

Hedonic test of "PURULA" product contained iron and vitamins with various flavors as food sprinkles

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Abstract. Anemia is a nutritional problem that threatens most adolescents in Indonesia. PURULA is the abbreviation for *Peptida Unggul Rumput Laut* (Seaweed Superior Peptide). PURULA is food in the form of a sprinkle that contains a premix of minerals (iron) and vitamins. Purula already been tested as a food additive in anemic adolescent girls. Giving 1-2 sachets per day can significantly increase serum ferritin levels after two weeks of use. PURULA, in terms of taste, is quite what many adolescents say PURULA is not tasty. For increasing the acceptance of PURULA, it is necessary to develop PURULA flavor variants. Observation variables for hedonic test analysis included a taste of the PURULA of each treatment to determine the PURULA product most favored by the panelists. This test used 54 semi-trained panelists from Lebak, Banten, and 43 semi-trained panelists from Maros, South Sulawesi. Data analyzed non-parametric using Kruskal Wallis test and Mann-Whitney test to examine differences with a p-value less than 0.05 ($p < 0.05$) set as the significance limit. The most preferred flavor by girl adolescents in the hedonic test in Lebak was corn flavor. Meanwhile, the most preferred flavors by girl adolescents in the hedonic test in Maros were garlic and corn flavors.

1 Introduction

Anemia is a nutritional problem that threatens most adolescents in Indonesia. The leading cause is lack of iron consumption. Based on Basic Health Research data, in 2013, the prevalence of anemia at 15-24 years was 18.4 % and increased to 32 % in 2018. This figure is high because it is above the World Health Organization (WHO) standard of 10 percent [1]. The causes of iron deficiency are physiologically increased requirements (menstruation and growth), lack of iron absorption, bleeding, fetomaternal transfusion, hemoglobinuria, iatrogenic blood loss, idiopathic pulmonary hemosiderosis, and excessive exercise that is common in athletes [2].

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The Indonesian government has intensified anemia prevention and control programs in adolescent girls by prioritizing the administration of one tablet for a week to reduce anemia prevalence by 50%. Based on data from [3], the proportion of adolescent girls aged 10-11 years who received blood-supplementing tablets (TTD) was only 2.7 %. Meanwhile, 25.1 % for 12-15 years old, 34.6 % for 16-18 years old, and 25.5 % for 19 years old.

There is a significant relationship between adherence to the consumption of blood-supplementing tablets with the incidence of anemia in adolescent girls. Two factors affect compliance to taking blood-supplementing pills: health workers and factors from oneself, such as awareness in consuming blood-supplementing tablets [4]. The causes of the disobedience of adolescent girls in swallowing blood-supplementing pills are feelings of boredom or laziness, unpleasant taste, and aroma [5]. The side effects of consuming blood-supplementing pills (TTD) are nausea and vomiting, pain or burning in the gut, and black stools [6].

This condition has made some researchers from the Center for Agroindustrial Technology, Agency for the Assessment and Application of Technology (BPPT), develop innovative food companion products that can increase iron intake in adolescents. Based on previous research [7], PURULA is food in sprinkle food containing a premix of minerals (iron) and vitamins (vitamins B1, B3, B6, B12, and folic acid). This premix is needed to form red blood cells. The other ingredient of PURULA is Soybean Hydrolyzate (biopeptide), which functions to increase iron absorption in the blood, and Seaweed, which is rich in flavor, dietary fiber, and minerals.

Based on research conducted by BPPT [8], the results of the PURULA efficacy test against anemia in adolescent girls showed that PURULA consumption could increase serum ferritin and hemoglobin levels. The acceptance test conducted by the Center for Public Health Innovation in 2018 [9] showed that the total score of PURULA acceptance by adolescents in Pandeglang and Denpasar was in the excellent acceptance category. In terms of taste, quite a lot of teenagers say that the taste of PURULA is not good, bland, and tastes very salty when consumed directly. Acceptance of PURULA in terms of taste is quite many adolescents say PURULA is not tasty and causes nausea (due to iron content). For increasing the acceptance of PURULA, it is necessary to develop PURULA flavor variants. The addition of several flavor variants to PURULA is expected to increase the taste and preferences of adolescents towards PURULA.

2 Research method

2.1 Time and location

This research was conducted in December 2020 and March 2021 in two locations, namely Lebak (Banten) and Maros (South Sulawesi). The high stunting rate associated with anemia cases in the two regions was considered in choosing a location. Lebak Regency is ranked 2nd out of 8 regencies in Banten Province with a high stunting rate [10]. As for anemia, the prevalence in Banten Province was around 57% in women of childbearing age, indicating a higher prevalence than the national frequency [11]. In 2013 the prevalence of stunting reached 40.9%, at the same time placing South Sulawesi in the 13th rank as the province with the most stunting cases [1]. Proven cases of anemia in Maros Regency, the prevalence of iron deficiency anemia in pregnant women was found to be 41%, including severe anemia (Hb <8 g/dL) of 1.2%, moderate anemia (Hb 8-9.9 grams) /dL 43.9%, and 54.9% classified as mild anemia (HB 10-10.9 g/dL) [12].

One of the causes of stunting is iron deficiency anemia experienced by prospective mothers who were previously teenagers. Respondents from the study were adolescent girls

between the ages of 14 - 20 years. The high rate of stunting in early adolescent girls is inseparable from teenage girls' eating patterns, one of the causes of iron intake deficiency [13]. The leading causing factor for anemia is low iron intake [14]. The primary function of iron as the core of hemoglobin explains the effect of iron intake on the stunting prevention process. This process has theoretically already proved that low iron intake inhibits the metabolism of energy and other nutrients if a person is an iron-deficient due to insufficient oxidation capacity at the cellular level due to catching oxygen is not maximal [15]. Based on the efficacy that BPPT has carried out, PURULA could increase serum ferritin and hemoglobin in the blood, so the hedonic test of PURULA in locations with high levels of anemia can target potential consumers who suffer from anemia.

2.2 Stages of making PURULA with various flavors

PURULA sprinkle was made by mixing the main ingredients comprising soy protein hydrolyzate, seaweed, and fortified with vitamin and mineral premix using the drum dryer to form flakes. Then PURULA was formulated with adding various flavors namely garlic, corn, beef, juhi (squid), katsuobushi (bonito flakes), salted egg, shrimp paste, and fried anchovies. The added flavor was powdered and natural. The addition of flavor based on optimization was less than 10% and mixed manually until homogeneous.

2.3 Research methods

The procedure of the hedonic test, according to [16], used seven preference scales. Table 1 lists the assessment scores given based on the hedonic test criteria. Observation variables for hedonic test analysis included a taste of the PURULA product of each treatment to determine the PURULA product most favored by the panelists. This test used 54 semi-trained panelists from girls adolescents from Lebak and 43 semi-trained panelists from Maros. The semi-trained panelists came from high school and university students who had consumed the original Purula in the previous month. The eight product samples with a different random three digit code based on flavor were prepared for the test. The panelist rinsed their mouth with mineral water before tasting each piece.

Table 1. Organoleptic test and hedonic test assessment score

| Score | Criteria |
|-------|--------------------|
| 1 | Very dislike |
| 2 | Do not like |
| 3 | Rather dislike |
| 4 | Normal/Neutral |
| 5 | I like it a little |
| 6 | Like it |
| 7 | Really like it |

2.4 Data Analysis

Research data were processed using the Microsoft Excel program and analyzed using SPSS 23.0 for Windows. Kruskal Wallis test and Mann-Whitney test were applied to examine differences with a p-value less than 0.05 ($p < 0.05$) set as the significance limit.

3 Result and Discussion

Hedonic or affective responses are emotional reactions that frequently accompany the perception of a stimulus project. Consumer behavior manifests itself as feelings of liking or disliking in response to a product or its sensory or ideational attributes [17]. The reasons behind such hedonic testing are diverse and go from assessing the effect of a product change to the more general understanding of how product characteristics drive liking or dislike [18].

3.1 Hedonic test Result in Lebak, Banten

The result of the analysis of the Kruskal Wallis and Mann Whitney test PURULA Products with the flavors in girl adolescents in Lebak, Banten can be shown in Table 2.

Table 2. Hedonic test for taste of PURULA result in Lebak, Banten

| Code | Number of Panelists | Flavors of PURULA | Mean ± Stdev | | | Sig. |
|------|---------------------|-----------------------------|--------------|---|--------------------|--------------|
| 183 | 54 | Garlic | 3,44 | ± | 1,62 ^c | 0,000 |
| 220 | 54 | Corn | 4,39 | ± | 1,77 ^d | |
| 374 | 54 | Beef | 3,56 | ± | 1,73 ^c | |
| 492 | 54 | Juhi (Squid) | 3,54 | ± | 1,49 ^c | |
| 556 | 54 | Katsuobushi (Bonito Flakes) | 2,76 | ± | 1,58 ^{ab} | |
| 689 | 54 | Salted Egg | 3,24 | ± | 1,41 ^{bc} | |
| 732 | 54 | Shrimp Paste | 2,57 | ± | 1,44 ^a | |
| 851 | 54 | Fried Anchovy | 3,67 | ± | 1,54 ^c | |

Note: Result are mean±standard deviation: Mean at the same row with different superscript indicates significantly different (P<0,05)

Table 2 showed the hedonic test for PURULA’s taste with a significant value of less than 0,05, so there were significant differences between the samples. The most preferred flavor of PURULA is corn which is significantly different from the other flavors. The mean of Corn PURULA is 4,39, which is above neutral/normal. The second most liked by the panelist is fried anchovy, which is not significantly different from beef, garlic, juhi (squid), and salted egg.

The taste of corn in PURULA has a distinctive sweet and savory taste like natural sweet corn. This sweet taste is a taste that adolescents like. Following the research [18], which states that taste preferences for high school students prefer sweet flavors, tend to be salty, savory, and slightly spicy. Sweetness, juiciness, sucrose concentration were variables included in the first "sweet corn taste" factor positively related [19]. The public much like the application of corn flavor in snacks. Based on the research [20], the original flavored taro chips and roasted corn flavors have a high preference compared to other taro chips.

3.2 Hedonic test result in Maros, South Sulawesi

The result of the analysis of the Kruskal Wallis and Mann Whitney test PURULA Products with the flavors in girl adolescents in Maros, South Sulawesi, can be shown in Table 3.

Table 3. Hedonic test for taste of PURULA result in Maros, South Sulawesi

| Code | Number of Panelist | Flavors of PURULA | Mean ± Stdev | | | Sig. |
|------|--------------------|-----------------------------|--------------|---|--------------------|--------------|
| | | | | | | |
| 183 | 43 | Garlic | 4,84 | ± | 1,45 ^c | 0,000 |
| 220 | 43 | Corn | 4,65 | ± | 1,63 ^{bc} | |
| 374 | 43 | Beef | 3,81 | ± | 1,56 ^a | |
| 492 | 43 | Juhi (Squid) | 4,16 | ± | 1,31 ^{ab} | |
| 556 | 43 | Katsuobushi (Bonito Flakes) | 3,51 | ± | 1,68 ^a | |
| 689 | 43 | Salted Egg | 3,93 | ± | 1,52 ^a | |
| 732 | 43 | Shrimp Paste | 3,44 | ± | 1,55 ^a | |
| 851 | 43 | Fried Anchovy | 3,91 | ± | 1,56 ^a | |

Note: Result are mean±standard deviation: Mean at the same row with different superscript indicates significantly different (P<0,05)

Table 3 showed the hedonic test for PURULA’s taste with a significant value of less than 0,05, so there were substantial differences between the samples. The most preferred flavor of PURULA is garlic which is not significantly different from corn, but the significant difference with the other flavors. The mean of garlic PURULA is 4.84, and corn PURULA is 4.65, above neutral/normal. The second most liked by the panelist is juhi (squid), which is not significantly different from salted egg, fried anchovy, beef, katsuobushi (bonito flakes), and shrimp paste.

The taste of garlic has a primary flavor that tends to be savory, which adolescents like. According to Nina's research [22], one of the constituents of savory taste is protein. The protein in garlic is 4.5 mg in 100 g, so the higher the addition of garlic, the higher the savory flavor. Winarno's opinion [23] states that good taste is due to amino acids in protein and fat. Garlic (*Allium sativum* L.) is the main food ingredient widely used in cooking to complement and enhance the taste of meat products [24]. Garlic and onion produce sulfur odor and taste, but they are not considered off-odors or off-flavors [25].

3.3 Comparison of hedonic test results in Lebak and Maros

Based on the results of the hedonic test in Lebak in Table 2, PURULA with corn flavor is the most preferred taste by girl adolescents and significantly different from other flavors. PURULA with corn flavor is the only flavor with a score above 4 (neutral) on the PURULA hedonic test in Lebak. Panelists in this area consisted of students from SMK 1 Malingping and SMA 1 Wanasalam in rural areas. Rural areas have plant resources as a source of food. Based on research data in 2020 [26], the ten highest high-iron foods consumed in Pandeglang District, a rural area, the two-most frequent iron consumed foods came from plants sources. Corn includes in the category of plant resources that are easily accessible to the people of Lebak. According to the Central Statistics Agency [27], data on corn production in the Wanasalam sub-district reached 1093 tons and became one of the highest corn-producing areas in the Lebak Regency. It proves that PURULA's hedonic test panelists are familiar with the taste of corn because it is easy to access corn plants.

Based on the hedonic PURULA test results in Maros in Table 3, the garlic taste is the most preferred but is not significantly different from the corn taste. At the same time, the taste of corn is not substantially different from the taste of juhi (squid). The taste of juhi (squid) was not significantly different from other flavors that scored below. Garlic, corn, and juhi flavors cut above 4 (neutral) and higher than other flavors. It is related to the topography of the Maros Regency, which varies significantly from coastal areas to hills [28]. It allows the Maros people to consume more varied food than the people in Lebak

Regency. The taste acceptance in the hedonic test has a higher score and is less significantly different. The panelists for the PURULA hedonic test came from the STIKES Salewangang Maros students and students at the Al Islah Islamic boarding school located in the Turikale District, the capital of Maros Regency, and included in the category of urban communities. According to research in 2020 [29], urban communities can identify daily foods that are locally available from various sources and are easily accessible physically.

4 Conclusion

The addition of several flavors to PURULA differs significantly in the preferences of girl adolescents. The most preferred flavor by girl adolescents in the hedonic test in Lebak, Banten, was corn flavor. In the hedonic test in Maros, South Sulawesi, Garlic and corn flavors were the most preferred flavors. Lebak and Maros are two different areas in terms of topography but have similarities as cities with high anemia rates, so the results of the hedonic test have other effects.

References

1. Indonesian Ministry of Health. *Riset Kesehatan Dasar (RISKESDAS) 2013* (Kementerian Kesehatan RI, Jakarta, 2013)
2. J. Fitriany, A.I. Saputri. Anemia Defisiensi Besi. *J. Averrous* **4,2** (2018)
3. Indonesian Ministry of Health. *Riset Kesehatan Dasar (RISKESDAS) 2018* (Kementerian Kesehatan RI, Jakarta, 2018)
4. R.D. Putri, B.Y. Simanjuntak, Kusdalinah. Pengetahuan gizi, pola makan, dan kepatuhan konsumsi tablet tambah darah dengan kejadian anemia remaja putri. *J. Kesehatan* **8**, 3, pp. 404-409 (2017)
5. Aditianti, Y. Permanasari, E.D. Julianti. Family and cadre supports increased iron pills compliance in anemic pregnant women. *J. Penelitian Gizi dan Makanan* **38**, 1, pp. 71-78 (2015)
6. Yuniarti, Rusmilawaty, T. Tunggal. Hubungan antara kepatuhan minum tablet Fe dengan kejadian anemia pada remaja putri di MA Darul Imad Kecamatan Tatah Makmur Kabupaten Banjar. *J. Publikasi Kesehatan Masyarakat Indonesia* **2,1**, pp. 31-36 (2015)
7. Agency for the Assessment and Application of Technology Indonesia. "Purula Abon Tabur Cegah Anemia". bppt.go.id. <https://bppt.go.id/rilis-inovasi/purula-abon-tabur-cegah-anemia> (accessed October 23, 2021).
8. Agency for The Assessment and Application of Technology Indonesia. Laporan Kinerja Instansi Pemerintah (LKIP) Tahun 2020 Deputy Bidang Teknologi Agroindustri dan Bioteknologi. Jakarta: BPPT,2020.
9. Center of Public Health Innovation. "PURULA". [Cphi-unud.org](https://cphi-unud.org). <https://cphi-unud.org/nproject/purula/> (accessed October 23, 2021).
10. Pritasari K, Upaya percepatan penurunan stunting: evaluasi pelaksanaan tahun 2018 & rencana tindak tahun (Direktur Jenderal Kesehatan Masyarakat, Bogor, 2018)
11. S. Prihatini, V. Kartika, Y.D. Sari. Konsumsi daging sebagai indikator anemia pada wanita usia subur. *J. Penelitian Gizi dan Makanan* **32**, 2, pp 112-121 (2009)
12. S. Patimah, V. Hadju, B. Bahar, Z. Abdullah. Pola konsumsi dan kadar hemoglobin pada ibu hamil di Kabupaten Maros, Sulawesi Selatan. *J. Makara Kesehatan* **15**, 1, pp 31-36 (2011).

13. N.W. D. Tarini, W. Sugandini, N.K. Sulyastini. Prevalence of anemia and stunting in early adolescent girls. *J. Advances in Social Science, Education, and Humanities Research* **394**, pp 397-402.
14. D. Permaesih, S. Herman. Faktor-faktor yang mempengaruhi anemia pada remaja. *Buletin Penelitian Kesehatan* **33** (2005)
15. Sirajuddin, S. Rauf, Nursalim. Influence of iron substances correlated with the stunting in Maros District. *J. Indonesian Nutrition Association* **43,2**, pp 109-118 (2020).
16. E.T. Ardianto, Y. Subaktilah, A. Widiyawati, A.D. Elisanti. Biscuit organoleptic test of dragon fruit (*hylocereus polyrhizus*) and moringa leaves for anemia. *Proceedings of The Second International Conference on Food and Agriculture* **2**, pp 558-564 (2019).
17. Cardello, A. V., S. R. Jaeger. "Hedonic measurement for product development: new methods for direct and indirect scaling." In *Consumer-driven innovation in food and personal care products*, pp. 135-174 (Woodhead Publishing, 2010)
18. Delarue, Julien, I. Boutrolle. "The effects of context on liking: implications for hedonic measurements in new product development." In *Consumer-driven innovation in food and personal care products*, pp. 175-218 (Woodhead Publishing, 2010)
19. M. E. Wiguna. Preferensi remaja dan anak-anak terhadap Taucu Cianjur. *J. Agrosience* **5**, 1, pp 29-33 (2015)
20. F. Azanza, B.P. Klein, J.A. Juvik. Sensory characterization of sweet corn lines differing in physical and chemical composition. *J. Food Science* **61**, 1, pp 253-257 (1996)
21. S. Mulyati, Nuraeni. Studi prefensi konsumen terhadap atribut keripik talas beneng. *J. Agribisnis Terpadu* **9**, 1 (2016)
22. K. Nina, A. Faridah, R. Holinesti. Pengaruh penambahan bawang putih terhadap kualitas telur asin. *J. Home Economics and Tourism* **15**, 2 (2017)
23. F.G. Winarno. *Kimia Pangan dan Gizi*. (PT Gramedia Jakarta, 2004)
24. X. Tang, D.A. Cronin. The effects of brined onion extracts on lipid oxidation and sensory quality in refrigerated cooked turkey breast rolls during storage. *J. Food Chemistry* **100**, 2, pp 712-718 (2007).
25. H.S. Yang, E.J. Lee, S.H. Moon, H.D. Paik, D.U. Ahn. Addition of garlic or onion before irradiation on lipid oxidation, volatiles, and sensory characteristics of cooked ground beef. *J. Meat Science* **88**, 2, pp 286-291 (2011)
26. G.K. Aji, N. Laily, I. Susanti. Iron intake among adolescent girls based on family socio-economic, frequent high-iron foods consumed, and knowledge about anemia in Pandeglang District. *J. National Nutrition* **16**, 1, pp 17-25 (2021)
27. Central Bureau of Statistics Lebak. *Harvested Area, Productivity, Production of Corn and Soybean in 2017*, (Central Bureau of Statistics Lebak, Jakarta, 2018)
28. Maros District Health Office. *Maros District Health Profile 2013*, (Maros District Health Office, South Sulawesi, 2014)
29. D. Colozza. Dietary health perceptions and sources of nutritional knowledge in an urban food environment: a qualitative study from Indonesia. *J. Public Health Nutrition* **24**, 10, pp 1-11 (2020)