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Antioxidant properties of white sesame (*Sesamum indicum L.*) flour on human liver cells *in vitro*.

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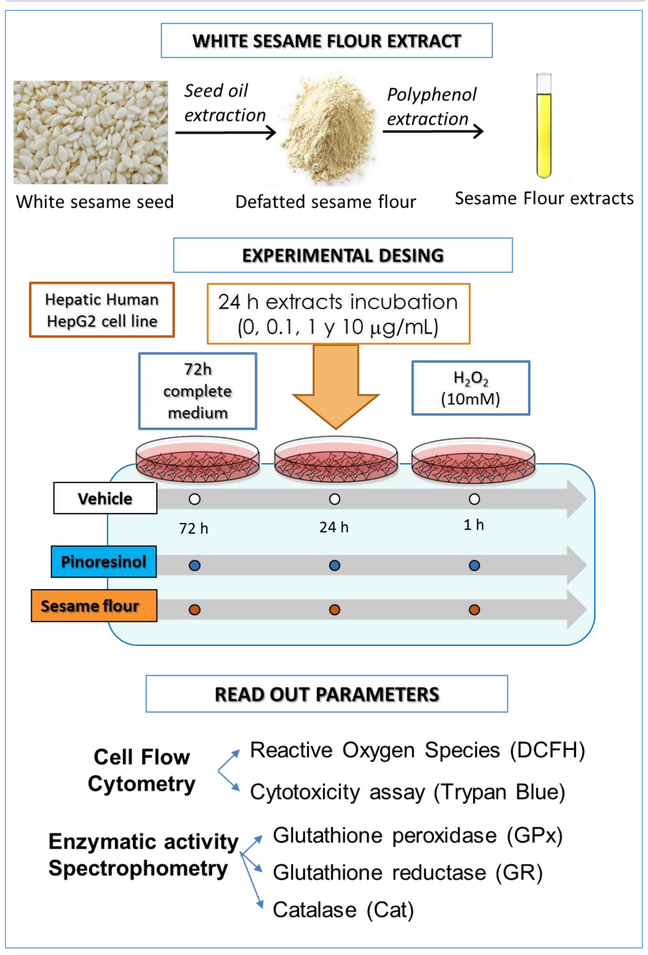
ABSTRACT

White sesame flour resulting after seed oil extraction is an edible residue, which may become a novel alternative of healthy products due to its high polyphenols content, compounds with many beneficial effects for human health. In the present study, the antioxidant properties of sesame flour were characterize in human cells in vitro. The hepatic cell line HepG2 was treated for 24h with degreased sesame flour extracts or pinoresinol, one of the main polyphenols of this flour. After, oxidative stress was induced by H2O2 exposure. Cell viability and reactive oxygen species amount were measured by flow cytometry. Antioxidant enzyme activity of glutathione peroxidase (GPx), reductase (GR) and Catalase (Cat) were determined by spectrophotometry. Results showed that pinoresinol decreased H2O2 oxidative effects up to a 40%, rising Cat and GR activity without compromising cellular viability. Sesame flour extracts mayor dose decreased H2O2 stress induction up to 46% yet it increased cell death levels. Also, sesame flour raised a 100% Cat and GPx activity. These findings suggest that sesame flour has antioxidant properties through antioxidant enzymes activity modulation. Since pinoresinol is one of the mayor polyphenols of sesame flour, this industrial residue might be a potential source for functional foods with health benefits.

Materials & Methods



Stats

Data are presented as media±SEM. Unless otherwise reported, one-way ANOVA was used for three independent samples with normal distribution (Wilk–Shapiro test) and homoscedasticity (Levene test). Where data did not meet the assumptions of the test, Generalized Linear Mixed Model (GLMM) test was used. Fisher Test was applied to detect significant difference, $p < 0.05$.

Acknowledgements

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Background

White sesame (*Sesamum indicum L.*) is considered a high nutritional seed and the possibility of its incorporation as an ingredient in functional food has increased in recent years. However, among the industrial by-products after sesame oil extraction through pressure, sesame flour, an it edible residue that is currently discard, represents a novel alternative of healthy products due to its high proportion of polyphenols, a group of pant-derived compounds which have several human health benefits such as antioxidant and anti-inflammatory effects. Therefore, to improve knowledge of the effective actions of this edible by-product in biological models that resemble human physiological responses become a relevant research topic.

Aim

To characterize the antioxidant properties of sesame flour in human hepatic HepG2 cells *in vitro*.

Cytotoxic assay

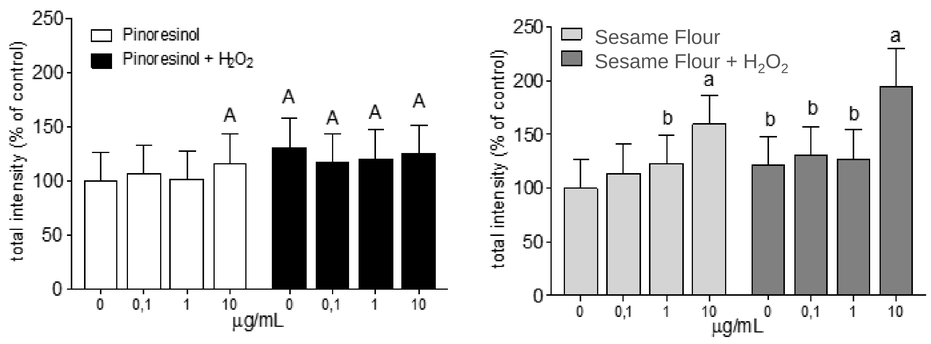

Figure 1. Cellular Cytotoxic Index. The hepatic cell line HepG2 was treated for 24 h with degreased sesame flour extracts or pinoresinol, one of the main polyphenols of this flour. After, oxidative stress was induced by H_2O_2 exposure. Cell viability amount was determined by Trypan Blue vital marker exclusion measured by flow cytometry.

Reactive oxygen species (ROS)

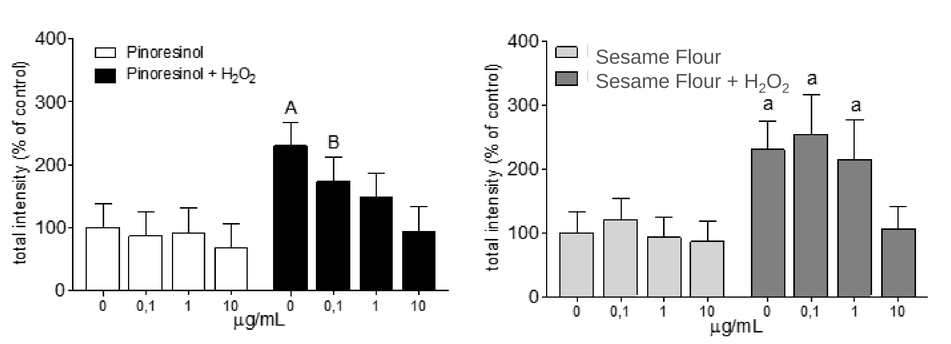

Figure 2. Cellular reactive oxygen species Index. The hepatic cell line HepG2 was treated for 24 h with degreased sesame flour extracts or pinoresinol, one of the main polyphenols of this flour. After, oxidative stress was induced by H_2O_2 exposure. Reactive oxygen species amount was determined by diclorofluorescein (DCFH) measured by flow cytometry.

Glutathione reductase

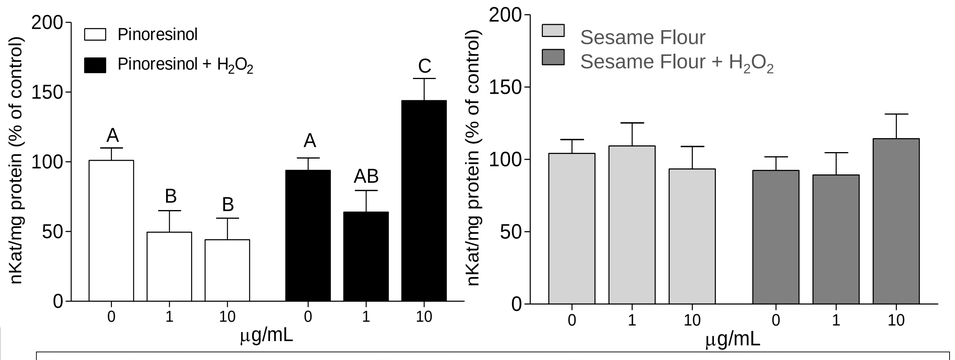

Figure 3. Gluthathione reductase activity . The hepatic cell line HepG2 was treated for 24 h with degreased sesame flour extracts or pinoresinol, one of the main polyphenols of this flour. After, oxidative stress was induced by H_2O_2 exposure. Antioxidant enzyme activity of glutathione reductase (GR) was determined by spectrophotometry.

Glutathione peroxidase

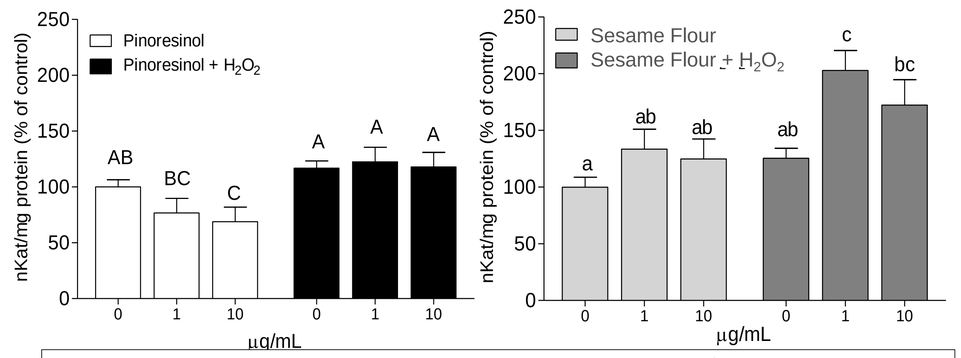

Figure 4. Gluthathione peroxidase activity . The hepatic cell line HepG2 was treated for 24 h with degreased sesame flour extracts or pinoresinol, one of the main polyphenols of this flour. After, oxidative stress was induced by H_2O_2 exposure. Antioxidant enzyme activity of glutathione peroxidase (GPx) was determined by spectrophotometry.

Catalasa

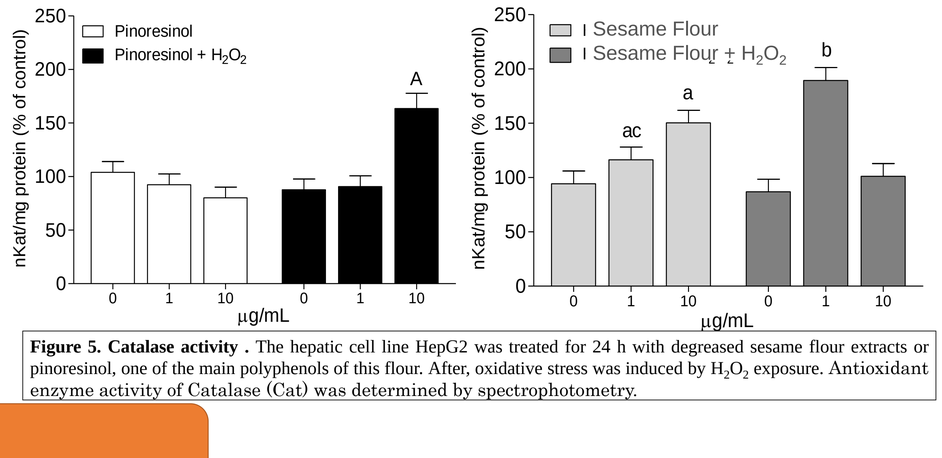

Figure 5. Catalase activity . The hepatic cell line HepG2 was treated for 24 h with degreased sesame flour extracts or pinoresinol, one of the main polyphenols of this flour. After, oxidative stress was induced by H_2O_2 exposure. Antioxidant enzyme activity of Catalase (Cat) was determined by spectrophotometry.

Highlights and Conclusions

- Findings presented suggest that sesame flour showed antioxidant properties *in vitro* in human liver cells, as it is able to increase the activity of antioxidant enzymes.
- Under the conditions of this study it was not possible to validate the anti-oxidative effect over H_2O_2 stimulus as the highest sesame flour dose used presented a cytotoxic action.
- Pinoresinol activity was be able to attenuate the oxidation induced by H_2O_2 and provokes increases in antioxidant enzyme response without affecting cellular viability.
- As pinoresinol compound is one of the main ones previously detected in sesame flour extract, it could be suggested that this industrial by-product is a potential source of nutrients for the production of functional foods with beneficial activity on human health.