ABSTRACT TESIS

Komposisi Kimia dan Aktivitas Inhibitor Topoisomerase I Dari Kablang (*Nerita albicilla*)

Oleh

Dani Sjafardan Royani, Linawati Hardjito, Joko Santoso

DNA topoisomerase (topo) I and II are molecular targets of several potent anticancer agents. Thus, inhibitors of these enzymes are potential candidates or model compounds for anticancer development. This paper reported the chemical composition of *Nerita albicilla* and its topo I inhibitor of hexane, ethyl acetate, and methanol extracts. Proximate and amino acid composition of *Nerita albicilla* dried powder were investigated using standard analytical techniques. The determination of topo I inhibitor activity was conducted using topo I drug screening kit from TopoGen. Inhibitor of DNA topo I activity was analysed by gel electrophoresis. The composition of *Nerita albicilla* included moisture of 12.44%; ash of 9.17%; protein of 62.05%; fat of 5.58%; crude fibre of 6.60%, and carbohydrate (by difference) of 4.16%. The amino acid analysis revealed that the Kablang was superior with respect to glutamate compared to Thunnus sp. and other clams. Yield of hexane, ethyl acetate and methanol extract of *Nerita albicilla* were 2.05%, 1.56%, and 6.99%; respectively. All extract showed topoisomerase I inhibitor activities. The hexane extract described catalytic activity of topo I, while ethyl acetate and methanol extract acted as topo I poison. Minimum inhibitory concentration (MIC) of methanol extract were $2.5\mu g/ml$. Phytochemical screening of the extracts showed that they contained steroid. In addition, the methanol extract also contained alkaloid.

Pemanfaatan Tepung Tulang Ikan Patin (*Pangasius sp*) Sebagai Sumber Kalsium dan Fosfor Dalam Pembuatan Biskuit

Oleh

Adrianus Orias Willem Kaya, Joko Santoso, Ella Salamah

The utilization of fisheries resource in fisheries processing industries has not been conducted yet optimally, mainly to utilize their waste such as bone, viscera, and skin. Patin fishbone is a main waste product from patin filleting industry. From the viewpoint of foodstuffs, it’s contains a high number of mineral especially Ca and P. These experiment were carried out to study the effect of fishbone powder producing methods i.e. dry and wet methods in correlation to their physicochemical characteristics including the solubility of Ca and P. The physicochemical characteristics of patin fishbone powder were not affected significantly of Ca and P than wet method. Based on organoleptic test through scoring test, adding 2% (formula A) and 4% (formula B) of patin fishbone powder into biscuit products gave the high average values of appearance, color, flavor, texture and taste; and they also had the higher values of appearance and color in comparison to commercial product. The physicochemical characteristics of biscuit formula A and B were almost same to the commercial product. The highest percent solubility of Ca and P were found in biscuit formula A and control (without adding patin fishbone powder) with values were 95.06% and 74.24% respectively. Consuming 7 pieces of biscuit formula A will contribute Ca and P requirements are 9.01% and 8.34%
respectively, whereas biscuit formula B are 14.92% and 18.43%; with assumption all of Ca and P can be absorbed well by human body.

Key words: biscuit, calcium, fishbone powder, mineral solubility, phosphorus

Penapisan Antibakteri dan Inhibitor Topoisomerase I dari *Xylocarpus granatum*

Oleh

Dewi Kartika Sari, Linawati Hardjito, Purwantiningsih Sugita

Plants having biological activities have been studied intensively due to the demand of natural medicines. One of coastal plants having antibacterial and cytotoxic activity is *Xylocarpus granatum*. This paper presented antibacterial and topoisomerase I inhibitor activities of *Xylocarpus granatum* extract. The antibacterial activity was assayed using agar diffusion method and topoisomerase I inhibitor activity was carried out using topoisomerase drug screening kit from TopoGen.

The result showed the methanol crude extract of *Xylocarpus granatum*’s root, stem, seed, and fruit inhibited the growth of non-clinical *E.coli* and *S.aureus*. they also inhibited topoisomerase I at concentration of 50µg/ml, except hexane crude extract. The MIC of stem methanol extract against topoisomerase I was 25µg/ml. Stem methanol extract contained alkaloid, flavonoid, and tannin. In addition, seed extract contained saponin. The alkaloid, flavonoid and tannin inhibited non-clinical *E.coli*, furthermore flavonoid compound described antibacterial activity against clinical isolates of *S. aureus* and *E.coli*.

Karakteristik Bakso Ikan dari Campuran Surimi Ikan Layang (*Decapterus spp*) dan Ikan Kakap Merah (*Lutjanus sp*) Pada Penyimpanan Suhu Dingin

Oleh

Chairita, Linawati Hardjito, Joko Santoso dan Santoso

The utilization of Mackerel Scad (*Decapterus spp*) has not been done optimally. This species is a potential fish to be processed into surimi that is raw material of fish jelly products, such as fishball. Mackerel Scad contains red meat in greater proportion compared to white meat. For this reason, surimi of Mackerel Scad (*Decapterus spp*) is produced using alkaline leaching method; and mixed with Red Snapper (*Lutjanus sp*) surimi to be used a raw material of fishball. The fishball was added by chitosan at concentration of 0,1% as preservative, while carrageenan was added at concentration of 1% as gelling agent. The fishball was stored in chilling condition (0-4ºC). The results indicated that surimi of *Decapterus spp* being leached twice showed the same quality as white meat surimi. Fishball containing Red Snapper surimi and Mackerel Scad surimi of 1:3 added by 25% of tapioca starch showed a good physical and sensory characteristics. The mixed surimi of fresh fish meat was better in term of its physical, chemical and sensory characteristics compared to the frozen one. Chitosan added at 0,1% could preserve the fishball for two weeks in chilling storage (0-4ºC) without causing any change of its physical and chemical characteristics. The fishball produced has a better flavor and texture was similar to commercial one.
The study investigated antibacterial activity of chitosan and its combination of potassium sorbate (S), sodium benzoate (B) and terung pungo (Solanum sp.) extract (T) against *Escherichia coli* and *Staphylococcus aureus*. Combination of 0.05% chitosan with 0.05% S, 0.05% B and 20 µg/ml T did not show synergistic inhibition against bacteria, however 0.1% chitosan showed higher antibacterial activities in comparison to others. Application of 0.1% chitosan in pre-cooked milkfish increased shelflife from 16 to 38 hours at 28-30°C. Chitosan was able to reduce the formation of TVB and TBA during preservation period. The results indicated that chitosan was an effective preservative agent for cooked milkfish.

Keywords: antibacterial activity, chitosan, cooked milkfish preservation

Carrageenans are commercially important hydrophilic colloids (watersoluble gums) which occur as matrix material in numerous species of red seaweeds (Rhodophyta) including *Eucheuma cottonii*. Carrageenans are used widely for pharmaceutical, cosmetic, food and others as gelling and binding agents, emulsifier and stabilizer. The quality of carrageenans are affected by some factors like part of thallus, seed weight and harvesting time of seaweed, which is specific locally in correlation to environmental parameters. Seaweed cultivation was carried out in West Seram District, Molluccas Province by floating system. Environmental marine waters in cultivation area are suitable for cultivation of *Eucheuma cottonii* seaweed with some reasons i.e. area is protected from wind blasts and big wave, depth 7.65-9.72 m, salinity 33-35 ppt, temperature 28-30°C, brightness 2.5-5.25 m, acidity (pH) 6.5-7.0, and flow current 2-48 cm/s. The best carrageenans were produced by 50 days of harvesting time, 50 g of seed weight and tip of thallus. This carrageenan has physicochemical characteristic as follows yield 26.56%, gel strength 330 g/cm², viscosity 30.73 cP, gelling point 33.20 °C, melting point 43.50 oC, whiteness degree 38.36%, moisture content 10.86%, ash content 22.76%, acid insoluble ash content 0.88%, and sulphate content 27.43%.

Key words: carrageenan, *Eucheuma cottonii*, part of thallus, seed weight, harvesting time.
Pemanfaatan Tepung Tulang Ikan Madidihang (*Thunnus albacares*) sebagai Sumber Kalsium dan Fosfor untuk Meningkatkan Nilai Gizi Makron Kenari

Oleh

Ahmad Thalib, Joko Santoso, Bustami Ibrahim

It is well known that madidihang fishbone contains a high number of mineral especially Ca and P; however, this fishbone also has high contents of protein and fat. Three types of boiling solutions *i.e.* water, acetic acid and chloric acid were performed in order to reduce the protein and fat contents prior to be processed become powder. Mainly the physico-chemical characteristics of madidihang fishbone powder were not affected significantly by boiling solutions; however, boiling in acetic acid produced the highest percent solubility of Ca and P. Based on organoleptic test (scoring test), adding 0.8% and 1.6% of madidihang fishbone powder into canary macron products namely formulas A2 and A4 respectively gave the high average values of color, flavor and taste; and they also had the higher values of appearance, taste, color and crispiners in comparison to commercial product. Canary macron formulas A2 and A4 contained high number of Ca and P and significantly different with control and commercial product, they also had the highest percent solubility of Ca and P.

Keywords: calcium, fishbone powder, macron canary, mineral solubility, phosphorus

Pengujuan Toksisitas Kerang Mas Ngur (*Atactodea striata*)

Oleh

Ahmad Muhamad Mutaqin, Linawati Hardjito, Dewi Ratih Agungpriyono

*Mas ngur* (*Atactodea striata*) has been proven containing of high nutritional and bioactive compounds. The analysis of shellfish toxins PSP (paralytic shellfish poisoning), DSP (diarrheic shellfish poisoning), ASP (amnesic shellfish poisoning) and heavy metals Hg (mercury), Pb (lead), Cd (cadmium) as a food safety requirement of shellfish product revealed that all of parameters under MPL (maximum permitted limits) and MRL (maximum residue limits), respectively. To fulfill a nutraceutical product requirement, 90 days sub-chronic toxicity assay was performed using Sprague Dawley male rats as target animal. The animals were fed by 0.04; 0.4 and 4 g/kg bw/day of powdered *A. striata* and without powdered *A. striata* as a control treatment. The parameter analysis included the examination of clinical symptoms such as general behavioral of rats, bodyweights and FCR (food conversion ratios); blood chemistry of SGPT (serum glutamic pyruvic transaminase), SGOT (serum glutamic oxaloacetic transaminase), BUN (blood urea nitrogen) and creatinin; liver and kidney histopathology. The results indicated there was no mortality rats observed throughout the experimental period. No significant clinical and pathology symptoms detected in any group, except the group fed by 4 g/kg bw/day. NOAELs (no-observed-adverse-effect-levels) was estimated to be 0.4 g/kg bw/day. It is concluded that *A. striata* powder is safe to be consumed routinely at level of 0.4 g/kg bw or 20 g/50 kg bw/day.

Keywords: *Atactodea striata*; nutraceutical; sub-chronic toxicity; toxicopathology
Flavor components recovery from liquid waste of crab meat pasteurization is an economic way for upgrading waste treatment. The process itself is environmental friendly. An appropriate membrane technology, such as reverse osmosis (RO) is useful for this purpose. RO which its pore sizes are generally <1 kDa might produce higher yield compared to other methods. Hence, this study was aimed to observe the influence of transmembrane pressure (TMP), temperature and pH on flux and rejection level as parameters of membrane performance. Response Surface Method (RSM) was used to determine the optimum condition of membrane productivity and then applied on concentration process of flavor. Flavor compounds were subsequently characterized for their proximate composition, non protein nitrogen (NPN) and amino acid profile. The results showed that TMP and temperature affected the membrane performance, however was not pH. Optimum condition of RO performance was at TMP 716 kPa, and 35 °C. Rejection level of protein by RO was up to 100%, it means these compounds cannot penetrate into membrane. The concentration process yielded 1,10% protein as flavor components or 1,64 fold than the initial feed. NPN as a flavor component contributed 0,21 % of flavoring (10% more concentrated than the initial feed). Moreover, the amino acids were dominated by glutamic acid and leucine which contributed 20% and 10% of total amino acid in the concentrate, respectively.

Keywords: crab meat pasteurization, flavor recovery, liquid waste treatment, optimization, reverse osmosis, Response Surface Method (RSM).

Bakasang is a fermented fish product, produced from viscera of skipjack which belongs to scombroid group. Those kinds of fish contains a lot of free histidin on their muscle tissue and easy to change become histamine due to decarboxylation reaction and activity of bacteria. These experiments were carried out to study the histamine growth during fermentation processed and storaging at room temperature of bakasang produced from viscera of skipjack. The viscera of skipjack were obtained from fish auction place at Muara Angke - North Jakarta. There were two main steps of experiment, i.e. fermentation processed of viscera for 8 days (0, 2, 4, 6, 8) and continued by storaging at room temperature for 90 days (0, 30, 60, 90). During fermentation processed, moisture content significance decreased from 75.87 % to71.57 % and the numbers of total microbe (TPC) increased significantly from $10^4$ to $10^5$ Cfu/g; however, the protein content, pH values and histamine content were not affected significantly. There was positive correlation between the numbers of total microbe (TPC) and histamine content of bakasang during storaging. Both of values increased $10^3$ to $10^6$ Cfu/g and from 18.59 to 64.20 ppm respectively; however, the histamine were still under the maximum limit established by Ditjen P2 HP DKP (2007). The moisture content of bakasang increased
significantly during fermentation and storaging, with values were from 75.93 % to 77.58 %. In opposite, protein contents significance decreased during fermentation and storaging from 49.26 % to 42.48 %. The pH values of bakasang only affected by the storaging and increased from 5.73 to 6.23. Based on organoleptic test, storaging until 90 days at room temperature still produced bakasang in good average level. Combination treatments between fermentation for 4 and 8 days without storaging (0 days) produced the high average values of color, odor, taste and texture; and they also had the higher values of odor and taste in comparison to commercial product. Both of combination treatments also had the highest protein contents and the lowest histamine values.

Keywords: bakasang, fermentation, histamine, viscera of skipjack, storing

Penggunaan Hidrolisat Kitin dan Karaginan Sebagai Cryoprotectant Dalam Penyimpanan Surimi Beku Ikan Manyung (Arius thalassinus)

Oleh

Candra, Joko Santoso, Sri Purwaningsih, dan Santoso

Surimi is concentrate of myofibrillar protein obtained from mechanically deboned fish flesh, which is washed with cold water. Surimi is served as a potential raw material for a variety of products, which become more increasingly popular due to their unique textural properties. Since surimi is an intermediate product, therefore storage in frozen condition is usually performed. The experiment was carried out to study the adding effect of hydrolisate chitin and carrageenan with the mesh size of 150 and 300 in different concentration on the characteristics changing of surimi during frozen storage. Surimi was stored at -25°C for 90 days. Samples were evaluated the parameter of organoleptic, protein crude content, myofibril protein content, moisture content, water holding capacity, myofibril and total protein contents and increasing value of moisture content. Adding 4% chitin hydrolisate 300 mesh size and 2% carrageenan 300 mesh size produced the best surimi in each group. The best result was found in the treatment of chitin hydrolisate 300 mesh size with concentration of 4%. Therefore, chitin hydrolysate and carrageenan appeared to be promising alternative for replacement commercial cryoprotectants (sucrose and sorbitol) owing capability to maintain the natural flavor of fish surimi.

Keywords: carrageenan, sryoprotectant, surimi, frozen storage, chitin hydrolisate

Toksisitas Subkronis Tepung Siput Laut Nerita albicilla

Oleh

Rr. Puji Hastuti Kusumawati, Linawati Hardjito, Dewi Ratih Agungpriyono

A subchronic oral toxicity study was conducted on Sprague Dawley (SD) male rats to evaluate the safety of Nerita albicilla powder. The objective of this study was to observe the
subchronic toxicity of the Nerita albicilla powder on blood chemistry, liver and kidney. The toxicology study was done in 13 weeks, by observing the mortality and the clinical sign of body weight gain, the alteration of blood serum clinical pathology (such as: SGPT, SGOT, BUN/blood urea nitrogen, and creatinine), also liver and kidney toxicopathology. The SD rats were divided into four groups, each group (three animals/group) of rats received respectively 0 g/kg bw (control group), 0.04 g/kg bw, 0.4 g/kg bw, 4 g/kg bw of N. albicilla powder per oral via gastric intubation. The results indicated that there was no rat mortality, and no clinical and pathological symptoms during the study at 0.04 g/kg bw and 0.4 g/kg bw concentration. In conclusion, the N. albicilla powder did not showed subchronic toxic effect up to 0.4 g/kg bw dosage toward the SD male rats.

Keywords: Nerita albicilla, subchronic toxicity, toxicopathology

Penggunaan Bahan Pencuci Alkali dan Perendaman Filet Dalam Pembuatan Surimi Pada Formulasi Pempek Patin (Pangasius pangasius)
Oleh
Susi Lestari, Joko Santoso, Agoes Mardiono Jacoeb

Catfish (Pangasius pangasius) was initially washed with NaHCO3 and Na2HPO4 solution (0%, 3%, 5% and 7% w/v), followed by 1,2,3 and 4-washing cycles to obtain surimi with lower fat content and better gel strength. At alkaline solution of 0% (water) and one-washing cycle produced best gel strength of surimi (230,42 g.cm) and had fat content lower in compared to minced flesh. Soaking of fillet before mincing were carried out for 0, 10, 20 and 30 minutes and followed by either with or without washing. The treatments were performed to determine the effectiveness of washing with water to reduce fat content. The gel strength of the surimi was prepared by 30-minutes soaking and one-washing cycle in cold water was highest. This surimi was subsequently used in pempek formulation. Commercial pempek was used as comparing control. Based on the different assessment of panelists gained formulation of 400 g surimi, tapioca 200 g, 150 ml water and 24 g of salt produced the best pempek. The level of similarity between this pempek with comparing control is 65%.

Keywords: fat content, gel strength, pempek, soaking, surimi, washing.

Purifikasi dan Karakterisasi Inhibitor Katepsin dari Ikan Bandeng (Chanos chanos, Forskal) dan Ikan Patin (Pangasius sp.)
Oleh
Sefri Rusyadi, Tati Nurhayati, Ruddy Suwandi

Proteolytic enzymes are distributed in all types of organisms including fishes. The cysteine protease is the largest group and includes lysosomal cathepsins were shown to cause softening and degradation of the myofibrillar protein. The action of proteases was regulated with endogenous inhibitors. The purposes of this research were to optimize extraction of protease inhibitor from skin, muscle, and viscera of fishes, to purify chatepsin inhibitor from the selected source, and to study the characteristics of the chatepsin inhibitor. A chatepsin protease inhibitor has been purified to homogeneity from the muscle of milk fish (Chanos chanos, Forskal) and catfishes (Pangasius sp.). Previously, we report the purification and further biochemical characterization of the endogenous chatepsin inhibitor. The purification
was carried out by DEAE-Sephadex A-50 and Sephadex G-100. Throughout the purification procedure, chatepsin inhibitory activity was assayed using haemoglobin as substrate. The molecular inhibitor was 16.65 kDa, as estimated by SDS-PAGE and gel filtration. The smaller protein was purified with yield 1.85 % and purity of 16.91 fold. The chatepsin inhibitor was stable in the pH range of 7.0-9.0 with maximum stability at pH 8.0. Inhibitor presented thermal stability at temperature below 60 °C and exhibited maximum activity at temperature of 20-50 °C.

Keyword : chatepsin, characterization, protease inhibitor, purification.

Purifikasi Dan Karakterisasi Kolagenase Dari Organ Dalam Ikan Bandeng (Chanos chanos, Forskal)
Oleh
Tatty Yuniarti, Tati Nurhayati, Agoes Mardiono Jacoeb

The texture of fish is an important quality characteristics, and soft fillets are a problem for the fish industry. The quality of fish muscle will deteriorate during iced storage of raw fish. Endogenous proteases, which are able to hydrolyze different proteins in the muscles, are important early in the deterioration process. Endogenous fish muscle proteases are located in intracellular fluids in the sarcoplasm, or they are associated with various cell organelles. In the live animals, the proteases function in muscle protein turnover. After death, the biological regulation of the enzymes is lost, and the enzymes hydrolyze muscle proteins and resolve the rigor mortis contraction. The proteolytic enzymes to be important for the textural properties of fish muscle, namely calpains, cathepsins, and collagenases.

Endogenous collagenases may break down the connective tissue in the fish muscle and thereby lead to undesirable textural changes and gaping, in addition to rendering the components of the extracellular matrix more vulnerable to attack by other proteases. So that is important to know its characterization of collagenase.

The milkfish (Chanos chanos, Forskal) is the most widely cultured marine fish in the Indonesia. Milkfish constitutes 269.530 ton of total production volume 2.625.800 ton from aquaculture. Collagenases activity in milkfish found in internal organ, and the highest was at post rigor such as intestine, pyloric caeca and liver.

The objectives of this study were to study a part of internal organ has the highest collagenase activity, to purify that’s enzyme, and to characterize the enzyme with respect to it responses to pH, temperature, and inhibitors. We also observed temperature and pH stabilization of that’s collagenase and the molecular mass of the purified.

Collagenase was purified from internal organ of milkfish (Chanos chanos, Forskal), by extraction, ammonium sulfate precipititation, ion exchange chromatography on DEAE Sephadex A-50 and gel filtration on a Sephadex G-100 column. The molecular mass of the purified enzyme was estimated by gel filtration and SDS polyacrylamide gel electrophoresis (SDS-PAGE).

Crude extract from intestine had the highest collagenase activity. The purification were 114,731 fold. The optimum temperature and pH of collagenase were 50°C and pH 7-9, it was strongly inhibited by serine proteinase inhibitor (PMSF), and that activity was increased by Ca²⁺ and Na⁺. The molecular mass of milkfish serine collagenase was estimated to be 14,63 kDa dan 27,46 kDa. Collagenase stabilized at 10-50°C and pH 8-9.

Keywords: collagenase, purification, internal organ of milkfish, characterization
Nori is a thin sheet product that is proceeded from mixture of Porphyra and water and subsequently dries it on bamboo mat. There are four types of nori namely hoshi-nori (raw), yaki-nori (toasted), ajitsuke-nori (seasoned) and tsukudani-nori (pasted). Utilization of Porphyra as food product in Indonesia has not been optimized yet. The experiment was carried out to study: 1) effect of processing methods and seasoning formulation to the sensory profile and physicochemical characteristics of nori from Porphyra marcosii, 2) correlation between sensory profile and physico-chemical characteristics of nori from P. marcosii, and 3) identification volatile compounds of nori from P. marcosii. Initial experiment was carried out on characterization of dried raw material of algae and determined optimum time rehydration. Further study was conducted on hoshi-nori processing with water amount and time processing treatments and ajitsuke-nori processing with seasoning formulation and application methods. Seasoning formulation consisted of salt, sugar, soy sauce, mirin, fish and shrimp head extracts. Descriptive quantitative analysis (QDA) was used to study sensory profiles of nori and two treatments were chosen for further study by method of effectivity index (DeGarmo et al. 1984). QDA is a method of sensory analysis by which trained panels identify and quantify properties of a product. Physico-chemical analysis included proximate, amino acids, fatty acids, dietary fiber, yield, colour and volatile compounds identification. Principal Component Analysis (PCA) is a method used to display the relative locations of the samples. Optimum time to rehydration of dried algae run 22 minutes. There were differences of physicochemical characteristics between Porphyra marcosii and other Porphyra as result of difference on species, season, marine region and production site. Porphyra marcosii was not suitable for production of hoshi-nori but it was more suitable for ajitsuke-nori. Water amount and processing time treatments influenced sensory profiles of hoshi-nori product. Product ajitsuke-nori, which was smeared with fish extract seasoning formulation, had the best sensory profile. Correlation between sensory attribute and physico-chemical characteristics were statistically significant for only few attributes at 1% probability. Sweet taste, salty taste, acid odor, savory odor, roasted odor and fishy odor correlated with hue, palmitic acid and oleic acid. Sour taste, savory taste, bitter odor and melting rate correlated with protein, soluble dietary fiber, total dietary fiber, glutamic acid, aspartic acid, serine, alanine, tyrosine, phenylalanine, lysine, and leucine. Bitter taste, color and glossiness correlated with glycine, threonine, and arginine. Crispness correlated with b value, chroma and linoleic acid. Volatiles compounds of nori product were influenced by processing methods and seasoning formulation. Volatile compounds of P. marcosii and nori product included phenols, ketones, esters, alcohols, carboxylic acids, hydrocarbons, functional groups and aldehydes.

Keywords: Porphyra, nori, sensory, physico-chemical, volatile compound
Gracilaria verrucosa is one kind of seaweed which produces agar and has important economic value especially for food and pharmaceutical industries. Characteristics of agar are affected by some factors such as culture method, seed weight, and planting period of seaweed, which is specific locally in correlation to environmental parameters. Seaweed cultivation was carried out in brackishwater pond (temperature 25-29 oC, salinitas 25-28 ppt, deeply 60 cm, pH 6-7, nitrat 0,120-0,170 mg/l, fosfat 0,015-0,022 mg/l) at Selok Village, District of Adipala, Cilacap Regency, Central Java. The experiment was carried out to: 1) determine the culture method, seed weight and planting period that provides the best growth rate of G. verrucosa; 2) to measure the physico-chemical characteristics of agar from G. verrucosa at different culture method, seed weight and planting period.

This study was begin with the cultivation of G. verrucosa used the culture method floating raft and sinking raft, seed weight 50, 75 and 100 g, and planting period of 45, 60, 75 and 90 day. G. verrucosa dried cultivated and then checked the moisture content, ash and acid insoluble ash content. Research continued with the extraction of G. verrucosa to produce agar which then carried out characteristics of yield, moisture content, ash content, gel strength, and viscosity. The best agar of each method for culture method and then do characteristics of which 3,6-anhydro-L-galaktosa content, sulfat content, heavy metal, geling point, melting point, and whiteness. Variety of observation data were analyzed and followed by Duncan multiple range test, with the program spss 13 on level 95%.

Environmental conditions at research area are suitable for cultivation of G. verrucosa. Seed weight and planting period had influence on growth rate of G. verrucosa, which floating method gave higher growth rate than sinking method. The quality of agar which cultivated using floating method was better than sinking method. Floating method with 50 g of seed weight and harvesting time at 60 days gave the best quality of agar.

Keywords: Gracilaria verrucosa, metode penanaman, bobot bibit, umur panen, agar

Shrimp head is fisheries waste that contains minerals, chitin and pigments. These waste can be extracted as an antioxidant source since it’s contains carotenoids such as astaxanthin and beta carotene. The objective of this research was to determine the optimum concentration of HCl on demineralizing shrimp head and to determine the optimum concentration of enzymes (pepsin or papain) on carotenoid pigments extracting and to characterize it’s antioxidant properties. The research consisted of two steps, i.e. preliminary and main research. The preliminary research was carried out to find out the optimum HCl concentration on demineralizing of shrimp head; whereas the main research was conducted to determine the optimum concentration of pepsin and papain enzymes on extracting of carotenoid pigments. Demineralization of shrimp head was initiated by cooking for 10 minutes (70-80°C), continued by soaking in HCl in concentration of 0; 0.75; 1.00 and 1.25M for 30 minutes. The optimum
The condition to demineralize of shrimp head waste was using HCl 1,25M for 30 minutes, whereas the optimum activities of pepsin and papain enzymes were pH 4 at 45°C and pH 6.2 at 55°C respectively. The concentration optimum of pepsin enzyme on carotenoid pigments extracting was 3%, which obtained phenolic compound of 83.76 mg GAE/l, inhibited oxidation of 32.87% (equal to 285.79 mg AAE/100g), had IC_{50} 2.05 µg/ml and contained 15.58% of beta carotene and 13.65% of astaxanthin; whereas the optimum concentration of papain enzyme was 8% produced phenolic compound of 49.35 mgGAE/L, inhibited oxidation 17.27% (equal to 150.00 mgAAE/100g), had IC_{50} 3.85 µg/ml, contained 15.58% of beta carotene and 11.62% of astaxanthin.

Keywords: Antioxidant, carotenoid, characterization, enzymatic, extraction, shrimp head.

Pemanfaatan Daging Ikan Tuna sebagai Kerupuk Kamplang dan Karakterisasi Produk yang Dihasilkan

Sitkun Deni, Linawati Hardjito, Ella Salamah

The objective of this research was to improve the kamplang crackers formulation. The research consisted of three parts. The first part, included the determination of tuna fish fillet quality (pH, TVBN and TMA), proximate analysis, heavy metal analysis and carrageenan concentration to the kamplang crackers formulation. The second part, was the production of kamplang covering the determination of sago and tapioca composition, tuna fish concentration, with carrageenan concentration that was selected in the previous part, applied sensory analysis and Analysis Hierarchy Process (AHP) to select the best products. The third part, was the determination of physical, chemical and microbiological characteristic of raw and fried kamplang. The results indicated that the tuna fish fillet described pH of 5.44±0.18 mg N/100 g, Total Base Nitrogen (TVBN) of 14.15±4.27 mg N/100 g, Trimetilamine (TMA) of 2.16±0.30 mg N/100 g, Cu of 4.40 ppm, Hg and Pb were not detected. Based on the results, it was concluded that the tuna fish fillet was in a good condition and safe to be consumed. The proximate of moisture, ash, protein, fat and carbohydrate were 72.20±0.38%, 2.14±0.09%, 21.30±1.65%, 0.38±0.00%, and 3.97±1.18%, respectively. The result of chemical characteristic analysis of raw kamplang crackers showed highest moisture content of 11.62±0.02% at commercial product, lowest protein content of 8.24±0.00% at product of sagotapioca 2:3 and tuna fish of 30%, and highest TPC was 2.5 x 10^4 colonies/g found in commercial product. The physical characteristic of fried kamplang crackers indicated that highest efflorescence level was 207.08±20.24% at product of sugu-tapioca 1:1 and tuna fish of 30%, and lowest hardness was 698.10±7.58 gf at product of sugu-tapioca 2:3 and tuna fish of 30%. The selected kamplang crackers, fulfill the SNI 2713.1 2009.

Keywords : utilization, fish, tuna, kamplang, crackers
Aplikasi Bakteri Lactobacillus plantarum 1B1 Pada Sosis Fermentasi Ikan Patin (*Pangasius* sp) 
Oleh 
Rita Marsuci Harmain, Linawati Hardjito, Winarti Zahiruddin

Catfish (*Pangasius* sp) is a potential commodity for local and export market. Fermented sausage provides health benefit, aroma specific and highly flavor product. This study aimed to produce fermented sausage of catfish (*Pangasius* sp.). The experiment applied storage period as a treatment. It was done by completely randomize design with single factor. The results of intensity rating sensory test was analyzed by randomized Complete Block Design, and hedonic test by non parametric *Kruskall Wallis* method. The result showed the best formulation to produce fermented sausage was the addition of carageenan of 2%, Soy Isolate Protein of 0,1%, angkak 0,5%, tapioca flour of 1,25% and Lactic Acid Bacteria *Lactobacillus plantarum* 1B1 of 10mL at OD 600 nm of 1,5. Storage periode effected the sensory hedonic value and total microorganisms, the number of lactic acid bacteria, *Escherichia coli*, *Salmonella* sp., *Staphylococcus* sp., yeast/mould, pH and water activity. The product that was stored for four days was the best interm of lactic acid bacteria and hedonic sensory value. Fermentation process influenced on amino acid, free amino acid, fatty acid content. Those compound resulted aromatic and flavor enhancement.

Keywords: catfish, sausage fermented, sensory, functional food, flavor

Identifikasi Bakteri Dan Komposisi Kimia Produk Fermentasi Telur Ikan Tambakan (*Helostoma temminckii* C.V) 
Oleh 
Rafitah Hasanah, Linawati Hardjito, Bustami Ibrahim

The research aimed to identify bacteria found in fermented kissing gourami fish roes. Furthermore, chemical composition of fermented product was reported. The parameters analyzed were metal content and proximate of fresh fish roes. Analyzed parameter of fermented product included proximate, Cl content, pH, amino acid, free amino acid, fatty acid and minerals (Mg, Ca, K, Na) contents. The results described 5 (five) different colony of bacteria grew dominantly. Those colonies were isolated using tryptic soy agar (TSA) media and determined using BBL Crystal method. The bacteria were identified as *Bacillus megaterium*, *Leifsonia aquatic* (*Corynebacterium aquaticum*), *Corynebacterium propinquum*, *Lysinibacillus sphaericus* (*Bacillus sphaericus*). The chemical analysis of fresh fish roes showed it contained Hg<0,001 mg/Kg, Pb<0,01 mg/Kg, Cd<0,01 mg/Kg. The moisture, protein, fat and ash content were 43,82±0,01%, 12,64±0,47%, 21,73±2,19%, 0,99±0,04% respectively. Based on the results it was concluded that fish roes was in a good condition and safe to be consumed. The chemical composition of the fermented product were 39,26±0,47%, 11,84±1,92%, 15,14±1,92%, 12,45±0,38% for moisture, protein, fat and ash respectively. Minerals contents were 0,08%, 0,06%, 0,15%, 4,76% for K, Ca, Mg, Na respectively. Cl content was 10,25% and pH of 5,26. The higher amino acid content of fermented fish roes protein was glutamic acid (2,02% of total amino acid) and the limiting amino acids were threonine and leucine. In addition it also contained free amino acid. Fatty acid composition of fermented showed that palmitoleic acid was higher than the others.

Keywords: fermentation, identification, kissing gourami fish roes.
Komposisi Kimia Dan Identifikasi Senyawa Antioksidan Dari Ekstrak Tambelo (*Bactronophorus thoracidades*)

Oleh

Juliana Leiwakabessy, Linawati Hardjito, Sri Purwaningsih

Tambelo (*Teredinidae*) is consumed freshly by local people in Papua without removing the digestive tracts. This study aimed to investigate the chemical composition of fresh tambelo, to conduct antioxidant and phytochemistry tests, and to identify the compound of active antioxidant obtained from selected fractionated extract. The research consisted of two stages. The first stage involved the analyses of proximate, fatty acid, amino acid and mineral. The second stage was the extraction of active materials by means of maceration. The maceration result was evaporated and partitioned with a solvent of n-hexane and ethyl acetate. Next, the extract underwent phytochemical and antioxidant tests (20, 40, 60, and 80 ppm) with DPPH method applying BHT and vitamin super ester C as the standard with a concentration of 4, 6, 8 and 10 ppm. Finally, the identification of fresh antioxidant compound was carried out using LC-MS. The composition of fresh tambelo divided into moisture 82,72±0,01%, protein 7,21±0,31%, fat 0,28±0,04%, ash 2,07±0,27%, and carbohydrate (by difference) 7,72±0,62%. The composition of dried tambelo was moisture 6,63±0,01%, protein 42,77±2,01%, fat 14,27±0,22%, ash 5,88±1,04%, carbohydrate (by difference) 30,45±2,83%. The protein of tambelo contained nine essential amino acids and eight non essensial amino acids. It had seven saturated fatty acids and eight unsaturated fatty acids. It contained calcium of 3532,46 ppm and phosphor of 2363,06 ppm. The highest antioxidant activity was found in the crude extract of ethyl acetate with IC50 of 15 ppm. The highest antioxidant activity obtained by clumn fractionation was the 9th fraction with IC50 of 8,87 ppm. Phytochemical test,described the crude extract of tambelo contained a group of alkaloid, flavonoid, steroid and triterpenoid. MarinLit database (Blunt and Blunt 2008), 9th fraction was similar to farnesic acid glyceride, sesquiterpenoic acid glyceride and labdane diterpenoid.

Keywords: activity antioxidant, teredinidae, shipworm, chemical, compound.

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Formulasi dan Uji Stabilitas Minuman Fungsional Berbahan Dasar Lintah Laut (*Discodoris* sp.)

Oleh

Asri Silvana Naiu, Tati Nurhayati, Nurjanah

Since long time ago people who live in some seaboards of Indonesia have been exploiting of fresh sea slugs (*Discodoris* sp.) which provide health benefits for human body. For the purpose, we conducted research about antioxidant activity and formulation on functional foods formulas based sea slugs. At this research, we made six kinds of formula with composition of sea slugs as treatment. We added ginger and citric acid as aroma and taste neutralizers for the sea slugs. They were applied in the same number for all formulas. Dry sea slug powder, dry ginger powder, and citric acid were formulated in a teabag, then the antioxidant activity was tested by applying of DPPH method. Observation based on the temperature and volume of water, and infusing time. The result showed that Formula 3 which contained of 0,24 grams dry sea slug powder that was infused over 20 minutes in 70 ml water of hot water 90 oC had highest antioxidant activity by 46,16%. There was a synergistic effect of antioxidant to Formula 3. Based on the product stability testing by chemical and
microbiology measurements showed that the product had shelf-life by 33 days in 20°C storage condition.

Key words: Discodoris sp., antioxidant, formulation, stability

Ekstraksi dan Identifikasi Senyawa Bioaktif Lintah Laut (Discodoris sp) Sebagai Antioksidan
Oleh
Hafiluddin, Tati Nurhayati, Nurjanah

One of commodities produced from the ocean that have a bioactive compounds is a sea slug (Discodoris sp). That is very interesting to study mainly deals with the nature of both chemical and biochemical characteristics and their use for the field of food and health. The purpose of this study is to determine the nutrient content of sea slug, determine antioxidant activity, and determine the bioactive compounds of sea slug. The experiment was conducted with several stages: sample preparation, extraction bioactive compound, fractionation by TLC and identification of compounds by GC-MS. Sea slug from the island of Madura Pamekasan potential as a source of protein, fat and minerals. Sea slug has esensial amino acids amount to 5,57% was dominated by leucin of 1,42%. Nonesial amino acids amount to 6,54% which was dominated by glutamic acid 2,19%. Saturated fatty acids amounted to 27.53% of sea slug was dominated by palmitic (C16:0) which was 13.36%. Unsaturated fatty acids amounted to 34.66%, which was dominated by the essential fatty acids linolenic (C18:3, n-3) 20.91%. The highest yield of the crude extract was ethanol of 6.97% and contained alkaloid, steroids, saponin, phenols, carbohydrates and reducing sugar compound. The bioactive compounds in the meat of sea slug with ethanol solvent was galoxolide, dibuthyl phthalate, di-n-octyl phthalate, oleic acid amide, erucylamide, squalene and has an IC\textsubscript{50} best antioxidant activity in fraction 5 at 150.92 ppm.

Keywords: antioxidant, bioactive compounds, sea slug (Discodoris sp)

Karakterisasi dan Pendugaan Umur Simpan Savory Chips Ikan Nike (Awaous melanocephalus)
Oleh
Nikmawatisusanti Yusuf, Sri Purwaningsih, Wini Trilaksani

Nike fish (Awaous melanocephalus) were schooling of juvenile fish species found in Gorontalo waters. Nike processing as a savory snack chips was an effort to diversify the fishery products and one of some alternatives to meet the needs of healthy and nutritious snacks. The purpose of this study was to characterize the nutrition of nike, determine the formula of savory chips, learn best frying time and temperature for nike savory chips products, and predicted the shelf life. Formulation study was conducted with 3 flour (rice, tapioca, and wheat) which were added with sodium bicarbonate (baking soda) as anticaking agent. The frying method used deep-fat frying at a temperature 160°C, 170°C, and 180°C, for 3, 4, and 5 minutes. Selected product was determined for texture and sensory analysis. Estimation of shelf life savory chips conducted with acceleration method on 3 conditions of storage temperature, and 2 packaging materials types (aluminium foil and polypropilen). Thiobarbituric acid value (TBA) used as a parameter of the reduction in quality chips. Nike fish’s nutritional composition consisting of
proximate including 79.76% water, protein 16.89%, fat 0.76%, 0.3% carbohydrate, and ash 1.93%. The highest concentration of essential amino acid was conceived by 1.153% leucine and 0.843% lysine, and the highest concentration of non-essential amino acids dominated by amino acids glutamate and proline approximately 1.478% and 0.821%. Unsaturated fatty acid content of nike is relatively high that composed dokosaheksanoate acid (DHA) 14.81%, 8.50% oleic acid, and eikosapentanoat acid (EPA) 2.22%. Mineral composition of nike consisted of calcium 677.34 ppm, 211.58 ppm magnesium, iron 15.77%, 17.88 ppm zinc, iodine 0.079 ppm.

The best selected formula of savory chips was a formulation from rice flour and tapioca with 1.5% anticaking agent concentration, and the temperature of 170°C for 5 minutes is the best frying temperature and frying time. Characterization of selected products indicating nutritional composition of the water content of 4.62%, 37.03% fat content, and 22.62% protein content. Products were packed by aluminium foil packaging slower rate of decline in quality than the polypropilen packing, and had a longer shelf life as long as 360 days at room temperature, so the alufo packaging can be recommended as a packing method for nike savory chips.

Key words: Awaous melanocephalus, characterization, formulation, shelf life.

Formulasi Biskuit Dengan Penambahan Tepung Ikan Lele Dumbo (Clarias gariepinus), Asam Folat, Vitamin A dan Zat Besi (Fe) untuk Meningkatkan Kesehatan Ibu Hamil dan Menyusui [Kajian Pendahuluan Menggunakan Uji In-Vivo pada Mencit (Mus mucuslus)]

Oleh
Raspiana, Ruddy Suwandi, Bambang Riyanto

Fish meal is a source of good and complete nutrition. In form of fish meal, it still could be used as a source of protein, either for food or feed utilization. Catfish is a species of freshwater fish consumed in Indonesia, it has a good taste and high nutritional content. Most of all consumed catfish in Indonesia are produced from aquaculture farm. To increase the utilization (beside being processed into several main products and its diversification), catfish could also be processed into fish meal, which used as substitutional material for wheat flour in this study. Biscuit were formulated with additional material of catfish meal (from body and head parts), folic acid, ferro sulphate and retinol A. The study was carried out through an in-vivo laboratory research using 75 mice (Mus mucuslus).

The study indicated that fish meal from the head part as much as 24.19 percent while from the body 63.15 percent. The appearance is slightly brownish for head's fish meal and whiter for body's fish meal. Proximate chemical tests on samples of biscuit formula shows that the levels of fat and protein have met the fismeal's national standards, while the moisture content, ash and carbohydrates are still below the standards (SNI 01-2973-1992). Growth in weight of mice witch fed biscuit samples were better than mice with control feed (F5). The F1-F4 formula larger 22.17 percent compared with formula F5. The total serum test was carried out and showed that the biscuits formula fortified with folic acid, vitamin A and iron (Fe) significantly affected on the increase of mice's micronutrient status.

Keywords : Catfish meal, Folic Acid, Infant Health, Iron (Fe), Vitamin A.
Indonesia is a rich country of natural resources, specially aquatic resources. One of them is seaweed that is a potential commodity that has a good prospect and high economic value. *Kappaphycus alvarezii* is also known by the trade name of *Eucheuma cottonii* is one of the class Rhodophyceae (red seaweeds) producing carrageenan. Carrageenan is located in the middle of lamella in the cell wall of plant forming a condensed material. Histology on seaweed aimed to observe changes in the structure of organs in some harvesting time. Histology on seeds origin from Kota Baru showed round shapes and seeds origin from Karimun tended to oval shapes after using thoulidin blue. Increasing in age of plant, the organs tended to irregular shapes. Carrageenan is a hydrocolloid secondary metabolite that is chain length polysaccharide resulted from the extraction of dried seaweed *Kappaphycus alvarezii*. Carrageenan is useful as gelling mixtures agent, stabilizer, emulsifier, suspending agent, and dispersing agent. The quality of carrageenan is influenced by several factors such as cultivation method, raw materials used, and methods of extraction. Dried seaweeds were taken from the Bogam Bay Kotawaringin Barat, County District Kumai, Central Kalimantan. The seeds origin of the seaweed were from two different places those are Kota Baru and Karimun Island. Both of the seeds were from aid of Marine And Fisheries Affairs of Kotawaringin Barat Regency. The observation was done on 30, 45 and 60 days of harvesting time. Water content, ash and acid insoluble ash content were analyzed. Addition of 0.05%, 0.10%, 0.15% chitosan in the extraction process aimed to refining, improving the quality of carrageenan, and reducing of chemicals materials during the process. This research resulted that only the 30 days of harvesting seaweed showed the difference structure of organs either seed from Kota Baru or Karimun Island. The yields, water content, ash content, gel strength, and viscosity were analyzed on carrageenan powder. it was obtained that seeds origin from Kota Baru which were harvested within 45 days, and addition of 0.10% chitosan in extraction process was the best quality of carrageenan. While the origin seed from Karimun Island has the best quality for 45 days harvesting with the addition of 0.15% chitosan. Heavy metal, whiteness, sulphate content, swelling point, and melting point were analyzed on the best carrageenan from both seeds origin.

Keywords: carrageenan, *Kappaphycus alvarezii*, seeds origin, harvesting time, extraction using chitosan.

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*Ikan pe, ikan fufu, ikan salai* and *ikan kayu* are Indonesian traditional smoked fish delicacies. The differences in raw materials, type of woods, smoking conditions and methods that were applied in Indonesian smoked fish processing gives the products its special characteristics. All of these varieties will affect its chemical and flavor characteristics. The aims of this research were to inventory Indonesian traditional smoked fish processes and also to identify flavor compounds, chemical and sensory characteristics of each product. This research was carried out in two stages. The first one was interviewing the smoked fish processing owner, observing on smoked fish process and collecting samples and in second stage, samples were analyzed on
its composition of proximate, phenolic, salt, free amino acids and Gas Chromatography-Mass Spectrometry was used to identify polycyclic aromatic hydrocarbon content and volatile compounds in smoked fish. Quantitative Descriptive Analysis with Principal Component Analysis were used to evaluate samples sensory characteristics based on attributes that were given by 10 trained panelists was also performed. The results showed that samples differences gave a significant effect on moisture, ash, fat, protein, total phenol and salt contents. Ikan pe had the highest water content (76.44%), total phenol (59.34 ppm) and salt content (0.29%) compared to other samples. Ikan kayu had the highest protein (69.12%) and carbohydrate (7.98%) content and ikan salai had the highest ash (5.55%) and fat (5.87%) content. The free amino acids analysis result were varied depends on the type of samples and none of any 18 Polycyclic Aromatic Hydrocarbon compounds (at detection limit 660 ppb) were detected in any of these samples. Most volatile compounds detected came from hydrocarbons, aldehydes, ketones, alcohols, furans, phenolic, ethers and esters groups. The Quantitative Descriptive Analysis and Principal Component Analysis results showed that each sample had a certain distinctive characteristics on aroma and taste sensory attributes and can be characterized based on those certain sensory attributes.

Keywords: flavor, smoked-fish, volatile, sensory

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Pengembangan Edible Coating pada Udang Rebus Berbahan Dasar Surimi Limbah Filet Ikan Kakap Merah (Lutjanus sp.)

Oleh
Iis Rostini, Bustami Ibrahim, Wini Trilaksani

Cooked shrimp is a value added product with high protein content, specific taste, ready to eat, and have an interested colour for consumers. Cooked shrimp must be protected from quality deterioration during storage. The purpose of this study was to determined physical characteristics of edible coating made from meat of red snapper fillet waste; examined the effectivity of surimi edible coating protection towards physic, chemistry and microbiology damage indicators; learned surimi edible coating application to inhibit the quality deterioration of cooked shrimp during storage at 1-5 oC. Surimi concentration that used as edible coating were 2, 6, 10, and 14% (w/v), each edible coating treated with two treatments, which were without and added by secang extract. Peeled undevined (PUD) vannamei (Litopenaeus vannamei) with size 60-70 was used as object. Application of surimi edible coating on cooked shrimp was comprised boiled then coated and coated then boiled. Quality of cooked shrimp alteration was determined everyday, including total plate count (TPC), total volatile base (TVB), pH, water content, aw, water holding capacity (WHC), and colour exchange. The treatments giving best result were edible coating with 14% surimi concentration, added by secang extract, and processed with boiling then coating. Surimi edible coating combined with secang extract effectively protect cooked shrimp towards physic, chemistry, and microbiology damage, improved cooked shrimp appearance, stabilized colour during storage, and extended the shelf life until 6 days.

Keywords: cooked shrimp, surimi edible coating, secang extract, shelf life.
Pemanfaatan Konsentrat Protein Ikan dan Tepung Tulang Ikan Lele Dumbo (*Clarias gariepinus*) dalam Makanan Bayi Pendamping ASI

Oleh
Lilis Widiyawati, Joko Santoso, Komariah Tampubolon

Low intake protein is the one problem nutrition in Indonesia especially for infant growth. Using *Clarias gariepinus* oversizes for protein resources can improve its economic value. Non edible portion from *Clarias gariepinus* oversizes (bones) can used as calcium sources. Fish protein concentrate (FPC) and fishbone flour can used as protein and calcium resources respectively in infant food formula. The research was carried out to determine: (1) the best extraction method (extraction time and extraction repeating phase) to produce FPC, (2) the best method (wet and dry method) to produce fishbone flour and (3) the best infant food formulas. The most effective extraction method was 30 minutes with 3 times of repeating, produced type B of FPC. The profile of essential amino acid of FPC was adequate lysin, with histidin was a limiting essential amino acid. Fishbone flour that produced from wet method showed higher yield and total calcium than dry method. The infant food formulas B1 (75% skim milk : 25% FPC + 1g fishbone) and C1 (50% skim milk : 50% FPC + 1g fishbone) produced the best organoleptic properties. Both formulas had lower water and fat absorption and higher bulk density in comparison to commercial product. The infant food formulas have fulfilled WHO/FAO infant food standard based on proximate composition. The protein digestibility of formulas B1 and C1 were 92.86% and 92.03% respectively. The profile of essential amino acid of formulas B1 and C1 was adequate lysin with no was a limiting essential amino acid.

Keywords: *Clarias gariepinus* oversizes, fish protein concentrate, fishbone flour, infant food

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Pengasapan Cair Dengan Kombinasi Larutan Pala (*Myristica fragrans*) Sebagai Pengawet Tambahan Pada Ikan Cakalang (*Katsuwonus pelamis*) Asap Tradisional Kota Ternate

Oleh
Sahrazad Ridha Kasim, Ruddy Suwandi, Bustami Ibrahim

Study on the effects of liquid smoke concentration combine with nutmeg fruit juice (*Myristica fragrans*) on the quality of smoked skipjack has been conducted. The objective of the study were to observe the effect of dipping treatment on chemical and sensory characteristics of skipjack fillet in storage at room temperature. Using the wells agar method, antibacterial activity of nutmeg fruit juice was analyzed with *Staphylococcus aureus* as subject. The preliminary studies give positive result with the formation of clear zone around the wells about 27mm in diameter. Shelf life of fish smoke increased TVB from 114.23 to 155.75, but the nutmeg fruit juice caused no significant difference to TVB value during 5 days storage. Levels of phenols both 10% and 15% of nutmeg juice fruit gives additional phenol and ability to inhibit the oxidation rate of smoked skipjack stored at room temperature, with TBA value after five days storage 1.958 and 2.305 mg malonaldehyde/100gr respectively. Range water activity during five days storage between 0.811 to 0.903. a_w is enough for bacteria and mold to grow and shorten product’s shelf life. The cooking process at 80ºC and 6-7 hours caused the antibacterial in the flesh vaporized. Beside the microflora of nutmeg, carbohydrates contained in nutmeg juice can will accelerate the growth of fungi, and related to a_w levels of smoked fish product. There is decrease of a_w level from 0.90 to 0.84 five day storage, which is the optimal condition for mold to grow. Smoked fish with liquid smoke treatment has the highest preference level, especially in appearance (6.16) and odor (6.29).
Pemanfaatan Siput Laut Gonggong (*Strombus canarium*) Asal Pulau Bintan Kepulauan Riau Menjadi Seasoning Alami

Oleh

Lily Viruly, Joko Santoso, Winarti

Gonggong is one of the sea snails, endemic species living on coastal waters of Bintan Island and surrounding islands of the Province of Riau- Archipelago. Traditionally, it is used to boost the appetite and vitality. The aim of the study is to utilize gonggong as natural seasoning through fermentation process (biological/semi-biological) to hydrolyze protein from the snail. It was made by using gonggong and pineapple concentrate with the ratio 1:4 (w/v), 2% (w/v) of sugar and 15% (w/v) of salt. Then, the products were fermented in an airproofed container at 25 oC for 10 days. The fermentation processes were stopped using sterilization (121 oC, 15 min) and pasteurization (70 oC, 30 min). The final product of seasoning was stored for 14 days. At each week, pH, total lactic acid, TPC and hedonic test of the products seasoning were analyzed. The best product of the seasoning was compared to commercial product of oyster sauce (“Saori”) using description, paired comparison and chemistry tests. Results of the research indicated that fresh gonggong contains 19.77% of protein and 4.1 mg/g of free amino acid glutamate. It is more preferred than “Saori” which had been sample pasteurized and stored for 7 days at 25 oC. Levels of pH, total lactic acid, TPC, and free amino acid content of this seasoning were 4.75, 0.53%, 1.48 x 103 cfu/g, and 8.0 mg/g, respectively. It had 7 value of based on hedonic test, furthermore description and paired comparison tests was better than commercial original seasoning (“Saori”). The results suggest that it can be used as an alternative seasoning to replace the synthetic seasoning (MSG).

Keywords: gonggong, sea snail, seasoning, free amino acid, hydrolysis

Aplikasi Kappa Karaginan dari Rumput Laut *Kappaphycus alvarezii* sebagai Edible Film pada Udang Kupas Rebus

Oleh

Nurlaila Ervina Herliany, Joko Santoso, Ella Salamah

One of the most popular seaweed in Indonesia is *Kappaphycus alvarezii* that produce carrageenan. Carrageenan is a linear polysaccharide polymer, has a lot of function in industrial used such as viscosifier and gelling agent. Using carrageenan as edible film can improve its economic value. The research was carried out to study: (1) the optimum of KOH concentration (0.5; 1 and 1.5% w/v) and extraction time (1; 2 and 3 hours) to produce carrageenan, (2) the effect of carrageenan concentration (0.5; 1; 1.5 and 2% w/v) on the characteristic of edible film and (3) the effect of application carrageenan on coating of boiling shrimp quality during chill storage. This research consist of three steps as follows, carrageenan extraction, making of edible film and application carrageenan solution on coating of boiling shrimp coating. The research shows that yield and viscosity of carrageenan were influenced by interaction of KOH concentration and extraction time. The best treatment was extraction with 0.5% KOH solution for 1 hour. Using 1.5% carrageenan on making edible film exhibited better properties in compared to others. Carrageenan concentration demonstrated significant
effect on tensile strength and elongation percentage, however exhibited insignificant effect on thickness and water vapor transmission rate. SEM analysis shows that addition of carrageenan could improve the internal structure of edible film. Application of carrageenan solution on boiling shrimp coating indicate that coating application could extend its shelf life until 9 days based on value of total microbes for frozen boiling shrimp (SNI 01-3458-2006), while uncoated product could extend only 3 days.

Keywords: boiled shrimp, carrageenan, edible film, extraction method

Karakteristik Nugget dari Ikan Lele Dumbo (*Clarias* Sp) dengan Bahan Pengisi dan Pelapis dari Talas Bogor
Oleh
Mutia Hikmawati, Sri Purwaningsih, Bustami Ibrahim

The study was carried out to characterize proximate composition of catfish, taro corms and taro flour and to evaluate the effect of washing catfish mince (0, 1, 2, 3 times) and taro flour’s concentration (0%; 5%; 10%; 15%; 20%) on the parameters of filler. The best result of the previous treatment was used to evaluate the effect of taro flour and maize starch ratio (4:0; 3:1; 2:2; 1:3; 0:4) on the parameters of batter. In order to characterize nugget product and to estimate its self life, the best result of the third treatment was used. The selected nugget product is produced from catfish mince with once washing treatment and 5% taro flour’s concentration as filler, and 1:3 taro flour and maize starch ratio for batter. The most abundant amino acids was glutamic acid (2%) while leucine was the most abundant essential amino acid (0.86%). The fatty acid compositions score showed that unsaturated fatty acid was higher than saturated fatty acid. The highest unsaturated fatty acid was oleic acid (30.44%) and the lowest was miristoleic acid (0.02%). Potassium (K) was the highest mineral content and flour (F) was the lowest ones. Quantitative descriptive analysis showed that nugget product has higher fish flavour and crunchiness, and lower oiliness values than commercial nugget. Results of the present study suggest that TPC appeared to be the main measurable indicators of quality changes in nugget product. Based on TPC, the estimation of product’s shelf life was 27.35 weeks (191.45 days).

Keywords: catfish, taro flour, filler, batter, nugget

Produksi Transglutaminase dari *Streptoverticillium ladakanum* dengan Media Alternatif yang Mengandung Hidrolisat Limbah Cair Pengolahan Surimi dan Tepung Tapioka
Oleh
Untung Trimo Laksono, Tati Nurhayati, Achmad Poernomo

Microbial Transglutaminase (MTGase) is one of the potential gelling agents for textural properties on proteins based products. MTGase could be produced from fermentation of *Streptoverticillium ladakanum*. The source of N and C for fermentation of *Sv. ladakanum* can be manipulated from low economic sources such as Surimi Wash Water (SWW) and tapioca starch. The aim of this study was to obtain alternative growth media for *Sv. ladakanum* and applicate this enzyme to fish meats (lele and nila) compare with carragenan and STPP. Tapioca starch and SWW were hydrolized by α-amilase 0.09% (v/v) and crude papain 1% (b/v).
Hydrolysates was added to replace pepton and glycerol from initial media. Media was fermented on 30 °C and 150 rpm on orbital shaker for 6 days and the sampling was done every 24 h. MTGase activity increased depend on treatment combinations, the highest activity has found in N3T3 (0,15% SWW and 1,5% Tapioca starch hydrolysates) with 0,6889 U/mL for 3 days (72 H). Crude enzyme was condensed by using ultrafiltration and increase to 2,209 U/mL. Characteristic of this enzyme on optimum pH were 6 on acetic acid buffer, optimum temperature 40 °C and not inhibited by Na+, Ca2+, Mg2+, K+, Fe3+, and EDTA but inhibited by Li+. Additions MTGase on lele (Clarias sp.) meat increased the gel strength, folding test hardness, chewiness, and cohesiveness however decreased in WHC and springiness. The effect of MTGase additions on nila (Oreochromis niloticus) meat could increased the folding test, and sensories texture, but low in WHC, gel strength, hardness, cohesiveness and chewiness.

Keywords: enzyme, activity, hydrolysates, MTGase, Sv. ladakanum, texture

Pemanfaatan Air Cucian Surimi dan Tepung Tapioka Sebagai Media Pertumbuhan Streptoverticillium ladakanum Oleh Suwarjoyowirayatno, Tati Nurhayati, Singgih Wibowo

Surimi wash water (SWW) and tapioca starch can be utilized as bacterial growth media. The SWW can function as nitrogen source and tapioca starch as carbon source. This utilization can reduce medium cost for TGase enzyme production for Streptoverticillium ladakanum. This study was aimed to observe the optimum composition of medium substitution SWW and tapioca starch. Beside that, the effects of application enzyme MTGase production on surimi from lele fish (Clarias sp.) were studied. Response Surface Method (RSM) was used to determine the optimum composition of medium for S. ladakanum and then applied on surimi. The combination of 65% SWW:35% pepton and 75% tapioca starch:25% glyserol resulted in the optimal enzyme activity of 0,6311 U/ml. The optimum pH and temperature enzyme activity was 6 and 35 °C respectively. The activity of this enzyme was increased with addition of metal ion Na+, Ca2+, Mg2+, K+, Li+, Fe3+ and it was not inhibited with EDTA inhibitor 5 mM. This MTGase enzyme application on kamaboko from lele fish showed that the structure of meat more solid and homogen, it was improved the mechanical properties of textural meat such as gel strength, water holding capacity, folding test and sensory value.

Keywords: Kamaboko, MTGase, Response Surface Method, S. ladakanum, Surimi wash water, Tapioca starch.

Aktivitas Antioksidan dan Efek Hepatoprotektif Ekstrak Daun Mangrove Api-api Putih (Avicennia Marina) Oleh Safrina Dyah Hardiningtyas, Sri Purwaningsih, Ekowati Handharyani

Grey Mangrove (Avicennia marina) is a native plant used in traditional medicine, especially for treating a variety of liver disorder. This research aimed to extraction of antioxidant compound from Grey Mangrove leave, purification of antioxidant compound from crude
extract, and in vivo test of effect hepatoprotective of crude extract selected. The effects of extraction parameters (solvent extraction and extraction time) on extracting of antioxidant compounds from A. marina were determined based on single factor experiment. After solvent extraction, the A. marina extracts were subjected to antioxidant compound assays used 1,1-diphenyl-2-picrylhydrazil (DPPH) method. Purification of ethyl acetate extract was conducted using column chromatography followed by preparative TLC. In vivo test was performed by evaluated malondialdehyde (MDA) level, enzyme of aspartate transaminase (AST) dan alanine transaminase (ALT) level, and histopathology. The result showed that extraction A.marina leaf with ethyl acetate solvent at 1 day resulted in the best antioxidant activity. Phytochemical of ethyl acetate extract of A.marina leaf is flavonoid and steroid/triterpenoid. Fraction 1 from crude ethyl acetate extract showed highest antioxidant activity. Treatment with ethyl acetate extract of A.marina leaves normalized various biochemical parameters (MDA, AST, and ALT level) of oxidative stress and was compared with standard Silymarin. Therefore, the results of this study show that A.marina leaves can be proposed to protect the liver against CCl4-induced oxidative damage in rats, and the hepatoprotective effect might be correlated with its antioxidant and free radical scavenger effects.

Key word: mangrove, Avicennia marina, antioxidant, hepatoprotective

Penggunaan Edible Film dari Kitosan dengan Plasticizer Karboksimetilselulosa (CMC) sebagai Pengemas Burger Lele Dumbo
Oleh
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The aim of this research was to study the capability of CMC in improving the characteristics of edible film made from kitosan, as well as to see the ability of edible film in maintaining the shelf life of fish burger product at room temperature. Three various concentration of CMC was used, namely 0.1%, 0.3% and 0.5%. The results of kitosan edible film characterization from the three concentrations of CMC showed that the concentration of 0.1% was the best concentration as a plasticizer, with thickness 0.19 mm, water vapor transmission rate 50.8 ml/m2/day, the tensile strength 24.2 kgf/cm2 and percentage elongation 18.1%. The shelf life of fish burger wrapped with kitosan edible film with 0.1% CMC was longer (two days) than burger without edible film at room temperature, indicated by the some parameters such as water content, protein content, fat content, ash content, water activity and TPC (total plate count) and organoleptic value.

Keywords: Edible film, kitosan, CMC (carboximetilselulosa)