


# Chapter 3

## Health Benefits Indonesian Fermented Food of *Tempeh Gembus* Upon National Readiness for Sustainable Development Goals Achievement


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### ABSTRACT

*Tempeh gembus is a traditional Indonesian prepared from solid tofu waste fermented by *Rhizopus oligosporus*. It contained some nutritional value and bioactives from fermentation, making tempeh gembus a functional food with variety of health benefits. Previous research had investigated functional properties of tempeh gembus, such as amidolytic, antimicrobial, and antioxidant, as well as proteolytic, fibrinolytic, fibrinogenolytic, and anti-inflammation, which were linked to a variety health benefits, including atherosclerosis, diabetes mellitus, hyperlipidaemia, obesity, metabolic syndrome, and osteopenia. Tempeh gembus is sometimes underestimated because it is prepared from tofu waste and is frequently consumed by low-income people due to its low cost. Tempeh gembus intake is also low due to a lack of knowledge about its health benefits. This article reviews the health benefits of tempeh gembus as one of Indonesia's local functional foods.*

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## INTRODUCTION

Producing *tempeh gembus* is one approach to achieving sustainable development goal number 2 of reducing hunger, achieving food security, and better nutrition because the main ingredients are formed from the pulp left over after making tofu. Indonesia has an estimated 84,000 tofu manufacturing units (Damanik et al., 2018) that produce roughly 1,024 million tonnes of solid waste and 20 million m<sup>3</sup>/year of wastewaters having soybean as their main ingredient (Kurniasari et al., 2017). Adding *Rhizopus oligosporus* to tofu waste resulted in *tempeh gembus*, which was fermented for many days. *Tempeh gembus* includes protein, glucose, fiber, calcium, iron, fosfor, essential fatty acids, and bioactive compounds (Afifah et al., 2019a), even though the base material is waste-tofu.

The *tempeh gembus* fermenting process may lead to nutritional content and bioactive compound alteration. A previous study showed the variety of nutrition composition in soybean, tofu waste, and *tempeh gembus*. The carbohydrate, fat, and protein content in *tempeh gembus* are more easily digestible because the tempeh mold creates digestive enzymes. That study also indicated that fermentation may help to improve the fatty acids profile (Damanik et al., 2018).

*Tempe gembus* provides a variety of health benefits for humans due to its content, which is rich in nutrients and bioactives. Because *tempeh gembus* contains fibrinolytic enzymes, previous studies investigated its cardiovascular effects. Another study looked at the benefits of *tempeh gembus* for atherosclerosis, finding that *tempeh gembus* administration had a favorable association with homocysteine and malondialdehyde, though the correlation was not statistically significant. Another study revealed that *tempeh gembus* contains three times the fiber level of regular *tempeh*, which may be helpful to individuals who deal with obesity or diabetes. Another study found that *tempeh gembus* was positively connected with hyperlipidemia due to its ability to reduce cholesterol when consumed.

Because there is still limited information on *tempeh gembus*, it is necessary to write an article that explores *tempeh gembus* so that it can be useful to the community. This review article aims to investigate *tempeh gembus* nutritional and bioactive content, in addition to its health benefits.

## Nutrition Content of *Tempeh Gembus*

*Tempeh gembus* is a soybean-based food produced from tofu waste. The nutritional value of *tempeh gembus* was investigated by Sulchan and Endang. Energy 65 kcal, total carbs 11.94 g, fiber 3.93 g, protein 3.41 g, fat 0.20 g, calcium 143 mg, iron 0.40 g, phosphorus 50 mg in 100 g *tempeh gembus*. Ruth, et al. investigated the nutritional composition of *tempeh gembus* as it changed from soybeans to tofu

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