PERSPECTIVE

Enhancing nutritional values, isoflavone aglycones, and antioxidant capacity of edible mushroom by-products with soybeans

Kevin Joseph

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ABSTRACT

Douchi is a traditional soybean dish that has been salt-fermented. It has a number of bioactivities, including those that are anti-oxidant, anti-diabetic, and anti-hypertensive. protease and -glucosidase are used in the making of koji. Ideal are edible mushroom by-products .Due to their distinct nutritional properties, additives can improve the flavour and nutritional value of food high protein, abundant amino acid content, and low calorie properties. There is, however, no study on preparing douchi using a combination of fermentation of edible mushroom byproducts and soybeans. Using protease and glucosidase activities as indicators, the fermentation conditions of the Edible Mushroom by-product Douchi Koji (EMDK) were optimised in this study using response surface methodology (RSM). Unfermented Raw Samples (URS), Douchi koji Without Edible Mushroom by-product (DKWE), and EMDK were then compared for changes in the main bioactive compounds and antioxidant activities. Aspergillus oryzae to Mucor racemosus ratio inoculation amount, edible mushroom amount, and fermentation time of were the best conditions for EMDK fermentation, according to the results of single-factor tests and RSM. The activities of protease and -glucosidase under these conditions, respectively. In addition, EMDK's total isoflavone and -glucoside isoflavone contents were noticeably lower than those of URS and DKWE, although its amino nitrogen, total phenolics, total flavonoids, and aglycone isoflavone levels, as well as its antioxidant capacity, were noticeably higher. Significant relationships between the aforementioned elements and antioxidant capability were also discovered. These findings demonstrated the possibility of co-fermenting soybeans with an edible mushroom byproduct, increasing the nutritional content and antioxidant potential of Douchi koji.

Key Words: *Douchi koji; Edible mushroom; Protease, β-glucosidase; Isoflavone; Antioxidant activity*

INTRODUCTION

Due to its alluring scent, high nutritional content, and specific physiological actions, such as anti-oxidation, anti diadiabetes, and and anti-hypertension, douchi, a traditional salt-fermented soybean snack, has been widely used as a culinary condiment in China. Douchi may generally be classified into four types: Mucor-type, Aspergillus-type, Bacterial-type, and Rhizopus-type—all based on the major microorganisms participating in the koji-making stage. Douchi are the best known Douchi available, and they have been made in China for at least years. It is important to remember that manufacturing koji is a crucial stage in creating durable and useful Douchi goods.

The enzyme system produced by bacteria is crucial to this process of acquisition of nutrients and component transformation. For instance, proteinase catalyses enzymatic activities that transform the majority of the proteins in soybeans into peptone, polypeptide, and free amino acids, which are better for human absorption. Additionally, a-glucosidase may transform isoflavonoid glycosides, one of the most significant substances in soybeans with several health benefits, into aglycon isoflavonoids with a higher level of functional activity, providing superior nutrition for Douchi. Therefore, the secret to producing Douchi koji is to increase the activities of protease and -glucosidase.

Editorial Office, Applied Food Science Journal, Windsor, United Kingdom

Correspondence: Kevin Joseph, Editorial Office, Applied Food Science, Windsor, United Kingdom, E-mail:Foodscitech@scholarcentral.org

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Due to their unique nutritional qualities of high protein, rich amino acids, and low calories, edible mushrooms are well-liked around the world. They also have many health-beneficial aspects (such as an antioxidant activity). Nevertheless, it was calculated that throughout the mushroom manufacturing process, close to one-fifth of the by-product was created, including caps, stalks, and malformed mushrooms, which not only results in the loss of raw resources but also creates certain environmental issues. To support the circular economy and environmental conservation, numerous strategies are being investigated to improve the value-added product from mushroom waste. The nutritional value of cookies was significantly improved by the addition of mushroom powder, which raised protein, fibre, minerals, phenolics, flavonoids, and antioxidants while lowering starch hydrolysis and the glycemic index. The moisture content, carbohydrates, total phenolic content, and antioxidant capabilities of pasta with Agaricus bisporus powder increased. The mushroom powder is a strong option for usage in meals to raise their nutritional profiles, according to these studies. Enzymatic hydrolysis and fermentation are also thought to be successful techniques for enhancing the nutritional value and sensory qualities of food. Pleurotus eryngii fermented with selenium-enriched Lactobacillus Plantarum had considerably higher total phenolic content and antioxidant qualities. Additionally, it was noted that proteinase K hydrolysis considerably improved the antioxidant activity of Pleurotus ostreatus. Similar to the nutrients found in soybeans, the by-products of edible mushrooms are a rich source of proteins, amino acids, polypeptides, flavonoids, and other nutritional active components.

Additionally, the plentiful protease used in the production of Douchi koji has the best enzymolysis impact on the flavour protein of edible mushrooms, which is crucial for producing more flavour peptides to improve food flavour. To increase the nutritional value and flavour of Douchi koji, we thus hypothesise that edible mushrooms will be an excellent companion. Although Douchi has been made in China for a very long time, we are not aware of any accounts of it being made using fermented edible mushroom leftovers and soybeans. The objective of this study was to compare the changes in the main bioactive compounds and antioxidant activities before and after fermentation, with a focus on the optimal fermentation progress of the Edible Mushroom By-Product Douchi Koji (EMDK) using protease and -glucosidase enzyme activities as indicators.

CONCLUSION

According to this study, the ideal conditions for EMDK fermentation were a ratio of Aspergillus oryzae to Mucor racemosus, for inoculation, for edible mushrooms, and hours for fermentation. Under these conditions, neutral protease and -glucosidase activities were, respectively. Additionally, EMDK's antioxidant capacity was much higher than that of URS and DKWE. This improvement was favourably connected with the rise in AN, TPC, TFC, and aglycone isoflavones, but negatively correlated with the fall in -glucoside isoflavones. Soybeans and edible mushroom by-products co-fermenting together may be a practical way to increase the nutritional content and antioxidant activity of Douchi koji.