THE PRODUCT AND PROCESS DEVELOPMENT OF CANNED SALTED-FERMENTING CRAB: SENSORY AND SAFETY ASPECTS

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ABSTRACT

Salted-fermenting crab is popular and used as an appetizer/ingredient for local Thai people across the country. However, this traditional product has short shelf life, prone to contamination, inconsistent taste and flavor. This study aims to bring this unique product to another level in terms of high and consistent sensory value, long shelf life, and safety focus so that its full potential values will be realized commercially. In this work the authors developed the processing method of salted fermenting product from mangrove crab by focusing on the best practice to achieve both safe consumption and high sensory acceptance. It was found that both goals could only be achieved when the raw materials were cleaned and scrubbed in the clean, filtered and sanitized sea water for at least three times before draining and underwent further fermenting process. According to our study, the best formulation of seasoning solution for mangrove 100 g of crab was that:- filtered sea water 50 %, ammonium sulfate 10 %, calcium carbonate 10 %, and sodium chloride (with iodine supplement) 30% by weight. To lengthen the product to more than half a year as well as to ensure the product safety, canning and retort sterilization was chosen. It was done in the can size of 307 x 113 in^2. Each can contained 2 pieces of mangrove crab with crab weight 110 g, net weight 210 g, pH 6.8. Heating process in retort temperature was 121 ◦C for 75 min with lethality F_0 at least 46.5 min. Chemical composition for ash, moisture, fat and protein content by weight of the product was that:- 2.52 %, 5.21 %, 2.36 % and 45.81 %, respectively. Microbial analysis for Coliforms, Staphylococcus aureus, Salmonellas spp and Vibrio parahaemolyticus were determined and the results showed that all are not found. The product obtained consumer acceptance by sensory test and the storage time was more than 5 months.

Keywords: Canned traditional sea foods, mangrove crab, salted-fermenting crab, storage time.

INTRODUCTION

Salt pickled crab is a popular traditional Thai food used to enhance flavor for various other products. There is a promising tendency that the product can be extended and incorporated or developed into new product formulations especially in the Southern regions of Thailand. There are numerous salted picked crab production sites near coastal area both on Andaman and Thai gulf sides in many provinces e.g. Ranong, Trang, Surat Thani, Nakorn Si Thammarat, Songkhla and so on. Most salted picked crab products were produced by particular groups of community or households especially in districts near sea due to high raw material availability and local markets. Most raw materials used for salt-pickled crab production are Meder's mangrove crab and freshwater crab residing in paddy fields. For most Southern area part of Thailand, Meder's mangrove crab is the raw material of choice owing to its good flavor. However, one main problem related to crab consumption was that most consumers prefer to consume it as a raw or unheated form, and this may risk consumers for infection from parasite or some pathogen from soil, water and surface area in which crabs live. In addition, these parasites and pathogens are may derived from crab handling people or unclean equipment/apparatus. Additionally, after being distributed and marketed for a certain period of time, crab meat shows some degree of self-degradation such as rancid, stale flavor and mold development. Another possible obstacle may derive from locally traditional packaging used or tinned bucket used to pack crab. These problems are main obstacles for extending products into modern or urban trading system or for export purpose. Therefore , it is comparatively urgent to improve or develop new packaging and to process development to add value to crab product and, at the same time, to build confidence for consumers and seeking for better marketing opportunities as well as ensure product safety for consumers.

MATERIALS AND METHODS

Crabs were classified into three size ranges: small (0-20 g/crab), medium (20-50 g/crab) and large (>50 g/crab). The classification of crab sizes was based on normal size range of Meder's mangrove crab found in Thailand. Prior to salt pickling, crab samples were detected for parasites under stereo microscope and analysed for heavy metal e.g. Lead, Mercury, Cadmium and Arsenic as indicated in Standard for Community Products no. 1334/2549 Three levels of salt, and calcium chloride concentration were mixed with the crabs, namely: 10, 20 and 30 %.The samples were pickled in glass containers with 7-cm diameter closed lids. 15 crabs were picked for 15 days at room temperature. Every day, three of them were sampled for sensory test in terms of colour, odour, taste, appearance and overall acceptance using 9-point Hedonic scale and 20 trained panellists. All organoliptic tests were carried out in organoliptic laboratory in Rajamangala University of Technology Srivijaya, Trang, Thailand. The standard procedures were followed in chosing panelists, testing environment and sample preparation. (Reference …..) Microbiological examination included total plate count, yeast and mould count [1]. Chemical analysis included salinity, pH and acidity [1].

The effects of crab size, salt concentration, calcium carbonate and ammonium sulphate were studied via sensory tests (colour, odour, taste, appearance and overall acceptance by 9 point Hedonic scale and 30 trained panellists). Completely randomized design (3x3 CRD) was used. Analysis of variance and mean difference were performed through Duncan's New Multiple Range Test (DMRT) using SPSS.

The product shelf-life was investigated by using appropriate package e.g. specific can for packaging low-acid canned foods and glass. Samples were incubated at room temperature and another control set as usual temperature storage used in the community for comparisons. A shelf-life test of salt picked crab (based on the formulation that had highest acceptance). After that, crab was removed out of the container and subjected to retort sterilization (121^{o}C, 15

min)/pasteurization (74 ^{o}C, 15 sec) and enzymatic inhibition in glass containers. Thermally processed samples were examined every one month for 5 months. Physical examination included texture, appearance, colour, odour, flavour and foreign matters. Chemical examination included salinity, heavy metal (Lead, Arsenic, Mercury and Cadmium). Microbiological examination included parasites, total plate count, yeast and mould count, MPN Coilforms, *S. aureus*, *Salmonells spp*. *V. parphaemolyticus.*

RESULTS AND DISCUSSION

Parasite examination

Raw and fresh samples were microscopically examined under stereo microscope. Various parts of the samples e.g. their walking limbs or gills. Results that parasites were externally and internally found due to the fact that Meder's mangrove crab naturally live on soil's surface, mud or tree debris. According to the Standard of Community's Product no 1334/2549, for consumers' safety, no found parasites were allowed for salt pickled crab.

Microbiological examination

Raw and fresh crabs used as samples in the experiment were microbiologically examined whether they conformed to The Standard of Community's Products no. 133/2549

Table 1. Microbiological count in crab samples prior to being salted picked

Microorganisms **Number of colony (N)**	**Results**	**Criteria**
MPN Coliforms (N/g sample)	> 1,100	< 20
S. aureus (N/g sample)	< 10	< 100
Salmonells spp. (N/25 g sample)	Not detected	Not detected
V. parphaemolyticus (N/g sample)	< 10	< 100
Yeast and mould count (N/g sample)	610	< 500
Total plate count (N/g sample)	$1.3x\ 10^{4}$	$< 10^{6}$

Note: The criteria are according to The Standard of Community's Products no. 133/2549

As indicated by the results mentioned above, MPN and yeast and mound count were higher than indicated by The Standard of Community's Products no. 133/2549 due to the fat that when salt pickling of crab was undertaken, a raw or live crab need to be used, it was inevitable to be contaminated of parasites and microorganism or some pathogen living together in natural habitat. In addition, contamination was possibly occurred through container used, people who handling crabs. And as these crabs are initially contaminated with parasites and microorganisms or even some pathogen that also naturally live in the same natural habitat (Ministry of science and Technology, 2002). These conditions are clearly affected coliform contents.

Heavy metal

Heavy metal examination

Table 2. Results of heavy metal examination in crab sample prior to being salt-pickled

Element (mg/kg)	**Results**	**Criteria (mg/kg)**
Lead	Not detected	< 1
Arsenic	0.486	< 2
Mercury	Not detected	< 0.5
Cadmium	0.018	< 0.2

Note: samples were delivered and inspected by central Laboratory Unit, Prince of Songkhla University, Haadyai campus by ICP-OES method

Based on table 2, when crab samples were probed for their heavy metal contaminant occurrence, results revealed that all heavy metal examined (lead, arsenic, mercury and cadmium) were lower than values as specified in the Standard of Community's Products no. 134/2549. Therefore, crab caught from a source in Sub-District of Tha-Suk, Muang District, Nakorn Si Thammarat Province could be safely consumed as indicated by the The Standard of Community's Products no. 133/2549.

Proximate analysis, mineral element and vitamins in crab

Results of proximate analysis and some important mineral element demonstrated that crab's protein, fat, ash and energy value were of 10.63$\pm$0.67, 1.38 $\pm$0.29, 9.39$\pm$0.56 g/100 g sample and 81-94 Kcal/g respectively. Furthermore, consumption of Meder's mangrove crab will clearly gain benefits in terms of mineral and vitamin good for health as results of iron, calcium, phosphorous content as well as Vitamin B_2 content were of 7.22, 3,842 , 117.5 mg/ 100 g of edible part and 338.1 µg/ 100 g of edible part. However, there was no vitamin B present or could be detected in the sample.

Size screening of crab

After being anaesthetized by ice and weighed, crab samples' length was measured to categorize into 3 sizes: small, medium and large as shown in figure 1.

Size screening

When raw and fresh Meder's mangrove crabs were screened based on their size or weight by weighing as grams and categorization into 3 groups. It appeared that, out of total 458 crabs that were screened, about 3 measurements per one crab were made to obtain rather constant weight. Its female sex was 52.99 % as male sex was merely 47.00 %. For sex classification of particular weight or size screening, it was revealed that for small size crab or 20-25 g/a crab, its female sexes were 2 times higher than male sexes. For medium size crab or 25-36 g/a crab, it appeared that it's both sexes were relatively equal (female sexes was 57.40% as male sex was 42.59). For large size crab or more than 45-55 g/ a crab, it appeared that its female sex was merely 8.6% as most of them was male sex. As a matter of fact, most crabs that were caught

by farmers, or are generally accepted by common consumers are mostly middle size or have a rather equal proportion of female and male In addition, a quantity of crab sold in the local market are usually rather limited owing to the fact that villagers and farmers ceased catching crabs for 2 periods: the first round is from April to July and the second round from September to November because these two periods are egg-laying periods. As its raw material availability and consumers' need are taken into account it is plainly clear that medium size crabs are the size of choice. Moreover, when salinity was regarded, medium size will be the appropriate size as well. Therefore, in a later experiment, medium size crabs will be employed. (Table 3 and 4)

Table 3. Results of crab size screening

Size	Sex	weight (gram)	body area (length*width) (cm.)	total length(cm)
Small	Female	23.06^{a}±0.05	13.45^{a}±0.01	15.84^{a}±0.1
		23.12^{a}±0.11	10.72^{a}±0.02	14.78^{a}±0.4
Medium	female	36.24^{b}±0.13	14.85^{b}±0.01	15.24^{b}±0.02
		36.15^{b}±0.04	13.45^{b}±0.05	15.20^{b}±0.01
Large	Female	49.37^{c}±0.05	16.98^{c}±0.04	18.32^{c}±0.02
		48.45^{c}±0.04	18.44^{c}±0.01	16.60^{c}±0.01

Note: different letters in the same column indicate statistically significant difference

(a) Female (b) Male

Figure 1. General Morphological characteristics of female and male mangrove crab (Mangrove crab, *Sesarma mederri*)

Table 4. frequency of female and male crab used as raw materials

Size	Male (%)	Female (%)
Small	17.00^{a}±0.02	83.00^{a}±0.22
medium	42.5^{b}±0.015	57.40^{b}±041
large	91.40^{c}±0.14	8.60^{c}±0.13

Size screening of raw or fresh mangrove crabs when raw and fresh mangrove crabs were screened by a means of weighing and their weight were averaged, it was found that, for small size crabs or 20-25 g/ a crab, they comprised 83% female and 17% male sexes respectively or female crabs were four times more than male crabs, for middle or medium size crabs or 26-35 g/ a crab, they constituted 57.40% female and 43.59% male crabs or numbers of both were slightly different and for large size crabs or larger than 45-55 g/ a crab , they were composed of only 8.6% female but 91.4% male crabs. Most crabs sold in local market or in Southern or coastal area market were of medium size and mostly a few crabs were caught and sold due to limited period of crab catching. Farmers and villagers had a common agreement with government agency and other related sectors to cease catching crabs in 2 egg-laying seasons: the first egg-laying stage was from April to July and the second egg-laying stage was from September to November. When both natural provision and market need were taken into account, it was clearly viewed that the medium size crab or 26-35 gram per a crab was a size of choice. Thus, in this experiment, the crab of medium size was chosen as subjects.

Chemical addition

At the stage of raw material preparation for salt- picked process prior to salt-pickling of mangrove crab, raw and fresh mangrove crabs were thoroughly washed with marine water. Later, they were anaesthetized by ice (ice used was prepared by boiling municipality water) allowed to be cool and used for ice making for an aesthetic purpose. Later, crabs were screened and categorized by their size or weight as indicated previously. Subsequently, crab samples were thoroughly washed in a mixture of marine water and saturated calcium hydroxide (50:50) for the first stage washing. After that, the samples were washed by filtered marine water to remove excess calcium hydroxide. For the second and third stage, washing was performed by filtered marine water.

Microbiological examination revealed that total plate count of samples after passing through the first, second and third washing were of 5.78 x 10^{6}, 5.28 x 10^{6} (CFU/g)for both 2^{nd} and 3^{rd} washing as yeast and mold count were of 1.9 x 10^{6} and < 10 (CFU/g) (for both the 2^{nd} and 3^{rd} washing). These figures clearly demonstrated that these three times washing was able to reduce yeast and mould load. Further, it was also clearly observed that the washed water has reduced turbidity with less earthy smell but stronger crab's characteristic odour. Samples were left to stand to eliminate excess water before being used for a later experiment. These samples preparation was applied in a similar manner to all experiment.

Salt

Several types of salt were used in the experiment e.g. grained salt, powdered salt. All salt are supplemented with iodine or was iodized previously. The Department of Health, Ministry of Public Health in Thailand had legally issued related regulations no. 153 (1994) stating that, as iodine plays an important role in various health development and in order to promote beneficially physical health, brain and intellectual development, all salted used need to be supplemented or

iodized for such proposes. All salt forms intended for consumption use have to be supplemented with iodine at least 30 ppm per one kilogram of table salt.

Grained salt or brine is generally employed as one commonly effective food preservation. Salt help preservation or extend shelf-life by attracting water out of food or in this case, crab. After leaving crabs immersed in brine solution, salt is added periodically to prevent its dilution effect. Salt or brine works more effectively when preserved in summer or during relatively high temperature environment. Most salt or brine preservation in Thailand is performed by this manner. Food grade purified grain salt was one popular choice as mentioned [4] giving reasons that a penetration of salt into tissue inside crab meat chunk is directly proportional to used salt purity as calcium and magnesium present as impurity in salt will hinder rate of salt penetration for example, when 0.40 calcium chloride present in salt will obviously retard salt penetration.

Effect of calcium carbonate addition

In this investigation, calcium carbonate was added into brine solution at the percentage of 10, 20 and 30 % as 25 % salinity was constantly maintained.

When 10, 20 and 30 % calcium carbonate concentration was added, pH value at room temperature was 6.3-6.75 and at chilled temperature was 6.80-6.75, and therefore a general tendency of pH at these 2 conditions was generally rather neutral and fell in the range as indicated by the standard of Community's Product no. 1334/2006. For the effect of 25% salt concentration, it was demonstrated that its final salt content was 24.8-25.5%. The result of sensory examination in terms of colour, odour, flavour, saline flavour, appearance scores showed that, among all 9 treatments, they were no statistically significant difference ($P>0.05$) but merely overall scores that was actually statistically significant difference ($P>0.05$). These statistical figures were based on the condition of 25% salt concentration and 10% calcium carbonate.

Effect of ammonium sulphate addition

Based on the general condition in the experiment that 25% salt concentration and 10% calcium carbonate in the formulation that was most acceptable by panellists. Therefore, the formulation was chosen for a later experimental stage that effect of ammonium sulphate was investigated at the concentration of 10, 20 and 30% percentage respectively.

Results of ammonium sulphate addition found that when 10, 20 and 30% ammonium sulphate was supplemented, their pH at room temperature and at chilled temperature was 6.12-6.55 and 6.30-6.50 respectively. These pH figures fell within limited range as determined by the standard of Community's Product no. 1334/2006. For results of 25% salt concentration addition at both room temperature and at chilled temperature in both meat portion and solution portion, it was found that final salt concentrations were 24.5 and 25.5 successively. For organoleptic or sensory examinations among 9 treatments in terms of colour, odour, flavour, saline taste and appearance scores, there were no any statistically significant difference ($P<0.05$) but solely overall acceptance scores that there was really statistically significant difference ($P<0.05$). The condition performed in the experiment was 25% salt, 10% calcium carbonate and 10% ammonium sulphate at room temperature as demonstrated in table 3 and 4.

Sterilization heat treatment

Crab samples was sterilized in horizontal retort (1 basket) at the Food Processing Laboratory, Faculty Agro-Industry, Prince of Songkhla University, Had-Yai campus and results were displayed in table 5

Table 5. Heat penetration test for caned salt-pickled mangrove crab

Attibutes	Can size, Arrangement Patterns or Sterilization Time
can size	307 x 113 (2 chunks)
number of cans	12
arrangement patterns	plastic net asserted between each storeys
net weight (gram)	110
sterilization temperature	210
sterilization time	121 □C 75 min
pH	6.8
initial product temperature (□C)	32.2
Come-up-time) (min)	10
(Heating parameters to calculate Fo)	
fh	19.3
F2	-
j	0.833
Xbh	-
Lethality (Fo)	46.5 (F)

The sterilization process for canned food product of the fermented crab to lengthen the storage time was done in the can size of 307 x 113 in2. Each can contained 2 pieces of mangrove crab with crab weight 110 g, net weight 210 g, pH 6.8. Heating process in retort temperature was 121 ◦C for 75 min with lethality F_o at least 46.5 min. and consistent with the general canned food [2], [3]. After that, commercial sterilization test was performed and results demonstrated that there was no apparently microbial growth as showed in table 6.

Canned salt-pickled crabs were organoleptic ally tested. Sensory examination was carried out by 10 trained panellists, three replication were performed for 15 sat-pickling days. Crab samples were drawn out on day5, day 10 and day 15 in a row. Comparison between room temperature (32±2 °C) and chilled temperature was also performed. Results revealed that panelists accepted the product.

Table 6. Results of commercial sterility test shortly after being sterilized

Name and Attributes	Performed conditions	Method of Examination	Results
canned salt-pickled crab	Aerobic incubation at 35 □C	BAM 2001	Negative
vacuum pressure (in Hg) = 0.78	Anaerobic incubation at 35 □C	BAM 2001	Negative
head Space (mm) = 26	Aerobic incubation at 55 □C	BAM 2001	Negative
pH 6.81	Anaerobic incubation at 55 □C	BAM 2001	Negative

Table 7. Sensory examinations of sterilized salt-pickled crabs

Storage condition	Storage time (months)	Attributes					
		Appearance	Colour	Odour	Flavor	Texture	Overall acceptance
room temperature	1	7.00^{a}±0.77	6.72^{a}±1.00	7.00^{a}±0.89	6.82a±1.08	6.55^{a}±0.68	7.27^{a}±0.64
	2	6.50^{a}±0.83	6.50^{a}±1.22	6.83^{a}±0.40	7.50^{b}±0.54	7.33^{a}±0.81	7.50^{b}±0.54
	3	7.18^{a}±0.98	7.09^{a}±0.83	6.91^{a}±0.70	7.09^{a}±1.51	7.00^{a}±0.44	7.18^{a}±1.16
	4	7.27^{a}±1.34	7.45^{b}±1.57	7.36^{b}±1.02	6.91^{a}±2.21	7.45^{b}±1.96	7.63^{b}±1.28
	5	7.33^{b}±0.81	6.33^{a}±0.51	7.33^{b}±0.51	7.16^{a}±0.98	7.00^{a}±0.89	7.66^{b}±0.51

Note: All letters in the same column signified statistical difference ($p<0.05$)

Microbiological results of 5-month storage

Microbiological results of canned salt-picked crabs in terms of MPN coliforms/ gram sample, *S. aureus* / 25 g sample, *V. parphaemolyticus* / gram sample showed that, after 5-month storage and microbiological examination was carried out every month for 5 months, all organisms were within or below limits as required by the standard of Community's Product no. 1334/2006 as shown in table 8 and 9.

Table 8. Microbiological results of canned salt-pickled crabs for 5-month storage

Organism	1-month storage	2-month storage	3-month storage	4-month storage	5-month storage	Specifications
MPN Coliforms / g sample	N.D.	N.D.	N.D.	N.D.	N.D.	< 20
S. aureus / gram sample	N.D.	N.D.	N.D.	N.D.	N.D.	< 100
Salmonells spp. / gram sample	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
V. parphaemolyticus / gram sample	N.D.	N.D.	N.D	N.D.	N.D.	< 100

Table 9. Results of commercial sterility test of 5-month storage

Sample and attributes	Performed tests	Method of examination	Results
Salt-pickled crabs	aerobic incubation, 35 □C	[6]	Negative
Vacuuum (in Hg) 0.78	anaerobe incubation, 35 □C	[6]	Negative
Head Space (mm) 26	aerobic incubation, 55 □C	[6]	Negative
pH 6.81	anaerobic incubation 55 □C	[6]	Negative

Chemical examinations

When chemical examinations were performed by identification of heavy metal (Lead, Arsenic, Mercury and Cadmium content), results demonstrated that all obtained values were below or fell within the range as specified by the standard of Community's Product no. 1334/2006. Moreover, when proximate analysis by determination of moisture, fat, protein and ash content was performed, their values were of 2.52, 5.21, 2.36 and 45.81% respectively. All mentioned above values were within the range as required by the standard of Community's Product no. 1334/2006.

Comparison of sensory examination of raw and sterilized salt-pickled crabs

When the comparison of sensory examination in terms of colour, odour, taste, texture and overall acceptance of raw/salted crabs and sterilizer salt-pickled crabs was made, it was demonstrated that sterilized salt-pickled crabs were given scores that were all below raw and salted, non-fermented crabs and all scores were statistically significant difference ($P<0.05$) and table 10.

Parasite examinations

When the most panellists' accepted formulation or the formulation with 25% salt, 10% calcium carbonate and 10% ammonium sulphate were added, results revealed that there was no parasitic egg, larva and adult found.

Table 10. Sensory results of canned salt-pickled crabs of 5-month storage

storage condition	**storage period (month)**	**Attributes**					
		Appearance	**Colour**	**odour**	**Flavour**	**texture**	**overall acceptance**
room temperature	1	7.00^{a}±0.77	8.72^{a}±1.0	7.50^{a}±0.8	8.82^{a}±1.8	7.55^{a}±0.68	8.27^{ab}±0.6
	2	7.10^{a}±0.83	7.50^{a}±1.2	7.83^{a}±0.4	7.50^{a}±0.5	7.33^{a}±0.8	8.50^{ab}±0.5
	3	7.18^{a}±0.98	7.09^{a}±0.83	7.6^{a}1±0.7	7.09^{a}±1.5	7.00^{a}±0.4	8.18^{a}±1.1

	4	7.27^{a}±1.34	7.45^{a}±1.57	7.36^{a}±1.02	6.91^{a}±2.21	7.45^{a}±1.96	8.63^{ab}±1.8
	5	8.33^{a}±0.81	7.33^{a}±0.51	7.33^{a}±0.51	7.16^{a}±0.98	7.00^{a}±0.89	8.66^{b}±0.51

Note: All letters in the same column signified statistical difference

Parasite examinations

When the most panellists' accepted formulation or the formulation with 25% salt, 10% calcium carbonate and 10% ammonium sulphate were added, results revealed that there was no parasitic egg, larva and adult found.

Nutritional analysis

Iron content of salt-pickled crabs was 56.31 mg. Additionally, consumption of whole crab would provide high content of calcium as it contains as high as 3,842-6,451 mg. Apart from this, analysis of heavy metal in crab revealed that no mercury present as it consisted of only 0.01 mg/ edible portion of 1 kilogram (fresh or wet basis) of Cadmium and Lead as Cadmium was merely 0.03-0.06 mg/ one kilogram of fresh or wet basis weight.

CONCLUSIONS

A process establishment of sterilized crabs to ensure consumption safety for consumers and general public. A general process was composed of washing, anesthetizing, filling of salt-pickling solution, filling in a glass container, filling in can and sterilizing. In detailed process, a process was begun by bring mangrove crabs packed in sealed rigid foam package from their natural habitat but still was alive and was transported to the laboratory within 3 hours after being caught. Crab sample were first roughly washed to eliminate dirt and debris. After that, mangrove crab sample were thoroughly washed with a mixture of marine water and calcium solution with a ratio of filtered marine water and saturated calcium hydroxide at a ratio of 50:50). Marine water was filtered to ensure its sterility and saturated calcium hydroxide solution prepared by mixing sterilize water with calcium carbonate and left overnight to ensure its saturation, only supernatant portion was used. Only external washing was performed. Three times washing were employed and crab samples were allowed to stand to remove excess water. Completeness of washing was simply monitored by smelling, if natural crab's odor present without mud or stale odour present, this meant that it was comparatively washed. Salt-pickling solution was prepared by employing filtered marine water to ensure its sterility and 3% iodized grained salt and 35 calcium carbonate were added and the prepared samples were kept in tight-air container. This storage condition is usually suitable for up to 15 day storage.

The investigation of shelf-life of newly established salt-pickled canned product revealed that storage at room temperature brought to the highest consumer satisfaction. The canned salt-pickled product could be kept with almost noticeable change for up to 5 months in glass container. However, pasteurization heat treatment may be problematic due to glass quality and shape of container to be used and sensory consumer acceptability. Sterilization heat treatment is better alternative manner of processing when 307 x 113 can size was used with 2 crab meat chunk with 210 g net weight at pH 6.8 using 121 °C for 75 min with F_0 of 46.5 (Fahrenheit). Proximate analysis demonstrated that ash, moisture, fat and protein content were equivalent to 2.52, 5.21, 2.36 and 45.81 % in a succession. Sensory evaluation revealed its acceptance by consumer.

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