CHARACTERISTICS PROFILE AND DEVELOPMENT OF WHITE SALTED SEAWEED NOODLES

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PROFIL SIFAT-SIFAT DAN PEMBUATAN MEE RUMPAY LAUT PUTIH BERGARAM

Mee merupakan makanan rugi dikalangan kebanyakan masyarakat Asian. Maka timbul minat yang mendalam untuk membangunkan pembuatan mee yang berkualiti dengan menggunakan bahan mentah tempatan. Kajian lepas menunjukkan kanji tepung gandum merupakan komponen paling penting untuk memberi kesan terhadap kualiti mee. Walau bagaimanapun, dalam kajian ini penggunaan serbuk rumpai laut yang mengandungi komponen hidrolkoloid didapati mempengaruhi sifat fizikal dan mekanikal mee rumpai laut. Mee rumpai laut putih bergaram dibuat bagi mengkaji kesan serbuk rumpai laut dalam pembuatan mee berasaskan gandum. Peratus rumpai laut yang digunakan dalam kajian ini adalah diantara 0% hingga 50% bagi membuat mee rumpai laut. Enam sample telah diuji dengan Rapid Visco Analyzer (RVA) untuk mendapatkan sifat fisiokimia berpadan dengan pembuatan mee rumpai laut. Formulasi F4 dengan nisbah SW:WF (30:70) menunjukan sifat fisiokimia yang terbaik. Kekuatan tensile diukur dan didapati bahawa formulasi F4 menunjuk sifat fizikal dengan kekuatan tensil 37.5 ± 2.9 MPa. Disamping itu, formulasi F4 menunjukkan sifat fizikal yang diingini dengan hasil masakan yang tinggi dan kehilangan masakan yang rendah. Kelarutan bahan-bahan terlarut dalam mee rumpai laut meningkat dengan peningkatan komponen serbuk rumpai laut. Formulasi F4 juga menunjukkan penyerapan air pada tahap yang sederhana. Melalui ujian sensori hedonik, formulasi F4 telah dipilih sebagai produk yang paling diterima dengan jumlah nilai purata 5.13 ± 1.33. Analisis proksimat menunjukkan baawa rumpai laut mengandungi 0.34 ± 0.02% kandungan kelembapan, 12.24 ± 0.03% kandungan protin, 11.49 ± 0.02% kandungan abu, 9.32 ± 0.04% kandungan lemak, 2.31 ± 0.02% kandungan serabut kasar dan 75.00 ± 0.00% kandungan karbohidrat. Ujian mikrobiologi menunjukan bahawa sampel ini adalah bebas daripada pertumbuhan mikroorganisma. Sebagai kesimpulan, ini menunjukkan bahawa mee rumpai laut adalah produk yang berjaya.
ABSTRACT

CHARACTERISTICS PROFILE AND DEVELOPMENT OF WHITE SALTED SEAWEED NOODLE

Noodles are the staple foods for many Asian people. Therefore, it is of great interest to produce high quality noodles by using domestic raw materials. Previous study concluded that the starch of the wheat flour is the most important component affecting the quality wheat noodle. However in this study the usage of seaweed powder which contains hydrocolloid properties was found to influence the physical and mechanical properties of the seaweed noodle. Further, the white salted seaweed noodle was developed to study the effect of the seaweed powder on noodle development based on wheat noodle. The percentage of seaweed powder used to develop the seaweed noodle was from 0% to 50%. Six samples with diverse Rapid Visco Analyzer (RVA) pasting characteristic were evaluated for their physicochemical characteristic relative to their suitability for making seaweed noodle. Formulation F4 with the ratio of SW:WF (30:70) showed the best physicochemical characteristic. Tensile strength was 37.5 ± 2.9 MPa and this showed that formulation F4 exhibit a higher tensile strength. This formulation showed desired physical properties with higher cooking yield and low cooking loss. The solubility for the seaweed noodle increased with the increased of seaweed powder components. Formulation F4 also showed moderate level of water absorption. Formulation F4 was the most accepted product selected based on hedonic sensory with total mean score of 5.13 ± 1.33. Proximate analysis showed that the seaweed noodle contains 0.34 ± 0.02% moisture content, 12.24 ± 0.03% protein, 11.49 ± 0.02% ash, 9.32 ± 0.04% fat, 2.31 ± 0.02% fiber and 75.00 ± 0.00% carbohydrate. Microbiological test indicated that the sample was free from microbial growth. This shown that this seaweed noodle was a successful product.
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<table>
<thead>
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<th>Abbreviation</th>
<th>Description</th>
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<tbody>
<tr>
<td>%</td>
<td>percentage</td>
</tr>
<tr>
<td>Kg</td>
<td>kilogram</td>
</tr>
<tr>
<td>g</td>
<td>gram</td>
</tr>
<tr>
<td>mg</td>
<td>milligram</td>
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<tr>
<td>l</td>
<td>liter</td>
</tr>
<tr>
<td>ml</td>
<td>milliliter</td>
</tr>
<tr>
<td>cm</td>
<td>centimeter</td>
</tr>
<tr>
<td>m</td>
<td>meter</td>
</tr>
<tr>
<td>°C</td>
<td>degree Celsius</td>
</tr>
<tr>
<td>cfu/g</td>
<td>coloni forming unit/gram</td>
</tr>
<tr>
<td>RVA</td>
<td>Rapid Visco Analyzer</td>
</tr>
<tr>
<td>RVU</td>
<td>Rapid Visco Unit</td>
</tr>
<tr>
<td>SW</td>
<td>Seaweed</td>
</tr>
<tr>
<td>WF</td>
<td>Wheat flour</td>
</tr>
<tr>
<td>K$_2$SO$_4$</td>
<td>Potassium Sulfate</td>
</tr>
<tr>
<td>CuSO$_4$</td>
<td>Copper Sulfate</td>
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CHAPTER 1

INTRODUCTION

This project was aimed for a better use of the abundantly produced seaweed in Sabah. However this abundant resource is still poorly utilized (Ranjith, 2000). At present, there is no significant farming of seaweeds in Malaysia, although small-scale farming of *Eucheuma cottonii* is carried out in Semporna, Sabah and the experimental scale culture of *Gracilaria* carried out on the Middle Bank in Penang (Faazaz, 1986; Choo, 1990). In spite of the that, it is cheaper compared to other land vegetable. The industrial utilization of seaweed mainly based on carrageenan that can be isolated from this sea vegetable and also used as ingredient for food processing.

Noodles are an important food consumed in Asian countries. It is estimated that about 30-40% of total wheat flour consumption are noodle products in most Asian countries (Miskelly, 1993). Noodles are originated from China and dated back over 6000 years from northern China (Hatcher, 2001), then gradually spread to other Asian countries such as Japan, Korea, Thailand and Malaysia (Nagao, 1981). Many types of noodles exist with differences in composition, method of preparation and also presentation based on regional preference (Edwards *et al.*, 1996). Asian noodles are characterized by thin strips slit from sheeted dough that has been made from flour, water and salt (Hou & Kruk, 1998).
Texture is one of the most important criteria for eating quality of noodles. The requirements for white salted noodles are bright and creamy in color, smooth and glossy surface appearance, soft texture with a slight surface firmness and elasticity (Crosbie et al., 1998). Moreover, the white noodles, which are made from soft wheat flour of low to medium protein levels (8-10%), low ash content (0.36-0.40%), low level of damaged starch, and a good color grade (Nagoa et al., 1997; Crosbie et al., 1990) gives a bright, creamy appearance to the noodles. On the other hand, the moisture content is also one of the important factor determining the texture of noodles (Kojima et al., 2004)

Apart from the eating quality of noodles there is a vast demand for healthy and nutritional noodles made from high raw material. Seaweed is one of the potential nutritional sea vegetable, which is now being explored by food industry to include seaweed as raw or semi-processed materials in formulation of seafood products, soups, drinks and cheese etc (Mabeau & Fleurence, 1993). Seaweeds belong to the Rhodophyta (*Eucheuma cottonii*) family group which is available abundantly in South East Asia contains substantial amounts of protein (10-47% DW), mineral contents, vitamin B12 (Seshadri, 1993) and the functional properties of their polysaccharides are potential for human and animal foods (Wong & Peter, 2001; Joel, 1999).

Besides the high protein level and balanced amino acids profile the red seaweed appeared to be an excellent potential source of plant food proteins (Abbott, 1996). It also contains large amounts of dietary fiber which are particularly rich in the soluble fraction (Darcy-Vrillon, 1993; Mabeau & Fleurence, 1993). Novazcek (2001) stated that seaweed can be eaten raw, dried or cooked and can offer alternatives for better nutrition. In France, seaweeds have been approved for human consumption
as vegetable and condiments (Serge & Joel, 1993). Thus this shows significant value for seaweed as a suitable food to be used as one of the ingredient in product development. Such an effort is being made to utilize the seaweed as one of the major components for producing white salted seaweed noodles.

The aim of this research is to evaluate the use of seaweed to manufacture a high quality noodle in order to develop a nutritional noodle with an addition of seaweed. Thus, the objectives of this research project are as below:

a) Determine the best formulation for seaweed noodle by analyzing the textural properties, pasting properties, physiochemical properties and sensory test.
b) Determine physiochemical content through proximate analysis.
c) Determine the quality of the noodle by analyzing the storage study of the noodle.
Noodles are carbohydrate rich products which have many varieties with different types of ingredients. However starch is always the major component in noodles. Noodles can be generally classified in various groups such Wheat noodles, Buckwheat noodles, Naengmyon noodles, Rice noodles, Starch noodles and Pasta as shown in Figure 2.1. Wheat noodles are generally made from wheat flours which include Chinese type and Japanese type. Hatcher (2001) stated that Soba is another type of Japanese noodle, which is made from the composite of wheat flour and less than 50 percent of buckwheat flour without adding any salt. It has a special gray color and clear bite texture. Besides Naengmyon noodle, there is a Korean type noodles which are very popular during the summer season (Kim, 1997).

Rice noodles have a white color, a clear bite, smooth mouth-feel and traditionally consumed in tropical and sub-tropical areas of Asian countries. It's made from rice flour slurry which is spread on cloth and steamed and then cut or made by extrusion (Luh, 2001). Starch noodles are made from starch, also named glass
noodle, clear noodle, transparent noodle, bihon or harusame is popularly consumed both as a noodle food and in dishes (Takahashi et al., 1985; Miskelly, 1993; Callado et al., 2001).

![Figure 2.1: Classification of Noodle Products](source)

Wheat noodles can be classified into Chinese type and Japanese type. This classification is based on the quality of the wheat flour. Chinese noodles are made...
from hard wheat flour; meanwhile Japanese noodles are made from soft wheat flour (Kuakoon et al., 2003). Chinese type noodles have two varieties, that is yellow alkaline noodle and white salted noodle. On the other hand Japanese noodles only have single choice that is white salted noodle. Although white salted noodle can be found in both types of the noodle, its local name, the size of the noodle, producing method are totally different (Hou, 2001).

Pasta such as spaghetti, macaroni and other types with different shapes, are western type noodles and traditionally made from durum wheat semolina by extrusion (Marchylo & Dexter, 2001). Although pastas originated from oriental noodles, there are key differences between them. Firstly, pastas are usually made from durum semolina and water, while noodles are made from wheat flour, water and common salt or alkaline salt. Secondly, noodles are characterized by thin strips slit from sheeted wheat dough, while pastas are extruded through a metal die under pressure. Thirdly, noodles are often consumed in water-rich condition, such as soup, while pastas are often eaten in dishes containing limited water (Hou, 2001).

Besides the classification of noodle which is based on ingredient, Kuakoon et al. (2003) have classified the noodles based on various criteria and characteristic as stated in Table 2.1. The characteristic of the wheat flour noodle which are made from soft wheat flour have white or creamy color and soft texture compared to the hard wheat flour which have light yellow in color and stiff texture. Starch noodle such as mung bean and sweet potato are uniquely translucent, have firm and elastic texture and a bland taste (Chiu & Chua, 1989). Noodles are also classified based on the strand width. The strand width is varies from the thinnest size with 1.0 mm to flat and thick size with 7.5 mm (Kuakoon et al., 2003).
Besides this, based on the drying method, noodles can be classified into non-fried noodles and fried noodles. Non-fried noodles can be dried by hot blast air with low temperature in the range of 70-80 °C. The advantages of air drying are that the products have a low fat content, and this makes many people to prefer them; and also, they have a longer shelf life because little fat rancidity is involved (Li, 2003).

Table 2.1: Noodle Types Based on their Characteristic

<table>
<thead>
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<th>Criteria</th>
<th>Class/Type</th>
<th>Characteristics</th>
</tr>
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<tr>
<td>Raw material</td>
<td>1. Soft Wheat Flour - Japanese noodles (udon)</td>
<td>White or creamy white in color and soft texture</td>
</tr>
<tr>
<td></td>
<td>2. Hard wheat flour - Chinese noodles (re-men, chuka-Ramen, chukka-soba)</td>
<td>Light yellow in color and a little stiff in texture</td>
</tr>
<tr>
<td></td>
<td>3. Buck wheat (mixed with wheat flour) - Buckwheat noodle (soba)</td>
<td>Light brown or gray in color with a unique taste and flavor</td>
</tr>
<tr>
<td></td>
<td>4. Rice flour - mien, bihon, beehon, bifun - knanom-jeen</td>
<td>White to yellow color and opaque with tender texture</td>
</tr>
<tr>
<td></td>
<td>5. Mungbean starch - glass noodles</td>
<td>Transparent and firm texture</td>
</tr>
<tr>
<td></td>
<td>6. Sweetpotato starch</td>
<td>Transparent and elastic</td>
</tr>
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<td>7. Other starches - potato, Canna</td>
<td></td>
</tr>
<tr>
<td>Noodle size</td>
<td>1. Very thin - So-men</td>
<td>1.0-1.2 mm strand width</td>
</tr>
<tr>
<td></td>
<td>2. Thin - Hiya-mugi</td>
<td>1.3-1.7 mm strand width</td>
</tr>
<tr>
<td></td>
<td>3. Standard - Udon</td>
<td>2.0-3.8 mm strand width</td>
</tr>
<tr>
<td></td>
<td>4. Flat - Hira men</td>
<td>5.0-7.5 mm strand width</td>
</tr>
<tr>
<td>Criteria</td>
<td>Class/Type</td>
<td>Characteristic</td>
</tr>
<tr>
<td>---------------</td>
<td>------------------------------------------------</td>
<td>----------------</td>
</tr>
<tr>
<td>Process</td>
<td>1. Type of binders</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Protein: wheat flour noodle</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Pregelatinized starch: starch noodles</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2. Strand making</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Sheeting &amp; cutting: So-men, Udon</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Extrusion: Rice noodles</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3. Equipment</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Handmade; Tenobe so-men</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Machine-made: Udon, Hiramemen</td>
<td></td>
</tr>
<tr>
<td>Product form</td>
<td>1. Fresh and uncooked</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2. Cooked noodles (Boiled and steamed)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3. Frozen boiled noodles</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4. Dried noodles</td>
<td></td>
</tr>
<tr>
<td></td>
<td>5. Instant noodles</td>
<td></td>
</tr>
</tbody>
</table>

### 2.2 Wheat Flour

Wheat noodles are one of the Asian countries major noodle products where about 30-40% of all wheat flour is consumed as part of wheat noodles (Miskelly, 1993; Crosbie, 1991). Generally the type of wheat flour is either hard versus soft wheat. It can be classified into Chinese type and Japanese type (Chen, 2003). Besides, Edwards *et al.* (2000) concluded in their study that the finest particle size of wheat flours gave noodles superior textural qualities. In wheat flour, the starch characteristics, that includes amylase-amylopectin ratio, starch pasting properties and swelling powers are also highly related to eating quality of white salted noodles (Toyokawa *et al.*, 1989; Crosbie, 1991; Crosbie *et al.*, 1992; Konik *et al.*, 1992).

Nagao *et al.* (1976) stated that low protein flour, which is soft flour is favored for manufacturing white salted noodles. Besides that noodle color also depend on
several factors such as flour particle size (Hatcher et al., 2001), protein content (Miskelly, 1984; Wang et al., 2004), ash content (Crosbie et al., 1990) and enzyme activity (Hatcher & Kruger, 1996).

2.2.1 Wheat protein

Wheat flour contains between 8 - 16% protein. The protein component of wheat flour is represented by albumin, globulin, gliadin and glutenin. Each of these has different chemical and physical properties. In the preparation of the dough, albumin and globulin, although necessary, have relatively marginal functions, while gliadin and glutenin are the two protein fractions insoluble in water, which form gluten (Huang & Morrion, 1988). The influence of flour protein on the quality characteristics of dry noodles was investigated by Oh et al. (1985a) who found that the optimum cooking time of dried salt noodles increased linearly with flour protein content.

However, flour protein content was not correlated with surface firmness. Surface firmness may vary with the degree of gluten development in the dried salt noodle (Oh et al., 1985b). Dexter et al. (1983) reported that surface stickiness of spaghetti was partly related to the semolina protein content. However, the differences in flour protein level does not always account for the differences in noodle quality. When hard wheat and soft wheat of dried salt noodles with similar protein content were compared, the hard wheat noodles are generally darker and stronger but less firm at the surface (Oh et al., 1985a).

These differences may be due to protein quality or other factors, rather than the protein level. Also, the cooking time of hard wheat noodles increased linearly
REFERENCE


Gi-Tae Kim, Yong-Duck Ko, & Dong Sun, 2003. Lee Shelf Life Determination of Korean Seasoned Side Dishes. *Food Science and Technology International 9:* 257-263


