REVIEW STUDY OF MICROBIOLOGY BIODIVERSITY FROM LOCAL FERMENTED FOOD

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ABSTRACT

Fermented foods are generally produced using plant or animal ingredients in combination with microorganisms which are either sourced from the environment, or carefully kept in cultures maintained by humans. In Asia, we easily find the local fermented food products. This study was to previously preserve the fermented food products because of the conventional technology. Each country has a traditional itself to produce fermented food. There are many microbiological studies deal with identification of organisms isolated from various fermented foods. The numerous fermented food products in Asia can be categorized into three groups: (1) fermented soybean products, (2) fermented fish products and (3) fermented fruit and vegetable products. The objective of this study is to intoduce microorganism of biodiversity from local fermented food. In addition we can get a knowledge from the local fermented food product.

Keywords: *local fermented food, biodiversity, microorganisms, preservation, knowledge*

INTRODUCTION

Fermented foods are generally produced using plant or animal ingredients in combination with microorganisms which are either sourced from the environtment, or carefully kept in cultures maintained by humans. Just as living organisms cover the surface of the earth, fermentation microbes cover the surface of the organisms. Microorganisms components in foodstuffs in the fermentation process can be converted into the desired product beacuse they play a role in the fermentation process among other yeast, fungi and bacteria (Volk & wheeler, 1984).

This study was to previously preserve the fermented food products but now it becomes a product that has a high economic value and functionality. Lactic acid bacteria (LAB) are examples of beneficial microorganisms and has an important role in the food industry (Rahayu & Margino, 1997). Moreover, LAB produces organic acids, especially lactic acid, aroma substances, ethanol, and bacteriocin; an antimicrobial agent produced by some members of LAB. These metabolic products are useful to enhance product

quality and safety (Kandler 1983; Leroy and Vuyst 2004). It can be found at traditional fermented food product and becomes microorganism which used as comercial product.

The numerous fermented food products in Asia can be categorized into three groups: (1) fermented soybean products, (2) fermented fish products and (3) fermented fruit and vegetable products. The advantages of acidic food fermentation are: (1) renders foods resistant to microbial spoilage and the development of food toxins, (2) makes foods less likely to transfer pathogenic microorganisms, (3) generally preserves foods between the time of harvest and consumption, (4) modifies the flavor of the original ingredients and often improves nutritional value (Steinkraus, 1988). The objective of this study is to intoduce biodiversity from local fermented foods. In addition we can get a knowledge from the local fermented food product.

SOYBEAN PRODUCTS

Tempeh (Indonesia)

Tempeh is a fermented food product made from Indonesia that have been soaked and cooked to soften them (Astuti *et al.*, 2000). Tempeh is a widely consumed Indonesian traditional fermented food, which is principally made with soybeans, but can also be made from a variety of legumes and seeds. Historical evidence shows that soybean tempeh is a fermented product originally made by Central Javanese people and appeared in their food pattern around the 1700s.

There are four steps in the tempeh manufacturing process, soaking, boiling, inoculating with microbia and incubating at room temperature. Tempeh in Indonesia is fermented with *Rhizopus* sp. mould, especially *Rhizopus oligosporus*, *R. oryzae, R. arhizus, R. stolonifer* and *R. microspores.* Traditional inoculum is prepared in Hibiscus or teak leaf and inoculum powder is prepared from cooked rice. Tempeh producers in Indonesia do not use the pure culture of *R. oligosporus*, but they use a mixed culture of *Rhizopus* sp. There is no standard process for tempe making, which is one of the reasons why there is a lot of variation in tempe making from one region and one producer to another (Astuti *et al.*, 2000).

Miso (Japan)

Miso is the name for the product used in Japan. Miso-like products, however, are also made in other countries throughout the Orient and their names mean literally bean paste because they are pastes and are made from soybeans. Miso is generally used as a flavoring agent with various foods including fish, meats, and vegetables. In Japan, miso is used primarily to make a soup with vegetables which takes tho place of our hot cereal for breakfast (Hesseltine, 1986).

Miso manufacture is essentially two successive fermentations. The first involves the preparation of koji under aerobic conditions from strains of *A. Oryzae* and *A. sojae.* The molded rice koji serves as source of enzymes and nutrients for the second fermentation. The second is an anaerobic fermentation involving yeasts and bacteria.

Natto (Japan)

In the natural fermentation of soybeans, molds usually dominate, but natto is one of the few products in which bacteria predominate during fermentation. *Bacillus natto,* identified as *Bacillus subtilis,* is claimed to be the organism responsible for natto fermentation. Consequently, natto possesses the characteristic odor and persistent musty flavor of this organism, and is also covered with viscous, sticky polymers that this organism produces.

Many papers have been published concerning the microorganisms in natto fermentation; however, it is now well established that bacilli are the most important ones. Based on Muramatsu's account (1912), Sawamura was first to give the name of *B. natto* to 1 of the 2 bacilli that he isolated from natto. He identified the other one as a variety of *B. Mes. Vulgatus*. He also believed that both bacilli were required to make good natto. *B. natto* produced natto with good taste and aroma and *B. Mes. Vulgatus* provided the needed stickiness. But Muto (also cited by Muramatsu 1912) found that only one bacterium, which belonged to the B. subtilis group, was necessary for the preparation of natto.

FRUIT AND VEGETABLE PRODUCT

Mandai jackfruit

Mandai jackfruit is a traditional food made from jackfruit dami which fermented using the high salinity is around 10-20% (w / w) for 1-2 weeks (Rahayu, 2003). Jackfruit dami is part of the jackfruit that can be processed and used as traditional food, even when processed can be used as a substrate for the identification of lactic acid bacteria. According Rahayu (2003), she said that type of the lactic acid bacteria *Lactobacillus plantarum* and *Streptococcus thermophillus pentosus* influences in the fermentation process mandai jackfruit. The characteristic of completed fermentation of dami jackfruit is tender and flavorful texture dami alcohol that is not too sting.

Kimchi (Korea)

Kimchi fermentation is the Korean method of preserving the fresh and crispy texture of vegetables during the winter when fresh vegetable are not available. The name of each particular kimchi is based on the major ingredients korean cabbage radish, various vegetable, and salt are also added. Kimchi has a sour, sweet, and carbonated taste and is usually served cold (Lee, 2001). It is side dish that is commonly served with cooked rice and soup.

Acid fermented vegetables are important sources of vitamins and minerals. *L. Mesenteroides* has been found to be important in the initiation of fermentation of many vegetables such as cabbabges, cucumber, beets, etc (Lee *et al.*, 1994). The microorganisms of kimchi are *Lactobacillus mesenteroides, L. brevis, L. plantarum*.

In vegetables, *L. mesenteroides* grows rapidly and produces carbon dioxide and acids that quickly lower the pH, thereby inhibiting the development of undesirable microorganisms and the activity of their enzymes as well as preventing unfavorable softening of the vegetables. The carbon dioxide produced replaces air and provides anaerobic conditions that favor stabilization of ascorbic acid and the natural colors of the vegetables. *L. mesenteroides* converts glucose to approximately 45% levorotatory D-lactic acid, 25% carbon dioxide, and 25% acetic acid and ethyl alcohol. The combination of acids and alcohol are conducive to the formation of esters, which impart desirable flavors (Lee, 1994). Overall, the initial growth of *L. Mesenteroides* leads to modification of the environtment that favors the growth of othe lactic acid bacteria

FISH PRODUCT

Peda (Indonesia)

Peda usually made drom "kembung" fish, both male or female. The good peda has fresh red color, fat content for about 7-14% that brings delicious taste, and special taste because of fermentation (Astawan, 1997). Peda is fermented with high salt content spontaneously. That means the fermentation runs naturally by selected microbia because of salt added and bekept for a couple days. Salt added in the fermentation can increase the taste of fish, form the texture, and control the microorganisms, stimulate growth of microorganisms needed and inhibit the growth of rotting and pathogen microorganisms. Fermentation in peda can change the characteristic and form of fish, and also can prolong the shelf life of the fish (Ilminigtyas *et al.,* 2000)

The microorganism used in the fermentation come from the fish itself or from the salt added. Advanced identification is needed to know the appropriate bacteria. from many researches, can be found that the microbia can be from genus *Acinetobacter*, *Flavobacterium*,*Cytophaga*, *Halobacterium, Halococcus, Micrococcus*, *Staphylococcus* and *Corynebacterium*.

Plaa-som (Thailand)

Plaa-som is described as a group of traditional Thai fermented fish products obtained from the fermentation of either whole fish or fish fillets with salt, steamed rice or sticky rice, and garlic until its taste becomes sour (TISI, 2005). The fermentation spontaneously occurs due to the presence of natural adventitious microorganisms, mainly Lactic Acid

bacteria (LAB), that are found in the raw material on the processing untensils and in the local atmosphere as natural starters to initiate the fermentation process (Khieokhschee *et al.,* 1997, Valyasevi and Rolle 2002; Visessanguan *et al.,* 2004). The LAB were identified to 4 species as *Lactobacillus plantarun, L. acidophilus, L. Fermentum* and *L. Pentosus.*

FUTURE PRODUCT

The potential benefits from microbial diversity in fermented foods harnessed for many industrial application. One of the important developments is food enzymes production. The majority of the enzymes used in food processing such as amylases, proteinases, cellulases, pectinases, and others are produced by microorganisms that are important iin processing fermented foods like wine, dairy products, fruit and vegetable pickles, fishery products, etc.

Application of these enzymes are numerous, protease for examples, control viscosity, emulsifivation, develope flavor and specific application for tenderize meat and chili proofing in the brewing industry. The other enzymes like lactase is used to hydrolize lactose in ice cream to prevent crystallization and amylases important in manufacturing glucose syrup in corn (Nga *et al.,* 1999)

Some of the beneficial effect of lactic acid bacteria consumption include: (i) improving intestinal tract health; (ii) enhancing the immune system, synthesizing and enhancing the bioavailability of nutrients; (iii) reducing symptoms of lactose intolerance, decreasing the prevalence of allergy in susceptible individuals; and (iv) reducing risk of certain cancers (Parvez *et al.,* 2006).

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