.

MATERIAL AND METHOD

The research has been carried out on samples of original almond milk and almond milk with olive oil. 1-5 g of sample were weight into an ashing crucible , brought to a constant weight previously. The samples were introduced into a calcining furnace Nabertherm L3/11/ B170 in order to be burnt for 3 hours at 550 ° C. After 3 hours the sample were removed and cooled. 2 ml of ultrapure water and 2 ml of HNO_3 were added and the samples were burnt again into the calcining furnace for 2 hours at the same temperature. The samples were cooled and 5 ml HCl 6 M, were added and brought almost to boil temperature on a hot plate ,moved into 50 ml calibrated flask and brought to sign. In the last dilution 5 ml lanthanum nitrate solution, 133 g/l, 5 ml CsCl, 100g/l and 5 ml HCl 0,6 M, were added. In parallel a blank is prepared and pass through the same procedure (A.O.A.C. 985.35)

For calibration curve, the dilution corresponding to areas of linearity were prepared as it is shown below(tab.1).

Tabel 1.

The dilution corresponding to range of linearity for Ca calibration curve

	Solution	PC	Blank	1	2	3	4	5
Ca	Dilution 100 ppm	2.5	0	0.5	1	2	3	4
	Sol. La(NO3)3	5	5	5	5	5	5	5
	Sol. CsCl	5	5	5	5	5	5	5
	Sol HCl 0,6 M	5	5	5	5	5	5	5
	Diluted at	100	100	100	100	100	100	100
	Concentration, ppm	2.5	0	0.5	1	2	3	4

Almond milk samples were prepared as described in US 2011/ 0293787 A1 Patent Application (Antonio Pons Biescas,2011).

The calibration curve solutions, together with samples were vaporized in an air-acetylene flame by using Atomic Absorption spectrophotometer – Sens AA GBC Scientific Equipment. Calcium compounds were atomized and the calcium atoms thus formed absorbed radiation from the hollow cathode lamp. The absorbance was measured at a wavelength of 422.7 nm.

RESULTS AND DISSCUSIONS

The content of calcium from original almond milk samples and almond milk with olive oil samples was expressed in mg/100 g and was calculated with this formula:

Ca =c*f/ m where :

m = amount of samples weighted, g

f = inverse of dilution factor of the sample

c = the amount of calcium from calibration curve, ppm

From read absorbance, the calibration curve was build, by representing the absorbance in relation with solution concentrations(fig.1).

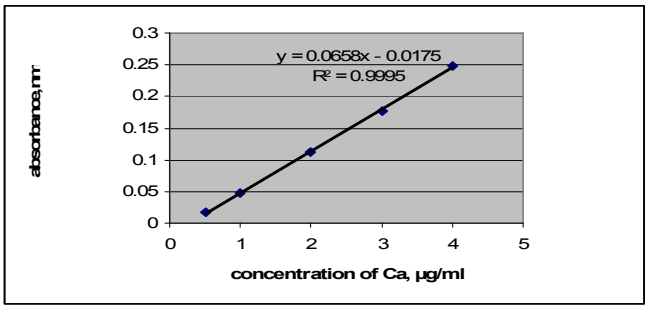

Fig. 1 Calibration curve for calcium

The values of calcium from original almond milk samples and almond milk with olive oil are shown below(tab.4).

Table 2

Calcium values for almond milk samples

ID	Average value for almond milk samples mg/100 g	Average values for almond milk with olive oil samples mg/100 g
	0,63	1,3

CONCLUSIONS

Nowadays, the consumers are very concerned not only about the texture, flavor, taste or color of a product , but also about its quality , nutrients and safety.

The research showed in almond milk a content of 0,63mg calcium/ 100 g, being lower than the content of calcium from almond milk with olive oil.

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