

Thesis Title Save Time Processing For Bioproduction
of Soy Sauce

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Date of Graduation 19 September B.E. 2537 (1994)

ABSTRACT

The whole, crushed and powdered soybeans were studied for their most suitability to be used as the raw material for soy sauce production. Results revealed that there was no difference in these forms of soybeans to support growth and utilization by *Aspergillus oryzae*, a microorganism usually applied for making fermented soy sauce. The viscosity of these forms of soybeans reduced in the same manner within 5 days. When *A. oryzae* mixed with *Zygosaccharomyces rouxii* or *Pediococcus halophilus* separately, as well as with a new discovered strain encoded AZ-MP-001 were studied for their most suitability as the cultures for soy sauce production. It was found that only the mixed cultures between *A. oryzae* and AZ-MP-001 could produce soy sauce odor within 5 days. Furthermore, when different carbohydrate sources, namely, cassava flour, corn flour, glutinous rice

flour, rice flour, wheat flour (in plain and roasted forms) and molass were screened for most suitability to be used as raw material(s) in soy sauce production, roasted wheat flour and molass were found to be promising. The products from these two sources gave rise different soy sauce odor which could be detected within 5 days. When the above products were examined for pH, total protein, and aroma patterns in comparison to the products from the same raw materials which were operated with *A. oryzae* alone, the former two properties of these products were not significantly different but the volatile substances as detected by gas chromatography (GC) were different especially from the products produced from wheat flour which showed remarkable different peaks, while the one produced from molass showed different concentration in aroma peaks.

Finally, the products produced from wheat flour and from molass at different fermentation periods were analysed. Data obtained revealed that pH dropped while color intensity and total protein increased and specific gravity increased after longer fermentation. In terms of odor, it appeared in both types of product within 5 days. The strongest odor was shown on day 21 and day 14 for the products from wheat flour and molass, respectively. Unexpectedly, the odor of the former faded on day 28 (the last day of fermentation) while the latter still gave good soy sauce odor until the last day of fermentation. In comparing to the traditional fermented products done within the same length of fermentation, no significant pH change and odor

was observed, but the color intensity varied with time. When the aroma patterns were analysed by GC, it was observed that peaks at about 3.5 and 3.4 min from the products produced from wheat flour and molass, respectively, were significantly changed in height and area. In comparison to the conventional Chinese and Japanese soy sauces selected from the market, the volatile substances which showed the remarkable peaks were also detected at 3.5 and 3.4 min, respectively.

The products from molass using *A. oryzae* and AZ-MP-001 as the producers, and the one added with 20% sodium chloride were fed to rats, no death or any physical or behavioral change of the experimented rats was observed except rats given with the product with salt drank more water than the control group.