

Physiologically-Active Potencies of Tropical Food Ingredients

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Indonesia is the biggest archipelago tropical country in the world, therefore this country is rich of tropical natural resources which can be developed as various foods. Moreover, Indonesia has a dense population with multi-ethnic groups which will create various culinary cultures and eating habits. Since long time ago, some Indonesian indigenous food is well known for its potencies to prevent diseases and to maintain healthy condition beside to fulfill the nutrition requirements. In relation with food diversity which differs on each kind of food ingredients, Indonesia has lots of food ingredients that can give physiologically active potencies.

Nowadays, there has been found hundreds of scientific researches on physiologically active compounds or ingredients as part of Indonesian diet. Unfortunately, most of the researches are still in the early stage of exploration and have not yet fully overcome due to the lack of supporting infra-structures or financial problems. We need further and more comprehensive investigation to obtain reliable data and scientifically sound as well as to back up their responsible utilization. So far, there are only a few benefits that could be taken from the tropical food ingredients which giving physiological effects on human's health. The use of food bio-active compounds is only based on heritage or belief, lack of scientifically proven. Thus, positive supports and aids from every agency which concern on those aspects were deeply expected to make good integrated collaborations with local authority and scientists to develop as well as create potential innovations.

Several kinds of foods which give physiologically active potencies which the researches have been done mostly in Food Science and Technology Depart., Bogor Agricultural University, will be illustrated in this presentation. The examples are including "cincau hijau", "lalap", "petai" (*Parkia speciosa Hassk.*), "andaliman" (*Zanthoxylum acanthopodium DC.*), "picung" (*Pangium edule Reinw.*), "daun kedondong" (*Spondia scythera Sonn.*), and "ginger". These components are reported to give advantages on preventing degenerative diseases, improving vitality, and human's

1. Mizutani, 1988. " Volatile Flavor Agents Vinylidithiols from *Allium victorialis*". J. caucas (*A. victorialis* L.). Proceedings 3rd Joint and Technology, October 8-9, 1990. Bogor.
2. Mizutani, 1990. Effect of drying on volatile caucas (*A. victorialis* L.). Proceedings 3rd Joint and Technology, October 8-9, 1990. Bogor.
3. Mizutani, 1991. Influence of Constituents of Caucas. J. Food Science 1: 72.
4. Andini, 1993. Oriental Natural Food the Food Ingredients Asia conference.
5. Flavor, Liquid and spray-dried flavor leaves in Food Flavors : Generation, Analysis mbous (ed.), P. 235. Elsevier Science B. V.
6. S. Koswara and F. Zakaria, 1995 and Garlic Dried Powder Made of Local Perspectives on Functional Foods. Singapore.
7. E. Suryani and A. Aprilyantono, 1996. Fruit Flavor-Optimization of Cempedak (r) Flavor Extraction. In Flavor Science and D. S. Mottram (eds.), p.86. The Royal
8. F. Zakaria and S. Koswara, 1996. Anti-come Allium spp Crown in Indonesia. Natural
9. H. Rahajna and T.A. Ngakan, 1999. Flavor (r), An Exotic Tropical Fruit. In Flavor and Ho (eds.), p.119. Kluwer
10. F. Zakaria and S. Koswara, 2000. Anti-ilot and Garlic Dried Powders made of Local and Nutrition Progress 1:13.
11. Aprilyantono, 2002. Volatile Aroma andaliman (*Z. acanthopodium* L.) Fruit.
12. 11 (6) 680-683.
13. 2003. Aroma Volatiles of Several Obscure research at The Dawn of the Twenty-first vant (eds.) p 749, Intercept Publishers, Paris.
14. K. Schippel and G. Ebert, 2004. Different Cultivars of Snake-Fruit (*Salacca rotomatography-Olfactometry*. J. Agric. Food

immune system as well. "Buah Merah" (*Pandanus conoideus*), a tropical fruit originated from Papua, is becoming the hottest issue for its capability in giving physiologically active potencies. This fruit is used by Papua ethnic group as part of their daily diet which is believed in improving their vitality and energy from the severe climate and to maintain their immunity from low hygiene condition. Advanced research showed that "Buah Merah" contains high carotenoid, tocopherols, potassium, and iron compounds. This fruit was also reported to have the ability in diabetic prevention.

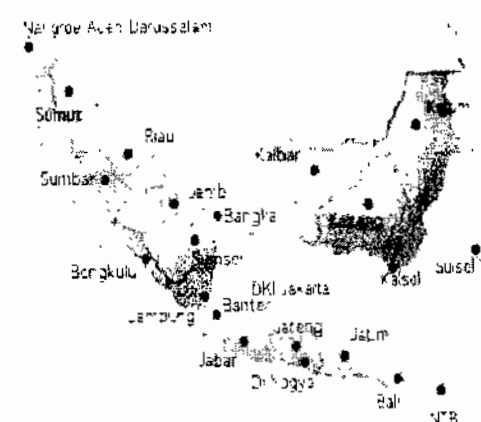
Indonesia is also rich for its fermentation products. The tropical climate gives benefit for microorganisms to live and growth, also gives more opportunity for us to develop and use those microbes to produce the products which with higher physiological effects. Wastes or useless materials can be developed into better food ingredients which can give additional value of nutrition and functional properties. Fermentation process gives physiologically active potency on food ingredients which is formerly inactive. "Tempe", Indonesian indigenous food, has been well recognized in the world for its potency on improving physiologically effects. "Tempe" which is made from soybean is the most popular product in the world wide. Aside from that, "tempe" actually can be made from other sources or even from waste. Just name several products of tempe: *tempe gembus*, which is made from solid tofu waste. The use of other microorganisms as agent of fermentation results different products, like "oncom". Oncom products are well recognized especially in West Java, with two kinds of variety: *oncom merah* and *oncom hitam*. There are many other fermented products from different tropical area, like "dadih"-spontaneous fermented product made from buffalo's milk which is stored in "bumbung bambu" or bamboo pole. This product can also be considered as probiotic because of its valuable active Lactic Acid Bacteria.

There are many other tropical food ingredients which can give physiologically active potencies, which is still under utilized. It will be an unfortunate if those "precious treasures" lost along with the "map-carriers"- our "nini-sepuh" or great grandparents who bring the knowledge and information which had been distributed orally for ages. This information is not well documented. It will give a big lost for the scientific world. Many things we can dig and develop, waiting for researchers to play the role, based on research etiquette codes, not only based on profits.

Physiologically-active of Tropical Food

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Indonesia is an tropical archipelago

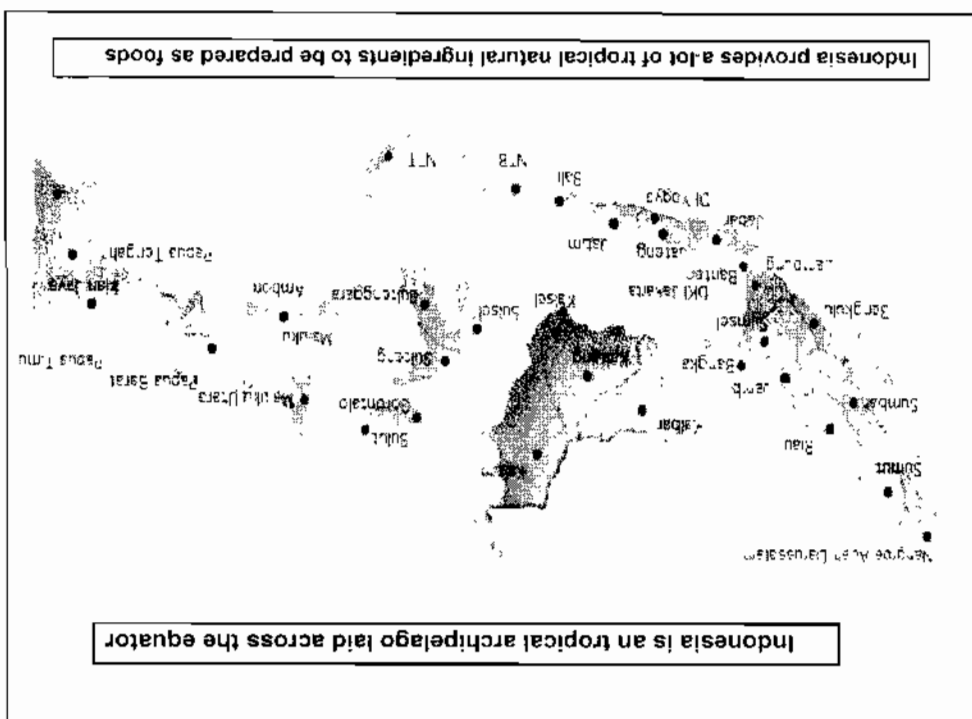


Indonesia provides a lot of tropical natural resources

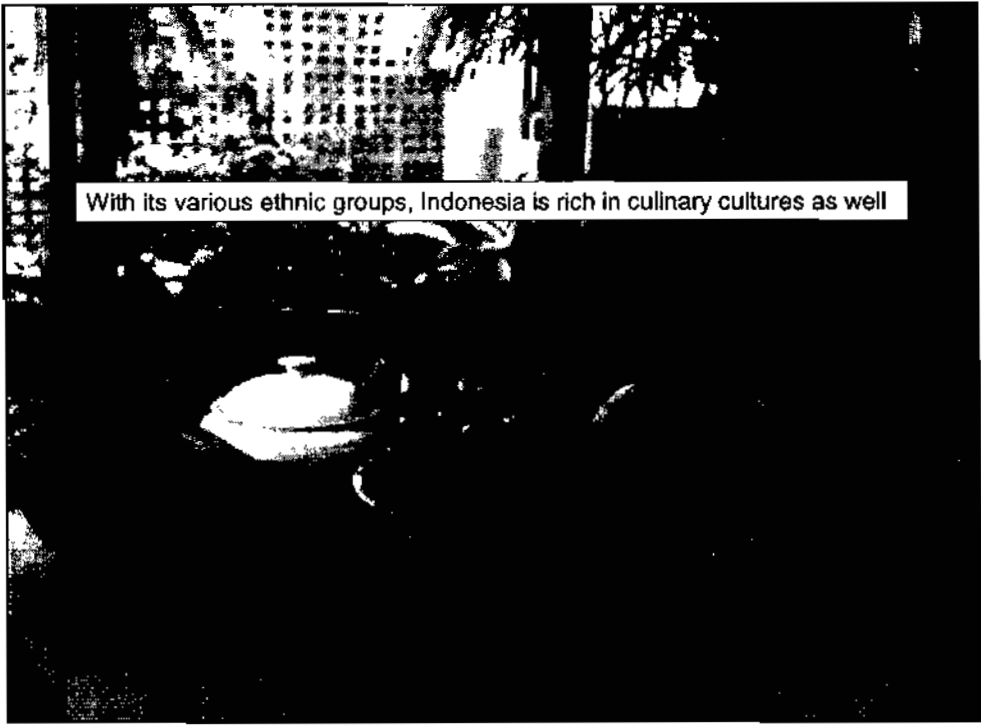
Physiologically-active Potencies of Tropical Food Ingredients

Kennang leaves
Photo by Elvis et al.

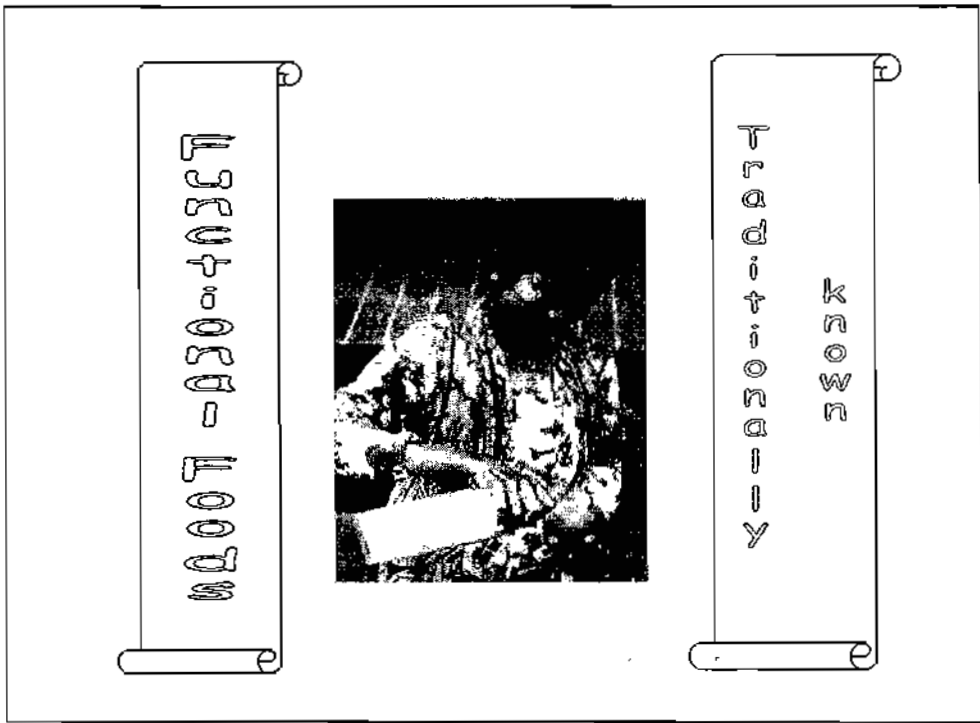
C. Hanny Wijaya
Department of Food Science and Technology
Faculty of Agricultural Technology
Bogor Agricultural University
Indonesia



(*Pandanus conoides*), a tropical fruit originated issue for its capability in giving physiologically a ethnic group as part of their daily diet which energy from the severe climate and to maintain condition. Advanced research showed that "Buah crows, potassium, and iron compounds. This fruit abetic prevention. mentation products. The tropical climate gives growth, also gives more opportunity for us to ce the products which with higher physiological e developed into better food ingredients which and functional properties. Fermentation process food ingredients which is formerly inactive. has been well recognized in the world for its ects. "Tempe" which is made from soybean is ide. Aside from that, "tempe" actually can be ste. Just name several products of tempe: *tempe* ste. The use of other microorganisms as agent s, like "oncom". Oncom products are well wo kinds of variety: *oncom merah* and *oncom* products from different tropical area, like made from buffalo's milk which is stored in product can also be considered as probiotic bacteria. ingredients which can give physiologically d. It will be an unfortunate if those "precious" our "mini-sepuh" or great grandparents who h had been distributed orally for ages. This give a big lost for the scientific world. Many researchers to play the role, based on research



With its various ethnic groups, Indonesia is rich in culinary cultures as well



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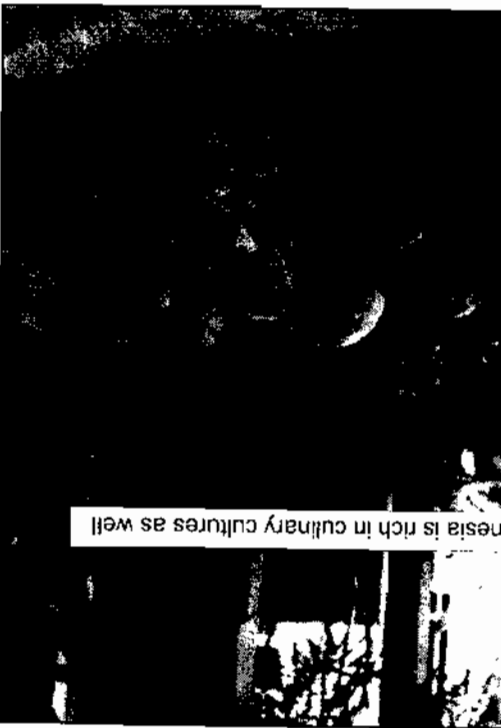
Traditional drink

- Beras kencur (curcuma-rice)
- Wedang jahe (ginger)
- Kunir asam (tamarind curcuma based)
- Bandrek (mix-herb)
- Bir pletok (tamarind beer)

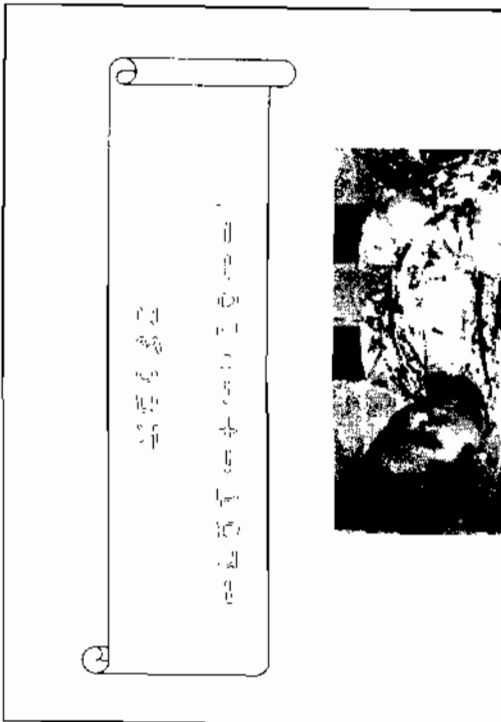
There are numbers of food reported as having physiological effects. Hundreds of scientific researches on their bio-activity have been conducted

Unfortunately most of the researches are still in the early stage of exploration and have not yet fully overcome.

Need further and more investigation to obtain scientifically sound and responsible utilization



Indonesia is rich in culinary cultures as well



Traditional drinks

- Beras kencur (curcuma-rice based)
- Wedang jahe (ginger tea)
- Kunir asam (tamarind-cucurma based)
- Bandrek (mix-spices based)
- Bir pletok (temulawak-based)



There are numbers of food ingredients are reported as having physiological activities. Hundreds of scientific researches and experiments on their bio-active potencies have been conducted

Unfortunately most of the researches are still in the early stage of exploration and have not yet fully overcome.

Need further and more comprehensive investigation to obtain reliable data and scientifically sound as well as to back up their responsible utilization



Some Researches on Food's Bio-activities

- Astawan, M.; Yasni, S.; Suliantri; Olih. 1997. Study on the Potency of Soybean-Rice Mixed Tempe Hydrolysate as a Hypotensive Substance to Decrease Blood Pressure of Rats.
- Murhadi; Soekarto, TS; Jenie, BSL, Apriyantono, A; Yasni, S. 2004. Spectroscopic characteristics of Antibacterial Components of Atung (*Parinarium glaberrimum* Hassk).
- Sarastani, D; Soekarto, ST; Muchtadi, TR; Fardiaz, D; Apriyantono, A. Antioxidant activities of *Parinarium glaberrimum* Hassk extracts and their fractions.
- Septiana, A.T.; Zakaria, FR.; Sulistiyani. *Ginger* (*Zingiber officinale* Roscoe) Extracts Inhibits LDL Oxidation..
- Suryono. 2003. Dadih: produk olahan susu fermentasi tradisional yang berpotensi sebagai pangan probiotik.
- Tejasari; Zakaria, F.R.; Sajuthi, D. 2003. Effects of bioactive Compounds of ginger (*Zingiber officinale* Roscoe) roots on B Cell Lymphocyte Function in in vitro system.
- Wresdiyati, T.; Astawan, M.; Adnyane, IKM. 2003. Anti-inflammation Activity of Ginger (*Zingiber officinale*) Oleoresin on Kidney of Rats under Stress Condition.
- Astuti P. 2004. Characterization of bioactive Compounds Isolated from Indonesian Marine Sponge Collection
- Mahendratna M. 2005. The Combination of spice extract and re-distilled liquid smoke on minimizing hydrazine formation in smoked kembung fish (*Rastrelliger* sp).
- Sugiyono. 2004 Isolation, pra-identification and antibacterial activities of active compounds from liver and liver oil of (*Carcharhinus limbatus*).
- Rusmarilin H. 2003. Anticancer activity of alpinia (*Alpinia galanga* (L) Sw) extract
- Astuti, I.B. 1997. Extraction of bio-active compounds of seaweed (*Laurencia* sp) and its antifungal activity.
- Lastari DS. 1998. Study on bioactive compounds of garlic on cytotoxic activity of human lymphocyte cells in vitro.
- Ramdhani TH. 2004. Isolation and identification of bioactive compounds of celery in inhibiting xanthin oxidase.

Beneficial claims

- antidiarrhea
- antidiabetic
- antiatherosclerosis
- anticancer
- antioxidant
- antiwrinkle and
- smoothing the skin



'Lalapan' ?? (West Java's traditional salad)

a side-dish including several kind of raw, boiled, or steam vegetables, served with chili sauces

Lalap has been believed as a daily diet with a lot of beneficial impact on human health and beauty.



Vegetables well-known as lalap in W



Cucumber
(*Cucumis sativus* L)



Leunca
(*Solanum nigrum*)

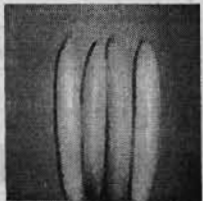
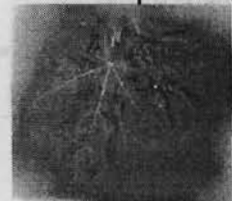


Tomato
(*Lycopersium
esculentum* Mill)



Kedondong leaf
(*Spondias cythraea* Sonn)

Vegetables well-known as lalap in West Java:

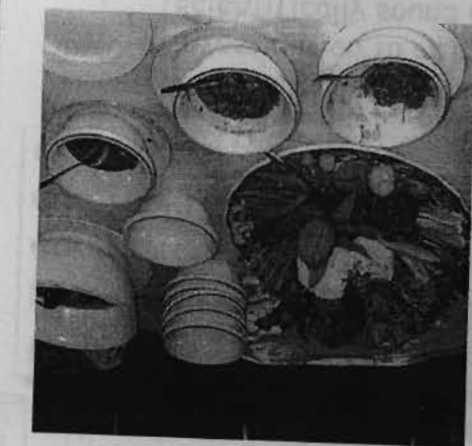
			
Tomato (<i>Lycopersium esculentum</i> Mill)	Cucumber (<i>Cucumis sativus</i> L)	Kedondong leaves (<i>Spondias cytherea</i> , (Mangifera kemanga) Sonn)	Papaya leaves (<i>Carica papaya</i> L)
			
Leunca (<i>Solanum nigrum</i>)	Kembang leaves (<i>Mangifera kemanga</i>)		

Beneficial claims

- antidiarrhea
- antidiabetic
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- antioxidant
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Utilization in functional foods ?

Scientific approval ?

Java's traditional salad

Food's Bio-activities

17. Study on the Potency of Soybean-Rice Mixed Substance to Decrease Blood Pressure of Rats.
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 nents of Atung (*Parinari glaberrima* Hassk).
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 y of Rats under Stress Condition.
 -Compounds Isolated from Indonesian Marine
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 limbatas).
 Alpinia (*Alpinia galanga* (L.) Sw) extract
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 nds of garlic on cytotoxic activity of human
 tion of bioactive compounds of celery in

Vegetables well-known as lalap in West Java:



• Long bean (*Vigna sinensis* L. Walp)



• Cassava leaves (*Manihot esculenta* crantz)



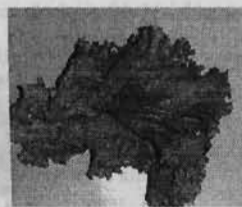
• Pohpohan (*Pilea trinervia* L)



• Kemangi (*Ocimum americanum* L)



• Cabbage (*Brassica oleraceae* var. *capitata* L)



• Lettuce (*Lactuca sativa* L)

MAXIMUM PLATELET AGGREGATION OF VARIOUS LALAP

Lalap	Max. Aggregation (%)	
	Control	Sample
Lettuce	48,2	71,4
Kemangi	49,1	73,6
Pohpohan	63,2	75,5
Leunca	42,3	48,2
Kemang leaves	48,2	18,6
Kedondong leaves	64,5	0,0
Papaya leaves	51,8	27,3
Tomato	48,2	18,6
Long bean	64,5	61,4
Cucumber	51,8	50,9
Cassava leaves	51,8	38,6
Cabbage	46,8	44,1

D₅₀ OF LALAP WITH SIG PLATELET AGGREGAT

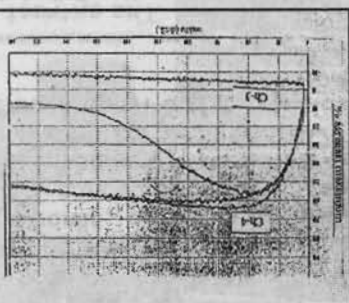
Name of lalap	D ₅₀ (mg extract/ml PRP)	Yield (% bb)	N (mg PRP)
Kemang leaves	20.05	21.70	92
Kedondong leaves	5.11	11.95	42
Papaya leaves	27.95	29.47	94
Tomato ^c	13.23	44.70	29

Utilization as functional ingredients

Extract of kemang leaves, tomato were suitable for je of extracts up to 8 % into t were still accepted by pane extract gave un-acceptable

D₅₀ OF LALAP WITH SIGNIFICANT ANTI PLATELET AGGREGATION ACTIVITY

Name of lalap	D ₅₀ (mg extract/ml PRP)	Yield (% bb)	Nilai D ₅₀ (mg lalap/ml PRP)
Kemang leaves	20.05	21.70	92.40
Kedondong leaves	5.11	11.95	42.76
Papaya leaves	27.95	29.47	94.84
Tomato ^c	13.23	44.70	29.60



in West Java:

•Pohpohan
(*Pilea trinervia* L.)

•Lettuce
Lactuca sativa L.)

•Pilea trinervia L.)

ET AGGREGATION OF LALAP

Sample	Max. Aggregation (%)
Control	8.2
71.4	9.1
73.6	3.2
75.5	2.3
48.2	8.2
18.6	4.5
0.0	8
27.3	3.2
18.6	4.5
50.9	1.8
38.6	1.8
44.1	5.8

Utilization as functional food ingredients



Extract of kemang leaves, kedondong leaves and tomato were suitable for jelly products. Additional of extracts up to 8 % into the jelly agar formula were still accepted by panelists. Papaya leaves extract gave un-acceptable bitter taste.

Cincau (West Java's traditional dessert)

A green jelly made from the leaves extract of *Cyclea barbata* L Miers or *Premna oblongifolia* Merr.

Cincau gel has been proved as having a significant immune response, antioxidant and anti-cancer activities. The responsible compounds are including carotenoids, chlorophyll and flavonoids



F.R.Zakaria, E. Prangdimurti and D. Nurfaridah (2003)

Kedondong Leaves

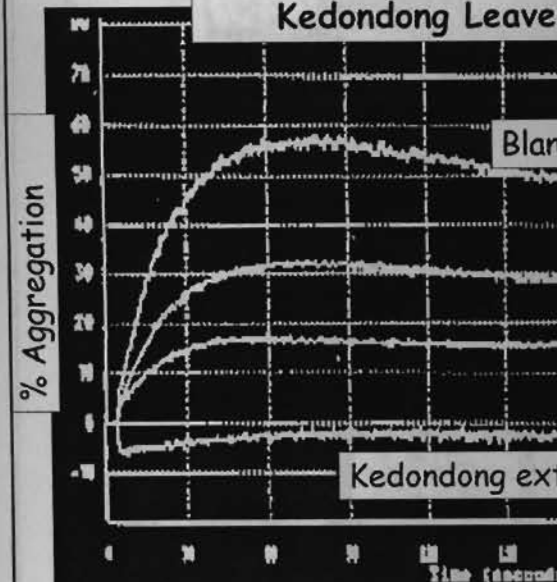
Spondia scytherea Sonn.

- Young leaves freshly consumed to accompany main dishes such as grilled fish, & fried chicken or cooking vegetable.
- Antiplatelet aggregation (Wijaya et al, 2001)
- Active fraction (ethyl acetate) stable at high temperature—alkaloid, terpenoid or phenolic? (not yet fully identified)



Photo from: <http://www.pagopago.com/PolyHerbs/polymedherbs.htm>

Anti Platelet Aggr Kedondong Leave



Picung

Pangium edule Rein

Traditionally used as:

- Spices (fermented picung)
- Black Colorant (fermented)
- Preservative for fresh fish
- Anti skin-parasite



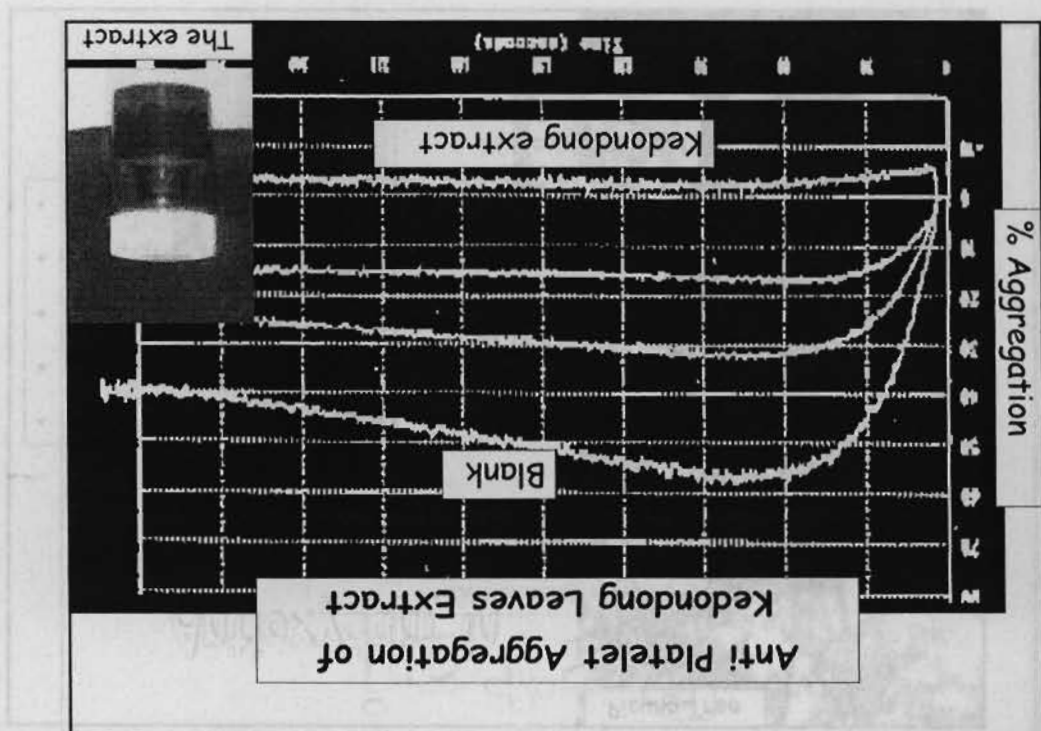
Picung Fruit

Picung Seed

Pangium edule Reinw.

Traditionally used as:

- Spices (fermented picung)
- Black Colorant (fermented picung)
- Preservative for fresh fish
- Anti skin-parasite



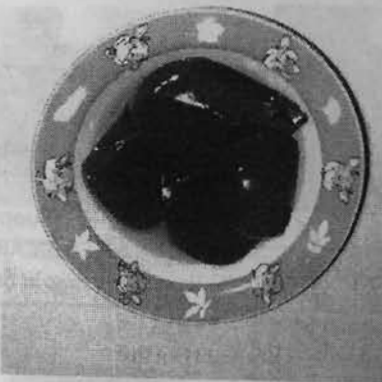


Wijaya

Wijaya Leaves

Albizia saman.

Consumed to s such as grilled or cooking



Kedondong Leaves Extract

West Java's traditional dessert

Antioxydant in Fermented Picung Seed

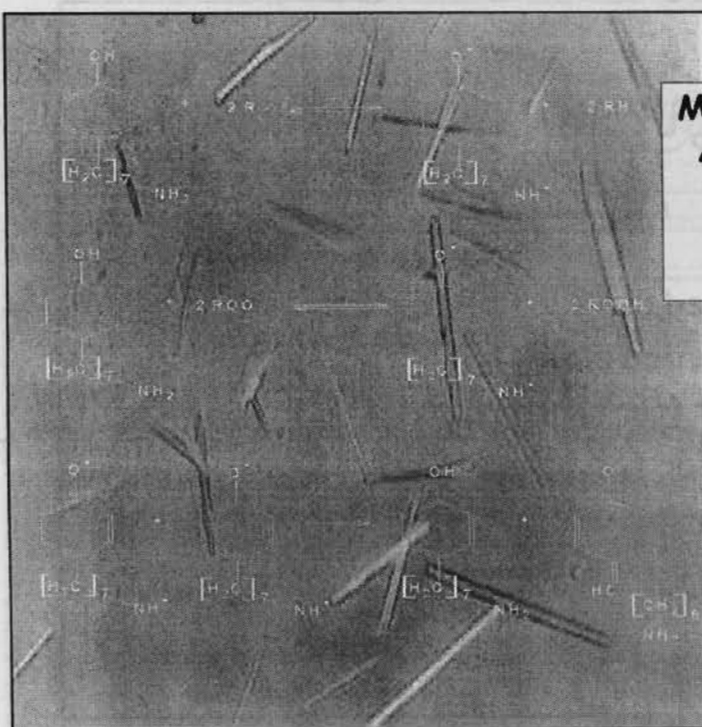
- 1-p-hydroxyphenyl-7-aminoheptane
- Methanol Extract
- Conc. 0.01% → higher than BHT
- Needle shape
- White crystal, mp 127°C

Picung Tree



Fresh Picung

Mechanism of Antioxidant Activity of Fermented Picung



Background photo:
Antioxidant
Crystal of
Fermented Picung

Petai

Parkia Speciosa L.

Petai is rich in phosphorus, vitamin A

Claims:

- Gives an instant, sustain and substantial boost of energy, two servings of p provide enough energy for a stren 90-minute workout.
- Helps to overcome or prevent a substa number of illnesses and conditions
- Eating petai regularly can cut the risk death by strokes by as much as 40%
- Mosquito bites: the inside of petai skin reduces swelling and irritation

- Petai crude extract has renoprotec nephrotoxicity on rats
- Petai seeds and pods showed high phenolic contents

- Petai helps to keep blood sugar levels up to
- High in B vitamins that help calm the nervo
- Petai contain the natural mood enhancer, tr known to make relax, improve mood and fe Affective Disorder (SAD).
- The B6 and B12 vitamin, potassium and ma nicotine withdrawal.
- Potassium helps normalize the heartbeat, s regulates body's water balance, good for st
- Petai is also high in iron which can stimulat good for anemia-cure.
- High potassium yet low in salt, making it ca
- Petai is also high in iron which can stimulat
- Fiber in petai can restore normal bowel acti constipation without resorting to laxatives.

Petai

- Petai crude extract has renoprotective affect to ciplastin nephrotoxicity on rats
- Petai seeds and pods showed high antioxidant activity and phenolic contents

- Petai helps to keep blood sugar levels up to avoid 'morning sickness'.
- High in B vitamins that help calm the nervous system.
- Petai contain the natural mood enhancer, tryptophan (converts into serotonin, known to make relax, improve mood and feel happy) effective for Seasonal Affective Disorder (SAD).
- The B6 and B12 vitamin, potassium and magnesium, diminish the effects of nicotine withdrawal.
- Potassium helps normalize the heartbeat, sends oxygen to the brain and regulates body's water balance, good for stress release.
- Petai is also high in iron which can stimulate the production of hemoglobin good for anemia-cure.
- High potassium yet low in salt, making it can beat blood pressure.
- Petai is also high in iron which can stimulate the production of hemoglobin.
- Fiber in petai can restore normal bowel action, help to overcome the constipation without resorting to laxatives.

Petai

Parkia Speciosa Hassk

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Picung Tree

Seed

heptane

BHT

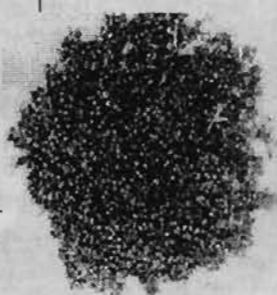
Mechanism of Antioxidant Activity of Fermented Picung

Background photo:
Antioxidant Crystal of
Fermented Picung

Andaliman

Zanthoxylum acanthopodium DC

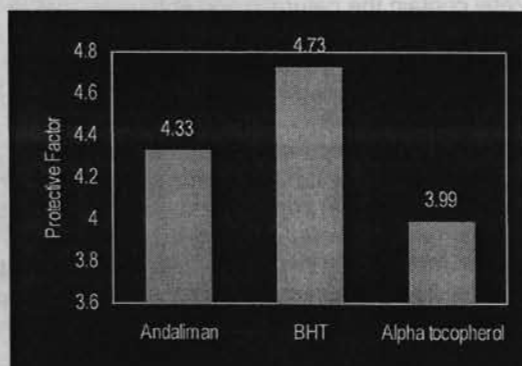
- Wild plant at Northern Sumatra. Fruit is utilized by Mandailing and Angkola ethnic groups especially in "naniura" (raw meat dishes)
- Trigeminally active compound
- Potent odorant
 - citronellal
 - limonene
- 2E, 6Z, 8E, 10E-N-(2'-methylpropyl)-dodecatetraamine
- Antioxidant, anti-microbes and immunoregulator activity



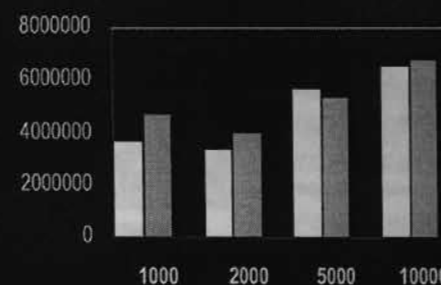
Irene Triyanti Hadiprodjo, and C. Hanny Wijaya (2000)

Antioxidant Activity of Andaliman

- highest at aqueous system
- slightly good on emulsion and oily system
- relatively resistant on high temperature
- polar fraction



Ginger



■ Fresh Ginger 3686000 3424333 5688000 6571333
 ■ Shooted ginger 4783000 4042000 5354333 6805000
 ■ Control

Linayanti, D. Fransiska R.Z., Yadi H., and C. Han

Hot topic

Buah M

Pandanus cono

- Papua native consuming this fruit in their staple food (mixing of tubers and vegetables)—baked and squeezed to obtain the oil and paste
- Types of fruit : *Ogi* or *barugum*, *maller*, *wonna*, *bullur* or *wanggeni* (yellow, highest in active compounds content), *kanenen*, *kwambir*, *muni* etc

Claims: tonic, HIV/AIDS prevention, immune enhancement, anti-cancer, reducing high blood pressure, stroke-prevention, anti-osteoporosis, diabetes mellitus healing, eyes health, improving brain-power

Hot topic

Buah Merah

Pandanus conoides

Papua native consuming this fruit in their staple food (mixing of tubers and vegetables)—baked and squeezed to obtain the oil and paste

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Photo from: H.Machmud Yuliyana and Bernard T. Waluya Wiyana

Ginger

Linayanti, D. Fransiska R.Z., Yadi H., and C. Hanny Wijaya (1995)

■ Fresh Ginger 3686000 3424333 5688000 6571333 4420000

■ Shooted ginger 4783000 4042000 5354333 6805000 6576667

■ Control 4223000

0 1000 2000 5000 10000 20000 4000000 6000000 8000000

FCS 10%

Zingiber officinale

Andaliman

Andaliman 4.73

BHT 4.33

Alpha tocopherol 3.99

high temperature and oily system

Andaliman

acanthopodium DC

Sumatra, Fruit in "naniura" compound

methylopropyl)-obes and ity

Energi	395 kalori
Protein	3.300 mg
Lemak	28.100 mg
Serat	20.800 mg
Kalsium	54.000 mg
Fosfor	30 mg
Besi	2,44 mg
Vitamin B1	0,90 mg
Vitamin C	25,70 mg
Niasin	1,8 mg
Air	34,90 ml

Energi	395 kalori
Protein	3.300 mg
Lemak	28.100 mg
Serat	20.800 mg
Kalsium	54.000 mg
Fosfor	30 mg
Besi	2,44 mg
Vitamin B1	0,90 mg
Vitamin C	25,70 mg
Niasin	1,8 mg
Air	34,90 ml

Source: Bonus TruBox, 422, XXXVI, Janus 2009

Total karotenoid	12.000 ppm
Total tokoferol	11.000 ppm
Betakaroten	700 ppm
Alfa tokoferol	500 ppm
Asam oleat	58 %
Asam linoleat	8,8 %
Asam linolenat	7,8 %
Dekanolat	2,0 %

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Sumber: Bonus *Thubus* 422, XXXVI, Januari 2004.

Non-nutritive active compounds?

Source: Khasiat dan manfaat buah merah. Yahya & Wirvanta . 2005

Tempe has been known and produced by Indonesians for centuries, found in many parts of Indonesia, particularly important in Java and Bali.

Advantage
World War II
Japanese had
major
malnourished
dysentery
tolerate the heat
while the unfed
un-digestible (S
Wood



Oncom

Dage

- **Tempe benguk** : fermented velvet bean (*M. Rhizopus oryzae*, *R. oligosporus*, *R. arrhizus*) with a violet tint, typical smell, slightly sweet
- **Tempe gembus** : fermented solid residue of *Rhizopus spp.*, *R. Oryzae*, *R. oligosporus*; white, slightly beany smell, bland taste
- **Tempe kecipir**: fermented Winged bean (*C. seeds*; *R. oryzae*, *R. arrhizus*, *R. oligosporus*) solid, yellowish to brownish white, sharp beany, bland taste
- **Tempe koro pedang** : fermented Jack bean (*arrhizus*, *R. achlamydosporus*; solid, light yellow, beany smell, bland taste
- **Tempe lamtoro** : fermented wild tamarind (*leucocephala*); "ragi tempe" (traditional term)
- **Tempe kedele** : fermented soybean—soybean young papaya fruit, cassava, coconuts preferred (*oligosporus*, *R. oryzae*; solid, white to grey)

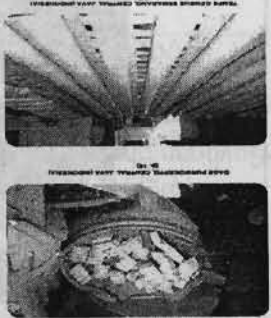
Sorts of tempe

- **Tempe benguk** : fermented velvet bean (*Mucuna pruriens*) seeds; *Rhizopus oryzae*, *R. oligosporus*, *R. arrhizus*; solid, greyish white with a violet tint, typical smell, slightly sweet sour
- **Tempe gembus** : fermented solid residue of soybean curd; *Rhizopus spp.*, *R. Oryzae*, *R. oligosporus*; solid, soft, greyish white, slightly beany smell, bland taste
- **Tempe kecipir**: fermented winged bean (*Canavalia ensiformis*) seeds; *R. oryzae*, *R. arrhizus*, *R. oligosporus*, *R. achlamydosporus*; solid, yellowish to brownish white, sharp beany smell
- **Tempe koro pedang** : fermented Jack bean seeds; *R. oryzae*, *R. arrhizus*, *R. achlamydosporus*; solid, light yellowish white, typical beany smell, bland taste
- **Tempe lamtoto** : fermented wild tamarind bean (*Leucaena leucocephala*); "ragi tempe" (traditional tempe starter)
- **Tempe kedele** : fermented soybean---soybean, tapioca flour, maize grits, young papaya fruit, cassava, coconuts press cake; *Rhizopus sp.*, *R. oligosporus*, *R. oryzae*; solid, white to greyish white, pleasant aroma, bland taste

Tempe (tempeh)

Tempe has been known and produced by Indonesians for centuries, found in many parts of Indonesia, particularly important in Java and Bali.

Advantages of tempe arose during World War II when many prisoners of Japanese had to rely upon tempe as a major protein source---even malnourished prisoners suffering from dysentery were able to digest and tolerate the beans in the form of tempe while the unfermented soybeans were un-digestible (Stahel, 1946; Smith and Woodruff, 1951; Grant, 1952).



Buah Merah

Non-injunctive active compounds?



3.300 mg	3.300 mg
20.100 mg	20.100 mg
20.800 mg	20.800 mg
54.000 mg	54.000 mg
20 mg	20 mg
0.80 mg	0.80 mg
25.700 mg	25.700 mg
1.8 mg	1.8 mg
34.00 mg	34.00 mg
1.8 mg	1.8 mg
2.0 %	2.0 %
8.8 %	8.8 %
7.0 %	7.0 %
500 ppm	500 ppm
500 ppm	500 ppm
700 ppm	700 ppm
11.000 ppm	11.000 ppm
12.000 ppm	12.000 ppm
12.000 ppm	12.000 ppm

Source: Khasiat dan manfaat buah merah, Yaya & Wiyatna, 2005

Tempe kedele

Known as "tempe" as "tempeh"

Tempe is a white, mold covered cake produced by fungal fermentation of dehulled, hydrated (soaked), and partially cooked soybean cotyledons (figure 1). Packets of traditional tempe wrapped in witted banana leaves as shown as they appear on the market in Indonesia (figure 2)

Fig 1.

Fig.2

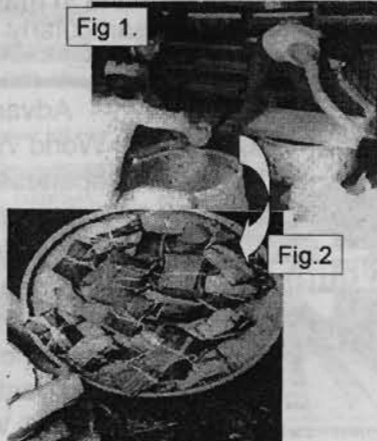
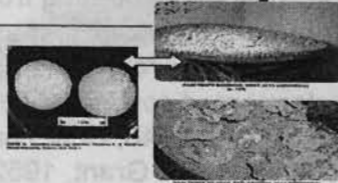


FIGURE 1. Tempe cakes prepared in the laboratory and marketed in the market. (Courtesy of R. S. Sudarmadji, Gadjah Mada University, Yogyakarta)

Tempe kedele

The best quality tempe is made solely from soybean, but lower cost, lower quality tempe may contain young papauw fruits grits, cassava grits (tapioca waste), soybean seedcoats, soy milk or tofu residue (okara)

Freshly fermented tempe has a clean, mushroom-like aroma. Following deep frying, the flavor becomes nutlike and peppery due, in part, to the presence of free fatty acids. In soups, tempe reflects the flavors of the other ingredients



FIGURE 2. Tempe cakes prepared in the laboratory and marketed in the market. (Courtesy of R. S. Sudarmadji, Gadjah Mada University, Yogyakarta)

Nutrient

- All commercial tempes so far examined have been made with pure mold under aerobic conditions. Tempe made with pure mold under aerobic conditions has B12 activity. The bacterium responsible for B12 activity is *Klebsiella pneumoniae* (Curties et al, 1977).
- Fermented soybean had a greater apparent protein utilization.
- Tempe has increasing riboflavin, pyridoxin, and lower thiamine.
- Murata (1977) attributed the improved nutritive value to the stabilization of the oil by antioxidants produced during fermentation and synthesis of B vitamins.
- Soybean phytic acid, which may exacerbate iron deficiency in man by hindering absorption in the gut, is reduced during fermentation. The reduction is attributed to *Oligosporus* (Sudarmadji and Markaki, 1980).

Function

- Medium-chain peptides (5-10 amino acids) from soybean hydrolysate showed hypotensive activity in rats. The activity of *Angiotensin I Converting Enzyme* (ACE) was inhibited with mixed-wild cultures (laru pasaka) compared to the pure-innoculum.
- Transformation of Isoflavon during tempe fermentation producing daidzein and genistein, which have antioxidant and anti-angiogenic activity.
- 6,7-4-trihydroxy isoflavon from tempe is a potent antioxidant compound with anti-hemolysis role. It has been reported as an active component in reducing cholesterol level as well as inhibiting (LDL Lipoprotein) formation.
- Tempe with its beta-sitosterol content has a hypocholesterolemic potency.
- Wang et al (1969) reported that *R. Oligosporus* is antibiotic active against a number of bacteria, including *Staphylococcus aureus* and *Bacillus subtilis*.

Tempe kedele

- Medium-chain peptides (5-10 amino acids) of tempe hydrolysaate showed hypotensive ability by inhibiting the activity of *Angiotensin I Converting Enzyme* (ACE). Tempe fermented with mixed-wild cultures (laru pasar) has higher activity comparing to the pure-innoculum.
- Transformation of Isoflavon during tempe fermentation producing daidzein and genistein contributed to the anti-oxidation and anti-angiogenic activities.
- 6,7-4-trihydroxy isoflavon from tempe has been reported as a compound with anti-hemolysis role . This compound has also been reported as an active compound which able to reduce the cholesterol level as well as inhibiting the LDL (Low Density Lipoprotein) formation.
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made solely from soybean,
y tempe may contain young
a gits (tapioca waste),
ilk or tofu residue (okara)



...the other
acids. In
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ap trying,

Tempe kedele

- All commercial tempes so far examined have contained B12 activity. Tempe made with pure mold under aseptic conditions contain no B12 activity. The bacterium responsible has been identified as *Klebsiella pneumoniae* (Curties et al, 1977).
- Fermented soybean had a greater apparent biological value and net protein utilization.
- Tempe has increasing riboflavin, pyridoxine, niacin, vitamin B 12 but lower thiamine.
- Murata (1977) attributed the improved nutritive value of tempe to stabilization of the oil by antioxidants produced during the fermentation and synthesis of B vitamins.
- Soybean phytic acid, which may exacerbate mineral deficiencies in man by hindering absorption in the gut, is reduced by 22% during fermentation. The reduction is attributed to phytase activity in *R. oligosporus* (Sudarmadji and Markakis, 1977).



de "as "tempoh"

Oncom

Oncom is a cakelike product prepared by fermenting a soaked, cooked substrate consisting of peanut press-cake as the major ingredient, along with solid waste of tapioca and solid waste of tofu, using culture of microorganism with *Rhizopus* or *Neurospora* species predominating. Oncom is produced mainly in West Java. It is an important ingredient of the daily menu of Sundanese, particularly those of the lower class of the community.

Oncom hitam: black fermented peanut press cake; solid greyish black, pleasant smell, bland taste; *Mucor spp*, *Rhizopus spp*

Oncom merah : orange fermented peanut press cake; solid, orange to reddish orange, pleasant smell, bland taste; *Neurospora spp*

Oncom merah Bogor: orange fermented solid residue of soybean curd; solid, orange to reddish, pleasant smell, bland taste; *Neurospora spp*

Oncom merah---Total protein content remains constant during fermentation: total fat content decreases slightly. Calcium content increases significantly fro, 204 to 226 mg/ 100 g substrate and carotene increased from 10.3 to 22.0 I.U./ 100 g substrate (Ganjar and Slamet, 1972)







There are many potential tropical food ingredients with significant physiological active compounds still undercovered

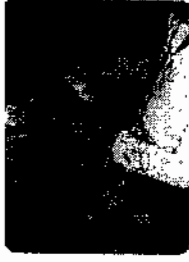
- animal products
- sea products
- local culinary

Dadih

Fermented Buffalo Milk.
Semi-solid, white, acid taste

Fresh buffalo milk is put into cut fresh bamboo stems, the tops of which are then covered tightly with banana leaves. They are kept at room temperature for 24-48 hr

Rich in lactic acid microbes (BAL) which produced metabolite as bacteriocin. The exopolysaccharides, the cell components, have exhibited anti-mutagen and anti-cancer capability.





TERIMA KASIH

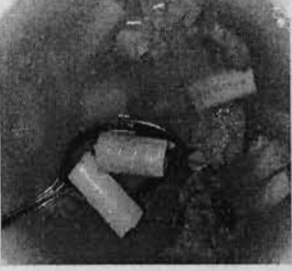


Future challenges

There are many potential tropical food ingredients with significant physiological active compounds still under cover

Earlier handling will avoid the loosing of verbally information

-animal products
-sea products
-local culinary




Dadih

...lactic acid microbes which produced polite as bacteriocin. The polysaccharides, the cell nutrients, have exhibited mutagen and anti-cancer ability.

...acid taste

...also Milk.



Oncom

...by fermenting a g of peanut press-waste of solid waste of g culture of *Neurospora* species mainly in West Java. lower class of the

...solid greyish fermented peanut press cake; *Rhizopus* spp. and taste; *Mucor* spp. *Rhizopus* spp. fermented peanut press cake; solid, orange ant smell, bland taste; *Neurospora* spp. orange fermented solid residue of soybean; blandish, pleasant smell, bland taste; *Neurospora* spp. remains constant during 04 to 226 mg/100 g Calcium 10.3 to 22.0 I.U./100 g