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Use of soybean processing residues for formulation of rich extract in bioactive polyphenols: fermentative process.

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Abstract

Soy isoflavones have been studied for its several benefits, especially for women. When they are in aglycone forms, isoflavones have higher bioactive potential. A way to convert the isoflavones to aglycone forms is using fermentative process. For this reason, the goal of this scientific project was to evaluate the capacity of eleven microorganisms to change the glycosylated isoflavones in their more bioavailable aglycones. The results showed that the fermentation process with all microorganisms was able to increase the content of aglycone isoflavones in soymilk.

Key words:

Soy, phenolic compounds, bioactivity.

Introduction

Isoflavone, widely found in soybeans, is a bioactive chemical compound known as phytoestrogen. Its structure is similar to the main female hormone: estradiol. Like estradiol, isoflavone fits estrogen receptor and has several benefits for women, including reducing menopausal symptoms (FERRARI et al, 2001).

Researches have been demonstrated that isoflavones in glycoside forms, such as daidzin and genistin, have less bioavailability than the daidzein and genistein, their aglycone forms, when they are not attached to a sugar molecule anymore. This difference of bioavailability is responsible for the fact that aglycone forms are more absorbed by the human body than the glycoside forms (SETCHELL et al., 2002).

In this context, the fermentative process of soy has been an alternative to improve its quality and nutritional value.

Results and Discussion

The concentration of isoflavones, before (Sample 1) and after the fermentative processes, were evaluated using HPLC-DAD. The microorganisms used in the fermentative process were *Lactobacillus acidophilus* LA3 (Sample 2), *Lactobacillus casei* MB 151 (Sample 3), *Lactobacillus delbrueckii* MB153 (Sample 4), *Lactobacillus rhamnosus* MB154 (Sample 5), *Streptococcus thermophilus* ST066 (Sample 6), *Bifidobacterium lactis* BLC 01 (Sample 7), *Kluyveromyces marxianus* ATCC 16045 (Sample 8), *Saccharomyces cerevisiae* CBMAI 194 (Sample 9), *Lactobacillus kefir* CBMAI 0212 (Sample 10), a domestic Kefir (Sample 11) and a mixture of Simfort® composed by *Lactobacillus acidophilus*, *Lactobacillus casei*, *Lactococcus lactis*, *Bifidobacterium bifidum* and *Bifidobacterium lactis* (Sample 12).

The isoflavone contents of samples can be found in Table 1. In soymilk, daidzin and genistin were the predominant forms, but after fermentative processes the glycoside isoflavones decreased and the aglycone isoflavones increased.

The results suggest that these microorganisms, through β -glucosidase enzyme activity, were responsible for the biotransformation of glycoside isoflavones (MACEDO et al., 2015; QUEIRÓS et al., 2016).

Table 1. Concentration of isoflavones in soymilk before and after the fermentative processes.

Sample	Isoflavone contents ($\mu\text{g/mL}$)			
	Glycoside		Aglycone	
	Daidzin	Genistin	Daidzein	Genistein
1	93.5 $\pm$ 4.8 ^a	31.1 $\pm$ 2.0 ^{de}	5.8 $\pm$ 0.4 ^e	6.4 $\pm$ 0.7 ^f
2	83.5 $\pm$ 0.8 ^{ab}	32.0 $\pm$ 0.5 ^{bcde}	16.2 $\pm$ 0.2 ^{cd}	31.2 $\pm$ 0.3 ^d
3	3.6 $\pm$ 4.0 ^e	33.8 $\pm$ 0.4 ^{bcde}	60.8 $\pm$ 1.8 ^a	56.6 $\pm$ 1.8 ^{ab}
4	5.3 $\pm$ 3.5 ^{de}	36.1 $\pm$ 0.9 ^{bc}	60.6 $\pm$ 0.9 ^a	56.3 $\pm$ 0.9 ^{ab}
5	3.6 $\pm$ 4.0 ^e	35.1 $\pm$ 0.6 ^{bcd}	59.1 $\pm$ 1.5 ^a	54.8 $\pm$ 1.6 ^{ab}
6	13.1 $\pm$ 0.6 ^{de}	32.1 $\pm$ 0.9 ^{cde}	48.0 $\pm$ 1.2 ^b	50.1 $\pm$ 1.3 ^{bc}
7	12.9 $\pm$ 0.8 ^d	31.7 $\pm$ 0.9 ^e	59.6 $\pm$ 2.2 ^a	55.7 $\pm$ 2.1 ^a
8	76.5 $\pm$ 5.0 ^b	35.3 $\pm$ 0.2 ^{bcd}	18.9 $\pm$ 1.5 ^c	43.6 $\pm$ 3.2 ^c
9	33.2 $\pm$ 3.1 ^c	33.9 $\pm$ 3.0 ^{bcde}	45.1 $\pm$ 0.6 ^b	27.4 $\pm$ 0.2 ^{de}
10	4.7 $\pm$ 2.9 ^{de}	36.7 $\pm$ 0.3 ^{ab}	61.0 $\pm$ 1.4 ^a	56.0 $\pm$ 1.5 ^{ab}
11	86.1 $\pm$ 7.9 ^{ab}	31.0 $\pm$ 1.5 ^{de}	12.3 $\pm$ 3.9 ^d	21.9 $\pm$ 7.1 ^e
12	15.9 $\pm$ 3.4 ^{de}	29.8 $\pm$ 3.2 ^{cde}	63.8 $\pm$ 1.9 ^a	61.3 $\pm$ 2.1 ^{ab}

The results are expressed as mean $\pm$ standard deviation (n=3). Means in the same column with different letters are significantly different (p<0.05).

Conclusions

All microorganisms evaluated in this research showed a great capacity to bioconvert the glycoside isoflavones to aglycone forms.

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