FOOD COMPOSITION OF SOME FERMENTED SEAFOOD IN BRUNEI DARUSSALAM

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Introduction

Fermentation has been an important method in the preservation of food. It is a relatively efficient low-energy preservation processes very much practice in backyard industry scale. During fermentation, substrates containing rich source of carbohydrates, proteins and fats are converted into products, which are wholesome, nutritive and enriched in flavour. In Brunei Darussalam, fish and other type of shellfish are plentiful and are important sources of protein for the population. Most of the fermented seafood products come from the water villages and coastal areas. Shrimps of the Acetes species are dried or fermented into Belacan and Cincauk. Mussel such as Adula schmididi is fermented into a semi-liquid product known as Budu kupang.

Traditionally fermented foods are National Heritage and form an important part of the local culture. The documentation of fermented food provides base knowledge and improves understanding of fermentation processes on scientific basis and at the same time preserving traditional technology. The study also compiles information on stages involved in the traditional processing of Budu Kupang, Cincau and Belacan in Brunei Darussalam.

Budu Kupang is made from fermenting mussel (Adula schmididi) and is normally consumed without further processing. About 2% salt is added to 1 kilogram of mussels’ flesh (Adula schmididi). The mixture is placed in a closed container and allowed to ferment for 24 hours at room temperature. After 24 hours fermentation, the mixture will appear slimy. Other ingredients such as Rabok (milled roasted rice), and beansprouts are also added. Bean sprouts will increase the moisture content and adds crunchiness to the final products. An optional ingredient, sliced Kepayang (Pangium edule reinw) is sometimes added to the fermenting mixture on consecutive second or third day of fermentation. The Kepayang when added will give an extra nutty flavour and crunchier product. On the third or fourth day of fermentation the mixture is ready for consumption. Cooled boiled water is added to dilute the thickened paste and can then be repacked into glass bottle for the market. Each bottle of budu kupang can cost between BS 3.00 to BS 5.00. The shelf life of this product is about 1 week at 30°C.

In the processing of Belacan washed and cleaned shrimp Acetes species or Bubok is mixed with 15-20% salt and the mixture is kept overnight. The shrimp and salt mixture is sun-dried for a few hours the next day and then pounded to form cohesive paste.
Sometimes dry *bubok* is used but it is not very popular, as it will not give the pasty and a cohesive paste. The paste is allowed to ferment in a container for two months or longer. The end product has been described as a pungent, salty paste with a strong shrimp flavour. Balls/blocks of *belacan* cost $2.00-$10.00. Use as seasoning in cooking, sauces and dips.

Similar or related products are also found in other parts of South East Asia in particular Malaysia, Indonesia, Thailand and Burma.

*Cincahu* or *Kabur kabur* Semi-solid product with strong shrimp odour, has salty, acidic taste. The first stage of processing *Cincahu* is the same as *Belacan*. Shrimp (*Acetes* spp.) is mixed with 5-10% sugar and same amount of salt and packed in glass bottle, fermented for 5-7 days, ready for consumption. *Cincahu* is used as a condiment, flavouring agent and made into sauces. It is consumed without further processing and usually fresh sliced chilies, shallots and lemon juice are added then served with meals. The shelf life can be extended to a few months if refrigerated.

### Materials and Method

**Proximate and Mineral Content Analysis**

Samples of *Belacan*, *Cincahu/Kabur kabur* and *Budu Kupang* were obtained from the local traditional makers.

The samples were analyzed for nutritional and mineral content. Proximate analysis on moisture, ash, fat, crude fibre, protein and carbohydrate were carried out using AOAC methods (1984).

Mineral content were analyzed using the Atomic Absorption Spectrophotometer, PU9100 pH is measured using a pH meter.

### Results and discussion

**Table 1** A summary of the (%) chemical composition of four samples each of *Belacan*, *Budu Kupang* and *Cincahu*.

<table>
<thead>
<tr>
<th>Chemical composition (%)</th>
<th>Belacan</th>
<th>Budu Kupang</th>
<th>Cincahu</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ash</td>
<td>22.4</td>
<td>0.63</td>
<td>10.9</td>
</tr>
<tr>
<td>Moisture</td>
<td>29.9</td>
<td>84.6</td>
<td>67.6</td>
</tr>
<tr>
<td>Protein</td>
<td>48.4</td>
<td>3.2</td>
<td>13.8</td>
</tr>
<tr>
<td>Fat</td>
<td>1.31</td>
<td>2.0</td>
<td>1.30</td>
</tr>
<tr>
<td>Carbohydrate</td>
<td>nil</td>
<td>8.1</td>
<td>0.35</td>
</tr>
<tr>
<td>Fibre</td>
<td>5.0</td>
<td>0.77</td>
<td>6.0</td>
</tr>
</tbody>
</table>
The results are presented as average range (%) between the samples of each product analyzed.

Both Belacan and Cincalu have high protein content. Some amounts of fibre are also present in Belacan and Cincalu. Moisture content of Budu kupang is highest when compared to the other two products. The addition of water and breansprouts to mussels’ flesh during processing increases the moisture content of Budu Kupang (ave. 84.6g/100g of edible portion). Shelf life of Budu Kupang is about 1 week at 30°C due to high moisture content. Shelf life can be further increased if the product is refrigerated (5°-7°C). The average content of carbohydrate in Budu Kupang is 8.1g / 100g (2.8g/100g edible portion).

Reduction in water content of Belacan increases shelf life of product up to 3 months at 30°C, it can be further increased by refrigeration and freezing.

**Table 2 - Mineral content and pH of Cincalu, Belacan and Budu Kupang (mg/100g edible portion)**

<table>
<thead>
<tr>
<th>Mineral/pH</th>
<th>Belacan</th>
<th>Budu Kupang</th>
<th>Cincalu</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calcium</td>
<td>329</td>
<td>30.3</td>
<td>197</td>
</tr>
<tr>
<td>Iron</td>
<td>322</td>
<td>35.7</td>
<td>53.5</td>
</tr>
<tr>
<td>Potassium</td>
<td>2640</td>
<td>3.7</td>
<td>1660</td>
</tr>
<tr>
<td>Sodium</td>
<td>4500</td>
<td>54.3</td>
<td>4440</td>
</tr>
<tr>
<td>Zinc</td>
<td>173</td>
<td>49.1</td>
<td>93</td>
</tr>
<tr>
<td>pH</td>
<td>7.89</td>
<td>3.2</td>
<td>6.01</td>
</tr>
</tbody>
</table>

The averages of the ranges are calculated. Since there is no control exercised over their processes, the range and inconsistency between samples are wide.

Fermentation reduces pH of Budu kupang and Cincalu and increased that of Belacan to 8.13 hence helps inhibit spoilage and food poisoning bacteria hence increasing shelf life of these products.

Belacan and Cincalu - high in protein, low in fat, but high salt and sodium content limits intake but can serve as source of zinc, potassium, calcium and iron. Budu Kupang has low mineral content compared to the other two products. All three products are usually made on seasonal basis when the raw materials are available.
Conclusion

A change in pH is due to the activity of fermenting microorganisms resulting in biochemical changes in the products. Low pH in products helps to inhibit spoilage, food poisoning bacteria and increase shelf life. Standardisation of processing, improvement in hygiene and packaging may increase acceptance of Budu Pakis, Belutak and Budu Kupang.

The fermentation processes such as process control, standardised quality (improved keeping quality, taste and nutritional quality) need to be refined without loss of desirable attributes. Improving hygiene and packaging may increase acceptance of these products. Study of traditional food technology is an essential prelude to innovations and introduction of new foods.

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