

MASTER THESIS

STUDIES ON EXPERIMENTAL INDONESIAN STYLE DRIED BEEF

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THE GRADUATE SCHOOL OF AGRICULTURE  
HOKKAIDO UNIVERSITY  
SAPPORO, JAPAN  
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it at the nearest market that opens weekly (pagaran) or monthly (pagaran gedé), or they slaughter their own animals. Under these conditions, there are surplus supplies and meat which can not be consumed at once is preserved as dendeng. There are many naturalized Chinese citizens who have some secret culinary arts that have been derived from the land of the ancestors, who have probably contributed to the improvement of the dendeng. Today, they produce the majority of the commercial dendeng.

The preservation of meat by sun drying has been practiced for many thousands of years. Lowering the moisture content (dehydration) to prevent foods from spoilage is a method well known in tropical areas. Such dried meat products are known as biltong in South Africa, charqui in South America, carne seca in Brazil, pemmican in North America.

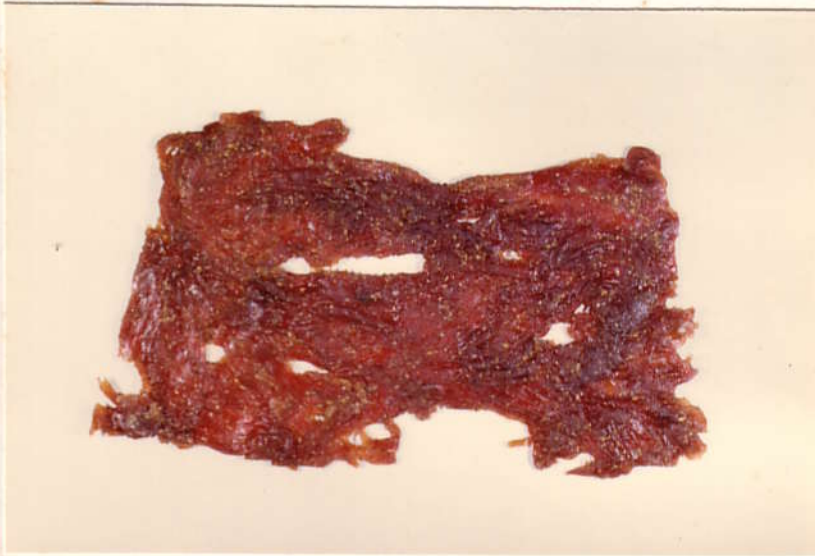
## INTRODUCTION

"Dendeng" is a popular traditional Indonesian meat product that has been made for centuries, originating in Java and Bali island. It may be prepared from beef, chicken, pork, or goat meat, but the dried beef, "dendeng sapi" (Fig. 1), is more commonly found in the markets of Indonesia. The history of dendeng preparation is unknown. The rural people in those islands where there are no slaughter houses have difficulty to get fresh meat. They can purchase it at the nearest market that opens weekly (pasaran) or monthly (pasaran gede), or they slaughter their own animals. Under these conditions, there are surplus supplies and meat which can not be consumed at once is preserved as dendeng. There are many naturalized Chinese citizens who have some secret culinary arts that have been derived from the land of the ancestors, who have probably contributed to the improvement of the dendeng. Today, they produce the majority of the commercial dendeng.

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A



B

Figure 1. Photographs of "Dendeng Sapi" (Dried Beef) in Package (A). The many small white spots on the surface are various spices.

tassajo in Uruguay, and dendeng (Sinell and Heutschel<sup>1)</sup> noted dendang as coming from the Malay archipelago) in Indonesia.<sup>1-4)</sup> commonly employed as a curing agent for meat

The preparation of the dendeng has not been standardized, but it involves slicing the meat to about 2 mm in thickness followed by soaking for 1 to 6 hrs in a soaking solution containing palm sugar, cooking salt, coriander (Coriandrum sativum), galangale root (Alpina officinarum), caraway seeds (Carum carvi), garlic (Allium sativum), tamarind (Tamarindus indica),<sup>2)</sup> onion,<sup>5)</sup> nitrate and nitrite,<sup>6,7)</sup> cane sugar, and/or dried cassava (Manihot utilisima).<sup>7)</sup> The amount of ingredients used is variable but the sugar usage is about 20-35%.<sup>2,7)</sup> The treated meat slices are then dried under sunlight and packaged for sale.

Since almost all food products are sold in an unrefrigerated state in Indonesia, the dendeng which is storable under unrefrigerated conditions for long time is a suitable, distributable and nutritious food. Unrefrigerated meat products recently gained interest in some parts of European countries since they save energy and thus costs during distribution and storage. Some successful discount shops in West Germany are selling unrefrigerated foods only.<sup>8)</sup> This reflects the fact that unrefrigerated meat products, especially traditional products, are very versatile. It would be beneficial for improving the quality, hygiene, and

availability of the Indonesian style dried meat product to examine the process in scientific and technological terms.

Nitrite is commonly employed as a curing agent for meat and fish products. The sodium and potassium salts of nitrite are used to improve the color<sup>9-13)</sup> and flavor of products.<sup>11,14-16)</sup> It is also known that nitrite can inhibit the growth of Clostridium botulinum in certain cured meat products.<sup>11,17-19)</sup> However, nitrite has received negative publicity over the last few years, because it can form nitrosamines which are known as a potent carcinogen<sup>20,21)</sup> and because it has toxicity in itself.<sup>22)</sup> The permissible level of nitrite in meat products varies among countries: Japan; 70 ppm,<sup>23)</sup> Czechoslovakia; 100 ppm,<sup>24)</sup> and USA; 200 ppm.<sup>25)</sup> Maximum addition of 200 ppm  $\text{NaNO}_2$  or  $\text{KNO}_2$  to meat and meat products is the legal standard in Indonesia.<sup>26)</sup>

In this work, I studied a characteristic function of nitrite in experimental dried beef. In addition, I studied the changes in moisture content, water activity, hardness, and changes of myofibrillar proteins in the dried beef. Total bacteria, thermoduric bacteria, coliform bacteria and Staphylococcus aureus in the dendeng were also estimated.

Samples dried at 40°C for 12 hrs were kept in a container at room temperature.

Sample Preparation for Nitrite Analysis. The sliced