

The microbial behavior of the Cambodian homemade-style pickles

AG-13-09

SHUKI MURAMATSU*¹, SOKLY SORM², MASATAKA UCHINO³, MOTOE SEKIDO⁴, YOSHIKI MURAMATSU⁵,
DAIKI OKA⁶, YURI TANIKOKA⁷, TAKAHIKO NAKAMURA⁵, TORU NAKAJIMA⁵, MARI ARIMITSU⁸, MACHITO MIHARA^{5,8}

1. Department of Health Science, Showa Women's University, Tokyo, Japan
2. Graduate School of Agriculture, Tokyo University of Agriculture, Tokyo, Japan
3. Faculty of Life Sciences, TUA, Japan
4. Department of Food and Nutrition, Yamanashi Gakuin Junior College, Tokyo, Japan
Email: s-muramatsu@swu.ac.jp

5. Faculty of Regional Environment Science, TUA, Tokyo, Japan
6. Faculty of Applied Bioscience, TUA, Tokyo, Japan
7. Faculty of International Agriculture and Food Studies, TUA, Tokyo, Japan
8. Institute of Environmental Rehabilitation and Conservation, Tokyo, Japan



ABSTRACT

Pickled products made using vegetables are popular in Cambodia. Many types of homemade pickles are sold at wet markets. Our previous study showed that pickles are seriously contaminated by microbes, including food poisoning bacteria. The objectives of this study were to investigate the levels of contaminating microbes and their growth patterns in pickles prepared according to traditional Cambodian recipes and to suggest an improved method to ensure the microbial safety of homemade pickles. Three kinds of pickles were prepared following the methods used by local people. The Brix values, salt concentrations, and pH of the samples were measured. Next, we conducted microbiological examination of the samples. This study revealed that microbial growth occurred in all tested pickles, resulting in a high risk of food spoilage and food poisoning. We suggest that an additional step of pasteurization would help provide microbiologically safe products. Moreover, use of food additives that do not alter the taste of pickles may allow maintenance of low levels of microorganisms.

INTRODUCTION

Pickled products made using vegetables are popular and many types of homemade pickles are sold at wet markets in Cambodia. Our previous study showed that pickles are seriously contaminated by microbes, including food poisoning bacteria. Microbial behavior during the preparation of pickled products is plausibly associated with food contamination. Therefore, in this study, we focused on microbial quality of homemade pickles and highlight existing issues in cooking methods and types of ingredients and seasoning used for their preparation.

OBJECTIVES

The objectives were 1) to determine the microbial quality and nutritional properties of homemade-style pickles, and 2) to suggest an improved method to obtain safe homemade products.

METHODOLOGY

Pickle production process

Pickles were prepared according to recipes used by local Cambodians. Samples were kept at 30 ° C for 4 days until the products were ready. 5 samples for each pickle were prepared in order to observe changes in their characteristics over time. A mixed sample was kept for 30 minutes and used as the day 0. Another was for 20–24 hours and considered the sample at day 1, and samples at days 2–4 were prepared in a similar manner.

Table 1 Ingredients and seasonings

Ingredients & Seasoning	Sample A	Sample B	Sample C
	Cucumber with fish sauce	Cucumber w/o fish sauce	Bok choy
Cucumber (g)	500	500	-
Bok choy (g)	-	-	500
Steamed rice (g)	-	-	18.0
Sugar (g)	80.0	-	6.0
Salt (g)	70.0	17.5	16.0
Soy sauce (ml)	48.0	-	-
Fish sauce (ml)	48.0	-	-
Hot water (ml)	300	-	-
Water (mL)	-	400	400
Garlic (g)	15	18.75	-
Small onion (g)	5	-	-
Chili (piece)	1	1	-

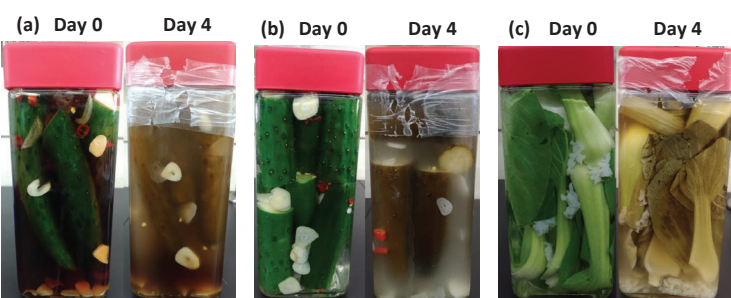


Fig. 1 Appearance of pickles at days 0 and day 4: (a) sample A, cucumber with fish sauce, (b) sample B, cucumber without fish sauce, and (c) sample C, bok choy

RESULTS & DISCUSSION

The Brix values of all pickles did not change much from day 0 to day 4 (not shown). During the 4-day storage period, the salt conc in samples B and C decreased slightly, whereas that in sample A remained constant. All samples first displayed pH values of approximately 6, but these decreased over time. The Brix and salt conc are presumably not sufficient to inhibit the growth of most bacteria and yeasts; therefore, molds grow regularly in pickles.

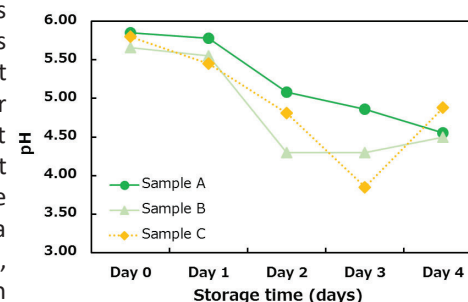
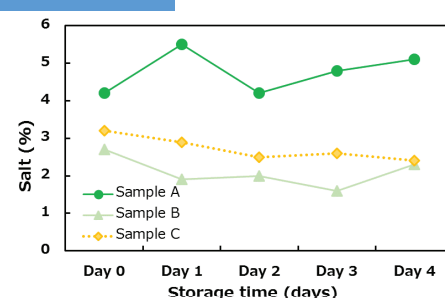
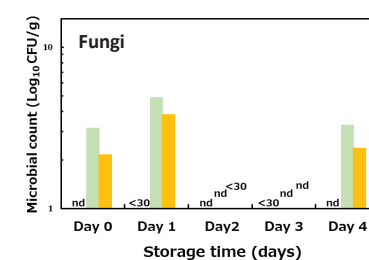
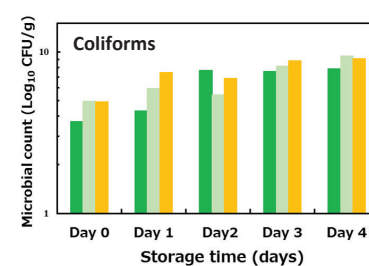
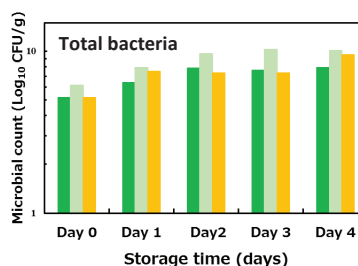


Fig. 2 Changes in salt and pH of the pickles



We tested the presence of total viable bacteria, coliforms, and fungi (Fig. 3). The results of this study suggest that microbial growth occurred in all three kinds of pickles, resulting in a high risk of food spoilage and food poisoning. Therefore, the current production process needs to be modified to improve microbial quality.

Fig. 3 Changes in the amount of microbes in the pickles

CONCLUSION

This study revealed that microbial growth occurs in all pickles, posing high risk to food spoilage and food poisoning. We suggest that pasteurization would help obtain microbiologically safe products. Moreover, use of food additives may allow maintenance of low levels of microorganisms.