Phytochemical Characteristics of Various Dimsum Fortified with Purslane Leaves

Wahyu Mushollaeni, Lorine Tantalu, and Muhammad A. Ghofur

ABSTRACT

(One of the villages with abundant natural resources is Wonosalam Village in Jombang, East Java. One of the potentials is purslane (Portulaca oleracea) but underutilized yet and just known as a wild plant or weed. The availability of purslane plants reaches 5-8 quintals/month from each population plot. However, this plant will be discarded because it interferes with the growth of economically valuable plants. Whereas according to research, purslane plants contain lots of phenolic bioactive compounds, flavonoids, carotenoids, and essential fatty acids that are useful as antioxidants and disease prevention. Therefore, this experiment aimed to obtain the best composition of various processed dimsum fortified using purslane leaves. This study used a randomized block design with various formulations of dimsum fortified using purslane leaves, namely purslane dumpling (SK), fantasy purslane dumpling (SKF), purslane drew-dumpling (DK) and purslane manti (KM). The results showed that purslane dumplings were the best treatment, with physico-chemical parameters of protein, fat, water, ash, and carbohydrate content of 14.10%; 5.4%; 50.54%; 2.37%; and 21.8%. All kinds of dimsum fortified with purslane leaves contain unsaturated fatty acids from the medium-chain fatty acid (MCFAs) and polyunsaturated fatty acids (PUFAs) group.

Keywords: dimsum, fortification, physico-chemical, polyunsaturated fatty acids, Portulaca oleracea.

I. INTRODUCTION

Geographical of Indonesia makes it one of the countries rich in germplasm. One of the areas in East Java, precisely in Wonosalam Village, Wonosalam District, Jombang Regency, owns a type of purslane plant (Portulaca oleracea) which is commonly found on rice fields, sidewalks, or on the edge of highways. The perspective of general public still considers that purslane is just only weed for the cultivation of other productive crops [1], [2]. Only a few of them are familiar with this weed that can be consumed as either fresh or cooked, and some use it as herbal medicine [3], [4].

Purslane formed look like flowering weeds that grow all year round [5], [6]. It could grow in tropical to subtropical areas, even in soil which is high in salt. The name of “Purslane “plant comes from the Latin, namely Porta which means “to carry” and “lac” which means milk, in terms of the presence of plant oil which resembles milk juice [7], [8]. Compared to weeds, purslane has green leaves, slightly red stems and blackish seeds as shown in Fig. 1. When it is consumed, there has slightly sour and salty taste resembling the taste of spinach [9] as a result of the crassulacean acid metabolism (CAM) process, namely the process of assimilation of carboxylic acids from CO₂ utilization [10].

Several recent studies have shown several advantages of purslane plant in the field of medicine known as a perennial plant [11] which can be used as an anti-inflammatory [1], [3], [12], anticancer [13], anti-virus (on viruses of the coronaviridae group) [5], anti-melanogenic [6], producing anticholinesterase-effect [2], [14], [15] and immunomodulatory regulation [16].

Fig 1. Purslane plants that grow a lot in the rice fields.

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This medicinal function presence by phytochemicals and bioactive compounds which is possessed on purslane plants includes alkaloids, flavonoids, organic acids, terpenoids, phenolic acids and esters, and high content of fatty acids such as omega-3 and alpha-linolenic acid [14]. In addition, purslane can also be used for the wool dyeing industry because of its high pigmentation and

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environmental friendliness [18] In food sector, several researchers have used purslane as a functional food in the form of tofu [19], stuffed with steamed brownies [20] and nuggets [21].

This study aims to develop a diversification of functional food products made from purslane into kinds of dimsum preparations which include purslane dumplings, fantasy dumplings, purslane fantasy dumplings, and manti. These four types of dimsum became the research choice based on the widespread consumption of dimsum products in recent years in the form of ready-to-eat or frozen foods [22]–[24].

II. MATERIALS AND METHODS

A. Dimsum Raw Material

The main ingredients for making four types of dimsum in this study were purslane plants taken from rice fields in Wonosalam Village, Wonosalam District, Jombang Regency. Other supporting ingredients are ready-to-use dumpling skin (UD Merjosari), chicken breast fillet, wheat flour, tapioca flour, eggs, and several types of seasonings. In fantasy dumplings and fantasy purslane dumplings, there is some addition of carrots to give a colorful impression.

B. Preparation of Dimsum Filling

The study used purslane as a filling for dumplings in addition to chicken fillet. The purslane plants, both stems and leaves, are boiled for 7 minutes then drained, followed by chopping them to a size of approximately 0.5 cm. Meanwhile, several other ingredients such as chicken fillet, wheat flour, tapioca flour, eggs and some seasonings are mixed together. Add chopped purslane plant and make dumplings stuffing. Furthermore, the stuffing could be added with grated carrots aimed to make any color to the dumpling filling.

C. Research Design

This research is expected to be able to provide the type of dimsum with purslane treatment which is able to provide the best parameter values for protein, fat, carbohydrates, water content and ash content. The design used in this study was a non-factorial randomized block design, with data analysis using ANOVA to calculate the significant effect of adding purslane to the stuffing of several types of dimsum. The researchers compared the treatment between the dimsum variants without and using purslane as a filling with the following variations as seen in Table I.

D. Nutritional Analysis and Fatty Acid Profile

Tests for proximate analysis which include parameters of protein, fat, carbohydrates, water, and ash, as well as testing of secondary metabolites which is PUFA follow the AOAC [25] method at the Test Laboratory of Airlangga University Surabaya, East Java.

III. RESULT

<table>
<thead>
<tr>
<th>No.</th>
<th>Dimsum Products</th>
<th>Protein (%)</th>
<th>Lipid (%)</th>
<th>Carbohydrates (%)</th>
<th>Ash (%)</th>
<th>Water content (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Siomay (S)</td>
<td>13.80</td>
<td>4.80</td>
<td>17.40</td>
<td>2.28</td>
<td>61.72</td>
</tr>
<tr>
<td>2</td>
<td>Siomay Krokot (SK)</td>
<td>12.30</td>
<td>5.50</td>
<td>19.90</td>
<td>3.13</td>
<td>59.18</td>
</tr>
<tr>
<td>3</td>
<td>Siomay Fantasy (SF)</td>
<td>10.05</td>
<td>2.90</td>
<td>33.75</td>
<td>2.19</td>
<td>51.81</td>
</tr>
<tr>
<td>4</td>
<td>Siomay Krokot Fantasy (SKF)</td>
<td>9.47</td>
<td>3.25</td>
<td>37.35</td>
<td>2.61</td>
<td>47.33</td>
</tr>
<tr>
<td>5</td>
<td>Drew-dumpling* (D)</td>
<td>11.70</td>
<td>4.20</td>
<td>22.00</td>
<td>3.17</td>
<td>58.94</td>
</tr>
<tr>
<td>6</td>
<td>Drew-dumpling krokot* (DK)</td>
<td>14.10</td>
<td>5.40</td>
<td>21.80</td>
<td>2.37</td>
<td>56.34</td>
</tr>
<tr>
<td>7</td>
<td>Manti** (M)</td>
<td>12.55</td>
<td>4.70</td>
<td>30.00</td>
<td>2.40</td>
<td>50.35</td>
</tr>
<tr>
<td>8</td>
<td>Manti Krokot (KM)**</td>
<td>11.95</td>
<td>5.15</td>
<td>28.40</td>
<td>3.29</td>
<td>28.40</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>GROUP OF FATTY ACID</th>
<th>NAME OF FATTY ACID</th>
<th>YIELD (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Saturated Fatty Acid</td>
<td>Palmitate</td>
<td>20.89</td>
</tr>
<tr>
<td></td>
<td>Stearat</td>
<td>7.29</td>
</tr>
<tr>
<td></td>
<td>Linolenat</td>
<td>1.46</td>
</tr>
<tr>
<td>Unsaturated Fatty</td>
<td>Lignosetate</td>
<td>0.10</td>
</tr>
<tr>
<td>Acids</td>
<td>Eikosatetraenoate</td>
<td>0.48</td>
</tr>
<tr>
<td></td>
<td>Eikosatrienoate</td>
<td>0.12</td>
</tr>
<tr>
<td></td>
<td>Eikosadienoate</td>
<td>0.11</td>
</tr>
<tr>
<td></td>
<td>Eikosenoate</td>
<td>0.47</td>
</tr>
</tbody>
</table>

IV. DISCUSSION

A. Proteins

The variants of dimsum produced in this study indicate that using purslane as a base material has a different effect on protein content. More variants of raw materials which is used to make the products will increasing protein content. Table II shows that the Drew-Dumpling Purslane variant has the highest average protein content up to 14.10%. Meanwhile, the dimsum variant with the lowest average protein content in this study was shown in the Siomay Krokot Fantasy dimsum formula with a value of 9.47%. The formulation of variant dimsum using purslane as the basic ingredient in this study was above the minimum number for protein content for dimsum according to SNI no. 7756:2013, which is a minimum of 5%. The results of the analysis of variance analysis related to the effect of adding purslane to the protein content of all dimsum variants showed no significant effect, this is indicated by evidence that F count (3.308) is smaller than F table 5% (3.79). This means that purslane is not an
ingredient that has an anti-nutritional effect for processed dimsum and is actually able to increase the total protein content of the dimsum.

Purslane plant is not a food ingredient to increase protein content, as in this study. This was also found in the research of Sulistiyani et al. [26], using purslane plant material in the form of flour in the manufacture of fish balls showed a decrease in protein content with an increasing percentage of the amount of purslane plant flour. However, when viewed from the processing of various dimsum using purslane plants to be used as raw materials, it shows that the processing with the aim of reducing water content such as frying will increase the protein content of the processed food. These results are in accordance with the research conducted by Sundari et al. [27], that food that were processed using high temperatures to press the water content will protein content enhancement.

B. Lipids

The purslane naturally contains omega-3 fatty acids which are beneficial for the human body. When this plant is used as an additive for food processing as a form of diversification, it shows an increase in the fat content of the food product of 4.5. It is proven in the food formulation for dimsum types of purslane dumplings that show the highest fat up to 5.50%, compared with other variant dimsum products contain purslane plants, with achievement of The lowest value of using purslane for the dimsum variant was in the Manti Purslane formulation, which was 5.15%. The data in Table II also shows that the presence of purslane for all types of dimsum variants shows a significant difference compared to the variant dimsum products without purslane.

Dimsum varieties with purslane added tend to show a higher fat content than similar varieties without purslane. The results of the analysis of variance also showed that there was a significant effect for the administration of purslane plants on the dimsum variant at a significant difference of 5% until it was continued to a significant difference of 1%, i.e., F count (4.597) is greater than F table 5% (3.79). In general, the lipid content for the dimsum variants produced in this study still under the Indonesian National Standard (SNI) for chicken dimsum No. 7756:2013, which is a maximum value 20%.

Every food processing needs to comprehend the characteristics of materials that have crucial nutritional content. As previously explained, the presence of fatty acids is important for body health is found in the purslane plant [28]. The existence of this substance certainly requires special handling to be useful properly. Table III shows the profile of fatty acids contained in Siomay Purslane products with the highest lipid content, both classified as saturated and unsaturated fatty acids. Some of the saturated fatty acids found in purslane-based dimsum products are myristic, palmitic, margaric, and stearic with a successive percentage value of 1.03%; 20.89%; 0.18%; and 7.29%. Palmitic fatty acid has the highest amount compared to other saturated fatty acids in the product. In general, palmitic fatty acid is easily obtained in some products within meat-based ingredients up to 50-60% [29]. Its proven in processed purslane dumplings, where chicken breast fillet is added to the filling to add a savory taste. Palmitic fatty acid if consumed in excess will cause various chronic diseases in adults, but if consumed in normal limits it will be an important component in the formation of cell membranes, the process of secretion and transport of lipids [30].

The unsaturated fatty acids found in purslane dumplings includes pentadecanoate, linoleic, linolenic, lignoserat, eicosatetraenoate, eicosatrienoate and eicosadienoic acid with a percentage value respectively of 0.1%; 1.46%; 0.10%; 0.16%; 0.48%; 0.12%; 0.11%; and 0.47%. All unsaturated fatty acids found in the product of this study are classified as Poly Unsaturated Fatty Acid (PUFA) omega 3 which is good for body health [30]. The highest value for omega-3 PUFAs contained in the product is in the form of linoleic fatty acid, which is useful for preventing skin tissue damage, assisting in the transportation and metabolism of cholesterol so that it can reduce blood cholesterol levels, and is a precursor of the active components of prostaglandins which are needed in all body tissues, and its activity to influence blood clotting and heart function [29]. The value of linoleic fatty acid in purslane dumpling products tends to have higher levels than other products such as catfish nuggets (0.72%).

C. Carbohydrates

Application purslane plants in processed of dimsum products has several effects, especially on the nutritional content of the product. It’s indicated by the presence of a very significant effect on the provision of purslane in the formulation of the dimsum product variant as shown in Table II which is strengthened by the results of analysis of variance with evidence that F count (8.830) is greater than F table 5% (6.99). The variants of fantasy purslane dumplings and purslane dumplings are evidence that using purslane plants can increase the carbohydrate content of the product up to 37.35% and 19.90%, respectively. On the other hand, the Drew-Dumpling Purslane and Manti Purslane of dimsum variants are not the same. Provision of purslane for the overall formulation of the dimsum variant showed an increase in the carbohydrate content (Table II). The purslane plant itself has a carbohydrate content of 3.8%, this is the basis for increasing the carbohydrate content of the product [12].

D. Ash Content

Ash content shows the total of organic and mineral materials contained in an ingredient which could be used as a basis for assessing whether or not the processing process, the authenticity of raw materials, to determine the nutritional parameters of a food ingredient. In this study, the highest value for ash content was in the Manti Purslane formulation with a figure of 3.29%, while the lowest value was found in the Drew-Dumpling Purslane formulation with a figure of 2.37%. The data in Table II generally shows that the use of purslane in the formulation of the dimsum variant is able to increase the ash content when compared to the product without purslane. This is reinforced by the results of analysis of variance which showed that the provision of purslane had a very significant effect on the ash content of the dimsum variant, as evidenced by the presence of F count (564.020) which was greater than F table 5% (6.99). The highest ash content basically exceeds the maximum threshold for chicken meat SNI No. 7756:2013, which is a maximum up to 2.5%.

E. Water Content

Table II shows that almost all of the various dimsum products contained in this study have an average water content, with an average of 60%.
content of 28.40%–59.18%. These results also had shown that application of purslane gave a significant water content reduction when compared to dimsum without purslane plants. This result is also evidenced by analysis of variance which shows that the F count is larger (19.979) than F table 5% (6.99) so that it shows a very significant difference between treatments with or without purslane for its water content. In general, the range of water content in the formulations in this study is still included in the quality standard of chemical quality, that according to SNI number 7756:2013 that the maximum water content for chicken dumpling dimsum is 60%. This value tends to have a higher value when compared to the results of research using mackerel to be used as a dumpling dimsum product [31], where the water content produced only reaches 12.08%.

V. CONCLUSION

This study has proven that purslane has potential to be a part of food that could increase the nutritional value of product. The presence of several parameters such as fat content, ash content, and water content showed a significant effect by purslane application in dimsum variants products. This yield was remained within the standard quality standard for chicken dumpling dimsum products in Indonesia number 7756:2013. Meanwhile, for protein content, the results of the depiction of saturated fatty acids contained in one of the products, namely purslane dumplings with the highest fat content, indicate the presence of palmitic saturated fatty acids which are still categorized as good if consumed in moderation. In addition, there is also an unsaturated fatty acid linoleic which is included in PUFA was part that promising well for the health of the body.

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CONFLICT OF INTEREST

Authors declare that they do not have any conflict of interest.

REFERENCES


