



Formula *Kahiguru* High Protein for Making of Food Supplement as Elimination Stunting



I Komang Agusjaya Mataram ^a; Yuli Laraeni ^b; Ni Putu Agustini ^c;

Article history: Received 10 August 2017; Accepted in revised form 20 November 2017; Approved 29 November 2017; Available online 12 December 2017

Correspondence Author ^a

Abstract



Keywords

Green Bean Flour;
Gude Bean Flour;
Kahiguru Formula;
Lemuru Fish Flour;
Supplementary Feeding;

In general, the objective of the study was to create a high protein "kahiguru" formula consisting of a mixture of green beans (*Vigna radiata*) flour, gude nuts (*Cajanus cajan*) flour and lemuru fish (*Sardinella L.*) flour. The preparation of kahiguru formula and supplementary feeding products (PMT) was made using a randomized block design. The nutrient content of kahiguru formula is the lowest protein content in formula A (25,2054%) and highest formula F (52,3365%); the lowest fat content in Formula A (3.6901%) and highest formula F (6.8923%). The highest amino acid arginine content in the formula F (3.033%), histidine in the formula D (4.744%), Isoleucine in the formula E (2.606%), Leucine in the formula F (2.920%), lysine in the formula B (12.765%), methionine in the formula D (3.828%), phenylalanine in the formula F (1.822%), threonine in the formula F (3.526%) and valine in the formula F (1.909%). Based on the amino acid content kahiguru formula can be made variations of PMT are preferred child under five years, such as cake, cookies, or brownies. The conclusion is 1) "kahiguru" formula containing high protein as the base material of PMT is a combination of green bean flour, gude bean flour and lemuru fish flour, 2) nutrient content of best kahiguru formula is formula "F" (20-20 -60) containing 52.3 grams of protein and 6.9 grams of fat, 3) high kahiguru formula containing amino acid hystidine (4.74%) is the formula "D"; methionine (3.82%) and isoleucine (2.60%) is the formula "E"; threonine (3.52%), arginine (3.03%), valine (1.90%), phenylalanine (1.82%), and leucine (2.92%) were the formula "F".

^a Department of Nutrition Poltekkes Denpasar, Indonesia

^b Department of Nutrition Polytechnic Mataram, Indonesia

^c Department of Nutrition Poltekkes Denpasar, Indonesia

e-ISSN : 2550-6986, p-ISSN : 2550-6994 © Copyright 2017. The Author. Published by ScienceScholar. This is an open access article under the CC-BY-SA license (<https://creativecommons.org/licenses/by/4.0/>) All rights reserved.

Contents

Abstract	14
1. Introduction	15
2. Research Method	15
3. Results and Analysis	16
3.1 Result	16
3.2 Discussion	18
4. Conclusion	19
Acknowledgements	20
References	21
Biography of Authors	24

1. Introduction

Nutrition programs in the field that are still a priority on the prevention of nutritional problems are Supplemental Feeding (PMT) extension and recovery. It seems that the provision of PMT has not produced an optimal impact so that specific studies by region are required.^{1,2} The prevalence of stunting in Indonesia in 2013 amounted to 19.2%, in Bali as much as 19.5% and NTB as much as 24.7%. These data show that the prevalence of stunting in Bali and NTB is higher than the national prevalence.³ Green beans (*Vigna radiata*) containing high protein (22.9%), gude beans (*Vigna radiata*) (20.7%) and lemuru fish (*Sardinella L.*) (16.0%), can be used as a basic formula for making PMT.^{4,5,6,7,8,9,10} The third mixture of the ingredients is named "kahiguru" formula containing at least 25% protein. Basic ingredients that contain high in nutrients, especially proteins can be used as high-protein PMT as one of the efforts of diversification of PMT-based local wisdom.

In general, the objective of the study is to create a high protein "kahiguru" formula that can be used as a PMT to help meet the nutritional needs of the child under five stunting. Specific objectives of the study were: 1) Calculating the yield of green bean flour, gude bean and lemuru fish, 2) Creating "kahiguru" formula containing high protein as the basic ingredient of PMT, 3) Analyzing the nutrient content (protein and fat) of kahiguru formula 4) Analyze the amino acid content of kahiguru formula, 5) Make a PMT snack product based on kahiguru formula, 6) Analyze the content of nutrients (protein and fat) of PMT product, 7) Analyze the amino acid content of PMT product, 8) Conduct an organoleptic test to taste PMT products.

The results of this study are expected to add information in the field of science and technology, especially about the formula kahiguru high protein ($\geq 25\%$ protein) that can be used as the basic ingredients PMT. If possible the results of this study can be tested directly apply experimental methods to a child under five stunting to determine the effectiveness of this product. The Ministry of Health will have an additional alternative to PMT that can be applied nationally while maintaining local wisdom.

2. Research Method

This study design was a using randomized block design with 6 treatments kahiguru formula and 3 replications so that the research unit is 18 units.¹¹ The kahiguru formula that is designed is a mixture of green bean flour, gude flour and lemuru fish flour with some weight variation. The weight of green bean flour is 20 grams and the weight of gude bean flour and lemuru fish flour

varies. For example, the "kahiguru formula A" is a formula consisting of 20 grams of green bean flour, 70 grams of gude bean flour and 10 grams of lemuru fish flour. The composition of the formula can then be read in Table 1.

Table 1.

Kahiguru Formula based on Amount of Basic Material Green Bean Flour, Gude Bean Flour and Lemuru Fish Flour

KAHIGURU FORMULA	FLOUR		
	Green Beans (gram)	Gude Beans (gram)	Lemuru Fish (gram)
A	20	70	10
B	20	60	20
C	20	50	30
D	20	40	40
E	20	30	50
F	20	20	60

Preparation of supplementary feeding (PMT) products using randomized block design with 6 treatments and 3 replications so that the unit of research amounted to 18 units. The type of PMT made is chips using kahiguru formula with the addition of ingredients such as wheat flour, chicken egg, salt, and sugar. The shape of PMT resembles chips with a thickness of 2 mm, 1 cm wide and 4 cm long. The composition of the PMT material used can be read in Table 2.

Table 2.

Composition of PMT Making Material

PMT FORMULA	INGREDIENTS				
	Kahiguru Formula (gram)	Wheat Flour (gram)	Chicken Eggs (gram)	Salt (gram)	Refined Sugar (gram)
A	100	100	50	2	10
B	100	100	50	2	10
C	100	100	50	2	10
D	100	100	50	2	10
E	100	100	50	2	10
F	100	100	50	2	10

Tastes that include flavor, aroma, color, texture and overall are obtained by organoleptic tests, using a slightly trained panelist of 30 people. Protein analysis using kjeldahl micro method, amino acid analysis using HPLC method and fat analysis using Soxhlet method.¹² Organoleptic test data were analyzed using ANOVA to determine the taste of the best PMT product.^{13,14}

3. Results and Analysis

3.1 Result

a. Rendemen Flour Material Formula Kahiguru

The yield of fish lemuru flour is quite low ranging from 10.3% to 12.0% with an average of 11.07%. Rendemen of green beans flour ranged from 87.5% to 91.5% with an average of 89.9% and gude beans flour ranging from 89.0% to 92.1% with an average of 90.4%.

b. Nutrition Analysis

Green beans, gude beans, and lemuru fish flour after analyzed nutrients (water, ash, protein, and fat) in the laboratory obtained data as shown in Table 3.

Table 3.

Average Results of Nutrient Analysis Green Bean Flour, Gude Bean Flour, and Lemuru Fish Flour

Flour	Water (%)	Ash (%)	Protein (%)	Fat (%)
Green Beans Flour	6.8092	4.1082	24.8766	2.8257
Gude Beans Flour	10.2744	4.5863	24.0002	1.9376
Lemuru Fish Flour	13.0254	6.4609	73.1726	5.8697

The result of analysis of nutrient content of kahiguru formula at Udayana University Food Technology Laboratory as follows are protein content in formula A (25,2054%) and increasing until F (52,3365%); fat content in Formula A (3.6901%) and highest formula F (6.8923%). All formulas qualify as high-protein formulas because they contain over 25% protein. For more details can be read Table 4.

Table 4.

Average Results of Nutrition Analysis of Kahiguru Formula

KAHIGURU FORMULA	Water (%)	Ash (%)	PROTEIN (%)	Fat (%)
A (20-70-10)	9.9306	4.6443	25.2054	3.6901
B (20-60-20)	9.3450	4.5657	30.3877	3.8186
C (20-50-30)	9.2224	4.8937	35.2662	5.5467
D (20-40-40)	9.9686	4.9751	40.5011	4.9753
E (20-30-50)	10.2392	5.2455	43.7589	6.7030
F (20-20-60)	9.3564	5.4738	52.3365	6.8923

The highest amino acid arginine content in the formula F (3.033%), hystidine in the formula D (4.744), Isoleusine in the formula E (2.606), Leusine in the formula F (2.920), lysine in the formula B (12.765), methionine in formula D (3.828), phenylalanine of the formula F (1.822), threonine in the formula F (3.526) and valine in the formula F (1.909). For more details can be read in Table 5.

Table 5.

Average Results of Amino Acid Analysis of Kahiguru Formula

AMINO ACID (AA)	FORMULA					
	A	B	C	D	E	F
AA Essential						
Arginine	1.565	1.289	0.228	0.065	1.962	3.033
Hystidine	0.150	0.108	4.521	4.744	0.777	1.074
Isoleusine	0.750	0.570	1.136	1.012	2.606	1.239
Leusine	1.298	0.862	0.099	0.872	0.431	2.920
Lysine	2.031	12.765	1.865	1.994	0.128	4.291
Metionine	0.039	0.859	1.539	0.545	3.828	0.085
Phenylalanine	1.587	0.701	0.598	0.503	1.051	1.822
Threonine	2.921	2.129	1.099	1.196	2.301	3.526
Valine	0.791	0.304	0.149	0.211	0.539	1.909

c. Supplemental Feeding Products (PMT)

The lowest protein content of PMT products was formula A (22.01%) and the highest was formula F (28.85%). The lowest fat content was formula A (19.61%) and the highest was formula F (22.73%). For more details can be read Table 7.

Table 7.
Average Results of Nutritional Analysis of Supplemental Feeding (PMT) Products

PMT	Water (%)	Ash (%)	Protein (%)	Fat (%)
FORMULA A	3.5684	2.4862	22.0131	19.6176
FORMULA B	6.8713	2.4403	22.7672	18.2990
FORMULA C	4.6779	2.3575	25.5312	19.8248
FORMULA D	7.6532	2.6036	25.3268	18.9824
FORMULA E	6.9786	2.6793	25.3093	21.7056
FORMULA F	6.7256	2.7662	28.8556	22.7384

PMT based kahiguru formula with the highest amino acid content of amino arginine (0.400%) formula E, histidine (2.881%) and isoleusine (1.297%) formula D, lysine (1.123%), phenylalanine (1.723%) and threonine (1.161%) formula F. For more details can be read Table 8.

Table 8.
Average Results of Amino Acid Analysis Supplemental Feeding (PMT) Product

AMINO ACID (AA)	PMT PRODUCTS WITH BASIC FORMULA					
	A	B	C	D	E	F
AA Essential						
Arginine	0.300	0.269	0.331	0.369	0.400	0.368
Hystidine	2.067	2.365	2.799	2.881	2.854	0.366
Isoleusine	0.643	1.099	1.264	1.277	1.297	0.565
Leusine	0.024	0.126	0.156	0.156	0.160	1.479
Lysine	0.547	0.062	0.080	0.075	0.076	1.123
Metionine	1.547	1.611	1.823	1.883	1.942	0.073
Phenylalanine	1.069	0.454	0.496	0.503	0.513	1.723
Threonine	0.622	0.641	0.731	0.734	0.717	1.161
Valine	0.260	0.259	0.278	0.272	0.257	0.023

Based on the organoleptic test, followed by ANOVA and duncan obtained results as follows are the preferred taste are formulas A and B, the flavor is formula B, the colors are formulas A, B and C, the textures is formula A and the preferred overall are formula A and B. For more details can be read Table 9.

Table 9.
Organoleptic Test Results of Supplemental Feeding (PMT)

KAHIGURU FORMULA	TASTE	AROMA	COLOR	TEXTURE	OVER ALL
A	3.21 a	3.05 a	2.92 ac	3.76 a	3.32 a
B	2.97 ab	3.37 b	3.08 ab	3.49 b	3.26 a
C	2.81 bc	2.86 a	3.02 ab	3.21 c	2.90 b
D	2.70 bc	2.56 c	3.16 b	3.21 c	2.66 bc
E	2.66 cd	2.46 c	2.69 d	3.0 d	2.66 bc
F	2.40 d	2.33 c	2.78 cd	2.84 e	2.54 c

3.2 Discussion

Protein content of green bean flour (24,87%), gude bean flour (24,00%) and lemuru fish flour (73,17%) after made formula containing protein as follows: formula A (25,20%), formula B (30.38%), formula C (35.26%), formula D (40.50%), formula E (43.75%) and F (52.33%). These data show that the more fish lemuru flour added to the formula the higher the protein content.

This means the contribution of lemuru fish flour is very important to increasing the protein content of the formula.

Amino acids consist of essential amino acids and non-essential amino acids. Essential amino acids are needed by the body in small quantities but the body can not produce itself, so it must be consumed from food. The essential amino acids required by children are the amino acid arginine, histidine, isoleucine, leucine, lysine, methionine, phenylalanine, threonine, tryptophan, and valine.

The composition of the amino acid content of a foodstuff will greatly determine the quality of its protein content. Consumption of nutrients, especially protein in a child under five to consider the composition of amino acids so that it can play a maximum role in body growth. Rarely there is one food that contains amino acids can meet the needs of the body so that the required variety of food in daily consumption.

Amino acids arginine one of its functions is to stimulate growth hormone, histidine (repair body tissue), isoleucine (helps the production of non-essential amino acids), Leucine (protein synthesis controller), lysine (maintaining normal cell growth), methionine (body tissue and protein synthesis), phenylalanine (control of appetite and weight regulator), threonine (enhances immune system function), valine (stimulates muscle coordination and repair damaged tissues), tryptophan (vitamin synthesis material).^{15,16} Based on the amino acid content kahiguru formula which varies as shown in table 5, can be made variations of PMT have preferred child under five, such as cake, cookies, or brownies.

Judging from the protein content of PMT products can be stated that all the PMT made based kahiguru formula has a protein content above 25%. This indicates that PMT already has a high protein content and can be applied in the field on monthly activities *posyandu*. Based on the Regulation of the Minister of Health of Indonesia Nomor: 51 of 2016, About Standard Production of Nutritional Supplements required minimum energy content of 400 kcal, protein 8-12 grams, fat 10-18 grams.¹⁷

To supplement the needs of amino acid threonine, phenylalanine, leucine and lysine can consume PMT based on the "kahiguru" formula. To complement the needs of arginine amino acids, methionine and isoleucine can consume PMT based kahiguru "E" formula. Mataram, IKA (2017) research, revealed that one of the causes of nutrient intake is low protein consumption.¹⁸ These high protein PMT pods can serve as an effort to overcome the lack of protein consumption in a child under five so that optimal growth occurs in the next period. Based on taste, aroma, color and overall after analyzed with ANOVA and continued with Duncan it can be concluded that the preferred product by panelist is PMT product based formula B.

4. Conclusion

Conclusions this research are 1) The "kahiguru" formula contains a minimum protein of 25% as a base material of PMT is a combination of green bean flour, gude bean flour and lemuru fish flour, 2) The nutrient content of the best kahiguru formula is the kahiguru "F" formula (20-20-60) containing 52.3 grams of protein and 6.9 grams of fat, 3) The high kahiguru formula containing the amino acid hystidine (4.74%) is the formula "D"; the high kahiguru formula containing the amino acid metionine (3.82%) and isoleucine (2.60%) is the formula "E"; high kahiguru formula contains amino acid threonine (3.52%), arginine (3.03%), valine (1.90%), phenylalanine (1.82%), and leucine (2.92%) is the formula " F ", 4) The best protein content of PMT product is PMT product with the formula of kahiguru F (protein 68.17%), 5) PMT product with a high content of amino acid hystidine (2,88%) is PMT with the formula "D"; PMT products with a high content of amino acid arginine (0.40%), methionine (1.94%), and isoleucine (1.29%) were PMT with the formula "E"; PMT products with high amino acid threonine (1,16%), phenylalanine (1,72%), leusine (1,47%) and lysine (1,12%) were PMT with formula "F" and 6) Based on the organoleptic test the preferred PMT product is a product of the kahiguru "B" formula (20-60-20) with a protein content of 30.38%.

Based on the research results can be suggested that is Kahiguru B formula used as the basic material of PMT making which is preferred by toddlers to be applied to *posyandu* activities and It needs to be pursued for the development of recipes so that the resulting PMT products are more varied by using the existing formula.

Acknowledgements

Further thanks to the director, chairman of the Nutrition Department of Polytechnic Denpasar and Mataram for the support that has been given. Also To the analytical laboratory of Udayana University Denpasar-Bali for the help of formula and PMT analysis.



References

1. Alm, J., Aten, R. H., & Bahl, R. (2001). Can Indonesia decentralize successfully? Plans, problems and prospects. *Bulletin of Indonesian Economic Studies*, 37(1), 83-102.
[View in \(Google Scholar\)](#) [\(Scopus\)](#)
2. Hariyati, R., Sri, T., Yani, A., Eryando, T., Hasibuan, Z., & Milanti, A. (2016). The effectiveness and efficiency of nursing care documentation using the SIMPRO model. *International journal of nursing knowledge*, 27(3), 136-142.
[View in \(Google Scholar\)](#) [\(Scopus\)](#)
3. Krishnan, A., Garg, R., & Kahandaliyanage, A. (2013). Hypertension in the South-East Asia region: an overview. In *Regional Health Forum* (Vol. 17, No. 1, pp. 7-14).
[View in \(Google Scholar\)](#) [\(Scopus\)](#)
4. Reed, M. G., Syverson, P. F., & Goldschlag, D. M. (1998). Anonymous connections and onion routing. *IEEE Journal on Selected areas in Communications*, 16(4), 482-494.
[View in \(Google Scholar\)](#) [\(Scopus\)](#)
5. Damiani, E., Aloia, A. M., Priore, M. G., Pastore, A., Nardulli, S., Lippolis, C., ... & Ferrannini, A. (2011). Vicia faba hypersensitivity and ASA intolerance in a farmer: a case report. *Journal of allergy*, 2011.
[View in \(Google Scholar\)](#) [\(Scopus\)](#)
6. Bean, L., & Hott, D. D. (2005). Wiki: A speedy new tool to manage projects. *Journal of Corporate Accounting & Finance*, 16(5), 3-8.
[View in \(Google Scholar\)](#) [\(Scopus\)](#)
7. Bean, L., & Hott, D. D. (2005). Wiki: A speedy new tool to manage projects. *Journal of Corporate Accounting & Finance*, 16(5), 3-8.
[View in \(Google Scholar\)](#) [\(Scopus\)](#)
8. Wikipedia, without years. Lemuru Fish.
[View in \(Google\)](#)
9. Wikipedia, without years. Chips.
[View in \(Google\)](#)
10. Wikipedia, without years. Green beans.
[View in \(Google\)](#)
11. Tenaya, I M. N., Raka, I D.G., and Agung, I D.G. Experiment Design I: Basic Design. Statistics Laboratory, Faculty of Agriculture, Udayana University, Denpasar.
[View in \(Google Scholar\)](#)
12. Darmanto, D., Sudarmadji, S., Maryono, A., & ah Mada, G. (2011). Dampak Lingkungan Pemanfaatan Alur Sungai di Kali Bayong, Kali Kuning, dan Kali Gendol. *Jurnal Manusia dan Lingkungan*, 18(2), 159-172.
[View in \(Google Scholar\)](#)
13. Arikunto, S. (2006). Research procedures a practice approach. *Jakarta: Reneka Cipta*.

Matarani, I., Laraeni, Y., & Agustini, N. (2017). Formula Kahiguru High Protein for Making of Food Supplement as Elimination Stunting. *International Journal Of Life Sciences (IJLS)*, 1(3), 14-27.
[doi:10.21744/ijls.v1i3.58](#)

- [View in \(Google Scholar\)](#)
14. Daniel, W. W. (1987). *Biostatistics: a foundation for analysis in the health sciences*. John Wiley and Sons. *Inc. Singapore*, 188-204.
[View in \(Google Scholar\) \(Scopus\)](#)
 15. Blogger, 2012. Essential Amino Acid Function.
[View in \(Google\)](#)
 16. Alodokter, 2016. Recognize the Function and Sources of Amine Acid Esensila Food.
[View in \(Google\)](#)
 17. Minister of Health of the Republic of Indonesia, 2016. Regulation of the Minister of Health of the Republic of Indonesia Number 51 Year 2016, on Standard of Nutritional Supelation Product. Jakarta.
[View in \(Google Scholar\) \(Scopus\)](#)
 18. Mataram, I. (2017). Stunting Cause Factors in the Village of Traditional Bali. *International Research Journal Of Engineering, IT & Scientific Research*, 3(2), 134 - 140. doi:10.21744/irjeis.v3i2.427
[View in \(Google Scholar\) \(CrossRef\)](#)
 19. Ogu, G. I., & Orjiakor, P. I. (2017). Microbiological and Nutritional Qualities of Fermented Melon Seed Shells. *International Journal of Life Sciences (IJLS)*, 1(2), 1-9.
[View in \(Google Scholar\)](#)
 20. Saxena, A. (2017). The Impact of Nutrition on the Overall Quality of Life Adolescent Girls are Living Across the City of Kota. *International Journal of Life Sciences (IJLS)*, 1(1), 40-48.
[View in \(Google Scholar\)](#)
 21. Omer, A. M. (2017). Identifying, Developing, and Moving Sustainable Communities through Application of Bioenergy for Energy or Materials: Future Perspective through Energy Efficiency. *International Journal of Life Sciences (IJLS)*, 1(1), 9-39.
[View in \(Google Scholar\)](#)
 22. Jain, P., Jain, A., Singhai, R., & Jain, S. (2017). Effect of Biodegradation and Non Degradable Substances in Environment. *International Journal of Life Sciences (IJLS)*, 1(1), 58-64.
[View in \(Google Scholar\)](#)
 23. Arcentales, G. A. T., Lucas, M. A. P., Guerrero, J. A. C., & Gordín, R. G. (2017). Evaluation for the Reduction of NH₃ Contamination Risks. *International Journal of Life Sciences (IJLS)*, 1(2), 10-17.
[View in \(Google Scholar\)](#)
 24. Jurado, W. C. C., Pérez, A. V. P., Quiroz, A. M. V., & Gámez, M. R. (2017). Environmental Impact On Electrical Networks Near The Manabita Litoral. *International Journal of Life Sciences (IJLS)*, 1(2), 18-27.
[View in \(Google Scholar\)](#)
 25. Alcivar, M. S. G., Pérez, A. V., Gilert, B. I. C., & Gámez, M. R. (2017). Zeolite in Wastewater Decontamination as a Local Development Solution. *International Journal of Life Sciences (IJLS)*, 1(3), 1-13.
[View in \(Google Scholar\)](#)


26. Omer, A. M. (2017). Identifying, Developing, and Moving Sustainable Communities through Application of Bioenergy for Energy or Materials: Future Perspective through Energy Efficiency. *International Journal of Life Sciences (IJLS)*, 1(1), 9-39.


[View in \(Google Scholar\)](#)



Mataram, I., Laraeni, Y., & Agustini, N. (2017). Formula Kahiguru High Protein for Making of Food Supplement as Elimination Stunting. International Journal Of Life Sciences (IJLS), 1(3), 14-27. doi:10.21744/ijls.v1i3.58

Biography of Authors

	<p>International Journals</p> <ol style="list-style-type: none"> 1. Stunting Cause Factors in the Village of Traditional Bali, International Research Journal of Engineering, IT & Scientific Research (IRJEIS) Available online at http://ijcu.us/online/journal/index.php/irjeis, Vol. 3 Issue 2, March 2017, pages: 134-140. 2. Effect Induction Bio Hormone on Production and Content of Nutritional Substances on Tomato Fruit Variety Cherry Small Fry and Cherry Japan (second researcher), International Research Journal of Engineering, IT & Scientific Research (IRJEIS), Available online at http://ijcu.us/online/journal/index.php/irjeis, Vol. 3 Issue 3, May 2017, pages: 87-96. <p>Previous publication (Local Journal)</p> <ol style="list-style-type: none"> 1. Aspects of Immunology Mother's Milk, Jurnal Ilmu Gizi, Vol. 2, No. 1, Pebruari 2011. 2. Integrated Health Pos (Posyandu) Revitalization Efforts With Knowledge Increases in the Village Kesiman Kertalangu Kader. East Denpasar, Jurnal Skala Husada, 2010, 7(1) 3. Knowledge level and the level of iodized salt consumption Characteristics Based Capital In the village of Seraya Barat Karangasem district Karangasem Bali Province. Jurnal Skala Husada, 2009, 6(2) 4. Perception and Application of Balanced Nutrition in Adolescents high schools in Denpasar Bali Province, Proceedings of the National Congress Persagi and XIV in Surabaya Scientific Meeting November 12-14, 2009. 5. Application of Behavior Clean and Healthy Lifestyle (PHBs) In Household In Order To Achieve Healthy Community Self In the province of Bali. Proceedings of the Symposium HRH No. ISBN 978-602-9531-0-4, in the Context of the Ministry of Health polytechnic VIII Anniversary of Denpasar, April 14, 2009. 6. Study Making of "Lala Chip" High Snacks Iodine. Proceedings of the National Congress of Indonesian Nutritionist Association (Persagi) and XII Scientific Meeting in Jakarta 8-10 July 2002.
---	---

	<p>Unpublished publication:</p> <ol style="list-style-type: none"> 1. Weighing Through the optimization activities Posyandu Cadre Training Kertalangu In the Village Kesiman, East Denpasar, Denpasar City, Bali Province (2008). 2. Effectiveness Booklet Knowledge To Improve Primary School Children As Iodized Salt Supply Innovators Families In district of Sidemen, Karangasem, Bali Province (2007). 3. Goiter Program Impact Evaluation In the district of Karangasem, Bali Province (2005). 4. Monitoring Maternal Chronic Energy Deficiency (KEK) Bali Province Year 2005 (2005). 5. Impact Evaluation Feeding (PMT) On Children Under Five Malnutrition and factors Affecting (2004). 6. Improved knowledge base About the undernourishment School Children by Utilizing Flannel Graf Viewer Tool to Increase Availability As Iodized Salt at Household Level (2003). 7. Study Making Formula of Anti Goiter (Phase II Trial in the Field) (2000). 8. Distribution and Level Evaluation System Availability iodized salt Endemic goiter On In Area Regional Health Office Bangli regency of Bali Province (1999). 9. Study Making Formula Anti Goiter (1998). <p>Work: Lecturer in the Department of Nutrition Health Polytechnic Denpasar (1985 until now)</p>
	<p>Education background:</p> <ol style="list-style-type: none"> 1. Diploma III Nutrition Department of Health Denpasar (1993) 2. Bachelor, Public Health Sciences Faculty of Medicine Unair Surabaya (2003) 3. Program Master, Public Health Sciences Faculty of Medicine UGM Yogyakarta (2010) <p>Unpublished publication:</p> <ol style="list-style-type: none"> 1. Determinants Factors Associated with Compliance Level of Iron Tablet Consumption in Pregnant Women in the working area of Dasan Cermen Public Health Center, Cakranegara,

	<p>Mataram City, 2006.</p> <ol style="list-style-type: none"> 2. Level of Knowledge, Attitudes, Behavior, and Status of Anemia of Pregnant Women in Ordinary and Ningrat Communities in Mataram City, 2010. 3. Different levels of energy, protein and Fe consumption before and after nutritional counseling through home visit in pregnant women with anemia in coastal areas of Cape Coast, 2012. <p>Work: Lecturer in the Department of Nutrition Health Polytechnic Mataram (1995 until now)</p>
	<p>Education background:</p> <ol style="list-style-type: none"> 1. Academy of Nutrition Malang, Indonesia (1987) 2. Faculty of Community Health, University of Airlangga Surabaya, Indonesia (1995) 3. Program Master, Biotechnology of Agriculture, University of Udayana Denpasar, Indonesia (2006) <p>International Journals</p> <ol style="list-style-type: none"> 1. Effect Induction Bio Hormone on Production and Content of Nutritional Substances on Tomato Fruit Variety Cherry Small Fry and Cherry Japan, International Research Journal of Engineering, IT & Scientific Research (IRJEIS), Available online at http://ijcu.us/online/journal/index.php/irjeis, Vol. 3 Issue 3, May 2017, pages: 87-96. <p>Previous publication (Local Journal)</p> <ol style="list-style-type: none"> 1. Micro E.coli contamination on Es Daluman for Sale in Denpasar City. Journal of Skala Husada, Vol 12 No.1, April 2015. 2. Nutritional and Physical Characteristics of Sweet Potato Flour and Taro Thermally Modified with Amylase Enzyme. Journal of Skala Husada, Vol 11 No.1, April 2014. 3. Identification of Rhodamine B on Snacking Puppies and Jajan Sirat at Pekutatan Village, Jembrana Regency. Journal of Nutrition Science, Vol V, No.1 in 2014. 4. Drink Energy Consumption Based on the Characteristics and Level of Employee Knowledge Hotel Sanur Beach Denpasar Bali. Journal of Skala Husada, Vol 8, No.1, April 2011. 5. Genetically Modified Food Security Aspect Food. Journal of Nutrition Science, Vol 2 No. February 1, 2011.

	<p>Unpublished publication:</p> <ol style="list-style-type: none">1. Application of HACCP (Hazard Analysis Critical Control Point) As a Quality Assurance Model of Food Safety at Sanglah General Hospital Denpasar Denpasar Province, 2015.2. Security Analysis of Es Daluman in Denpasar, 2014.3. Effectiveness of Counseling on the Behavior of Clean and Healthy Life on Improving the Knowledge of Primary School Children in Tulikup Village, Gianyar Regency, 2011. <p>Work:</p> <p>Lecturer in the Department of Nutrition Health Polytechnic Denpasar (1989 until now)</p>
--	---

