

# ANALYSIS OF CONTENTS OF MACRO AND MICRO NUTRITION IN THE COUPLES OF GUDE NUT FLOUR (CAJANUS CAJAN) AND MOCAF FLOURS (MODIFIED CASSAVA FLOUR)

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## ABSTRACT

Protein energy deficiency (KEP) is one of the nutritional problems in Indonesia. Ready to Use Separation Food (RUSF) is one of the nutritional interventions by providing food alternatives that are being promoted to overcome nutritional deficiency problems (Devis 2014). RUSF is a ready-to-eat food that is made as an energy-dense and nutrient-rich food. Cookies are one form of RUSF that is loved by all ages, especially toddlers. According to Indonesian National Standard (SNI) 2973-2011, cookies are dry bakery products made by baking dough made from wheat flour with or without substitution, oil or fat, with or without the addition of other food ingredients with additional food allowed. To determine the analysis of the content of macro and micro nutrients in cookies formulations of gude peanut flour (cajanus cajan) and mocaf flour. This research is an experimental study, which is making cookies, peanut flour, gude and mocaf formulations and assessing macro and micro nutrient content. Research on the analysis of macro nutrient content in cookies, namely protein as much as 4.672 grams, fat as much as 30.20 grams and carbohydrates as much as 13.72 grams. The content of micronutrients in cookies is calcium as much as 0.035 grams and iron as much as 0.0023 grams. The protein content in cookies is considered sufficient, high fat, carbohydrates, calcium and iron are still lacking.

**Keywords:** Macro and micro nutrition, gude and mocaf bean flour

## INTRODUCTION

Protein energy deficiency (KEP) is one of the nutritional problems in Indonesia. KEP has a variety of conditions caused by a lack of energy or protein in mild to severe degrees. At severe KEP degrees it is called marasmus which is caused due to deficiency of energy and nutrients, while kwashiorkor is caused due to protein deficiency, which means a lack of consumption of foods containing calories or protein (Adriani et al.2012).

The occurrence of lack of energy and protein of toddlers will have an impact later when adults. Results of the 2013 Riskesdas Nationally, the lean prevalence of toddlers is 12.1 percent and the prevalence of underweight is 19.6 percent (Riskesdas, 2013). From the 2016 Nutritional Status Monitoring (PSG) data based on South Sulawesi province, the prevalence of malnutrition among children under the age of 0-23 months is 4.4 percent, the prevalence of underweight children under five ages 0-23 months is 16.5 percent. The very thin prevalence in children under five 0-23 months of age is 2.7 percent, and the thinner prevalence in children under the age of 0-23 months is

8.3 percent. The data shows that the handling of malnutrition cases in Indonesia is still not optimal (PSG, 2016).

*Ready to Use Supplementary Food* (RUSF) is a nutritional intervention method with the provision of food alternatives that are currently being promoted to address nutritional deficiency problems (Devis 2014). RUSF is a ready-to-eat food that is made as an energy-dense and nutrient-rich food. Biscuits are one form of RUSF that is loved by all ages, especially toddlers. According to Indonesian National Standard (SNI) 2973-2011, biscuits are dry bakery products made by baking dough made from wheat flour with or without substitution, oil or fat, with or without the addition of other foods with additional food that is permitted.

Efforts are being made to overcome the nutritional problems of KEP which occur by using local food ingredients, namely gude beans (cajanus cajan) and mocaf flour. Gude beans (cajanus cajan) is one of the most drought-tolerant legumes and produces pods in the dry season. Gude beans has a combination of advantages such as an optimal nutritional profile, rich in starch, protein, calcium,

manganese, crude fiber, fat, and minerals. In addition, gude beans are also used as traditional medicine in various countries (Valenzuela and Smith 2002 in Sharma et al. 2011). The advantages of gude beans (*cajanus cajan*) compared to other types of beans are that they have a fairly high nutrient content of 65% carbohydrates, 22% protein, 15% fat (Fachruddin 2007).

Modified Cassava Fluor (MOCAF) is a flour product from cassava which is processed using the principle of modifying cassava cells by fermentation. Microbes that grow cause changes in the characteristics of flour produced in the form of increased viscosity, gelation ability, rehydration power, and ease of dissolution (Amanu & Susanto 2014).

On the other hand cassava is an abundant commodity of carbohydrate sources. MOCAF flour has similar characteristics to wheat flour so it can be used as a substitute or mixture of flour from 30-100% and can reduce the cost of consumption of wheat flour 30-100% (Regional Research and Development Agency of East Kalimantan, 2012).

The use of gude peanut flour (*cajanus cajan*) and MOCAF flour in making biscuits is expected to reduce or prevent one of the nutritional problems namely KEP which is currently occurring. Therefore, it is necessary to do an analysis of macro nutrient content and micro in cookies formulated with gude peanut flour (*cajanus cajan*) and mocaf flour.

**METHODS**

This research is an experimental research that is making cookies formulated with peanut flour, gude and mocaf, and assessing macro and micro nutrient content. The research design used was post test group design. The place of research was conducted at the Food Technology Laboratory of the Nutrition Department of the Makassar Health Polytechnic. The study was conducted in March-October 2018.

The process of making gude bean flour begins with sorting the gude beans that are good or not perforated, soaking is done for 24 hours, drying using the oven for 8 hours with a temperature of 55-60 ° C, crushing using a dry blender, sifting size 80 mash.

In making biscuits there are 3 types of biscuit formulas namely (20%). The process of making cookies begins by shaking the egg using a mixer until it turns white (expanding) at high speed after that add the butter and margarine that has been melted first. Add the mixture of MOCAF flour, gude bean flour (*cajanus cajan*) and baking powder into the mixture, stirring the cake spatula until smooth. The dough is ready to be printed and baked with a temperature of 50-60 ° C for ± 60 minutes.

Data collection of macro nutrient content was obtained from the results of the *Luff Schroll*, *Shoxlet*, and *Micro kjedhall* test. Data collection of micronutrient content was obtained from the results of the *Spectropometry* test.

**RESULTS**

**a. Gude Peanut Flour**

Making gude bean flour begins with the process of soaking, steaming, drying and the final stages of refining and sifting. Treat the gude beans by using an 80 mesh size sieve. The processed gude beans are as follows:

**Table 1.** Gude Peanut Flour

<b>Material</b>
<b>Weight Gude Nuts</b>
6,09 kg Gude Peanut Flour
5,04 kg

Source : Primary Data, 2018

The weight of the flour produced is 5, 04 kg of the net weight of the gude beans as much as 6, 09 kg. Material shrinkage

## b. Macro and Micronutrient Substances in Cookies

Analysis carried out in the laboratory to test the macro and micro nutrient content obtained as follows :

**Table 2. Macro and Micro Nutrient Substances in Cookies**

Type of Analysis	Analysis Results (%)
Protein	4.672
Fat	30.20
Carbohydrate	13.72
Iron	0.0023
C	0.035

Source : Primary Data, 2018

## DISCUSSION

### a. Gude Peanut Flour

Making gude peanut flour is made from clean gude beans at 6.08 kg and processed into flour to 5.04 kg in weight. Making the gude beans starts with washing the gude beans cleanly. After cleaning, the gude beans are soaked for 24 hours to soften the texture of the gude beans. During 24-hour immersion, every 6 hours the immersion water is replaced to remove the remaining of smell.

After the gude beans go through the soaking process for 24 hours, then the gude beans are then steamed for about 2 hours. After steaming the ingredients of the gude beans are then roasted in an oven where the temperature is controlled. The roasting time is approximately 18 hours and the oven temperature is 60 degrees Celsius. The dried gude beans are then mashed using a blender and sieved with an 80 mesh sieve.

The ready-to-use gude bean flour is mixed in the cookie dough along with the mocaf flour.

### b. Macro and Micro Nutrition Content

#### 1. Protein

The average number of nutritional needs recommended for school children 7-12 years is protein at 45 - 50 grams per person per day. The 2011 PMT-AS program, additional food can at least provide 10% of the total protein requirements according to the age of school children. The nutritional content of each additional food contains at least 4.5 - 5 grams of protein (Hardinsyah and Tambunan, 2004).

The results showed that the protein content of the cookies in the formulation of gude peanut flour and mocaf flour every 100 grams contained 4.672 g of protein. The protein content of cookies in the formulation of gude peanut flour and mocaf flour is in accordance with the standards prescribed by the PMT-AS program as a supplementary food.

Indonesian National Standard (SNI) cookies 01 - 2973 - 1992 minimum protein content of 9%. While the cookies formulation of gude peanut flour and mocaf flour contain only around 4.672%. If referring to SNI cookies, the cookies for the formulation of gude peanut flour and mocaf flour still need to be added to the protein so that it can reach the SNI standard of cookies.

#### 2. Fat

The fat content of the cookies in the formulation of gude peanut flour and mocaf flour is 30.20%. When compared with the standard SNI 01-292973 1992 the fat content of cookies is at least 9.5%. The fat content of cookies in the formulation of gude peanut flour and mocaf flour compared to SNI cookies is quite a lot. The highest fat source in cookies is the formulation of gude peanut flour and mocaf flour derived from margarine and butter cream which is included in the cookie dough.

### 3. Carbohydrate

The carbohydrate content according to SNI in cookies is 70 g. While the carbohydrate content in the cookies formulated with gude peanut flour and mocaf flour every 100 g is 13.72 g. The carbohydrate cookies content of gude bean flour formulation and mocaf flour are still low when compared to the SNI standard cookies.

### 4. Calcium

Calcium is a mineral that has an important role especially for the growth of bone and tooth formation. The calcium adequacy rate for children aged 1-3 years is 650 mg per day and for adolescents aged 10-18 years is 1200 mg per day. Adequacy of calcium intake and balance in the body are needed to support health. Calcium is not only needed for children and adolescents who are in their infancy but also for adults and the elderly both women and men.

Calcium content in cookies formulation of gude peanut flour and mocaf flour every 100 g is around 0.00175 g. Although there is calcium in the cookies, the formulation of gude peanut flour and mocaf flour, but the content is still low. This is because the percentage of gude and mocaf bean flour is only around 20%.

### 5. Iron

Iron is a mineral that is present in very small amounts in the body but has an important role for health. The highest iron requirement in healthy individuals is in women aged 13 - 49 years, namely 26 mg per day. Iron is needed by the body, especially for the formation of red blood cells.

Iron deficiency can result in decreased work productivity because red blood cells are unable to carry enough oxygen from the lungs to all body tissues causing fatigue, decreased concentration, headaches, and pallor.

The iron content in cookies formulations of gude peanut flour and mocaf flour every 100 grams is 0.0023 g. Although there is an iron content in

cookies, the formulation of gude peanut flour and mocaf flour, but the content is still low. This is because the percentage of gude and mocaf bean flour is only around 20%.

## CONCLUSION

1. The content of macro nutrients in cookies formulation of gude peanut flour and mocaf flour per 100 grams are 4.672 grams of protein, 30.20 grams of fat and 13.72 grams of carbohydrates.
2. The content of micronutrients in cookies formulation of gude peanut flour and mocaf flour per 100 grams is calcium as much as 0.035 grams and iron as much as 0.0023 grams.

## REFERENCES

- Adebowale O.J. (2011). *Effect of Fermentation Period on the Chemical Composition and Functional Properties of Pigeon Pea (Cajanus cajan) Seed Flour*. International Food Research Journal 18(4): 1329-1333.
- Agron, Edmon. (2009). *Promoting Pigeon Pea Coffee as A Nutritious Alternative Beverage Explored*. Bureau Agricultural research Chronicle A Monthly Publication 10(7). [www.bar.gov.ph/barchronicle/ltest\\_issue/juli2009\\_news4.asp](http://www.bar.gov.ph/barchronicle/ltest_issue/juli2009_news4.asp) diakses 14 Februari 2018.
- Annisaa', L.F, Diana Nur Afifah. (2015). *Kadar Protein, Nilai Cerna Protein In Vitro dan Tingkat Kesukaan Kue Kering Komplemtasi Tepung Jagung dan Tepung Kacang Merah Sebagai Makanan Tambahan Anak Gizi Kurang*. <http://ejournal-sl.undip.ac.id/index.php/jnc> diakses 03 Juli 2018.
- Anonim, (2014). *Peningkatan Ketahanan Pangan Melalui Pengembangan dan Diversifikasi Produk Kacang Gude (Cajanus cajan Linn)*. <http://historyblogger12.blogspot.com/2013/01/peningkatan-ketahanan->

- [pangan melalui.html](#) diakses pada 24 Februari 2018
- Astawan, M. (2004). *Tetap Sehat dengan Produk Makanan Olahan*. TigaSerangkai. Solo.
- Badan Standarisasi Nasional. (1995). SNI 01-3728-1995. *Syarat Mutu Tepung Kacang Hijau*. Jakarta. Badan Standarisasi Nasional.
- Bilqisti, Qoiman, et al. (2010). *Tepung Bonggol Pisang sebagai Upaya Mengurangi Ketergantungan Bahan Baku Tepung Dari Luar Negeri*. KTI. Institusi Pertanian Bogor. Bogor.
- Damaris, AO. (2007). *The potential of pigeonpea in Africa*. Natural Resource Forum 31 (2007): 297-305
- Diana. (2011). *Pengaruh Citra Tubuh Terhadap Perilaku Makan Dan Status Gizi Remaja Putri Di SMAN 1 Medan*. Tesis. Program Studi S2 Ilmu Kesehatan Masyarakat Fakultas Kesehatan Masyarakat Universitas Sumatera Utara. Medan
- Direktorat Gizi Depkes RI. (2013). *Daftar Komposisi Bahan Makanan*. Jakarta. Bhrataraya Karya Aksara.
- Fachruddin, Lisdiana. (2007). *Budi daya kacang-kacangan*. Kanisius. Yogyakarta
- Fatimah, Petti Siti. (2013). *Uji Daya Terima dan Nilai Gizi Biskuit yang Dimodifikasi dengan Tepung Kacang Merah*. Skripsi. Fakultas Kesehatan Masyarakat Universitas Sumatera Utara. Medan
- Fellows, P. J. (2014). *Teknologi Pengolahan Pangan Prinsip dari Praktik*. Jakarta. Penerbit Buku Kedokteran EGC.
- Gusliandra, Ardina. (2013). *Faktor Resiko Status Gizi Kurus pada Anak Usia 6-12 Tahun di Kelurahan Korong Gadang Kecamatan Kuranji Padang*. Karya Tulis Ilmiah. Politeknik Kesehatan Kemenkes Padang. Padang
- Hapsari, Rachmawati Nila. (2013). *Kontribusi Makanan Jajanan Terhadap Tingkat Kecukupan Asupan Energi dan Protein Pada Anak Sekolah yang Mendapat PMT-AS di SD Negeri Plalan 1 Kota Surakarta*. Jurnal Publikasi. Universitas Muhammadiyah Surakarta. Surakarta
- Hardinsyah dan Tambunan, V.(2004). *Angka Kecukupan Energi, Protein, Lemak dan Serat Makanan*. Widyakarya Nasional Pangan dan Gizi VIII. LIPI. Jakarta
- Jose, P. (2009). *Gandules / Pigeon Peas*. [www.caribbeanseeds.com/gandules.html](http://www.caribbeanseeds.com/gandules.html) diakses 18 September 2017
- Kazuma. (2009). *Tanaman Obat*. <http://forum.alulama.net>. Diakses 5 Februari 2018.
- Kementerian Kesehata RI. (2013). *Angka Kecukupan Gizi*. Jakarta
- Kementerian Kesehatan RI (Kemenkes RI). (2013). *Pedoman keamanan pangan jajanan anak sekolah*. Jakarta.
- Khairani, Liza. (2008). *Respon Pertumbuhan dan Produksi Kacang Hijau (Phaseolus radiatus L.) pada Beberapa Komposisi Lumpur Kering Limbah Domestik Sebagai Media Tanam*. Universitas Sumatera Utara Medan
- Khasanah, Uswatun. (2015). *Karakteristik Fisiko-Kimia Bolu Kukus Tepung Umbi Garut yang Diperkaya Protein Tepung Kacang Gude*. Skripsi. Fakultas Pertanian Peternakan Universitas Muhammadiyah Malang. Malang
- Krisnawati, Ayda. (2005). *Prospek Serta Pencandraan Sifat Kualitatif dan Kuantitatif Kacang Gude (Cajanus cajan L. Millsp.)*. Penelitian Pemuliaan Balai Penelitian dan Umbi-umbian Malang.
- Kuhnlein Harriet V. & Olivier Receveur. (2007). *Local Cultural Animal Food Contributes High Levels of Nutrients for Arctic Canadian Indigenous Adults and Children*. J.Nutr. 137: 1110-1114,2007.

- Kusharto CM, Astuti, Aisyah, Marliati SA, Rosmiati R. (2015). *Formulasi , Kandungan Gizi , Dan Daya Terima Kue-Kue Tradisional Makassar Berbasis Tepung Pupae – Mulberry (Pury) Sebagai Makanan Bergizi Masa Depan*. Jurnal Gizi Pangan, 10 (November), 197–206.
- Manik, L. (2001). *Identifikasi Kelayakan Makanan Kudapan Sekolah sebagai Makanan PMT-AS Menurut Aspek Gizi, Biaya, dan Keamanan Pangan*. Skripsi Jurusan Gizi Masyarakat dan Sumber Daya Keluarga, Fakultas Pertanian, IPB, Bogor.
- Mas'ud Syahrir, (2010). *Kajian Perusak Polong Sebagai Hama Utama pada Kacang Gude di Sulawesi Selatan*. Prosiding Pekan Serealia Nasional. Balai Penelitian Tanaman Serealia, Maros Hal 373–379.
- Murphy, SP., Constance Gewa,C., Grillenberger, M.,Bwibo,NO., Neumann, CG. (2007). Designing Snacks to Address Micronutrient Deficiencies in Rural Kenyan Schoolchildren. *J. Nutr.* 137 : 1093-1096.
- Nisa, Risa Ulfatun. (2016). *Perbandingan Tepung Sukun (Artocarpus communis) dengan Tepung Kacang Hijau (Vigna radiata L) dan Suhu Pemanggangan Terhadap Karakteristik Cookies*. Universitas Pasundan. Bandung
- Ohiokpehai Omo et al. (2009). *The Effects of Soybean (Glycine Max) and Pigeon Pea (Cajanus Cajan) Food Mixtures On The Nutritional Status Of School Children In Suba District, Kenya*. Journal of Food, Agriculture & Environment Vol.7 (2) : 59-63.
- Okpala L C., & Okoli E C. (2011). *Nutritional evaluation of cookies produced from pigeonpea, cocoyam and sorghum flour blends*. African Journal of Biotechnology Vol.10(3), pp. 433-438, 17 January, 2011.
- ISSN 1684-5315. Academic Journal.
- Panjaitan, Wanri E.S. (2012). *Hubungan Persepsi Body Image, Perilaku Makan Dan Status Gizi Pada Remaja*. Skripsi. Program Studi Ilmu Gizi Fakultas Ilmu – Ilmu Kesehatan Universitas Esa Unggul. Jakarta
- Pratiwi, Hesti. (2017). *Pengaruh pH Ekstraksi Terhadap Rendemen, Sifat Fisiko- Kimia dan Fungsional Konsentrat Protein Kacang Gude (Cajanus cajan (L.) Millsp.)*. Skripsi. Fakultas Teknologi Pertanian. Universitas Udayana. Bukit Jimbaran
- Pratiwi, Yoni. (2012). *Hubungan Asupan Energi dan Protein dengan Status Gizi Anak Asuh di Panti Asuhan Aisyiyah Cab. Nangglo Padang*. Karya Tulis Ilmiah. Politeknik Kesehatan Kemenkes Padang. Padang
- PSG. (2017). Hasil Pemantauan Status Gizi (PSG) 2016. *Biro Komunikasi Dan Pelayanan Masyarakat*, 140. Retrieved from <http://sehatnegeriku.kemkes.go.id>. diakses 10 Oktober 2017
- Rahmi AA & Muis SF. (2005). *Kontribusi Makanan Jajanan Terhadap Tingkat Kecukupan Energi dan Protein Serta Status Gizi Anak Sekolah Dasar Siliwangi Semarang*. Media medika muda. Nomor 1. Hal 55-59
- Riskesdas. (2013). *Riset Kesehatan Dasar (RISKESDAS) 2013. Laporan Nasional 2013*, 1–384. <https://doi.org/> diakses 09 September 2017
- Saswini, Andi Ade Ula, Veni Hadju, M. M. (2015). *Pengembangan Pangan Lokal Kacang Gude (Cajanus cajan) sebagai Alternatif PMT-AS dengan Sumber Protein dan Zat Besi dalam Pembuatan Kue Tradisional Baruasa di Kabupaten Jeneponto*. Jurnal Publikasi. Universitas Hasanuddin Makassar. Makassar



- Saxena KB. (2000). Pigeonpea in China. International Crops Research Institute for the Semi-Arid Tropics, Patancheru 502 324, A.P. India. (limited distribution). p. 29
- Saxena KB., Kumar RV., Gowda C. L. (2010). *Vegetable Pigeon Pea- A Review*. Journal of Food Legumes 23(2):91–98.
- SDT. (2014). *Diet total study: Survey of individual food consumption Indonesia 2014*. Ministry of Health Republic of Indonesia. <https://doi.org/978-602-1099-31-5> diakses 10 September 2017.
- Sharma, S, N.Agarwal, P. Verma. (2011). *J. of Functional and Environ. Bot.*1(2):91–101.
- Sihadi. (2004). *Makanan Jajanan Bagi Anak Sekolah*. Jurnal Kesehatan YARSI Sirajuddin, et al. (2015). *Survei Konsumsi Pangan*. Jakarta. Penerbit Buku Kedokteran EGC.
- Susanto, T. dan B. Saneto. (1994). *Teknologi Pengolahan Hasil Pertanian Binal Imu*. Surabaya.
- Sutriyati Purwanti, Kokom Komariah, P. E. (2006). *Pemanfaatan Bahan Pangan Lokal Untuk Menunjang Pengembangan Ragam Makanan Tambahan Anak Sekolah (PMT-AS) di Kecamatan Turi, Kabupaten Sleman Yogyakarta*. Jurnal Publikasi, 1–18.
- Tim Koordinasi Nasional Penyediaan Makanan Tambahan Anak Sekolah (PMT- AS). (2010). *Pedoman Penyediaan Makanan Tambahan Anak Sekolah (PMT-AS)*. Jakarta.
- Torres, Alexia, (2007). *Germinated Cajanus cajan Seeds As Ingredients in Pasta Products: Chemical, Biological and Sensory Evaluation*. Journal of Food Chemistry. Vol/No:101/1. Pg: 202–211. <http://www.sciencedirect.com/science> diakses 28 Februari 2018
- Uci Yulianti. (2011). *Faktor-faktor yang Mempengaruhi Konsumen dalam Pembelian Makanan Jajanan Tradisional di Kota Malang*. Jurnal Manajemen Bisnis, Vol 1(1).
- Venzon, M., Rosado M.C., Euzebio, D.E., Souza, B., Schoederer, J.H., (2006). *Suitability of Leguminous Cover Crop Pollens As Food Source For The Green Lancewing Chrysoperla Externa (Hagen) (Neuroptera: chrysopidae)*. Neotropical Entomology, 35: 371–376.
- Winarno. (2004). *Kimia Pangan dan Gizi*. Jakarta; PT.Gramedia Pustaka Utama. Winarno. F. G. (2002). *Kimia Pangan dan Gizi*. Jakarta. Gramedia. Pustaka Utama.
- Zakaria, et al. (2009). *Bahan Ajar Ilmu Teknologi Pangan*. Politeknik Kesehatan Depkes Makassar