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Fe content in "dragon fruits and *Moringa oleifera*" milk candy for stunting toddlers

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ABSTRAK

Latar Belakang: *Produk pangan fungsional telah menjadi trend sejak beberapa tahun terakhir. Hal ini tentunya sejalan dengan fokus bidang prioritas pada Rencana Induk Riset Nasional 2017-2045 terkait penerapan teknologi pengembangan nutrisi untuk mengatasi masalah stunting. Adapun salah satu kunci tren penggunaan pangan fungsional untuk permasalahan gizi adalah buah-buahan sebagai pangan fungsional. Terkait fokus stunting, selain makronutien, mikronutrien juga memegang peranan penting. Berbagai macam pangan fungsional telah di kaji, mulai dari biskuit, bubur, modisco, yogurt, susu. Namun masih sangat jarang pangan fungsional tentang produk permen susu berbahan dasar sayur dan buah.*
Tujuan: *Penelitian ini bertujuan untuk melakukan analisis kandungan zat besi pada permen susu berbahan dasar buah naga dan daun kelor.*
Metode: *Desain penelitian yang digunakan adalah penelitian deskriptif laboratorium, dengan sampel penelitian adalah produk permen susu buah naga dan daun kelor yang telah melalui uji organoleptik dan hedonik. Terdapat 3 sampel dalam penelitian yang masing-masing terdiri dari tepung buah naga: daun kelor: susu sapi yaitu P1 (12:1); P2 (14:2) dan P3 (16:3) dengan penambahan susu sapi 200 ml untuk semua sampel. Adapun preparasi sampel untuk proses pengujian diambil sebanyak 0,5 mg/sampel. Analisis kandungan zat besi pada permen menggunakan Atomic Absorbtion Spectrophotometer*
Hasil: *Nilai rata-rata kadar zat besi pada permen adalah 393,31 ppm sampai dengan 545,13 ppm. Kadar zat besi tertinggi terdapat pada perlakuan P2 yaitu 545,15 ppm dan perlakuan terendah terdapat pada P2 393,31 ppm. Nilai Fe dalam permen setara dengan 0,39331 sampai 0,54515 mg. Sedangkan angka kecukupan mineral zat besi harian untuk balita usia 1-3 tahun adalah 7 mg/ hari dan balita usia 4-5 tahun 10 mg/hari.*
Kesimpulan: *Kandungan Fe pada permen susu "Dragon Fruits and Moringa Oleifera" mencapai 1 gram/100 gr. Dalam 100 gram permen mampu memenuhi kebutuhan rata-rata mineral harian untuk balita usia 1 – 5 tahun.*

KATA KUNCI*: buah naga; daun kelor; permen susu; stunting**; zat besi***

ABSTRACT

Background: *Functional food products have become a trend in recent years. This is in line with the focus on priority areas in the 2017-2045 National Research Master Plan related to the application of nutrition development technology to overcome stunting problems. One of the key trends of using functional food for nutritional problems is fruit as a functional food. Regarding the stunting focus, various kinds of functional foods have been studied, ranging from biscuits, porridge, modisco, yogurt, milk. However, functional foods are still very rare regarding milk candy products made from vegetables and fruit.*
Objectives: *This study aims to analyze the iron content in "Dragon Fruits and Moringa Oleifera" milk candy made from dragon fruit and Moringa leaves*
Methods: *The research design used is a descriptive laboratory study, with the research samples being dragon fruit milk candy and Moringa leaves that have been through organoleptic and hedonic tests. There were 3 samples in the study, each of which consisted of dragon fruit flour: Moringa leaves: cow's milk, namely P1 (12:1); P2 (14:2) and P3 (16:3) with the addition of 200 ml of cow's milk for all samples. The sample preparation for the testing process taken as much as 0.5 mg/sample. Analysis of iron content in candy using Atomic Absorption Spectrophotometer.*
Results: *The average value of iron reached 393.31 ppm to 545.13 ppm. The highest iron content was found in the P2 treatment, namely 545.15 ppm and the lowest treatment was found at P2 393.31 ppm. The Fe value in milk candy is equivalent to 0.39331 to 0.54515 mg. While the daily mineral adequacy rate for toddlers aged 1-3 years is 7 mg/day and toddlers aged 4-5 years is 10 mg/day.*
Conclusions: *The Fe content in "Dragon Fruits and Moringa Oleifera" milk candy reaches 1 gram/100gr. In 100 grams of candy can meet the average daily mineral needs for toddlers aged 1-5 years.*

KEYWORDS*:* *dragon fruit; iron; milk candy; moringa leaves; stunting*

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INTRODUCTION

The 2017-2045 National Research Master Plan in the field of Health and Drug Research, focuses on the application of nutrition development technology (1). This master plan is in line with nutritional problems in Indonesia, one of which is stunting. So the main key to solving the stunting problem is improving the nutritional quality of pregnant women and toddlers (the first 1000 days of life) (2). It is important to increase the intake of micronutrients, one of which is iron. There is evidence that adequate levels of iron and zinc are significantly associated with stunting (3). However, giving iron tablets to pregnant women and toddlers is considered less effective because of the fishy taste and smell, so it is necessary to have functional food products based on local potential.Functional food is processed food containing one or more functional components which, based on scientific studies, have certain physiological functions, are proven to be harmless and beneficial to health (4).

Jember Regency is a producer of abundant plantation products, but has not been utilized optimally for functional foods, including dragon fruit, Moringa leaves and cow's milk. Ripe dragon fruit contains potassium, magnesium, calcium, iron and vitamin C (5). The iron content in dragon fruit reaches 0.03673% w/w to 0.04295% w/w (6). Moringa leaves contain iron 17.2 mg/100 g, calcium and protein (7)(8), while cow's milk contains 20% protein, 7% fat and 1.0% calcium (9). So that the local food

ingredients are very suitable as functional food raw materials, especially the required functional food components, namely minerals. Given the percentage of nutritional adequacy rates, especially minerals (iron, vitamin A, and zinc) in children aged 6-23 months in the low category (10). So we need an innovation of functional food products that have vitamin and mineral components and are favored by children, namely milk candy.

This candy is said to be unique because it combines some local foods from fruits and vegetables. So this milk candy is functional, especially it can be used as a snack to increase mineral intake in stunting toddlers. Of course, a study is needed to examine the levels of Fe contained in the milk candy. The results showed that the increase in hemoglobin levels and nutritional status in anemic children who received iron supplements in the form of candy was higher than those in anemic children who received iron supplements in the form of syrup (11). Through research in the form of assessment of Fe content, it will be obtained sources of nutritional information, especially Fe mineral content. So that besides being able to be consumed by stunting toddlers, the candy product can be consumed and developed also for adolescents and anemic pregnant women.

MATERIALS AND METHODS

Descriptive laboratory method, Fe content analysis was carried out for 4 weeks. The research process is carried out in a laboratory where the influence of the environment is easier to control, besides that the condition of the experimental unit is relatively homogeneous because there are no other factors that affect the response outside the treatment under study.

The unit of analysis is the proportion (comparison) between dragon fruit and Moringa leaf which consists of 3 treatment levels. The type of treatment uses the symbol P which is the proportion of dragon fruit flour: Moringa leaf flour: cow's milk. With 3 treatment levels, namely: P1 = 12:1:200, P2 = 14:2:200, P3 = 16:3:200, where each treatment was repeated four times. Furthermore, from each sample will be prepared at the Jember State Polytechnic Bioscience Laboratory and taken an amount of 0.5 mg/sample. Fe content in candy was analyzed using Atomic Absorption Spectrophotometer (AAS). The specification of the method used in the test is the Atomic Absorption cook book analytical application department, SHIMADZU corporation.

RESULTS AND DISCUSSIONS

The results of the analysis of iron levels in milk candy obtained an average value of 393.31 ppm to 545.13 ppm. The highest iron content was found in treatment P2 (545.15 ppm) and the lowest treatment was found in P3 (393.31 ppm). The results of the study can be seen in **Table 1**.

Table 1. Iron Levels of "Dragon Fruits and Moringa Oleifera" Milk Candy

Treatment	Iron (ppm)
P1 (12:1:200, dragon fruit: Moringa leaves: milk)	510.12
P2 (14:2:200, dragon fruit: Moringa leaves: milk)	545.13
P3 (16:3:200, dragon fruit: Moringa leaves: milk)	393.31

The AAS test explained a significant difference in the average iron content of milk candy in each treatment. Based on these results, the difference in the ratio of dragon fruit, Moringa leaves and fresh milk in the three treatments can affect the amount of iron content contained in milk candy. The difference in the results of iron levels in each milk candy treatment was due to the different ratios for each treatment, especially in the composition of dragon fruit and Moringa leaves.

The results of previous studies showed that the composition of iron (Fe) in Moringa

leaves was the second highest of the micro minerals found, reaching 20.49 mg/100g. The need for iron minerals for the body of children under five is about 7 to 10 mg per day. Iron minerals in the body function for the formation of hemoglobin (prevention of anemia), the immune system, components of cytochrome enzymes (enzymes in respiration), and play a role in increasing intelligence. High levels of iron in Moringa leaves have the potential to meet iron needs in the body (12)

While dragon fruit began to be widely consumed because of its chemical content that is beneficial to health. The chemical content of dragon fruit and dragon fruit peel are flavonoids, vitamins A, C, E and polyphenols (13). The scaly skin of dragon fruit is believed to contain pentacyclic, triyepene, and taraxast substances that can make blood vessels flexible, so blood will flow smoothly throughout the body.

Dragon fruit also contains iron to prevent anemia, calcium to strengthen bones, carotene to strengthen the brain, eye health and endurance, vitamin C for skin health, B vitamins to increase appetite, protein to increase body metabolism and maintain heart health. , fiber to prevent cancer and diabetes mellitus. Dragon fruit contains 9.4 mg iron, 134.5 mg calcium, 8.7 mg phosphorus, 60.4 mg magnesium (14).

One of the ingredients used in this dairy product is fresh milk. Fresh milk is milk produced by healthy milking directly that is not reduced or added to any ingredients. Fresh milk contains nutrients, especially animal protein with optimal ratios, easy to digest and no residue is wasted (15). In 100 grams of fresh milk contains about 3.8% fat content, protein between 1.5-4%, Calcium > 0.14%, 0.06% phosphorus, 0.50% Albumin, Lactose (4.6%), Vitamins and minerals are 0.85%, but this fresh milk has a boiling point between 100 -100.16o C, so the heating process that exceeds the boiling point will damage the quality of fresh milk (16)(17). In this study, it was shown that the difference in the ratio of dragon fruit, Moringa leaves and whole milk can affect the iron content of milk candy. Moringa leaf flour has an iron content of 28.2 mg/100g (18). Research conducted by (19), stated that the addition of Moringa leaf flour to the product could increase the iron content of the product.

There is an influence of variations in the mixing of Moringa leaves on the physical properties, organoleptic properties, and iron content of a product, the more mixture of Moringa leaves, the higher the iron content in the product, but the results of the study show that the more mixture of Moringa leaves in dim sum, the color of the dim filling. The sum is getting darker green, the aroma is getting more unpleasant, the savory taste is decreasing, and the texture is getting less chewy (hard) (19).

The findings in table 1 show that in the P3 treatment, the composition of Moringa leaves and dragon fruit was the most, but the lowest Fe content was 393.310 mg/100. Fe fumarate is an iron compound which is slightly soluble in water but soluble in acidic conditions. It is estimated that around 20% - 100% of Fe fumarate will be reduced depending on the amount of water used and the length of cooking time in the water (20). When food is cooked, processed, or stored, minerals can combine with other food components. As with vitamins, variations in the natural mineral content of raw foods and different cooking methods can result in variations in the mineral content of processed foods. Minerals are generally not sensitive to heat, so the heating process often does not have a significant impact on decreasing mineral levels (21).

The sample preparation process also has an effect on decreasing the Fe content of the test results, the preparation of a less homogeneous sample preparation can affect the test results. Because the sample sent is in the form of a ready-made candy, a dilution process is needed into a liquid form, which will then be taken 0.5 mg for the AAS test. It is possible that the sampling process that is less homogeneous is what affects the test results where the Fe content is lower than P1 and P2. The factor of

using several micronutrients together with iron is also an inhibitor of iron levels, for example vitamin A, vitamin C, vitamin B2, and vitamin B6 (22).

Another thing that causes a decrease in Fe levels during the processing is phytic acid or myoinositol hexophosphate salt. Phytic acid is the main form of element P in plants and is also an antioxidant. Phytic acid can bind mineral elements, especially calcium, magnesium, iron, and zinc, thereby reducing the availability of these minerals for the body (23). Phytic acid is found in many seeds and nuts, but it is possible that it is formed during the cooking process and the interactions between ingredients.

CONCLUSIONS AND RECOMMENDATIONS

The Fe content in "Dragon Fruits and Moringa Oleifera" milk candy is between 393,310 – 510,120 ppm. Equivalent to 0.39331 – 0.51012 mg/100 grams. In 100 grams of candy can fulfill the daily mineral adequacy rate (Fe) for stunting toddlers.

REFERENCES

1. Tim Nasional Percepatan Penanggulangan Kemiskinan. Strategi Nasional Percepatan Pencegahan Stunting 2018-2024 (National Strategy for Accelerating Stunting Prevention 2018-2024) [Internet]. Tim Nasional Percepatan Penanggulangan Kemiskinan (TNP2K) Sekretariat Wakil Presiden Republik Indonesia. 2018. p. 1–32. Available from: http://tnp2k.go.id/filemanager/files/Rakornis 2018/Sesi 1_01_RakorStuntingTNP2K_Stranas_22 Nov2018.pdf
2. Djauhari T. Gizi Dan 1000 Hpk. Saintika Med. 2017;13(2):125.
3. Dewi EK, Nindya TS. Hubungan Tingkat Kecukupan Zat Besi Dan Seng Dengan Kejadian Stunting Pada Balita 6-23 Bulan. Amerta Nutr. 2017;1(4):361.
4. BPOM. Jenis Pesat Berbagai Dengan. Peratur Kepala Badan Pengawas Obat dan Makanan Republik Indones. 2005;1–13.
5. Cai Y, Luo Q, Sun M, Corke H. Antioxidant activity and phenolic compounds of 112 traditional Chinese medicinal plants associated with anticancer. Life Sci. 2004;74(17):2157–84.
6. Dira D, Deviarny C, Riona W. Penetapan Kadar Zat Besi (Fe) Pada Buah Naga Isi Super Merah (Hylocereus costaricensis L.) Dan Isi Putih (Hylocereus undatus L.). Maj Kedokt Andalas. 2015;37(3):174.
7. William JA, Iddrisu LN, Damian T-D, Kwame O-B, Kwami BK. Nutrient composition of Moringa oleifera leaves from two agro ecological zones in Ghana. African J Plant Sci. 2014;8(1):65–71.
8. Bamishaiye EI, Olayemi FF, Awagu EF, Bamshaiye OM. Proximate and phytochemical composition of Moringa oleifera leaves at three stages of maturation. Adv J Food Sci Technol. 2011;3(4):233–7.
9. Utami KB, Radiati LE, Surjowardojo P, Peternakan F, Brawijaya U. Kajian kualitas susu sapi perah PFH (studi kasus pada anggota Kope- rasi Agro Niaga di Kecamatan Jabung Kabupaten Malang). J Ilmu-Ilmu Peternak. 2011;24(2):58–66.
10. Ignatius Hapsoro Wirandoko; Ruri Eka Maryam Mulyaningsih. Pengaruh Pemberian Zinc, Fe dan Vitamin A Terhadap Kejadian Infeksi dan Pertumbuhan. J Ilm Indones. 2020;5(1 Januari):85–8.
11. Siti Zulaekah dan Endang Nur Widiyaningsih. Daya Terima dan Pengaruh Suplementasi Fe Dalam bentuk Permen Pada Anak Sekolah Dasar Yang Anemia. J Penelit Sains Teknol. 2008;9(1):15–29.
12. Severino S;Magat;Ma.Cecilia M; Raquepo and Carmelita D.Pabustan. Mineral Macro-Nutrients, Micro-Nutrients and Other Elements in Leaves of Malunggay Plant (Moringa Oleifera) Sampled in

Some Location in the Philippines. Technol Notes. 2009;(Fahey 2005).

13. Siregar, Nur Khaidah, Rosidah, Aris S. Karakterisasi Simplisia dan Skrining Fitokimia serta Uji Aktivitas Antioksidan Ekstrak Etanol Buah Naga (Hylocereus undatus (Haw.) Britton & Rose) [Internet]. Universitas Sumatera Utara; 2018. Available from: https://onesearch.id/Record/IOS3619.123456789-29088#holdings
14. Dani Hendarto. Khasiat ampuh Buah Naga dan Delima [Internet]. 1st ed. Aldi Kurniawan, editor. Yogyakarta: Laksana; 2019. 112 p. Available from: https://www.google.co.id/books/edition/Khasiat_Ampuh_Buah_Naga_dan_Delima/K9jEDwAAQBAJ?hl=id&gbpv=1&dq=nutrisi+pada+buah+naga&pg=PA9&printsec=frontcover
15. Resnawati H. Kualitas Susu Pada berbagai Pengolahan dan Penyimpanan (The Quality of Milk and its Products on Several Processi ... Vol. 19, Semiloka Nasional Prospek Industri Sapi Perah Menuju Perdagangan Bebas 2020. Bogor; 2014.
16. Oka BW. Karakterisasi Kimia Susu Sapi Perah Di Kabupaten Sinjai. J Pendidik Teknol Pertan. 2017;3:195–202.
17. Banindra A. Dasar Pengolahan Susu dan Hasil Ikutan Ternak. In: Fakultas Pertanian Universitas Sumatera Utara. Sumatera Utara; 2004. p. 24.
18. Gopalakrishnan L, Doriya K, Kumar DS. Moringa oleifera: A review on nutritive importance and its medicinal application. Food Sci Hum Wellness [Internet]. 2016;5(2):49–56. Available from: http://dx.doi.org/10.1016/j.fshw.2016.04.001
19. Vidayana LR, Sari FK, Damayanti AY. The Effect of Addition Moringa Leave on Sensory Acceptability , Proximate Value and Iron Level in Catfish Nugget. SAGU. 2020;19(1):27–39.
20. Surahman DN. Stabilitas Zat Gizi Mikro (Iodium dan Fe)Selama Proses Pengolahan Pada Beras Terfortifikasi. Universitas Pasundan Bandung; 2014.
21. Enni Suwarsi Rahayu; Putik Pribadi. Kadar Vitamin dan Mineral Dalam Buah Segar dan Manisan Basah Karika Dieng (Carica pubescens Lenne & K. Koch). 2012;4(2).
22. Pratiwi R, Widari D. Hubungan Konsumsi Sumber Pangan Enhancer Dan Inhibitor Zat Besi Dengan Kejadian Anemia Pada Ibu Hamil. Amerta Nutr. 2018;2(3):283.
23. Siti Dewi Indrasari. Mutu Gizi Beras Kristal. Vol. 30. Subang; 2008.