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Submission date: 20-Mar-2022 01:28PM (UTC+0700)
Submission ID: 1788098512
File name: Fresh_noodles_enriched_with_Coleus_amboinicus_Lour_leaves_to.pdf (392.74K)
Word count: 3618
Character count: 18417

Fresh noodles enriched with *Coleus amboinicus Lour* leaves to lower the premenstrual syndrome level

Fresh noodles enriched with *Coleus amboinicus Lour* leaves to lower the premenstrual syndrome level

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Abstract. Most women feel pain or discomfort when menstruation approaches. They usually feel a symptom called Premenstrual Syndrome (PMS) before menstruation. The leaves of *Coleus amboinicus Lour* can reduce complaints of premenstrual syndrome since these leaves are rich in fiber and minerals. This study aimed to develop a healthy food product for women with premenstrual syndrome. This study was an experiment with four fresh noodle formulations, F0 (400 g flour: 0 g *C. amboinicus*), F1 (340 g flour: 60 g *C. amboinicus*), F2 (320 g flour: 80 g *C. amboinicus*), and F3 (300 g flour: 100 g *C. amboinicus*). Organoleptic test results using the Visual Analog Scale method on 25 semi-trained panelists showed that the addition of *C amboinicus* leaves, in general, did not affect the hedonic value and hedonic quality ($\alpha = 0.05$), except for the hedonic quality of color parameter ($p < 0.005$). The leaves of *C amboinicus* to fresh noodles also significantly decreased the value of fat content ($p = 0.001$) and tended to increase the carbohydrate content, although it was not statistically significant at $\alpha = 5\%$. Then, the mineral content of fresh noodles, particularly Fe, Ca, and Mg, can also be increased by adding *C amboinicus* leaves. In premenstrual syndrome, fat, carbohydrates, and minerals (Fe, Ca, and Mg) reduce premenstrual syndrome symptoms. Thus, the fresh noodles with *C amboinicus* leaves are suitable as a food alternative for women with premenstrual syndrome.

1. Introduction

Most women feel discomfort before and during menstruation time, called Premenstrual Syndrome (PMS). PMS is several complaints or physical, emotional, and behavioral symptoms in women of reproductive age [1]. PMS significantly affects the activities of most women, including female students. However, many women have not made efforts to anticipate productivity when menstruation comes.

Until now, the cause of PMS is not known with certainty, but several theories suggest that PMS occurs due to an imbalance in steroid hormones, namely an imbalance between the hormones estrogen and progesterone in the luteal phase [2]. Excess estrogen and progesterone deficit cause disruption of several chemical functions of the body. Research on premenstrual symptoms shows an association with sexual function maturation, which requires the role of vitamins A, B6, C, and E, as well as the

minerals magnesium (Mg), zinc (Zn), manganese (Mn), and iron (Fe). Women who often do diets have a higher chance of suffering from PMS because their diet will lead to low levels of micro substances.

Duke (2000) reported that *C amboinicus* leaves contain vitamin B1, vitamin B12, niacin, vitamin C, beta carotene, oxalic acid, fatty acids, fiber, carvacrol, and calcium [3]. Also, it is known that vegetables and fruits are rich in fiber and contain lots of vitamins and minerals that can reduce complaints of premenstrual syndrome. *Coleus amboinicus Lour* or commonly called *torbangun/bangun-bangun* within local people in Indonesia, is one type of species from the Labiatae family that contains many micronutrients and bioactive substances [4]. These leaves are rich in fiber and micronutrients such as 62.5 mg magnesium, 13.6 mg Fe, 279 mg calcium, α-tocopherol, and β-carotene. *C amboinicus* plants contain active substances that directly affect the tissue production of the hormone progesterone [5]. Besides, Devi et al., (2010) said this plant could reduce the complaints of Premenstrual Syndrome [4]. However, not everyone consumed vegetables, including the young females who like snacking, then manage their healthy food as a lifestyle. Therefore, this study aimed to formulate fresh noodles and leaves of *C amboinicus* to help women cope with premenstrual syndrom.

2. Methods

2.1. Design and materials

This research was an experimental type using a completely randomized design. The main ingredient, *C amboinicus* leaves, was obtained from the South Jakarta area.

2.2. Product preparation

The fresh *C amboinicus* leaves were sort and cleaned. Blend the *C amboinicus* leaves until entirely smooth. The manufacture of the product begins by mixing the ingredients according to the formulation shown in Table 1. Then, it was milled into thin sheets according to the size of the fresh noodles used a stainless steel-coated steel pool mill. The dough was shaped and cut with a cutting mill. The shaped dough was then boiled until cooked. Then, the cooked noodles are then removed from the pan, dipped in cold water, then drained.

Table 1. Product formulas.

Ingredients	Formulas			
	F0	F1	F2	F3
Flour (g)	400	340	320	300
C amboinicus leaves (g)	0	60	80	100
Egg (g)	65	65	65	65
Salt (g)	5	5	5	5
Water (mL)	150	150	150	150

2.3. Organoleptic test

The organoleptic test consisted of hedonic and hedonic quality tests was involving 25 semi-trained panelists. In the assessment criteria, an analog visual scale was used. The parameters tested included the color, aroma, taste, and texture of the product.

The assessment was carried out both hedonic and hedonic quality with the parameters of color, aroma, taste, and texture. The hedonic quality assessment on these four parameters was based on the level of preference, from very dislike to very fond (0–10 points). In the hedonic quality test, color parameters were assessed from pale yellow to green (0-10 points), aroma parameters from unpleasant to fresh aroma (0-10 points), taste parameters from bitter to savory (0-10 points), and parameters texture from fragile to chewy (0-10 points).

2.4. Proximate analysis

Several chemical analyses were conducted, including moisture and ash content using the oven method, fat was by the soxhlet method, while protein was by the Kjeldahl method [6]. Analysis of carbohydrate content using the by difference method [7].

2.5. Analysis of Iron, Calcium, and Magnesium

Determination of iron levels was carried out by referring to the Atomic Absorption Spectrometry (AAS) method [8]. Calcium in the sample was determined using the EDTA titrimetry method [9]. Then, the spectrophotometric method was used to determine the magnesium levels [10].

2.6. Data analysis

The data obtained were processed using Microsoft Excel 2007 SPSS 20.0 for Windows. The statistical test on organoleptic assessment used the One-Way ANOVA test. It continued with Duncan's New Multiple Range (DNMRT) test at the 5% level.

3. Results and Discussion

C amboinicus is a plant that contains lots of minerals. According to Damanik et al., (2001), apart from being a uterine cleanser, these leaves also function to reduce pain [11]. According to research Devi et al., (2010), 10 grams of fresh *C amboinicus* leaves can reduce PMS complaints such as breast pain, headaches, lower abdominal pain, and emotions compared to commercial herbs and placebo [4].

3.1. Organoleptic value

Table 2. Hedonic and Hedonic Quality of Fresh Noodle Enriched with *C amboinicus* leaves.

Parameters	Formulas*				p-value**
	F0	F1	F2	F3	
Hedonic					
Color	6.90±1.64	6.80±1.65	6.10±1.76	7.20±2.09	0.47
Aroma	5.40±2.01	5.46±1.91	4.58±2.49	4.40±1.76	0.16
Taste	6.50±1.67	6.33±1.52	6.15±1.51	5.54±1.65	0.17
Texture	6.72±1.80	6.49±1.74	6.86±1.34	6.66±1.69	0.89
Hedonic quality					
Color	1.40±3.05[a]	6.20±1.88[b]	7.40±1.84[c]	8.20±1.51[d]	0.00
Aroma	7.30±2.01	6.90±1.97	7.20±2.06	6.90±2.26	0.98
Taste	5.95±2.56	6.00±2.04	6.08±1.96	6.18±1.71	0.98
Texture	8.20±2.27	6.70±2.02	7.90±1.77	7.40±1.97	0.77

Note = * mean ± standard deviation. ** α = 0.05.

Table 2 shows the sensory acceptance values of 25 semi-trained panelists for fresh noodle products with the addition of *C amboinicus* leaves. The statistical test showed that the hedonic test obtained the same sensory acceptance values as the original fresh noodles (F0) at α = 5%. Likewise, there were no significant differences in the aroma, taste, and texture parameters in the hedonic quality test, except for the color parameter (P> 0.05).

The chlorophyll content in *C amboinicus* leaves is responsible for the green color. Besides, these leaves contain several aromatic compounds such as essential oils, phenols, carvacrol, isopropyl-o-cresol, and cineol, which contribute to taste and aroma.

3.2. Proximate value

The proximate values, including moisture, ash, fat, protein, and carbohydrate content of fresh noodle products, are presented in Table 3.

Table 3. Proximate value of fresh noodles enriched with *C amboinicus* leaves.

Parameters	Formulas*				p-value**
	F0	F1	F2	F3	
Water (%)	61.04±1.54[a]	59.75±1.14[a]	58.96±1.81[a]	62.26±0.73[a]	0.225
Ash (%)	1.02±0.02[a]	0.87±0.01[b]	1.02±0.03[a]	0.75±0.01[c]	0.001
Fat (%)	2.85±0.0 [a]	1.13±0.02[b]	1.47±0.02[c]	1.32±0.0[d]	0.001
Protein (%)	6.31±0.18[b]	5.37±0.16[a]	5.40±0.04[a]	5.08±0.10[a]	0.003
Carbohydrate (%)	28.78±1.79[a]	32.88±1.27[a]	33.15±1.86[a]	30.59±0.67[a]	0.112

Note = * mean ± standard deviation. ** α = 0.05.

The moisture content of the fresh noodle formulations F0, F1, F2, and F3 in percent were 61.04 ± 1.54, 59.75 ± 1.14, 58.96 ± 1.81, and 62.26 ± 0.73, respectively. From Table 3, the ash content of product F0, F1, F2, and F3 in percent were 1.02 ± 0.02, 0.87 ± 0.01, 1.02 ± 0.03, and 0.75 ± 0.01, respectively. F0 had the highest protein percent value for protein content, about 6.31 ± 0.18, and the lowest was F3 with a percentage value of 5.08 ± 0.10. The highest fat content of fresh noodle products was F0 (2.85 ± 0.05%), and the lowest was F1 (1.13 ± 0.02%). F2 was the highest (33.15 ± 1.86%), and the lowest was F0 (28.78 ± 1.79%).

Water content is the amount of water contained in a food product. Water content can also determine the storage time of a food product. Water content has a direct effect on food stability and quality. From this research, the addition of *C amboinicus* leaves to fresh noodles showed a tendency to decrease the moisture content of the fresh noodle products.

The ash content indicates the inorganic mineral in the material. The ash content of fresh noodles decided relatively low.

Protein content shows the amount of nitrogen in a substance [12]. This study showed that the protein content of fresh noodles added with *C amboinicus* leaves tended to decrease compared to the product without *C amboinicus* leaves.

The processing factor greatly influences the carbohydrate content. Cooking carbohydrates are necessary for proper starch digestibility. When the starch is heated, the starch granules swell and crack so that the starch is gelatinized. Following the results of the nutritional value of carbohydrates in fresh noodle products, it can be seen that there was an increase in carbohydrate content in the formulations F0, F1, and F2. However, there was a decrease in the F3 formulation. The more the addition of *C amboinicus* leaves, the less the addition of wheat flour. According to Wilopo and Sudargo (2012), PMS women encourage consuming high in complex carbohydrates such as fiber in vegetables and fruits [13]. Dietary changes are recommended to overcome premenstrual symptoms, especially in the luteal phase, including reducing salt, chocolate, coffee, and consuming complex carbohydrates.

Compared with claims for nutritional content, the average fat content of noodles with *C amboinicus* was low. Low-fat foods can reduce complaints of abdominal pain and swell in people with premenstrual syndrome. London et al., (1987) said that low-fat consumption could prevent premenstrual syndrome [14].

3.3. Mineral content of Fe, Calcium and Magnesium

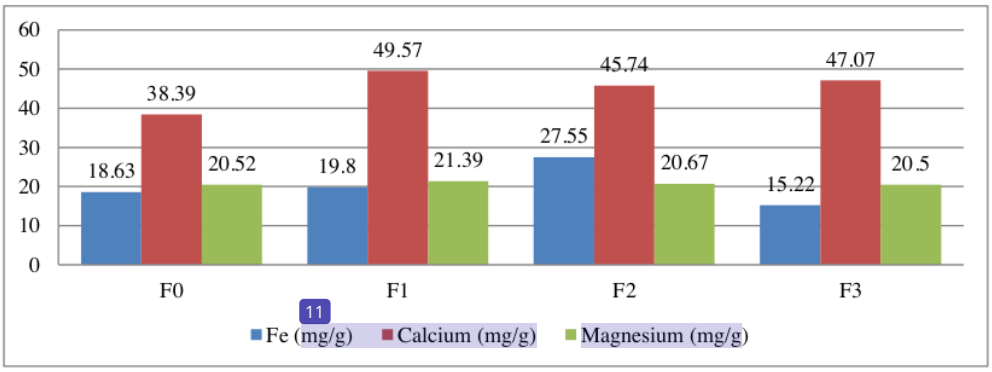

Figure 1. Fe, Calcium, and Magnesium of fresh noodles enriched with *C amboinicus* leaves.

Based on the mineral content of these fresh noodles, it can be seen that the highest Fe content was at F2 with a value of 27.55 mg, and the lowest was at F3 with a value of 15.22 mg. For calcium, the highest was at F2 (49.57 mg), and the lowest was at F0 (38.39 mg). The highest was in F1 (21.39 mg) for magnesium, and the lowest was in F3 (20.50 mg).

According to Devi et al., (2010), Fe deficiency means that our body lacks hemoglobin and oxygen, increasing the symptoms of premenstrual syndrome, especially headaches. Fe in this study obtained from whole eggs, wheat flour, and *C amboinicus* leaves [4]. Various studies have shown that Fe is directly related to the incidence of PMS. According to Dewi (2014), anemia is a factor in the lack of body resistance to pain during menstruation [15]. Anemia is not only one of the factors that cause dysmenorrhea but also worsen dysmenorrhea. However, *C amboinicus* leaf combined with fish liver and vitamin C may increase Hb levels in the body, as evidenced by increased blood Hb and ferritin levels.

Calcium is also a mineral that has been shown to reduce symptoms of premenstrual syndrome [16]. Bendich (2000) Many studies have conducted trials of giving various supplements to reduce symptoms of premenstrual syndrome [17]. Only calcium significantly effects on reducing symptoms of premenstrual syndrome. According to Baziad (2005), calcium deficiency can increase the severity of premenstrual syndrome complaints [18]. Calcium is the body's mineral constituent. Calcium levels in the blood are around 10 mg/100 ml. The value of this level must be maintained so that the organs of the body function properly. Abrams and Atkinson (2003) found that lack of calcium will cause blood calcium levels to decrease [19]. If low blood calcium is caused by insufficient calcium intake, the body will take calcium intake from the bones. Deficiency of calcium in the blood can result in neuromuscular irritability (uncontrolled muscle spasms and contractions). It can lead to increased complaints of premenstrual syndrome. Research by Ramadani (2012) shows that calcium influences mood and behavior disorders during premenstrual syndrome [20]. Symptoms such as restlessness, hydration, and depression improve in a person with premenstrual syndrome who takes calcium with no side effects. The same thing was also expressed by Hidayat et al., (2017) that calcium can lower PMS levels in women [21].

Lack of magnesium intake can disrupt carbohydrate metabolism and cause low production of the hormone serotonin in brain cells, which acts as a neurotransmitter [22]. Magnesium is also required to transport other ions such as potassium and calcium, and protein synthesis. Magnesium is also the most intracellular cation after potassium. Normal magnesium levels are between 1.70 - 2.43 mg/dL. The magnesium in this study mostly came from the leaves of *C amboinicus*. Magnesium is found in abundance in plants, particularly in the part that contains chlorophyll, such as the leaves. The structure of chlorophyll has the same structure as hemoglobin. The only difference is that it lies in the central atom of the molecule. The central atom of chlorophyll is magnesium, while the center atom of hemoglobin is Fe. According to Khine et al., (2006), the content of magnesium in the blood in women with premenstrual syndrome is lower than in women who do not have premenstrual syndrome [23].

Apart from playing a role in the hormone serotonin, magnesium also functions in controlling emotional stability. The same thing was also expressed by Christiany et al., (2009) that magnesium intake can help reduce premenstrual syndrome [24]. Ramadani (2012) found a significant effect between magnesium consumption and premenstrual syndrome in female students [20]. Magnesium is given during the luteal phase of the menstrual cycle until menstrual blood flow has been shown to reduce the total score of symptoms and negative affection symptoms.

4. Conclusion

Fresh noodles with *C amboinicus* leaves can be an alternative diet for women to reduce premenstrual syndrome. The fresh noodles with *C amboinicus* have a sensory acceptance value similar to the original fresh noodle, low fat, high energy, and suitable mineral content for women with premenstrual syndrome.

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