

CHAPTER 6 – CONCLUSIONS AND RECCOMENDATIONS

6.1 Conclusions

Constantly unmanaged blood sugar levels lead to high circulating insulin levels may have an impact on skin health and also reduce insulin sensitivity over time leading to poor blood sugar regulation. Hyperglycemia caused by poor blood glucose levels regulation leads to increased risks in CVD, PCOS and type 2 diabetes and there are certain individuals who are at a higher risk of developing these diseases. Not only to prevent diseases, improved glycemic control can also benefit skin health, mood, and energy levels. Hence, controlling blood sugar levels is able to benefit various types of population.

The general pattern from the survey is that for consumers' interest for blood sugar control, herbal products, and lemongrass and ginger based products are high. The types of consumers that generally have a higher interest in lemongrass and ginger based product for blood sugar control are healthy individuals, diabetics, people aged 40-59, and health-conscious people.

Lemongrass and ginger are proven able to lower blood sugar levels safely alongside with having a comparable efficacy with common pharmaceutical medicine. Other than that lemongrass and ginger are also able to normalize insulin levels and improve insulin sensitivity. In addition, they also have other health benefits such having antioxidant and anti-inflammatory activity, lowering total TG and LDL levels, inhibit AGEs, increase HDL levels, and reducing body weight. Lemongrass and ginger based products are also affordable, accessible, and have a desirable flavour to some consumers. Based on all these findings, it can be concluded that lemongrass and ginger based products with proven efficacy of controlling blood sugar levels have a good market potential in Indonesia.

6.2 Recommendations

It is ideal for the specific formulation of lemongrass and ginger based product to be sold in the market to be tested for its efficacy, either in-vitro or in-vivo in order to be able to state legal claims of the product. Interest of lemongrass and ginger based herbal products may improve by increasing awareness regarding the benefits of lemongrass and ginger, awareness of herbal products, and awareness in the importance of blood sugar control through educating the public regarding this topic.



GLOSSARY

PCOS – polycystic ovarian syndrome

BPOM – Badan Pengawas Obat dan Makanan (Indonesian Agency of Drug and Food Control)

CDC – Central for Disease Control

CVD – cardiovascular disease

AN – Acanthosis Nigricans

IGF – insulin like growth factor

NCD – non-communicable disease

NIDDK – National Institute of Diabetes and Digestive and Kidney Diseases

DN – diabetic nephropathy

DCCTR – The Diabetes Control and Complication Trial Research Group

EDIC – The Epidemiology of Diabetes Interventions and Complications

TG – triglycerides

TC – total cholesterol

LDL-C – low density lipoprotein cholesterol

HDL-C – high density lipoprotein cholesterol

BW – body weight

AGE – advanced end glycation products

LG – lemongrass

G – Ginger

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APPENDICES

Control

Observed	<20	20-39	40-59	>60	TOTAL
Actively control	5	21	35	5	66
Doesn't actively control	17	92	50	6	165
TOTAL	22	113	85	11	231
Percentage	23%	19%	41%	45%	29%

P-value 0.002844

Expected	<20	20-39	40-59	>60	TOTAL
Actively control	6.3	32.3	24.3	3.1	38.6
Doesn't actively control	15.7	80.7	60.7	7.9	96.4
TOTAL	22.0	113.0	85.0	11.0	231.0

P-values of adjusted residual

	<20	20-39	40-59	>60
Actively control	0.5072	5.83E-09	2.37E-05	0.1959
Doesn't actively control	0.5072	5.83E-09	2.37E-05	0.1959

Interest in LG and G

Observed	<20	20-39	40-59	>60	TOTAL
Interested	13	89	66	11	179
Not interested	6	12	6	0	24
TOTAL	19	101	72	11	203
Percentage	86%	89%	85%	100%	100%

P-value 0.024091 Significant

Observed	<20	20-39	40-59	>60	TOTAL
Interested	16.8	89.1	63.5	9.7	179.0
Not interested	2.2	11.9	8.5	1.3	24.0
TOTAL	19.0	101.0	72.0	11.0	203.0

P-values of adjusted residual

	<20	20-39	40-59	>60
Actively control	0.5072	5.83E-09	2.37E-05	0.1959
Doesn't actively control	0.5072	5.83E-09	2.37E-05	0.1959

Interest in LG and G

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Not interested	2.2	11.9	8.5	1.3	24.0
TOTAL	19.0	101.0	72.0	11.0	203.0

P-values of adjusted residual

	<20	20-39	40-59	>60
Actively control	0.0051	0.979496	0.253653	0.2118
Doesn't actively control	0.0051	0.979496	0.253653	0.2118

Like flavour

Observed	<20	20-39	40-59	>60	TOTAL
Like	3	10	56	7	76
Neutral	9	43	11	4	67
Dislike	7	48	5	0	60
TOTAL	19	101	72	11	203
Percentage	86%	89%	85%	100%	100%

P-value 4.23E-18

Observed	<20	20-39	40-59	>60	TOTAL
Like	7.1	37.8	27.0	4.1	44.9
Neutral	6.3	33.3	23.8	3.6	39.6
Dislike	5.6	29.9	21.3	3.3	60.0
TOTAL	19.0	101.0	72.0	11.0	203.0

P-values of adjusted residual

	<20	20-39	40-59	>60
Like	0.0336	7.87E-47	4.95E-29	0.0596
Neutral	0.1467	2.75E-07	4.24E-07	0.8037
Dislike	0.4648	2.36E-08	1.65E-07	0.0272

Observed	<20	20-39	40-59	>60	TOTAL
Like/Neutral	12	53	67	11	143
Dislike	7	48	5	0	60
TOTAL	19	101	72	11	203
Percentage	86%	89%	85%	100%	100%

P-value 2.28E-08

Observed	<20	20-39	40-59	>60	TOTAL
Like/Neutral	13.4	71.1	50.7	7.7	84.5
Dislike	5.6	29.9	21.3	3.3	35.5
TOTAL	19.0	101.0	72.0	11.0	203.0

P-values of adjusted residual

	<20	20-39	40-59	>60
Actively control	0.4481	2.64E-23	2.96E-11	0.0242
Doesn't actively control	0.4481	2.64E-23	2.96E-11	0.0242

Herbal preference

OBSERVED	<Rp 4,000,000	Rp 4,000,000 - Rp 7,000,000	>Rp 7,000,000 - Rp 10,000,000	>Rp 10,000,000 - Rp 20,000,000	RP 20,000,000 - Rp 30,000,000	>Rp 30,000,000	Total
Prefer herbal product	52	21	20	18	8	16	135
Prefer synthetic drugs	18	18	3	10	7	12	68
TOTAL	70	39	23	28	15	28	203
Percentage	74%	54%	87%	64%	53%	57%	

EXPECTED	<Rp 4,000,000	Rp 4,000,000 - Rp 7,000,000	>Rp 7,000,000 - Rp 10,000,000	>Rp 10,000,000 - Rp 20,000,000	RP 20,000,000 - Rp 30,000,000	>Rp 30,000,000	Total
Prefer herbal product	46.6	25.9	15.3	18.6	10.0	18.6	135.0
Prefer synthetic drugs	23.4	13.1	7.7	9.4	5.0	9.4	68.0
TOTAL	70.0	39.0	23.0	28.0	15.0	28.0	203.0

P-value 0.0447

P-value	<Rp 4,000,000	Rp 4,000,000 - Rp 7,000,000	>Rp 7,000,000 - Rp 10,000,000	>Rp 10,000,000 - Rp 20,000,000	RP 20,000,000 - Rp 30,000,000	>Rp 30,000,000
Prefer herbal product	0.0882804 2	0.06244578 1	0.02730428 1	0.78895358 9	0.26147402 1	0.2584084 4
Prefer synthetic drugs	0.0882804 2	0.06244578 1	0.02730428 1	0.78895358 9	0.26147402 1	0.2584084 4

Alpha 0.00417

Herbal consumption

Observed	Maintain	Moderately	Does not	TOTAL
Consume	22	57	23	102
Doesn't consume	30	26	45	101
TOTAL	52	83	68	203

Percentage 0.423076923 0.686746988 0.338235294

P-value 4.71987E-05

Expected	Maintain	Moderately	Does not	TOTAL
Consume	26.1	41.7	34.2	67.8
Doesn't consume	25.9	41.3	33.8	67.2
TOTAL	52.0	83.0	68.0	203.0

P-values of adjusted residual	Maintain	Moderately	Does not
Consume	0.1442	6E-08	0.0001
Doesn't consume	0.1442	6E-08	0.0001

Alpha 0.0083

Herbal preference

Observed	Maintain	Moderately	Does not	TOTAL
Prefer herbal products	30	68	37	135
Prefer synthetic drugs	22	15	31	68

TOTAL	52	83	68	203
Percentage	0.576923077	0.819277108	0.544117647	
P-value	0.010923272			

Expected	Maintain	Moderately	Does not	TOTAL
Prefer herbal products	34.6	72.9	45.2	107.5
Prefer synthetic drugs	17.4	10.1	22.8	27.5
TOTAL	52.0	83.0	68.0	203.0

P-values of adjusted residual	Maintain	Moderately	Does not
Prefer herbal products	0.1022	0.0034	0.0055
Prefer synthetic drugs	0.0261	0.0369	3E-07

Alpha 0.0083

Knowledge benefits of LG and G

Observed	Maintain	Moderately	Does not	TOTAL
Know	33	70	39	142
Doesn't know	19	13	29	61
TOTAL	52	83	68	203
Percentage	0.634615385	0.843373494	0.573529412	
P-value	0.027970831			

Expected	Maintain	Moderately	Does not	TOTAL
Know	36.4	72.9	47.6	109.3
Doesn't know	15.6	10.1	20.4	25.7
TOTAL	52.0	83.0	68.0	203.0

P-values of adjusted residual	Maintain	Moderately	Does not
Know	0.2115	0.0866	0.0026
Doesn't know	0.1029	0.205	5E-07

Alpha 0.0083

Knowledge benefits of LG and G in control

Observed	Maintain	Moderately	Does not	TOTAL
Know	15	53	12	80
Doesn't know	37	30	56	123
TOTAL	52	83	68	203
Percentage	0.288461538	0.638554217	0.176470588	
P-value	6.01057E-14			

Expected	Maintain	Moderately	Does not	TOTAL
Know	20.5	72.9	26.8	93.4
Doesn't know	31.5	10.1	41.2	41.6
TOTAL	52.0	83.0	68.0	203.0

P-values of adjusted residual	Maintain	Moderately	Does not
Know	0.0777	2E-46	1E-05
Doesn't know	0.0015	1E-14	0

Alpha 0.0083

Interest in control

OBSERVED	Healthy individuals	Diabetics	Family history	Overweight/obese	PCOS	Total
Interested	88	12	55	45	3	203
Not interested	19	0	9	0	0	28
TOTAL	107	12	64	45	3	231
Percentage	82%	100%	86%	100%	100%	

EXPECTED	Healthy individuals	Diabetics	Family history	Overweight/obese	PCOS	Total
Interested	94.0	10.5	56.2	39.5	2.6	203.0
Not interested	13.0	1.5	7.8	5.5	0.4	28.0
TOTAL	107.0	12.0	64.0	45.0	3.0	231.0

P value 0.0198

P-value	Healthy individuals	Diabetics	Family history	Overweight/obese	PCOS
Interested	0.014770233	0.186397179	0.5757	0.0055	0.5173
Not interested	0.014770233	0.186397179	0.5757	0.0055	0.5173

Alpha 0.005

Actively control

OBSERVED	Healthy individuals	Diabetics	Family history	Overweight/obese	PCOS	Total
Actively control	22	10	17	16	1	66
Doesn't actively control	85	2	47	29	2	165
TOTAL	107	12	64	45	3	231
Percentage	21%	83%	27%	36%	33%	

EXPECTED	Healthy individuals	Diabetics	Family history	Overweight/obese	PCOS	Total
Actively control	30.6	3.4	18.3	12.9	0.9	66.0
Doesn't actively control	76.4	8.6	45.7	32.1	2.1	165.0
TOTAL	107.0	12.0	64.0	45.0	3.0	231.0

P-value 0.0001801

P-value	Healthy individuals	Diabetics	Family history	Overweight/obese	PCOS
Actively control	0.012295783	1.61259E-05	0.6756	0.2478	0.8542
Doesn't actively control	0.012295783	1.61259E-05	0.6756	0.2478	0.8542

Herbal consumption

OBSERVED	Healthy individuals	Diabetics	Family history	Overweight/obese	PCOS	Total
Consume	45	5	5	9	2	66
Doesn't consume	43	7	50	36	1	137
TOTAL	88	12	55	45	3	203
Percentage	51%	42%	9%	20%	67%	

EXPECTED	Healthy individuals	Diabetics	Family history	Overweight/obese	PCOS	Total
Consume	28.6	3.9	17.9	14.6	1.0	66.0

Doesn't consume	59.4	8.1	37.1	30.4	2.0	137.0
TOTAL	88.0	12.0	55.0	45.0	3.0	203.0

P-value 1.23718E-06

P-value	Healthy individuals	Diabetics	Family history	Overweight/obese	PCOS
Consume	7.21834E-07	0.485219507	1E-05	0.0422	0.2033
Doesn't consume	7.21834E-07	0.485219507	1E-05	0.0422	0.2033

Knowledge vs interest

Observed	Knowledgeable	Not knowledgeable	TOTAL
Interested	132	47	179
Not interested	10	14	24
TOTAL	142	61	203

P value 0.00129

Expected	Knowledgeable	Not knowledgeable	TOTAL
Interested	125.2	53.8	179.0
Not interested	16.8	7.2	24.0
TOTAL	142.0	61.0	203.0

P-values of adjusted residual	Knowledgeable	Not knowledgeable
Interested	0.001289	0.0012885
Not interested	0.001289	0.0012885

Interest vs flavour likeness

Observed	Interested	Not interested	TOTAL
Likes	113	1	114
Neutral	61	6	67
Dislike	5	17	22
TOTAL	179	24	203

P-value 0.000223

Expected	Interested	Not interested	TOTAL
Likes	100.5	13.5	114.0
Neutral	59.1	7.9	67.0
Dislike	19.4	2.6	22.0
TOTAL	179.0	24.0	203.0

P-values of adjusted residual	Interested	Not interested
Likes	2.13E-11	4.117E-05
Neutral	0.341464	0.4358086
Dislike	1.42E-24	2.543E-22

CURRICULUM VITAE

 <p>CLAUDIA CHRISTY FOOD TECHNOLOGY STUDENT</p> <p>PERSONAL DATA Name : Claudia Christy D.O.B : 05 November 2000 Nationality : Indonesian Address : Taman Semanan Indah, West-Jakarta Phone number : +62 817 0051 120 E-Mail-Address : v.claudiachristy@gmail.com</p>	<p>EDUCATION</p> <p>SWISS GERMAN UNIVERSITY IN INDONESIA SINCE 2017 <i>Major: Food Technology</i></p> <p>2019 - Panel leader for sensory evaluation 2019 - Science Fair consumption committee 2019 - Head of PR & Documentation - for Student Association of Food Technology 2019 - Consumption member for Life Science Night Event 2019 - Project leader for Food Nutrition Project 2018 - 2019 Secretary for External Sports Cup 2016 - 2017 Secretary and Treasurer for Accessories Business project</p> <p>SPRINGFIELD HIGHSCHOOL IN INDONESIA 2016 - 2017</p> <p>WORK EXPERIENCE</p> <p>PT. MAYORA Quality Control Intern November 2018 - January 2019 Activities: Moisture analyzer validation, yeast & mold incubation method validation, measure coefficient of friction of packaging</p> <p>ADNROS GERMANY GMBH Quality Assurance Intern March 2020 - August 2020 Activities: -Product analysis (Brix, pH, viscosity, sensory, vitamin C) -Product sorting -Input analysis data to system -Prepare solutions and equipments -Make product certificate -Check for foreign materials</p> <p>KNOWLEDGE AND SKILLS</p> <p>Language: Indonesian: fluent (native) English: fluent</p> <p>Computer skills: Microsoft, CoF-Software, iMovie, Canva</p>
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