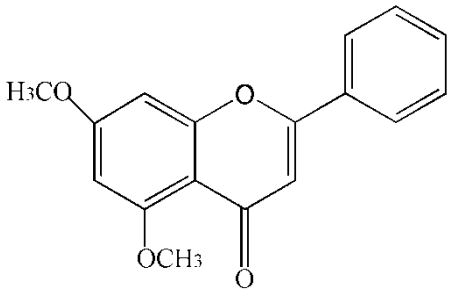
ORYZA OIL & FAT CHEMICAL CO.,

BLACK GINGER EXTRACT

Dietary ingredient for improvement of cold hands and feet and swelling, tonics, aphrodisiac, anti-obesity, anti-inflammation and cosmetics

- BLACK GINGER EXTRACT-P
  (Powder, Food Grade)
- BLACK GINGER EXTRACT-WSP
  (Water-soluble Powder, Food Grade)
- BLACK GINGER EXTRACT-PC
  (Powder, Cosmetic Grade)
- BLACK GINGER EXTRACT-WSPC
  (Water-soluble Powder, Cosmetic Grade)
- BLACK GINGER EXTRACT-LC
  (Liquid, Cosmetic Grade)



ORYZA OIL & FAT CHEMICAL CO.,

ver. 1.0 SJ

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Dietary ingredient for improvement of cold hands and feet and swelling, tonics, aphrodisiac, anti-obesity

1. Introduction

[What is Black Ginger]

Black Ginger, a plant of the genus Zingiberaceae Kaempferia, commonly grows in the tropical Asia. Scientifically, it is known as Kaempferia parviflora, in Japan it is commonly referred as “black turmeric” or “black ginger”. Meanwhile, it is known as *Krachai Dam* in its country of origin, Thailand. Traditionally, Black Ginger is known as an energy enhancer with excellent tonic effect.

Fig. 1 Rhizome of Black Ginger, above the ground & under the ground

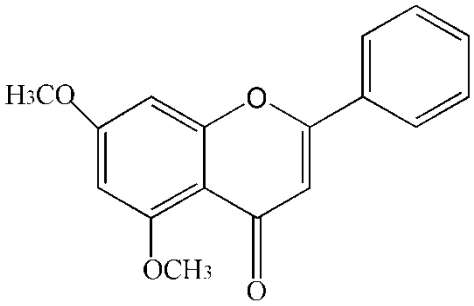
[Food uses of Black Ginger]

In South East Asia region, especially in Thailand, people drink tea boiled from sliced black ginger as well as alcohol soaked with black ginger. Alternatively, black ginger is commonly used a folk medicine for energy enhancement, and relief of gastrointestinal complaints. In conjunction with the “one village one product” campaign raised by the Thailand government, black ginger has been promoted as healthcare food to increase awareness among the public.

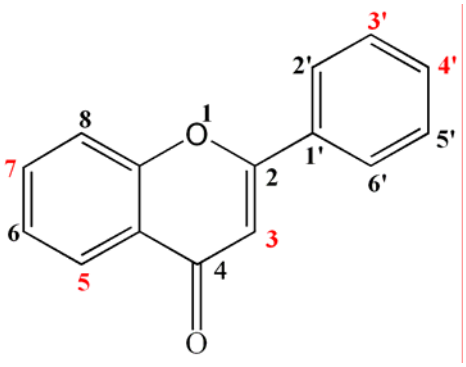
2. Functional Components of Black Ginger Extract

Black Ginger is loaded with flavonoids particularly with high content of polymethoxtflavone among all the flavonoids. In collaboration with Kyoto Pharmaceutical

University, 8 variance of polymethoxyflavone were identified in Black Ginger Extract with the highest content of 5,7-dimethoxyflavone present. (Fig. 2)



5,7-dimethoxyflavone



Bone Structure of Flavone

Identified Constituents	substitutional groups				
	3	5	7	3'	4'
5-hydroxy-7-methoxyflavone		OH	OMe		
5,7-dimethoxyflavone (Specification compound)		OMe	OMe		
5-hydroxy-3,7-dimethoxyflavone	OMe	OH	OMe		
4',5,7-trimethoxyflavone		OMe	OMe		OMe
5-hydroxy-3,7,4'-trimethoxyflavone	OMe	OH	OMe		OMe
3',4',5,7-tetramethoxyflavone		OMe	OMe	OMe	OMe
5-hydroxy-3,7,3',4' -tetramethoxyflavone	OMe	OH	OMe	OMe	OMe
3,5,7,3',4' -pentamethoxyflavone	OMe	OMe	OMe	OMe	OMe

Fig. 2 Chemical structures of polymethoxyflavones in Black Ginger Extract.

Oryza Oil & Fat Chemical Co., Ltd. with its very own cutting edge technology in the extraction and purification of unique natural products, successfully developed Black Ginger Extract, a Thai origin raw material. Findings from human clinical trials reported that Black Ginger Extract improves peripheral blood circulation and peripheral vasculature. Black Ginger Extract, is a functional food ingredients with blood circulation enhancing effect and relief of edema.

In this brochure, we shall introduce various health promoting effect of Black Ginger Extract such as anti-inflammatory effect, aphrodisiac effect, prevention of metabolic syndrome (anti-obesity and anti-diabetes) and etc .

3. Functional Effects of Black Ginger Extract

(1) Improve Peripheral Blood Circulation and Relieves Edema

Cold extremities (or Raynaud's phenomenon) is a condition where the hands and feet is feeling cold due to poor blood circulation to the extremities. Statistically, there is 1 in every 2 women and 1 in every 4 men is suffering from cold extremities.

Healthy blood circulation is important in the maintenance of homeostatic condition of our body (e.g. temperature and pH). Poor blood circulation to the extremities result in a lower temperature of the limbs, condition may worsen when outside temperature is lowered and vasoconstriction further reduced capillary circulation and oxygen supply to extremities causing painful sensation.

Edema is a swelling condition due to accumulation of interstitial fluid underneath the skin. Changes in the water retaining properties of tissues themselves, excessive intake of salt in the diet are major causes of edema. Other miscellaneous factors include remain sitting or standing in the same position for long time may contribute to edema.

Based on the above, improving peripheral blood circulation and peripheral vasculature is essential in the relief of cold extremities and edema.

1) Human Clinical Trial

A human clinical trial was conducted to examine the effect of Black Ginger Extract on peripheral blood circulation. In the trial, Black Ginger Extract-P (150mg/day) was given to 14 test subjects *ad libitum* in single dose and continuous intake for 1 week. Peripheral blood circulation and peripheral vasculature (shape and arrangement of blood vessels) as well as blood pressure was monitored before and after ingestion of Black Ginger Extract-P.

Trial Protocol:
Test subjects: 8 healthy males (aged 24-59), 6 healthy females (aged 26-48)
Test sample: Black Ginger Extract-P (contains >2.5% of 5,7-dimethoxyflavone; >10% of total flavonoids)
Dosage: 150mg/day
Test duration: Single dose and 1 week continuous intake
Analysis parameter: Blood pressure (Terumo Digital BP Monitor)
Peripheral Blood Circulation (Blood Circulation checker)
Peripheral Vasculature (Blood Vessel Monitor)

A Blood Circulation Checker

A Blood Vessel Monitor

As shown in Fig. 3 and Table. 1, peripheral blood circulation of test subjects improved 1 hour after oral administration of Black Ginger Extract-P 150mg. In addition, Table 2

illustrated that peripheral blood circulation improved 57.1% and 50.0% after 1 hour and 1 week continuous intake of Black Ginger Extract-P 150mg respectively.

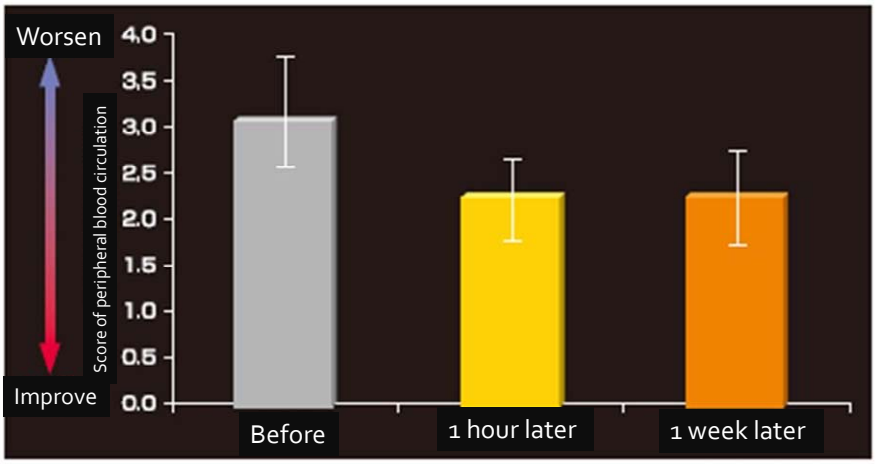


Fig. 3 Effect of Black Ginger Extract-P on Peripheral Blood Circulation (n=14, Mean ±SE)

Table 1. Readings of Peripheral Blood Flow condition

Result	A+	A	A-	B+	B+X	B	BX	C+	C	B-	B-X	C-	E+	E	D+	D	D-	E-	F/F-	G/G-
Digitalisation	0	0.5	1	1.5	2.5	3	3.5	4.5	5	5.5	6	6.5	7	7.5	8	8.5	9	9.5	10	10.5
Assessment	Excellent condition ◄																		► Low condition	

Table 2. Improvement of Peripheral Blood Flow (Red indicated improvement against initial, refer to table 1, n=14)

Test Subjects	Results		
	Initial	1 hour later	1 week later
A	C	C+	B
B	B-	B+X	B+
C	B	B+	B+
D	A-	C+	B
E	B+X	B+X	BX
F	B-	B+	B
G	C+	A-	A-
H	B+	A	A
I	C-	B-	E
J	A	B+X	A
K	A	A-	A-
L	C	A-	B+
M	B+	B+	B+X
N	A-	A-	A-
Improvement rate (%)	-	57.1	50.0

Meanwhile, peripheral vasculature (disposition and arrangement of blood vessels) was observed to return to its normal arrangement from a deformed state. (Fig. 4).

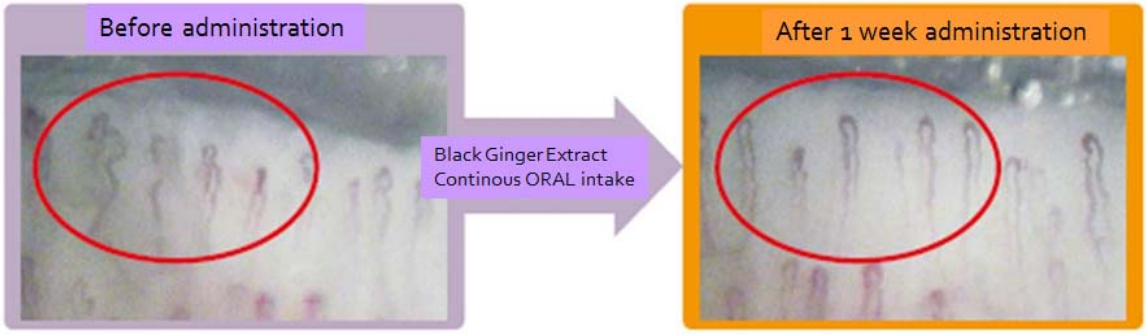


Fig. 4 Effect of Black Ginger Extract-P on Peripheral Vasculature

Furthermore, both systolic and diastolic blood pressure of test subjects was regulated to normal range 1 hour after single dose oral administration of Black Ginger Extract-P 150mg (Table 3, Fig. 5). Systolic BP was significantly reduced 2 hours after the single dose oral administration ($P<0.05$) and the blood pressure regulation effect was maintained for 2 hours.

Table 3. Effect of Black Ginger Extract-P on Blood Pressure (BP reading, n=14)

Subjects	Before		1H post administration		2H post administration		After 1W administration	
	Systolic	Diastolic	Systolic	Diastolic	Systolic	Diastolic	Systolic	Diastolic
Male								
A	117	69	124	70	115 ↓	65 ↓	106 ↓	75
B	149	101	141 ↓	90 ↓	145 ↓	97 ↓	144 ↓	98 ↓
C	101	62	109	70	108	60 ↓	109	74
D	137	102	133 ↓	90 ↓	120 ↓	94 ↓	130 ↓	98 ↓
E	121	63	112 ↓	63	106 ↓	63	112 ↓	66
F	126	96	120 ↓	83 ↓	121 ↓	91 ↓	120 ↓	88 ↓
G	107	72	119	65 ↓	113	74	110	69 ↓
H	133	80	125 ↓	83	116 ↓	78 ↓	132 ↓	87
Female								
I	133	82	149	94	155	92	-	-
J	99	66	97 ↓	67	95 ↓	62 ↓	109	68
K	126	57	113 ↓	63 ↓	122 ↓	65	128	76
L	135	81	97 ↓	76 ↓	109 ↓	85	116 ↓	66 ↓
M	117	73	105 ↓	63 ↓	101 ↓	58 ↓	104 ↓	73
N	105	71	106	68	107	73	104	68
Average	121.9	76.8	117.9	74.6	116.6	75.5	117.2	77.4
SE	4.0	3.8	4.2	3.0	4.3	3.7	3.4	3.1
Improvement Rate(%)			57.1	50.0	71.4	57.1	61.5	38.5

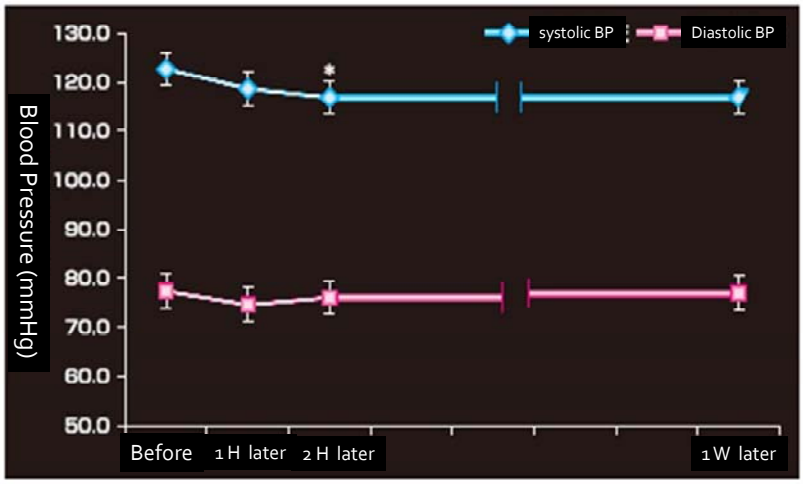


Fig. 5 Effect of Black Ginger Extract-P on Blood Pressure (n=13~14, Mean ± SE, *: $P<0.05$)

Questionnaire survey was conducted to evaluate the subjective comments of test subjects. Most responded that symptoms of edema, circulation, dry skin feeling and energy level noticeably improved (Fig. 6).

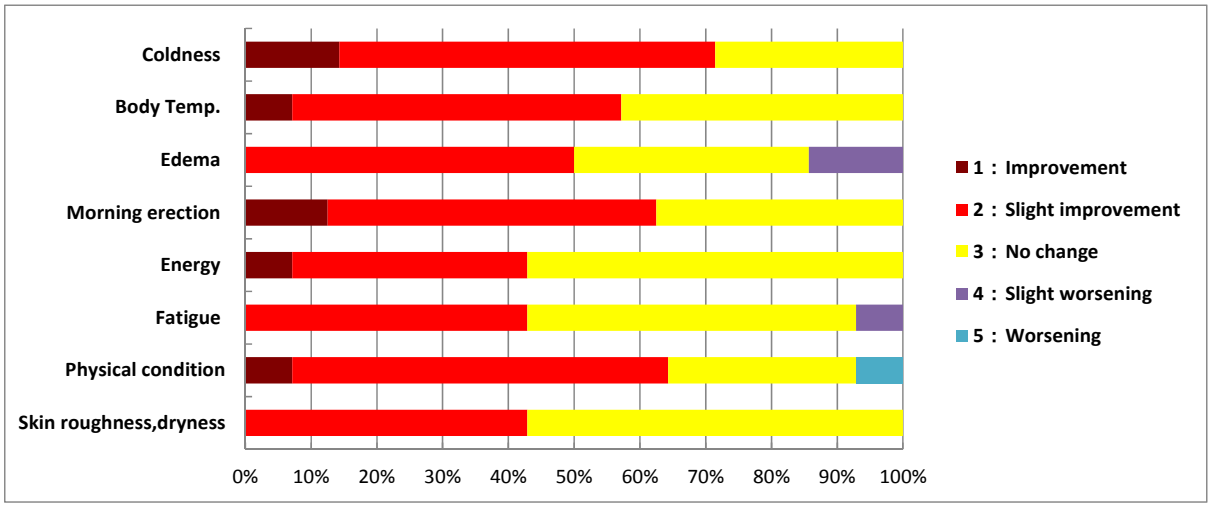


Fig.6 The Subjective comments on Black Ginger Extract-P

Above findings showed that continuous oral intake of Black Ginger Extract-P 150mg/day improved peripheral blood circulation, improve peripheral vasculature and relieved symptoms of edema.

In addition, blood pressure of test subjects was regulated to normal range after oral intake of Black Ginger Extract-P, in particular, systolic blood pressure significantly reduced and regulated to optimum range 2 hours after oral administration of Black Ginger Extract-P.

2) Promotion of Nitric Oxide (NO) Production in Endothelial Cells and Vascular Function

Nitric Oxide (NO) also known as "endothelium-derived relaxing factor", synthesized endogeneously by activation of various nitric oxide synthase (NOS). NO function as cell signaling factors in physiological and pathological processes.

NOS is classified into 2 major groups: Constitutive NOS (cNOS) that present in the cells at all times and the other inducible NOS (iNOS) in response to inflammation and stress. Constitutive NOS (cNOS) includes endothelial constitutive (eNOS) and brain constitutive (nNOS). Neuronal NOS (nNOS) produces NO in nervous tissue of central and peripheral nervous system. Meanwhile, endothelial NOS (eNOS) generates NO in blood vessels and involved in regulating blood vessel function especially vasodilation.

In a study conducted by Wattanapitayakul *et al.*, reported that Black Ginger Extract enhanced nitric oxide (NO) production in human umbilical vein endothelial cells (Fig. 8) and eNOS mRNA and protein expression were up-regulated (Fig. 7).

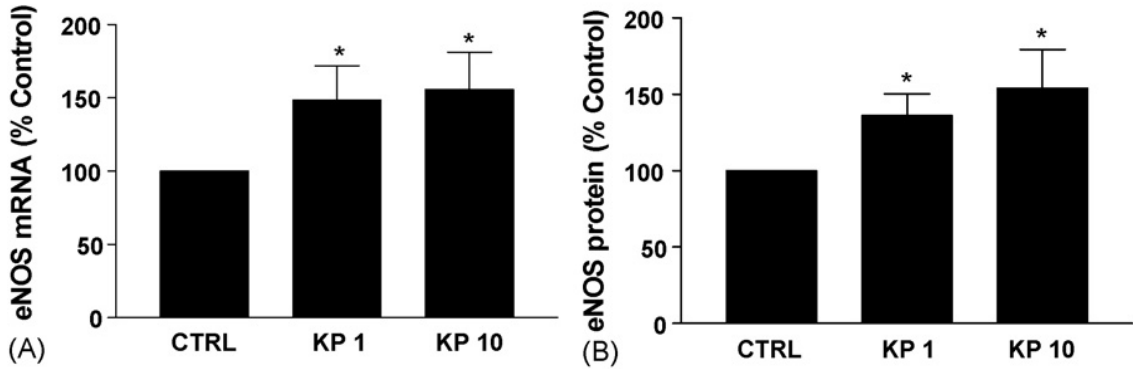


Fig. 7 The Effect of Black Ginger Extract on eNOS mRNA expression and eNOS protein expression. CTRL: Control, A: eNOS mRNA genetic expression, B: eNOS protein expression, KP1: Black Ginger Extract 1μg/mL, KP10: Black Ginger Extract 10μg/mL. Data are Mean ±SE, *: $P<0.05$ vs. control.

In addition, the effect of Black Ginger Extract at 10μg/mL on NO production was stronger than acetylecholline, the positive control (1000μg/mL) (Fig. 8). Meanwhile, production of NO was not affected by L-NAME, inhibitor of NO production, in samples containing Black Ginger Extract.

Endothelial NOS facilitate vascular function by generating NO production in the blood vessels, inhibit smooth muscle contraction and platelet aggregation. Black Ginger Extract enhances NO production, therefore, improve blood circulation and regulate blood pressure. It is potentially beneficial in vascular endothelial health promotion such as prevention of arteriosclerosis.

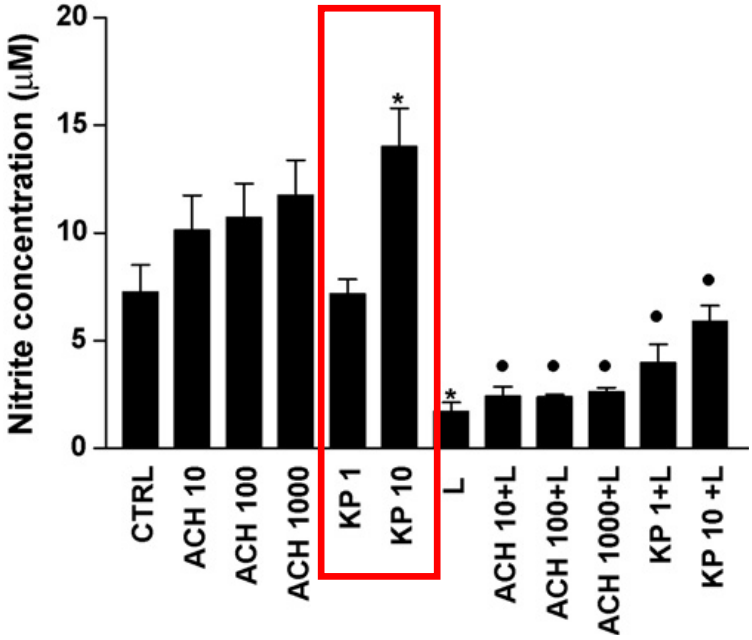


Fig. 8 The Effect of Black Ginger Extract on NO production in human umbilical vein endothelial cells. CTRL: Control, ACH: acetylcholine, NO production inducer, positive control, KP1, KP10: Black Ginger Extract 1, 10μg/mL, L: L-NAME, NO production inhibitor, negative control. Data are Mean ±SE, *: $P<0.05$ vs. control, ●: $P<0.05$ vs corresponding treatments without L-NAME.

Reference:
S.K. Wattanapitayakul *et al.* *Journal of Ethnopharmacology* **110**, 559–562 (2007)

(2) Aphrodisiac Effect

1) Inhibition of Phosphodiesterase-5

Phosphodiesterase or cyclic nucleotide phosphodiesterase consist of group of enzymes which degrades intracellular second messenger cGMP and cAMP. Phosphodiesterase type 5 (PDE 5), is one of the 11 enzymes that selectively degrades cGMP in vascular smooth muscle cells supplying the corpus cavernosum of the penis. Inhibition of PDE5 increases level of cGMP leading to smooth muscle relaxation, vasodilation and increased blood flow to the penile tissue. Therefore, PDE5 inhibitor is used in the treatment of erectile dysfunction (ED), e.g. Sildenafil of Viagra.

Temkitthawon *et al.*, conducted a study to evaluate the effect of Black Ginger Extract on phosphodiesterase-5. Result showed that Black Ginger Extract demonstrated inhibitory effect on PDE5 at concentration of 1μg/mL and 10μg/mL (Fig. 9). Furthermore, 5,7-dimethoxyflavone, the principal functional component of Black Ginger Extract has similarly inhibited PDE5 at concentration of 30μM (Fig. 9).

Similar to VIAGRA, a therapeutic agent for ED, Black Ginger Extract is aphrodisiac by inhibiting PDE5 activity resulting in smooth muscle relaxation, vasodilation and increased

blood flow to penile tissue. Table 4 showed that 5,7 dimethoxyflavone, the principal component of Black Ginger Extract, is the most potent flavones in PDE5 inhibition. However, no effect PDE5 observed in samples treated with Piper Longum and Ginger Extract (Fig 9).

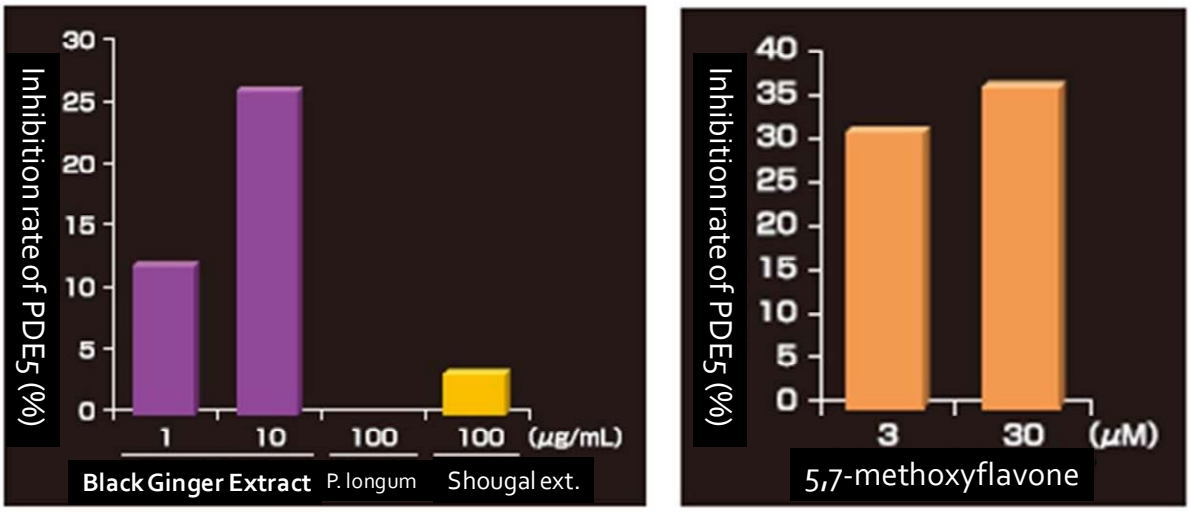


Fig. 9 The inhibitory effect of Black Ginger Extract and 5,7 dimethoxyflavone on PDE 5

Table 4. Inhibitory effect of functional components of Black Ginger Extract on PDE5

Compound	Inhibition rate on PDE5 (%, 10 μM)
5-hydroxy-7-methoxyflavone	18.23 ± 3.26
5,7-dimethoxyflavone	53.65 ± 1.15
5-hydroxy-7,4'-dimethoxyflavone	17.64 ± 3.19
4',5,7-trimethoxyflavone	37.82 ± 4.08
5-hydroxy-3,7-dimethoxyflavone	0.76 ± 1.26
3,5,7-trimethoxyflavone	44.96 ± 2.43
5-hydroxy-3,7,4' -trimethoxyflavone	6.02 ± 5.94
3,5,7,3',4' -pentamethoxyflavone	37.55 ± 2.07

Reference: Modified from P. Temkitthawon *et al.* *Journal of Ethnopharmacology* **137**, 1437– 1441 (2011)

(3) Anti-metabolic Syndrome (anti-obesity, anti-diabetic)

It has been estimated that there is approximately 86 million people suffering from metabolic syndrome in 6 most industrialized countries in the world. Recently, there are increasing cases of obesity in Japan due to irregular physical activity and dietary habits. The

Ministry of Health, Labor and Welfare reported that about 19 million Japanese in age group of 40-74 years were estimated to have metabolic syndrome, i.e. 1 in 2 males and 1 in 5 females are affected. In addition, sedentary lifestyle has been a huge consequence of metabolic syndrome and diseases such as hypertension, hyperlipidemia, diabetes and obesity. As a result, metabolism is disrupted with increasing visceral fat accumulation, insulin resistance and high blood cholesterol level. Besides, the equilibrium of physiologically active substances such as adipokines secretion is disrupted.

In a research to develop food and preventive treatment, the effect of Black Ginger Extract on spontaneously obese type II diabetic mice was examined. As shown in Fig. 10, Fig. 11 & Fig. 12 weight gain, visceral fat accumulation and blood sugar level were suppressed respectively in mice consuming Black Ginger Extract (1% and 3%) containing feed for 8 weeks. Meanwhile, no effect on above mentioned parameters were observed in normal mice (i.e. non-obese mice). It is suggestive that Black Ginger Extract is valuable as alternative preventive treatment for metabolic syndrome.

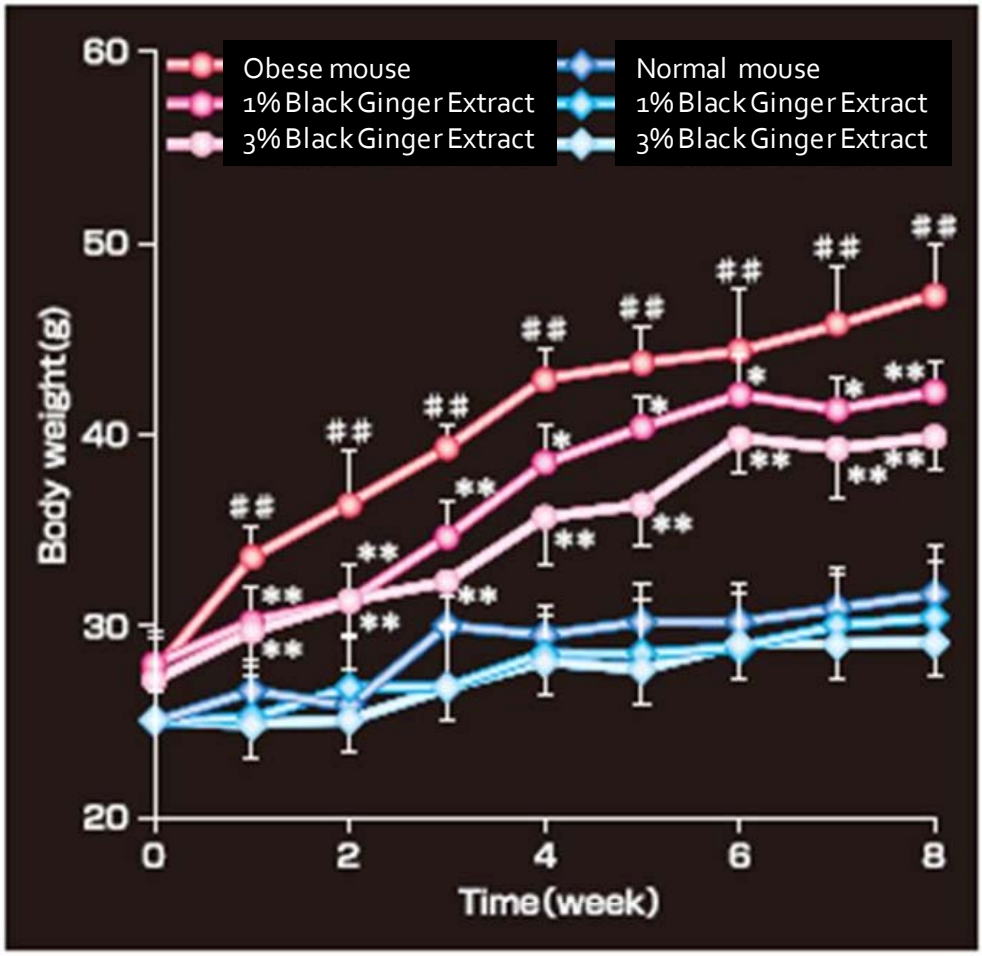
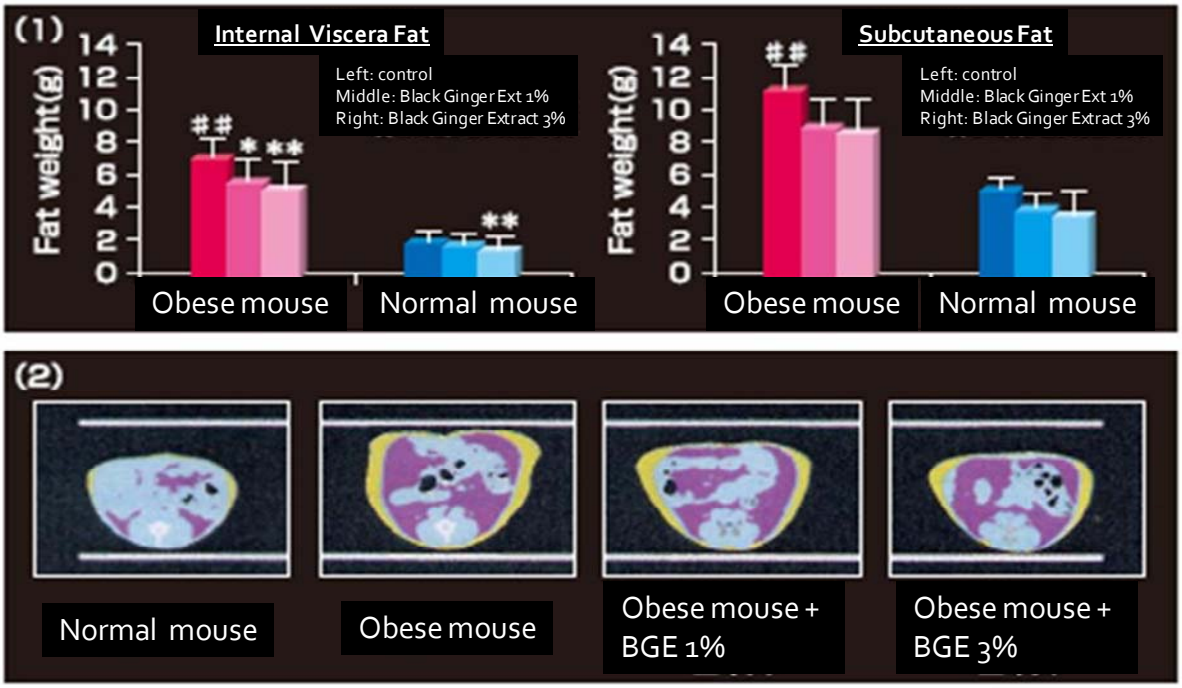


Fig. 10 Effect of Black Ginger Extract on mice weight changes over time



1. Effect on visceral fat and subcutaneous fat
2. CT Scan: purple: visceral fat, yellow: subcutaneous fat

Fig. 11 Effect of Black Ginger Extract on the accumulation of adipose tissue in spontaneously obese type II diabetic mice and normal mice.

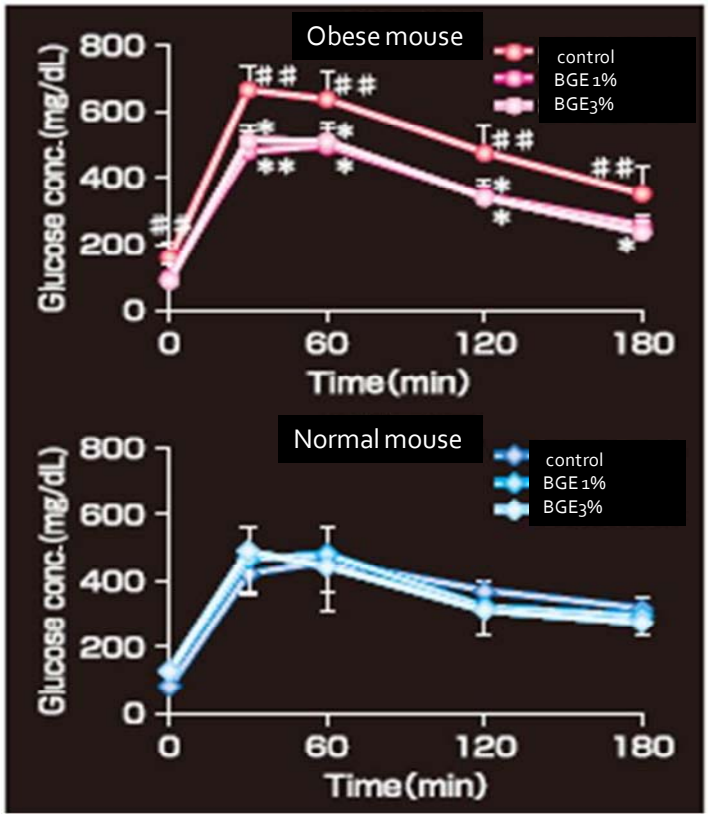
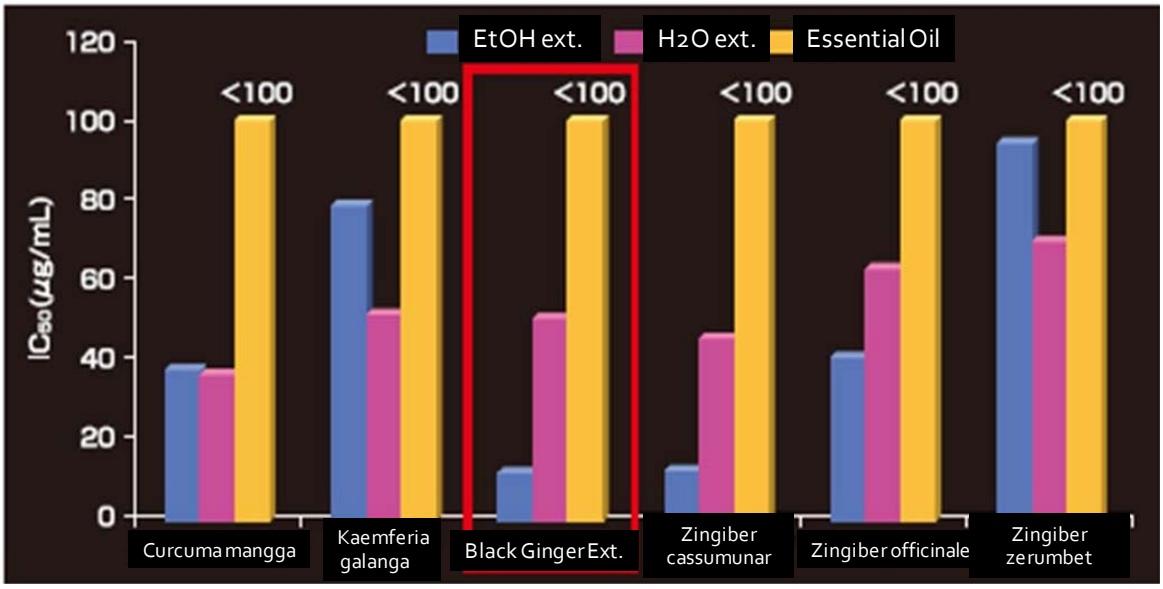


Fig. 12 Effect of Black Ginger Extract on Blood Sugar Level

Reference: T. Akase *et al. J Nat. Med.* **65**:73-80 (2011)

(4) Anti-allergy Effect

Tewtrakul et al., conducted an investigation examining and comparing the anti-allergic activity of selected Zingiberaceous plants (including Black Ginger Extract) using RBL-2H3 cell line. Upon mast cell degranulation, the enzyme β-hexosaminidase is released along with histamine, thus a biomarker for antigen induced degranulation in rat basophil. As shown in Fig. 13, the ethanolic extract of Black Ginger demonstrated the most potent anti-allergic effect on prevention of mast cells degranulation with an IC_{50} of about 10 μg/ml among the Zingingeraceous plants.



Among 6 different plant extract from ginger family, Black Ginger Extract (EtOH ext.) demonstrated the most potent activity on the inhibition of mast cells degranulation.

Fig. 13 Inhibitory effect of Black Ginger Extract on mast cell degranulation using RBL-2H3 cell line

Reference:

S. Tewtrakul *et al., J Ethnopharmacol.,* **109**(3):535-8, (2007)

(5) Anti-inflammatory Effect

The anti-inflammatory effect of Black Ginger Extract and 5 other Zinginberaceous plants was examined using RAW264.7 macrophage cells where inhibitory activity on E.coli derived

lipopolysaccharides (LPS) –induced NO release in RAW264.7 cells was investigated. Results showed that ethanolic extract of Black Ginger exhibited potent inhibition on NO production in RAW264.7 macrophage cells, thus potent anti-inflammatory effect (Fig. 14).

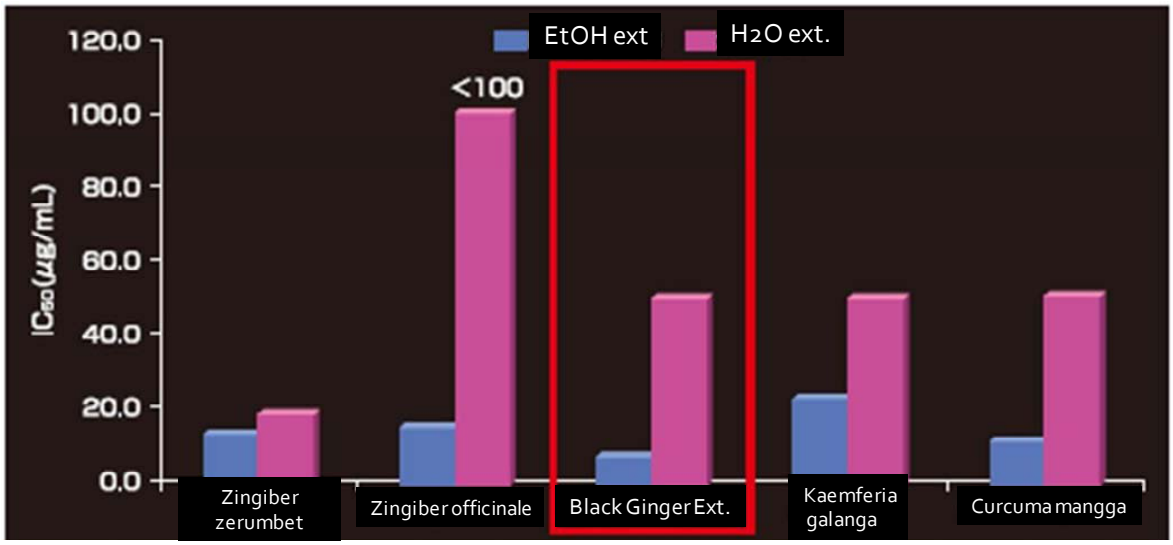


Fig. 14 Inhibitory effect of Black Ginger Extracton NO production in RAW264.7 macrophage cells

Reference:

S. Tewtrakul *et al., J Ethnopharmacol.,* **120**:81-84, (2008)

(6) Improve Brain Function

As described above, phosphodiesterases (PDEs) degrade phosphodiester bond in the second messenger molecule cAMP and cGMP, therefore important regulators of signal transduction mediated by these second messenger molecules. PDE2 is highly expressed in the brain and adrenal glands (SH Francis *et al*., *Prog Nucleic Acid RES Mol Biol*. **65**:1-52, 2001). The expression of mRNA of PDE has been identified in the hippocampus and cerebral cortex of the brain of rodents (WC Van Staveren et al., J Comp Neurol., 467:566-580, 2003). In a study conducted by Boess et al., reported that administration of PDE2 inhibitor BAY 60-7550 in rats improved memory function by potentiating long-term increase in nerve cells rats (FG Boess et al., *Neuropharmacology*, **47**:1081-1092, 2004).

The effect of Black Ginger Extract on PDE2 was examined. As shown in Fig. 15, Black Ginger Extract exhibited inhibitory effect on PDE2 at concentration of 1μg/mL and 10μg/mL.

Similarly, the standardized compound of Black Ginger Extract, 5,7-dimethoxyflavone inhibited PDE2 activity at concentration of 3μM and 30μM, hence the PDE2 inhibitory effect of Black Ginger Extract is contributed by 5,7-dimethoxyflavone. However, upon comparison with Piper Longum Extract, a health food ingredient with blood circulation enhancing effect, did not show inhibitory effect on PDE2 at low concentration of 10μg/mL but only at higher concentration of 100μg/mL (Fig. 15). As a result, Black Ginger Extract demonstrated 100 times more potent effect on the inhibition of PDE2 compared with Piper Longum Extract.

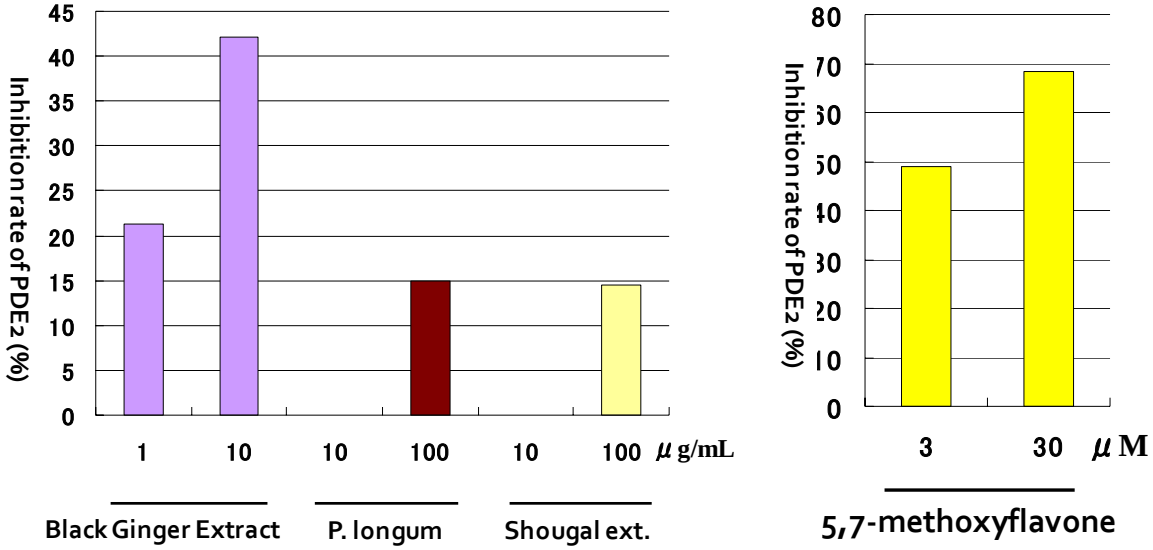


Fig. 15 Inhibitory Effect of Black Ginger Extract and 5,7-dimethoxyflavone on PDE2

(7) Antioxidant Effect

In a biological system, reactive oxygen species (e.g. superoxide and hydroxyl radicals) are generated in response to oxidative stress contributing to the development of various degenerative diseases e.g. cancer, inflammation, and ageing.

The antioxidant effect of Black Ginger Extract on Superoxide Dismutase (SOD) model and DPPH radical scavenging model was examined. As shown in Fig. 16, Black Ginger Extract demonstrated dose-dependent antioxidant effect on both SOD and DPPH radical scavenging models.

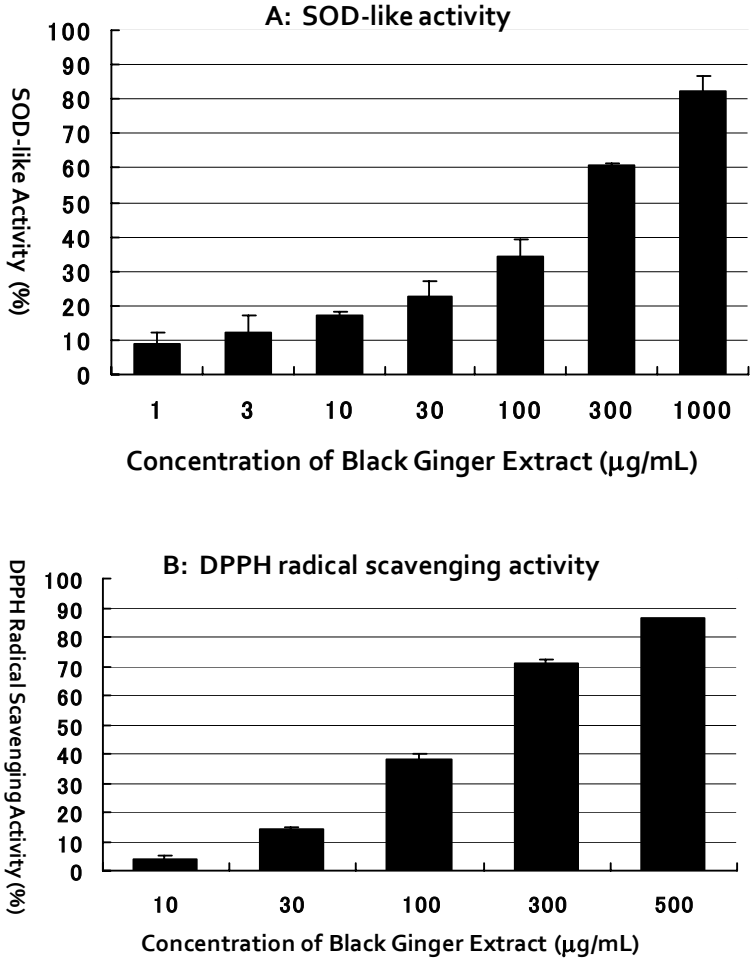


Fig. 16 Antioxidant Effects of Black Ginger Extract

4. Stability of Black Ginger Extract

(1) Heat Stability

The heat stability of Black Ginger Extract-P was examined by heating at 100°C and 120°C continuously for 1 hour. As shown in Fig. 17, content of 5,7-dimethoxyflavone, the principal component of Black Ginger Extract-P , and content of total flavonoids were not reduced after heating for 1 hour. Therefore, Black Ginger Extract-P is highly stable upon heating at normal food processing temperature.

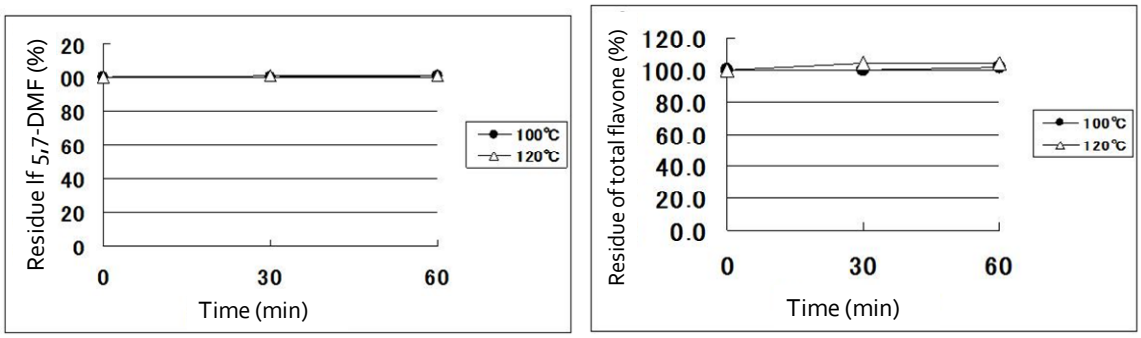


Fig. 17 The Heat Stability of Black Ginger Extract-P

5. Recommended Dosage

In accordance to the result of human clinical trials, the recommended dosage of Black Ginger Extract-P is 50-150mg/day.

6. Nutritional Profile

Analyzed Item	Black Ginger Extract-P	Black Ginger Extract-WSP	Analysis Method	Remarks
Energy	407 kcal/100g	410kcal/100g	Modified Atwater method	1
Protein	3.6g/100g	0.6g/100g	Kjeldahl method	2
Fatty Acid	5.3g/100g	0.9g/100g	Acid degradation	
Sugar	85.5g/100g	97.6g/100g	Calculation: 100 – (water + protein + fat + ash)	3
Ash	1.0g/100g	0.2g/100g	Direct incineration	
Water	3.3g/100g	0.6g/100g	Heat drying at atmospheric pressure	
Fiber	1.0g/100g	0.2g/100g	Prosky method	
Sodium	66.3mg/100g	11.1mg/100g	Atomic absorption spectrophotometry	
Sodium chloride equiv.	0.17g/100g	0.03g/100g	Sodium equiv. value	

Remarks:

1. Energy conversion: protein 4, fat 9, sugar 4, fiber 2
2. Protein conversion factor: 6.25
3. Calculation: 100 – (water + protein + fat + ash)
4. Nutritional Value of Black Ginger Extract-WSP is calculated from the Nutritional value of Black Ginger Extract-P

Test Trustee: Food Analysis Technology Centre SUNATEC

Date: May 15, 2012

Report No.: 120501169-001-01

7. Safety Profile

(1) Residual Agricultural Chemicals

Black Ginger Extract (without binder) was screened and analyzed for residual agricultural chemicals (535 items) stipulated under the Food Sanitation Act and Pesticides Control Act, presence of the test items was lower than the allowed limits.

Test Trustee: Masis Co., Ltd.; Center for Food Safety Evaluation and Analysis

Date: May 17, 2012

Report No.: 54521

(2) Acute Toxicity (LD_{50})

Acute Toxicity test was conducted according to the Guidelines for Single-Dose Toxicity Tests for Pharmaceutical Products where Black Ginger Extract (without binder) 2000mg/kg was orally given to mice (male & female ICR, 5 weeks old, weight 20-25g) for 14 days. The mice were housed at 23 ± 2°C and at 50 ± 10% humidity with free access to feed and drinking water for 14 days. No abnormal change was found in their weight as compared to the control group. No abnormalities were found in their organs upon autopsy after the test either. LD_{50} of Black Ginger Extract is deduced to be 2,000 mg/kg.

(3) Mutagenicity (Ames Test)

Ames test was conducted to evaluate the mutagenicity of Black Ginger Extract (without binder) using Salmonella typhimurium strain TA98 and TA100. There was no increase in the number of colonies (19.5 ~ 5000 μg / plate) in both direct method and metabolism activation method. Black Ginger Extract was considered as non-mutagenic.

8. Applications

	Applications Claims Examples	Claims	Examples
Food Nutritional Supplement	Food Nutritional Supplement	1. Improve blood circulation 2. Relief edema 3. Improve vitality 4. Anti-obesity 5. Anti-inflammatory 6. Beauty food 7. Cosmetics	Beverages Hard & soft capsules, tablets Candies, chewing gums, chocolates, wafers, jellies Ham, sausage, etc.
Beauty Food Eye health	Beauty Food Eye health		Lotions, toner, serum, rinse, treatment care, pack, body gel etc.

9. Packing

Black Ginger Extract-P (powder, food grade)

Black Ginger Extract-WSP (water soluble powder, food grade)

Black Ginger Extract-PC (powder, cosmetics grade)

Black Ginger Extract-WSPC (water soluble powder, cosmetics grade)

1kg, 5kg interior packing: Aluminium bag

Exterior packing: Cardboard box

Black Ginger Extract-LC (liquid, cosmetics grade)

1kg, 5kg Interior packing: Tin can

Exterior packing: Cardboard box

10. Storage

Store in a cool, dry and dark place. Avoid heat and places with high humidity.

11. Expression of Black Ginger Extract

Food grade:

Black Ginger Extract-P

Expression: Black Ginger Extract and modified starch

Black Ginger Extract-WSP

Expression: Black Ginger Extract and cyclodextrin

It is suggested to reconfirm with the Regional Agricultural Administration Office for public health and food labeling.

Cosmetic grade:

Black Ginger Extract-PC

INCI name: Kaempferia Parviflora Rhizome Extract (and) Starch Sodium Octenyl Succinate (application in progress)

Expression: Black Ginger Extract (application in progress), Starch Sodium Octenyl Succinate

Black Ginger Extract-WSPC

INCI name: Kaempferia Parviflora Rhizome Extract (and) Maltosyl Cyclodextrin (and) Cyclodextrin (and) Maltose (application in progress)

Expression: Black Ginger Extract (application in progress), Maltosyl Cyclodextrin and Cyclodextrin and Maltose

Black Ginger Extract-LC

INCI name: Kaempferia Parviflora Rhizome Extract (and) Propanediol (application in progress)

Expression: Black Ginger Extract (application in progress), Propanediol

PRODUCT STANDARD

PRODUCT NAME : **BLACK GINGER EXTRACT-P** (FOOD)

This product is extracted with aqueous ethanol from the rhizome of *Kaempferia parviflora* (*Zingiberaceae*). It contains a minimum of 2.5 % 5,7-dimethoxyflavone and 10.0 % total flavonoids.

Appearance	Purple powder with light unique aroma	
5,7-Dimethoxyflavone	Min. 2.5 %	(HPLC)
Total Flavonoids	Min. 10.0 %	(Spectrophotometry)
Loss on Drying	Max. 10.0 %	(Analysis for HygienicChemists, 1g, 105 ℃、2 hr)
Purity Test		
(1)Heavy Metals (as Pb)	Max. 10 ppm	(Sodium Sulfide Colorimetric Method)
(2) Arsenic (as As_2O_3)	Max. 1 ppm	(Standard Methods of Analysis in Food Safety Regulation, The Third Method, Apparatus B)
Standard Plate Counts	Max. 1×10^3 cfu/g	(Analysis for Hygienic Chemists)
Moulds and Yeasts	Max. 1×10^2 cfu/g	(Analysis for Hygienic Chemists)
Coliforms	Negative	(Analysis for Hygienic Chemists)

Composition

Ingredient	Content
Black Ginger Extract	30 %
Modified Starch	70 %
Total	100 %

PRODUCT STANDARD

PRODUCT NAME : **BLACK GINGER EXTRACT-WSP** (FOOD)

This product is extracted with aqueous ethanol from the rhizome of *Kaempferia parviflora* (*Zingiberaceae*). It contains a minimum of 0.25 % 5,7-dimethoxyflavone and 1.00 % total flavonoids. This product is water soluble.

Appearance	Light purple powder with light unique aroma	
5,7-Dimethoxyflavone	Min. 0.25 %	(HPLC)
Total Flavonoids	Min. 1.00 %	(Spectrophotometry)
Loss on Drying	Max. 10.0 %	(Analysis for HygienicChemists, 1g, 105 ℃、2 hr)
Purity Test		
(1)Heavy Metals (as Pb)	Max. 10 ppm	(Sodium Sulfide Colorimetric Method)
(2) Arsenic (as As_2O_3)	Max. 1 ppm	(Standard Methods of Analysis in Food Safety Regulation, The Third Method, Apparatus B)
Standard Plate Counts	Max. 1×10^3 cfu/g	(Analysis for Hygienic Chemists)
Moulds and Yeasts	Max. 1×10^2 cfu/g	(Analysis for Hygienic Chemists)
Coliforms	Negative	(Analysis for Hygienic Chemists)
Composition	Ingredient	Content
	Black Ginger Extract	5 %
	Cyclodextrin	95 %
	Total	100 %

PRODUCT STANDARD

PRODUCT NAME : **BLACK GINGER EXTRACT-PC** (COSMETIC)

This product is extracted with aqueous ethanol from the rhizome of *Kaempferia parviflora* (*Zingiberaceae*). It contains a minimum of 2.5 % 5,7-dimethoxyflavone and 10.0 % total flavonoids.

Appearance	Purple powder with light unique aroma.	
5,7-Dimethoxyflavone	Min. 2.5 %	(HPLC)
Total Flavonoids	Min. 10.0 %	(Spectrophotometry)
Loss on Drying	Max. 10.0 %	(Analysis for HygienicChemists, 1g, 105 ℃、2 hr)
Purity Test		
(1)Heavy Metals (as Pb)	Max. 10 ppm	(The Second Method of The Japanese Standards of Quasi-Drug Ingredients)
(2)Arsenic (as As_2O_3)	Max. 1 ppm	(The Third Method of The Japanese Standards of Quasi-Drug Ingredients)
Standard Plate Counts	Max. 1×10^2 cfu/g	(Analysis for Hygienic Chemists)
Moulds and Yeasts	Max. 1×10^2 cfu/g	(Analysis for Hygienic Chemists)
Coliforms	Negative	(Analysis for Hygienic Chemists)

Composition

Ingredient	Content
Starch Sodium Octenyl Succinate	70 %
Kaempferia Parviflora Rhizome Extract	30 %
Total	100 %

PRODUCT STANDARD

PRODUCT NAME : **BLACK GINGER EXTRACT-WSPC** (COSMETIC)

This product is extracted with aqueous ethanol from the rhizome of *Kaempferia parviflora* (*Zingiberaceae*). It contains a minimum of 0.25 % 5,7-dimethoxyflavone and 1.00 % total flavonoids. This product is water soluble.

Appearance	Light Purple powder with light unique aroma.	
5,7-Dimethoxyflavone	Min. 0.25 %	(HPLC)
Total Flavonoids	Min. 1.00 %	(Spectrophotometry)
Loss on Drying	Max. 10.0 %	(Analysis for HygienicChemists, 1g, 105 ℃、2 hr)
Purity Test		
(1)Heavy Metals (as Pb)	Max. 10 ppm	(The Second Method of The Japanese Standards of Quasi-Drug Ingredients)
(2)Arsenic (as As_2O_3)	Max. 1 ppm	(The Third Method of The Japanese Standards of Quasi-Drug Ingredients)
Standard Plate Counts	Max. 1×10^2 cfu/g	(Analysis for Hygienic Chemists)
Moulds and Yeasts	Max. 1×10^2 cfu/g	(Analysis for Hygienic Chemists)
Coliforms	Negative	(Analysis for Hygienic Chemists)

Composition

Ingredient	Content
Maltosyl Cyclodextrin Cyclodextrin Maltose	95 %
Kaempferia Parviflora Rhizome Extract	5 %
Total	100 %

PRODUCT STANDARD

PRODUCT NAME : **BLACK GINGER EXTRACT-LC** (COSMETIC)

This product is extracted from the rhizome of *Kaempferia parviflora* (*Zingiberaceae*), with aqueous ethanol and is dissolved in propanediol. It guarantees minimum 0.1% 5,7-dimethoxyflavone and 0.4% total flavonoids.

Appearance	Purple liquid with light unique aroma.	
5,7-Dimethoxyflavone	Min. 0.1 %	(HPLC)
Total Flavonoids	Min. 0.4 %	(Spectrophotometry)
Purity Test		
(1)Heavy Metals (as Pb)	Max. 10 ppm	(The Second Method of The Japanese Standards of Quasi-Drug Ingredients)
(2)Arsenic (as As_2O_3)	Max. 1 ppm	(The Third Method of The Japanese Standards of Quasi-Drug Ingredients)
Standard Plate Counts	Max. 1×10^2 cfu/g	(Analysis for Hygienic Chemists)
Moulds and Yeasts	Max. 1×10^2 cfu/g	(Analysis for Hygienic Chemists)
Coliforms	Negative	(Analysis for Hygienic Chemists)

Composition

Ingredient	Content
Propanediol	90 %
Water	9 %
Kaempferia Parviflora Rhizome Extract	1 %
Total	100 %

ORYZA OIL & FAT CHEMICAL CO., LTD. striving for the development of the new functional food materials to promote health and general well-being.

From product planning to OEM - For any additional information or assistance, please contact：

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ORYZA OIL & FAT CHEMICAL CO., LTD.