Evaluation of Bioactive Potential And Estrogenic Activity of Soy Milk

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Abstract

The isoflavones have been associated with estrogenic activity and other health benefits, however, its efficiency is related with the microbiota capability of metabolizing these compounds. This study aims to enhance the estrogenic activity and the antioxidant potential of soy milk (SM) by biotransformation of SM with Tannase Enzyme (SMT) and, as a control, with B-glycosidase Enzyme (SMB), since both enzyme have hydrolysis action. The Total Phenolic Content and DPPH assay (methanolic extract) did not present statistics differences between the samples. The SMT presented increased antioxidant potencial when compared with the control (SM) by Orac Assay and FRAP Assay. The Sulforhodamine Assay measured the MCF-7 BUS cells viability at concentrations from 0,1 to 1 µl/ml of sample; all samples increased cell proliferation when compared with the control, indicating that the SMT and SMB presented higher estrogenic activity, since this line is a human mama cancer estrogen responsive cell. All the samples presented synergy with Estradiol (E2) at E-screen assay, suggesting that SM, SMT and SMB react as phytohormone and have potential to become a alternative treatment to reduce postmenopausal symptoms.

Key words: Biotransformation, Estrogen Activity, Soy Milk.

Introduction

MS has high amount of isoflavones compounds, which are known for reducing the postmenopausal symptoms, however its bioavailability and estrogenic activity depends on the human microbiota capability to hydrolyze the glucose bonds by enzymatic via. This study aims to promote those benefits despites each individual microbiota. In order to achieve a bioavailable isoflavone, SM was biotransformed with Tannase Enzyme, since previous studies showed the increase of bioactive potential in samples biotransformed with Tannase and its hydrolytic action^[1].

Results and Discussion

The Total Phenolic Content⁵ and DPPH Value² did not exhibit differences from the control (SM).

At ORAC Assay³ SMT presented the highest antioxidant potential, followed by the MSB and SM. The SMT had the best performance, followed by SMB and SM, at FRAP⁴. Table 1 shows the Total Phenolics Content, DPPH, ORAC and FRAP results.

Table 1: Total Phenolics and Antioxidant Potential Results.

Sample	Total Phenolics [µg GAE/ml]	DPPH [µmol TE/ml]	ORAC [µmol TE/ml]	FRAP [µmol TE/ml]
SM	1.434 ^a ± 27	195 ^a ± 2	26.185 ^b ± 1605	5.643 ^{ab} ± 141
SMT	1.506 ^a ± 18	196 ^a ± 15	32.344 ^a ± 1328	6.462 ^a ± 507
SME	1.432 ^a ± 53	196 ^a ± 4	32.109 ^{ab} ± 3669	5.443 ^b ± 46

The results are expressed as mean±standart deviation (n=3). Means in the same column with different letters are significantly difference (p<0,05).

The FRAP and ORAC results indicate that Tannase Enzyme has an extensive action, which overcame β-glucosidase hydrolysis action. Tannase is able to cleave ester bonds and side bonds of tannins, producing sugar and gallic acid, therefore enhance the antioxidant potential.

MCF-7 BUS cells were viable^[6] at medium RPMI supplemented with sample at concentration from 1 to 0,005 µl/ml, measured at 24 and 144 hours. Chart 1 shows the increase of MCF-7 BUS proliferation^[7] when exposed to the samples or the samples supplemented with estrogen, indicating that the samples have synergy with this hormone and does not compete with estrogen active sites.

Chart 1: E-Screen.

Conclusion

The biotransformation can increase the SM antioxidant potential and estrogenic activity, enhancing the benefits of soy products consumption for postmenopausal treatments.

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- Macedo, J. et al. Increasing the antioxidant power of tea extracts by biotransformation of polyphenols. *Food Chemistry*, v.126, p. 491-497, 2011.
- Peschel, W. et al., An industrial approach in the search of natural antioxidants from vegetable and fruit wastes. *Food Chemistry*, v. 97, p. 137-150, 2006.
- Dávalos, A.; Gomez-Cordoves, C.; Bartolomé, B. Extending applicability of the oxygen radical absorbance capacity (ORAC-fluorescein) assay. *Journal of Agricultural and Food Chemistry*, v. 52, n. 1, p. 48-54, 2004.
- Benzie, I. F., & Strain, J. J. (1999). [2] Ferric reducing/antioxidant power assay: Direct measure of total antioxidant activity of biological fluids and modified version for simultaneous measurement of total antioxidant power and ascorbic acid concentration. *Methods in enzymology*, 299, 15-27.
- Swain, T.; Hillis, W. E. The phenolic constituents of *Prunus domestica* I – the quantitative analysis of phenolic constituents. *Journal of Science of Food and Agriculture*, v.10, n. 1, p. 6, 1959.
- Monks, A. et al. Feasibility of high-flux anticancer drug screen using a diverse panel of cultured human tumor cell lines. *Journal of the National Cancer Institute*, v. 83, n. 11, p. 757-766, 1991.
- Rasmussen, T. H.; Nielsen, J. B. Critical parameters in the MCF-7 cell proliferation bioassay (E-Screen). *Biomarkers*, v. 7, n. 4, p.322-336, 2002.