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## **EDITORIAL**

It is my proud privilege to welcome you all to the Researchfora International Conference at Hamburg, Germany in association with The IIER. I am happy to see the papers from all part of the world and some of the best paper published in this proceedings. This proceeding brings out the various Research papers from diverse areas of Science, Engineering, Technology and Management. This platform is intended to provide a platform for researchers, educators and professionals to present their discoveries and innovative practice and to explore future trends and applications in the field Science and Engineering. However, this conference will also provide a forum for dissemination of knowledge on both theoretical and applied research on the above said area with an ultimate aim to bridge the gap between these coherent disciplines of knowledge. Thus the forum accelerates the trend of development of technology for next generation. Our goal is to make the Conference proceedings useful and interesting to audiences involved in research in these areas, as well as to those involved in design, implementation and operation, to achieve the goal.

I once again give thanks to the Institute of Research and Journals, Researchfora, TheIIER for organizing this event in Hamburg, Germany. I am sure the contributions by the authors shall add value to the research community. I also thank all the International Advisory members and Reviewers for making this event a Successful one.

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# ASIAN GREEN MUSSELS (PERNA VIRIDIS) SAUCE (COOKING SAUCE) FROM LOW GRADE ASIAN GREEN MUSSELS FOR COMMUNITY ENTERPRISE

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**Abstract** - Asian Green Mussels Sauce produced from low grade Asian Green Mussels for community enterprises by the objective to study the Mussels Sauce producing and sensory acceptance of consumer. The preliminary survey found that most of fine Asian Green Mussels in the market were processed as dried mussels, mussels pickled. However, low grade Asian Green Mussels have not utilized except for animal feed thus the low-grade mussels were developed to be sauces for cooking in order to replace the oyster sauce. The research results that Asian Green Mussels Sauce from mussels juice extract (1:2 w/v) heated at 80° C for 3 hours then put into the sensory test get the acceptance score at 7.45 but need to improve smell and salty then can be developed formula by reducing salt and add scent (herbs). The consumer acceptance test found 94% of the consumers accepted the Asian Mussel Sauce. Next we study the shelf-life of Asian Mussel Sauce product without preservatives at 4°-6° C and room temperature. The test found all storage conditions can be stored for more than 12 weeks and Asian Mussel Sauce can be developed as a new interested product of the community enterprise group.

**Index Terms** - Asian Green Mussels, Sauce, cooking sauce, Community Enterprise.

## I. INTRODUCTION

The Asian Green Mussel, *Perna viridis* (Linnaeus, 1758) is an economically important mussel, belonging to the family Mytilidae (Mollusca; Bivalvia; Amelibranchia; Mytiloidea; Mytilidae). It is distributed throughout the coastal waters of the Indo-Pacific region (Rajagopal et al., 2006). [1][2]

The Asian Green Mussels are another economic value of marine animal. This kind of shellfish can earn a lot of money into the country each year. Be the good taste seafood plus high nutrition thus it is widely consume by fresh cooking or to preserve in various forms such as salted, dried, fermented, etc. [3].

Asian Green Mussels marketing consumers are moderate demand. Sometime, mussel traders cannot supply enough to meet the demand. The reason of consumer demand throughout may be from market price is not likely high. The average is around 32-33 baht per kilogram (mixed size). In 2006 - 2008 (Department of Internal Trade, Central Agricultural Products, 2009)[4] can be cooked variety of food. Mussels price depend on sizes [4]. According to market survey, most low grade Asian Green Mussels are processed into mussels pickled, dried mussels or to be mixture of animal feed [5]



Figure 1. Typical characteristics of Asian Green Mussels.

## II. OBJECTIVE

- To study Asian green mussel sauce producing.
- To study sensory acceptance of consumer.

## III. MATERIALS AND METHODS

### A. Preparation of Asian Green Mussels

In this research the producing Asian Green Mussel Sauce from low grade mussels from Chanthaburi province, packing in polyethylene bags and store in a refrigerator ( $4 \pm 2$  ° C) during the using.

### B. Preparation of Asian Green Mussels Sauce

Study Asian Green Mussel Sauce formulas which adapted from cockle sauce [6]. Table 1 Show preparation of mussel juice extracted in 1:2 (w/v) was heated at 80 ° C for 3 hours [5] afterward apply the formulas and methods to produce then make the sensory quality evaluated by 9 Point Hedonic Scale method by appearance evaluation such as color, flavor, taste, texture and overall liking in order to select the most acceptable formulas. Basic formula will be applied to the next testing.

| Ingredients                 | Content (g) |
|-----------------------------|-------------|
| Asian Green Mussels extract | 460         |
| Sweet Soy Sauce             | 3.8         |
| Seasoning Sauce             | 153.5       |
| Glucose                     | 76.8        |
| Sugar                       | 53.7        |
| Tapioca Starch              | 30.7        |
| Salt                        | 69.1        |
| Monosodium glutamate        | 20.7        |
| Citric acid                 | 0.12        |
| Water                       | 130.5       |

Table 1 Ingredients of Asian Green Mussels Sauce control

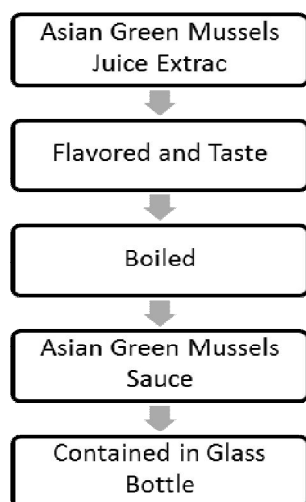


Figure 2. The method for Asian Green Mussels Sauce Source [7]

### C. Sensory Quality Testing

Sensory quality testing the appearance, color, smell, taste and overall liking by 30 non trained testers. Preparing a cup of 50 ml. of Asian Green Mussel Sauce then dip 10 ml. of sample top on soft boiled vegetables then hot served by using testing model 9-point hedonic scale. Planning test Randomized Complete Block Design : RCD.

### D. Studying the physical characteristics

Quality control of Asian Green Mussel Sauce including viscosity by using rheometer (Brookfield Digital Rheometer; (Model DV-III Model; USA) revolver number 4 speed 10 rounds/minute for 3 minutes. Analyze samples at room temperature and color measuring. (Hunter Lab Model Color Flex)

### E. Consumer acceptance testing

The consumer acceptance testing by Central Location Test (CLT) in order to get the consumer acceptance Asian Green Mussels Sauce product. The target group age between 20-60 years old. The consumer's score was rated by 9-point hedonic scale. The questionnaires were distributed to 100 general consumers.

### F. Statistical Analysis

Analysis of variance (ANOVA) by experimental design model CRD for sensory evaluation planning

test model RCBD. Statistical analysis was performed at 95% confidence compare with the difference in average value using Duncan's new multiple range test.

## IV. RESULTS AND DISCUSSION

### A. The study results of Asian Green Mussels extract

The Asian Green Mussel Sauce production by using extracted mussel juice extract at 1: 2 (w/v) by heated at 80° C, the extracted mussel juice was slightly turbid.



Figure 3. Asian Green Mussels extract 1:2 (w/v)

### B. Preparation of Asian Green Mussels Sauce

The basic formulation study of Asian Green Mussel Sauce producing by modified cockle sauce [6]. It was then tested for sensory evaluation with testers. In terms of appearance, color, smell, taste, texture and overall liking (Table 2). It was found that the Asian Green Mussel Sauce produced favorite score of appearance, color, texture and overall liking in level Like moderately. Beside Flavor and Taste were rated Like slightly because the sauce has a fishy smell of mussel and high salt content make the tester offer less score. The mussel sauce must be improved the taste next.

| Characteristic | Asian Green Mussels Sauce (M±SD) |
|----------------|----------------------------------|
| Appearance     | 7.85 ± 1.30                      |
| Color          | 7.60 ± 1.18                      |
| Flavor         | 6.55 ± 1.60                      |
| Taste          | 6.20 ± 1.87                      |
| Texture        | 7.60 ± 1.09                      |
| Overall liking | 7.45 ± 1.14                      |

Table 2 Sensory scores of Asian Green Mussels Sauce basic formulas

According to improve the quality of smell and taste (salty) of Asian Green Mussel Sauce have made by reduced salt content 50% of the original formula and added the herbal aroma as follows;

| Ingredients                 | Content (g) |
|-----------------------------|-------------|
| Asian Green Mussels extract | 460         |
| Sweet Soy Sauce             | 3.8         |
| Seasoning Sauce             | 153.5       |

|                      |       |
|----------------------|-------|
| Glucose              | 76.8  |
| Sugar                | 53.7  |
| Tapioca Starch       | 30.7  |
| Salt                 | 20    |
| Pepper               | 10    |
| Cinnamon             | 5     |
| Clove                | 5     |
| Monosodium glutamate | 20.7  |
| Citric acid          | 0.12  |
| Water                | 130.5 |

**Table 3 Ingredients of Developed Formula Asian Green Mussels Sauce**



**Figure 4. Asian Green Mussels Sauce**

### C. Physical Qualities Studying

The results of the physical qualities analysis of the developed Asian Green Mussel Sauce product such as viscosity value at 1423.86 centipoises compared with the Thai Industrial Standards Oyster sauce (TISI 1317-2538) [8]. It was set viscosity not exceed 18,000 centipoises.

Beside color of Asian Green Mussels Sauce measurement results showed color  $L^*$  was 0.52, color  $a^*$  was 1.86 and color  $b^*$  was 0.78.

The microbiological examination found safety standard in criteria for community products and the shelf-life Asian Green Mussel Sauce study without preservatives was stored at 4°-6° C and room temperature showed all storage conditions kept the sauce more than 12 weeks.

| Physical properties     | Asian Green Mussels Sauce |
|-------------------------|---------------------------|
| Viscosity (centipoises) | 1423.86±9.65              |
| Color Values            |                           |
| $L^*$                   | 0.52±0.12                 |
| $a^*$                   | 1.86±0.26                 |
| $b^*$                   | 0.78±0.13                 |

**Table 4 Physical properties of Asian Green Mussels Sauce**

### D. Consumer Acceptance Test Results

The consumer acceptance test for the Asian Green Mussel Sauce product showed that the testers offered rate average liking moderate (7.60) when asking for opinion if the products are sell, most consumers have accepted the mussel sauce 94%

### CONCLUSION

According to low grade Asian Green Mussels Sauce producing by intense juicing extract rate 1:2 (w/v) heated at 80°C for 3 hours before produced mussels sauce. The appropriate mussels sauce formula consist of Asian Green Mussels extract 460 g., Sweet Soy Sauce 3.8g., Seasoning Sauce 153.5 g., Glucose 76.8 g., sugar 53.7 g., Tapioca Starch 30.7 g., Salt 20 g., pepper 10 g., cinnamon 5 g., clove 5 g., monosodium glutamate 20.7 g., Citric acid 0.12 g., water 130.5 g. The Asian Green Mussel Sauce physical qualities examination meet standard in criteria (Industrial Product Standardization Mor-Or-Kor 1317-2538) and Asian Green Mussel Sauce can be developed as brand new interesting product of community enterprise.

### ACKNOWLEDGEMENTS

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### REFERENCES

- [1] Rajagopal, S., Venugopalan, V., Van der Velde, G., Jenner, H., 2006. "Greening of the coasts: a review of the *Perna viridis* success story. *Aquat*". *Ecol.* 40, 273-297.
- [2] Ying Ying, Y., Wansuk, S., Ji Ji, L., Hui Wen, C., Chang Wen, W. 2016 "Genetic diversity and population structure of the Asian green mussel *Perna viridis* in South China Sea based on microsatellite markers," *Biochemical Systematics and Ecology.* 68, 135-141.
- [3] Nidsaraporn Petsut. 2016. *Aquatic Animal Production : Coastal Aquaculture.* Ramkhamhaeng University Press. Bangkok.
- [4] Kanok Nuchniyom. 2011. *The Solutions to Productivity Improvement of Mussel Farming in Banlaem District, Petchaburi Province.* Master of Business Administration Thesis (General Management), Petchaburi Rajabhat University. Thailand
- [5] Dusit Bulan. 2015. *Development of Sauce from Asian Green Mussels.* Suan Sunandha Rajabhat University. Thailand
- [6] Wannabordee Eakpiyakul. 2006. *Product Development of Blood Clam (*Anadara granosa*) Sauce.* Master of Science Thesis (Fishery Products), Kasetsart University, Bangkok, Thailand
- [7] Suttinee Tantipanyathap. 2018. *Product Development of Sergestid Shrimp Sauce.* Master of Science Thesis (Fishery Products), Kasetsart University, Bangkok, Thailand
- [8] Thai Fishery Industrial Standards Institute 1995. *Oyster Sauce Industrial Standards Mor-Or-Kor 1317-2538 (Industrial Product Standardization 1317-2538),* Ministry of Industry, Bangkok.