Plant-Based Substitutes for Gelatin

by Ridar Hendri

Chapter 26
Plant-Based Substitutes for Gelatin

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Abstract Gelatin is one of the most widely used food ingredients. Its applications in food industries are very broad including enhancing the elasticity, consistency and stability of food products. Gelatin is also used as a stabilizer, particularly in dairy products and as a fat substitute that can be used to reduce the energy content of food without negative effects on the taste. Besides the food industry, gelatin is also useful in medicine, pharmaceutical and photographic industries. Gelatin is a valuable protein derived from animal byproducts obtained through partial hydrolysis of collagen originated from cartilages, bones, tendons and skins of animals. It is a translucent brittle solid substance, colourless or slightly yellow, nearly tasteless and odourless. Most commercial gelatin is currently sourced from beef bone, hide, pigskin and, more recently, pig bone. It was reported that 41% of the gelatin produced in the world is sourced from pig skin, 28.5% from bovine hides and 29.5% from bovine bones. This paper reviews the potential of plant-based products as halal substitutes for gelatin.

Keywords Gelatin · Halal · Plant-based · Substitutes

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26.1 Introduction

Gelatin is one of the most widely used food ingredients. Its applications in food industries are very broad including enhancing the elasticity, consistency and stability of food products (Berardini et al. 2005). Gelatin is also used as a stabilizer, particularly in dairy products and as a fat substitute that can be used to reduce the energy content of food without negative effects on the taste. Besides the food industry, gelatin is also useful in medicine, pharmaceutical and photographic industries. Among the issues surrounding gelatin is the halalness status, as majority of the gelatin available in the world's market is not halal. Gelatin replacers from plant can be taken as alternatives.

26.2 Gelatin and Its Origins

People nowadays consume too many calories in their daily diet. Therefore, the demand for low or fat-free products is continuously increasing causing a dilemma for modern food-designers. This is because fat is an important factor that influences the taste of most foods. In this situation, the sensory quality of gelatin is of great importance (Eyre and Caswell 1991). The melting point of gelatin resembles the body temperature of human being, thus the melting of gelatin causes a rich mouth feel that is far superior to other fat-substitutes. Therefore, by using gelatin as a fat substitute, it is possible to reduce the energy content of food without negative effects on the taste.

Gelatin is a valuable protein derived from animal byproducts obtained through partial hydrolysis of collagen originated from cartilages, bones, tendons and skins of animals. It is a translucent brittle solid substance, colourless or slightly yellow, nearly tasteless and odourless. Most commercial gelatin is currently sourced from beef bone, hide, pigskin and, more recently, pig bone. It was reported that 41% of the gelatin produced in the world is sourced from pig skin, 28.5% from bovine hides and 29.5% from bovine bones. In recent times, the concern and fear of BSE or "mad cow disease" has affected the gelatin market and has shifted the market towards porcine gelatin. Out of 500,000 metric tones annual world gelatin production, 90–95% of them are derived from non-Halal sources. At present, the production of fish gelatin as an alternative Halal gelatin is very minor (Gómez-Guillén et al. 2002).

Apart from fish gelatin, increasing demand for non-mammalian gelatin and the demand from vegetarian food groups has revived the interest in "veggie gelatin," a gelatin replacer from plants. Scientifically, there is no naturally occurring plant source of gelatin as plants have no collagens. However, research studies have been done for a long period to develop alternatives that possess most or all the unique functional properties of mammalian gelatin.

Fig. 26.1 Konnyaku

26.3 Plant-Based Gelatin Replacer

"Veggie gelatin" or plant-based gelatin replacers are normally developed from plant hyrocolloids. These include

- Agar: also called agar-agar, gelose, Chinese isinglass, Japanese isinglass, Bengal isinglass or Ceylon isinglass, it is powder, strips or flakes from a sea vegetable
- Carrageenan: polysaccharide extracted from red seaweed
- Pectin: polysaccharide substance present in cell walls of all plants
- Xanthan gum: gum produced by bacteria. The bacterial medium must be halal for the product to be halal
- Modified corn starch
- Cellulose gum.

Konjac is one of the newly developed veggie gelatins that receive good attention in food industries (Teramoto and Fuchigami 2000). In Japanese cuisine, konjac (or konnyaku, in Japanese) appears in various dishes, from traditional dishes like sashimi to noodle and jelly. Addition of konjac in the food sometimes is more valued for its texture than flavour (Fig. 26.1). Japanese konnyaku jelly is made by mixing konnyaku flour with water and some natural flavouring agents. Konjac has almost no calories but is very high in fibre. Thus, it is often used as a diet food (Gudmundsson and Hafsteinsson 1997; Thakur et al. 1997).

Malaysia has the potential to produce "veggie gelatin". Yam (Dioscorea alata) is reported to have similar properties to konjac. The International Islamic University Malaysia (IIUM) has started to carryout an extensive research to explore the potential of Malaysian plants, like yam, as gelatin replacers. However, the most challenging task in obtaining gelatin alternatives from plant sources is to obtain the thermo-reversible property of mammalian gelatin which is "melt-in-mouth" quality.

26.4 Conclusion

Development of gelatin replacers from plant should be encouraged in order to resolve problems surrounding the halalness status of gelatin. Malaysia has potentials to produce plant-based gelatin replacers.

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