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Note

Improvement of Storage Stability of Meatballs Using Propolis

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Abstract We investigated the food storage stability of propolis extracts using homemade meatballs. Propolis extracts were prepared by using the ethanol extraction method. After making the meatballs, propolis was mixed into the meatball materials and egg water with a final concentration of 1% v/v. Microbial cultivation results showed that the cultivation of *Staphylococcus aureus*, which is one of the food poisoning bacteria, was reduced by more than 90% and the period of storage was 1.5 times longer. Also, it was observed to be effective when propolis was added to meatballs, it was even more effective when propolis was mixed with egg water. Thus, propolis extracts may be a useful ingredient for food storage stability due to its anti-microbacterial function.

Keywords Propolis, Meatball, Anti-bacteria, Storage stability

INTRODUCTION

Food storage is the most important thing in human health for the present. Microorganism such as *Escherichia coli*, *Salmonella enteritidis* and *Staphylococcus aureus* etc. causes spoilage of food. As the safety of food become more important in modern society, many social problems have been caused by bacterial infections at the distribution stage (Yang *et al*., 2017; Vasilaki *et al*., 2019). Removing the microorganism from food material or set of utensils is the best method for food decaying. However, completely prevention of food spoilage is practically difficult. Because of this, chemical spoilage preservatives have been developed recently. However, chemical products have safety problems. Therefore, development of anti-corruption agents by using natural materials is deemed necessary.

Propolis is a resinous material produced by honey bee through mixing saliva and beeswax with a variety of exudate from trees and plants. Honeybees use propolis to protect their hive (Burdock, 1998). Propolis has been used since ancient times and has been proven to have an excellent antioxidant effect and antibacterial (Cavalaro *et al*., 2019; Duca *et al*., 2019). Its effects are widely known specially its antibacterial properties (El-Tayeb *et al*., 2019; Nazeri *et al*., 2019; Przybylek and Karpinski, 2019). The fact that it can effectively inhibit harmful bacteria can be associated with prevention food poisoning. There has been many attempts to approach this in terms of food preservation (Thamnopoulos *et al*., 2018; Pobiega *et al*., 2019).

In this study, the application of propolis with excellent antibacterial activity to home-made meats such as meatballs and patties can effectively suppress the generation and propagation of noxious bacteria. The meatballs and patties were made with propolis added directly to the ingredients. The prepared meatballs and patties were placed at room temperature to inhibit bacterial proliferation when stored, to find out if the addition of propolis can increase the safety of food. In addition, honeypolis, honey mixed with propolis was also added for comparison with propolis. As a result,

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propolis may be suggested as the natural ingredients for prevention of food spoilage.

MATERIALS AND METHODS

Propolis extract

To extract 1 kg of raw material propolis, 3.5 L of an 80% aqueous solution of ethanol was used. The extracted solution was filtered by using Whatman No. 2 Filter paper. The impurities were removed, concentrated to 18%, and the total flavonoid content was 1%.

Making honeypolis

Honeypolis was prepared by mixing 100 mL of propolis extract and 1 kg of acacia honey

Making meatballs

In making the meatballs, the grounded pork meat (990 g), tofu (460 g), finely chopped onion (280 g), salt (10 g), pepper (1 g), parsley powder (1 g), eggs (2 pcs), and sesame oil (2 ts), were mixed, and divided into three equal portions, the control group, with 15 g of honeypolis, with 6.6 mL of the extract was treated. We made meatballs weighing around 20 g each. The meatballs were dipped in flour with egg water, and fried using a deep fryer with enough oil to cover the meatballs. The egg water with propolis was obtained by adding 1.1 mL of propolis extract to four pieces of eggs. As shown in Fig. 1, meatballs were made by following the above mentioned recipe.

Making beef patty

In making the beef patty, beef (960 g), salt (10 g), pepper (1 g), liquor spices (6 ts), chopped onion (180 g), egg (1 pc), and chopped garlic (50 g) were mixed. Then it was divided into three equal portions, the control group, the patty with 10 g of honeypolis, and, the patty with 5 mL of the propolis extract solution was treated.

Staphylococcus aureus and general bacteriological tests

A 3M film was used to detect the *Staphylococcus aureus* and aerobic colonies growth test. From each meatball sample, 1 g was collected, and was thoroughly pulverized with 10 mL sterilized. Then, 1 mL was inoculated uniformly on the film, and cultured for 24 hours at 37°C.

RESULTS AND DISCUSSION

Propolis is known as a natural antibiotic. Propolis has been used since ancient times and has been proven to have an excellent antioxidant and antibacterial effects (Cavalaro *et al*., 2019; Duca *et al*., 2019).

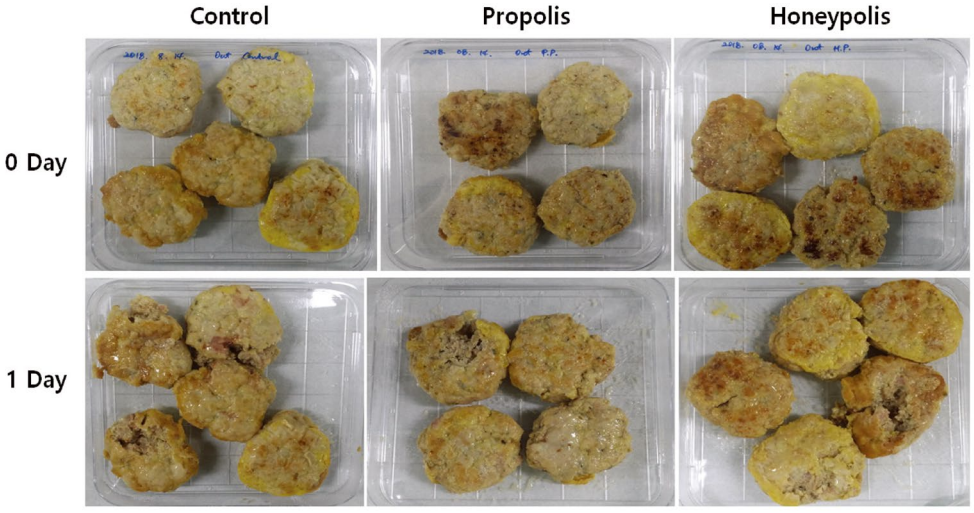

Fig. 1. Making the meatballs. Control was not treated propolis and honeypolis. Propolis and honeypolis was added to egg water.

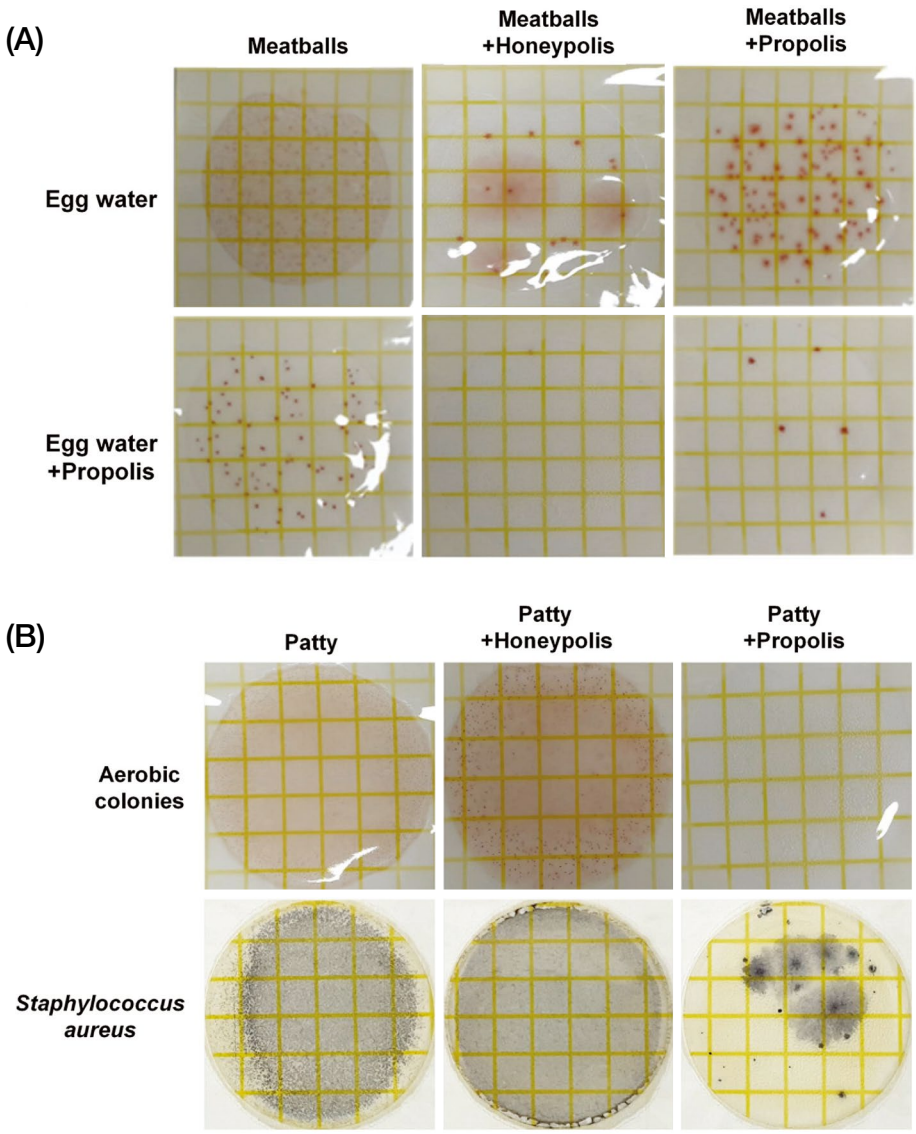

Fig. 2. Inhibitory effect of propolis treatment on the bacterial growth. (A) Propolis and honeypolis treatment inhibit the bacterial growth on meatballs. (B) Propolis and honeypolis was inhibit the growth of total bacteria and *staphylococcus aureus* as spoilage microorganism on beef patty.

The result in making meatballs with the normal control was prominent bacterial growth, but honeypolis and propolis were part of the combined effect that inhibited the growth of bacteria. Especially, when propolis was added to the eggs in making meatballs, it showed inhibition of bacterial penetration and growth by protecting the outer surface of the meatballs (Fig. 2A). For the patty, there was no noticeable inhibition of bacterial growth in the case of honeypolis, but the addition of propolis also inhibited the growth of general bacteria, and inhibited the proliferation of *Staphylococcus* aureus which is directly related to food poisoning (Fig. 2B).

This demonstrates the characteristics of the antibacterial properties of propolis. Propolis was added to the food at home to inhibit bacterial growth and proliferation, thus exhibiting safer and excellent preservative effect. In recent years, when food safety were emphasized, the propolis had an excellent effect that can ensure manufacturing and distribution of safe food through applying the antibacterial property of propolis to food.

ACKNOWLEDGEMENTS

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