https://jurnal.stkippersada.ac.id/jurnal/index.php/JBIO/index

Gmail YouTube Maps LKD - 0326097202...

JPBIO (Jurnal Pendidikan Biologi)

http://jurnal.stkippersada.ac.id/jurnal/index.php/JBIO/index jurnaljpbio@gmail.com 0812 - 3407 - 2682

HOME ABOUT LOGIN REGISTER SEARCH CURRENT ARCHIVES ANNOUNCEMENTS EDITORIAL TEAM REVIEWERS

Home > **Vol 7, No 2 (2022)**

JPBIO (Jurnal Pendidikan Biologi)

Journal title	**JPBIO (Jurnal Pendidikan Biologi)**
Initials	**JBIO**
Online Since	**2016**
Grade	**Accredited Sinta 3 Journal; decree No. 85/M/KPT/2020**
Frequency	**2 Issues per Year (April and November)**
Online ISSN	**2540-802X**
Editor-in-chief	**Yakobus Bustami (Scopus ID: 57194697472)**
Managing Editor	**Anyan (Sinta ID: 5999449)**
Publisher	**Biology Education Study Program of STKIP Persada Khatulistiwa Sintang**

DOI	**Prefix 10.31932** by Crossref
Indexed	**Sinta| Google Schoolar| Index Copernicus|Garuda| BASE|Dimensions**

JPBIO (Jurnal Pendidikan Biologi) is a scientific journal published by biology education study program of STKIP Persada Khatulistiwa Sintang with e-ISSN 2540-802X receiving manuscripts contribution that have never been published or sent to other journals related biology and biology education with the topics: (1) teaching and learning; (2) case study, lesson study, classroom action research, experiments, and others; (3) education curriculum; (4) learning evaluation; (5) learning media; (6) development of teaching materials; (7) school management or laboratory management; (8) problems / trends in the field of education; and (9) biological sciences. JPBIO (Jurnal Pendidikan Biologi) was published twice a year, on April and November and at least 5 articles per issue. This journal written in English. All submitted manuscripts will be initially reviewed by editors and are then evaluated by two reviewers through the double-blind review process. National accredited **Sinta 3** by the Ministry of Research-Technology and Higher Education Republic of Indonesia with decree Number **85/M/KPT/2020**.

Editorial Team
Reviewers
Peer Review Process
Focus & Scope
Indexing and Abstracting
Author Guidelines
Publication Ethics
Online Submission
Copyright Transfer Form
Plagiarism Check
Journal Licence & Copyright

Visitor Statistics

USER

Username marina2609
Password ••••••••
Remember me
Login

SUPPORTED BY:

RELAWAN JURNAL INDONESIA

https://jurnal.stkippersada.ac.id/jurnal/index.php/JBIO/about/editorialTeam

Gmail YouTube Maps LKD - 0326097202...

JPBIO (Jurnal Pendidikan Biologi)
http://jurnal.stkippersada.ac.id/jurnal/index.php/JBIO/index jurnaljpbio@gmail.com 0812 - 3407 - 2682
HOME ABOUT LOGIN REGISTER SEARCH CURRENT ARCHIVES ANNOUNCEMENTS EDITORIAL TEAM REVIEWERS

Home > About the Journal > **Editorial Team**

Editorial Team

Editor-in-Chief

Dr. Yakobus Bustami, M.Pd., (Scopus ID: 57194697472) STKIP Persada Khatulistiwa Sintang, Indonesia

Managing Editor

Anyan, M.Kom., (Sinta ID: 5999449) STKIP Persada Khatulistiwa Sintang, Indonesia

Assistant Editors

Didin Syafruddin, M.Si., (Scopus ID: 57207960619) STKIP Persada Khatulistiwa Sintang, Indonesia
Yuniarti Essi Utami, M.Pd., (Scopus ID: 57210448379) STKIP Persada Khatulistiwa Sintang, Indonesia

Editorial Team
Reviewers
Peer Review Process
Focus & Scope
Indexing and Abstracting
Author Guidelines
Publication Ethics
Online Submission
Copyright Transfer Form
Plagiarism Check

Editorial Board

Prof. Dr. Aloysius Duran Corebima, M.Pd, (Scopus ID: 56857563800) Universitas Kanjuruhan Malang, Indonesia
Dr. Agus Prasetyo Utomo, M.Pd., (Scopus ID: 57202605051) Universitas Muhammadiyah Jember, Indonesia
Asep Mulyani, M.Pd, (Sinta ID: 6039868) IAIN Syekh Nurjati Cirebon, Indonesia
Dr. Anggi Tias Pratama, M.Pd., (Scopus ID: 57191420208) Universitas Negeri Yogyakarta, Indonesia
Dr. Setiyo Prajoko, M.Pd., (Sinta ID: 6110903) Universitas Tidar, Indonesia
Suratmi M.Pd, (Sinta ID: 6083519) Universitas Sriwijaya, Indonesia
Dr. Sintje Liline, M.Pd., (Scopus ID: 57190258674) Universitas Pattimura, Indonesia
Leliavia Leliavia, M.Pd., (Scopus ID: 57210443205) STKIP Persada Khatulistiwa Sintang, Indonesia
Benediktus Ege, M.Pd., (Scopus ID: 57208839834) STKIP Persada Khatulistiwa, Indonesia
Hendrikus Julung, M.Pd., (Scopus ID: 57208835729) STKIP Persada Khatulistiwa Sintang, Indonesia
Rachmi Afriani, M.Si., (Scopus ID: 57207963749) Universitas Kapuas Sintang, Indonesia
Hendra Setiawan, M.Si., (Scopus ID: 56581861600) Universitas Kapuas Sintang, Indonesia
F Rahayu Esti Wahyuni, M.Pd., (Scopus ID: 57210750859) STKIP Persada Khatulistiwa Sintang, Indonesia

This work is licensed under a Creative Commons Attribution-ShareAlike 4.0 International License.

Journal Licence & Copyright
Visitor Statistics

USER
Username marina2609
Password ••••••••
Remember me
Login

SUPPORTED BY:
RELAWAN JURNAL INDONESIA

JPBIO (Jurnal Pendidikan Biologi)
http://jurnal.stkippersada.ac.id/jurnal/index.php/JBIO/index jurnaljpbio@gmail.com 0812-3407-2682

Vol 6, No 1 (2021)

April 2021

DOI: https://doi.org/10.31932/jpbio.v6i1

Available online since 30th April, 2021

Table of Contents

Front Matter PDF

Articles

Practicing creative thinking skills: Inquiry base activity sheets development in protists learning material PDF 1-11
DOI : 10.31932/jpbio.v6i1.847
Rossanita Truelovin Hadi Putri, Raharjo Raharjo, Fida Racmadiarti

The critical thinking skills on animal tissue learning: Inquiry based student activity sheets development PDF 12-26
DOI : 10.31932/jpbio.v6i1.845
Flaviana Claudia Andayani, Raharjo Raharjo, Widowati Budijastuti

The feasibility of herbarium based local wisdom on plant structure and development subject PDF 27-33
DOI : 10.31932/jpbio.v6i1.839
Mucharommah Sartika Ami, Anggi Indah Yuliana

The ethnobotony and local knowledge of sayur asem by the vegetable traders PDF 34-45
DOI : 10.31932/jpbio.v6i1.838
Marina Silalahi, Riska Septia Wahyuningtyas

Diversity of macroalgae diversity in the tidal waters PDF 46-54
DOI : 10.31932/jpbio.v6i1.732
Nurfauzi Ahmad, Diana Hernawati, Diki Muhamad Chaidir

Problem based learning model using vee diagrams on students' scientific literacy of environmental pollution material PDF 55-63
DOI : 10.31932/jpbio.v6i1.834

The utilization of sugarcane bagasse, cassava peels and corn husks in handmade paper production PDF 64-75
DOI : 10.31932/jpbio.v6i1.800
Aminah Asngad, Santhyami Santhyami, Ardiyana Rahma Pertiwi, Carissa Rahmitasari

The effectiveness of basil extract on the mildew saprolegnia within in vitro PDF 76-83
DOI : 10.31932/jpbio.v6i1.853
Shara Sasmita, Indah Anggraini Yusanti, Sofian Sofian

Organic waste processing and its application to potato plants through hydroponic techniques PDF 84-95
DOI : 10.31932/jpbio.v6i1.1040
Irmawanty Irmawanty, Dian Safitri, Wira Yustika Rukman, Haerul Syam

Take and give learning model during covid on students' learning outcomes in high school on ecosystem materials? PDF 96-107
DOI : 10.31932/jpbio.v6i1.982
Apriliana Dwi Putri, Adeng Slamet, Meilinda Meilinda

The measurement of indole acetic acid from rhizosphere bacteria PDF 108-115
DOI : 10.31932/jpbio.v6i1.872
Sukmawati Sukmawati, Nurul Kusuma Dewi, Melda Yunita

Plagiarism Check
Journal Licence & Copyright
Visitor Statistics

USER
Username marina2609
Password ••••••••
Remember me
Login

SUPPORTED BY:
RELAWAN JURNAL INDONESIA

We are Crossref Sponsoring Organization

Show desktop

COLLABORATION WITH
KPBI

FLAG COUNTER
Visitors
40,226 69
1,399 48
345 48
202 40
114 37
FLAG Counter

STAT COUNTER
00190802

Bioecological aspect of lamasi (Barbonymus gonionotus) in maililrever labuhanbatu district, indonesia PDF 116-124
DOI : 10.31932/jpbio.v6i1.1070
Nur Asia Nasution, Rusdi Machrizal

Subject-specific pedagogy: Development of biology teaching materials based on van hiele thinking theory PDF 125-132
DOI : 10.31932/jpbio.v6i1.933
Akbar Handoko, Santi Sartika, Bambang Sri Anggoro

This work is licensed under a Creative Commons Attribution-ShareAlike 4.0 International License.

PLAGIARISM CHECK
turnitin
Crossref Similarity Check
Powered by iThenticate
grammarly
REFERENCE TOOLS
MENDELEY

JPBIO (Jurnal Pendidikan Biologi)
Vol. 6, No. 1, April 2021, 34 – 45 //e-ISSN 2540-802X
http://jurnal.stkippersada.ac.id/jurnal/index.php/JBIO/index

The ethnobotony and local knowledge of sayur asem by the vegetable traders

Marina Silalahi*, Riska Septia Wahyuningtyas

Biology Education Study Program, Universitas Kristen Indonesia, Indonesia

*Corresponding author: marina_biouki@yahoo.com

Article Info

Article History:
Received 18 September 2020
Revised 19 October 2020
Accepted 03 December 2020
Published 30 April 2021

Keywords:
Antioxidant,
Antimicrobial
Gnetum gnemom
Tamarindus indica

ABSTRACT

The *sayur asem* is one of the traditional Indonesian dishes, especially the Betawi ethnic group. This study aims to document the local knowledge of vegetable traders in the Kranggan Mas market, the diversity of plants used as an ingredient in *sayur asem*. The method used in this research was a survey. Data were analyzed qualitatively and descriptively. The *sayur asem* is a soup-like vegetable that has a sour taste with the main ingredients of *melinjo* (*Gnetum gnemon*) leaves and seeds and tamarind fruit (*Tamarindus indica*). The total of 13 species belonging 12 genera and 10 families used to process of making *sayur asem*. The part of used to process of making *sayur asem* is dominated by fruits (8 species), followed leaves and tubers (each 2 species). The melinjo (*G. gnemon*) is the main ingredient in the making of *sayur asem*, while *Alphinia galanga, Syzygium polianthum* and *Tamarindus indica* are the main spices with a larger volume. The main ingredients and seasonings used mostly have antioxidant and antimicrobial activity and are therefore very good at supporting digestive tract health and providing healthful effects.

Copyright © 2021, Silalahi & Wahyuningtyas
This is an open access article under the CC–BY-SA license

Citation: Silalahi, M., & Wahyuningtyas. R.S. (2021). The ethnobotony and local knowledge of sayur asem by the vegetable traders. *JPBIO (Jurnal Pendidikan Biologi), 6*(1), 34-45. DOI: https://doi.org/10.31932/jpbio.v6i1.838

INTRODUCTION

The local people who live in Indonesia are rich in local wisdom, including traditional food. The study of local wisdom including traditional foodstuffs is one way to preserve the culture and also biodiversity (Purba, Silalahi & Nisyawati, 2018). Various local knowledge on foodstuffs tends to be degraded due to various factors such as information technology and modern food (Sujarwo, Arinasa, Salomone, Caneva & Fattorini, 2014). Those results in relatively lower local knowledge of the younger generation compared to the older ones (Silalahi, Nisyawati, Walujo & Supriatna, 2015).

Empirically, every region in Indonesia has a variety of traditional foods and varies from one region to another or from one ethnicity to another. For example, the Minangkabau ethnic group is

famous for its traditional cuisine (Nurmufida, Wangrimen, Reinalta & Leonardi, 2017), *ketupat* (Rianti, Novenia, Christopher, Lestari & Parassih, 2018), *lemang* (Wahyudi, Octavia, Hadipraja, Isnaeniah, & Viriani, 2017) by ethnic Malay (Rianti et al., 2018), and *terites* by Batak Karo ethnic (Purba et al., 2018), while the local people of Palembang have *mpek-mpek*. Those traditional food developed in every region and is related to the biodiversity found in the surrounding environment and due to cultural acculturation.

The Betawi ethnic is an indigenous ethnic Indonesian who mostly lives in Jakarta and surrounding areas. Biodiversity in the surrounding environment, especially plants, is used by the Betawi ethnic group as raw material for various traditional dishes, one of which is *sayur asem*. The sayur asem is a vegetable with a sour taste (*asem*), which is made from various types of the plant is processed by boiling, especially from melinjo (*Gnetum gnemon*) and tamarind (*Tamarindus indica*) (Dewiyanti & Suryani, 2017). Empirically, sometimes *sayur asem* is considered by groups of people (non-Betawi ethnics) as having less nutritional value, even though the plant ingredients or components used in the processing of these dishes have good nutritional value and even have a healthy effect. The seeds of *Gnetum gnemom* which is the main component of *sayur asem* have been reported to have antioxidant activity (Siswoyo, Mardiana, Lee & Hoshokawa, 2011) and antihypertension (Matra, Puspitasari & Siswoyo, 2018; Puspitaningrum, Efendi & Siswoyo, 2014).

The raw material for *sayur asem* is easily available in the surrounding environment and is currently being traded in many traditional markets in Indonesia (Silalahi, 2020). When traced, research on *sayur asem* as a food ingredient has been widely carried out but the ethnobotany study is still limited. Documentation of local knowledge is one of the steps for the conservation of biodiversity and culture (Hariyadi & Ticktin, 2012) include the ingredient of traditional food. Pawera, Khomsan, Zuhud, Hunter, Ickowitz & Polesny (2020) stated that the knowledge of the younger generation about local foodstuffs has decreased due to the entry of information technology, reduced supply so that one needs to be preserved through trading in the market. The Kranggan Mas market is a market in the Jatisampurna Sub-district, in which most vegetable traders trade the *sayur asem* ingredients. This study aims to reveal the local knowledge of vegetable traders in the Kranggan Mas market about *sayur asem* and explain their development prospects.

RESEARCH METHODS

Research Design

This research was qualitative research with a survey method. Qualitative research is widely used to provide in-depth information including the use of plants so that the information obtained is more comprehensive and in-depth. This research was conducted at the Kranggan Mas market, West Java (Figure 1). Administratively, the Kranggan Mas market is located in Jatisampurna Village, Jatisampurna Sub-District, Bekasi District, West Java. The research was conducted with an ethnobotany approach with surveys, interviews, and observations with modifications Silalahi, Nisyawati, Walujo, Supriatna & Mangunwardoyo, (2015). The survey was conducted in March-June 2020.

Respondents

The population in this study were all vegetable traders (11 respondents) in the Kranggan Mas market, Jatisampurna Sub-District, Bekasi District, West Java. Respondents in the study were *sayur asem* who traded its ingredients.

Instruments

The instrument in this study was an interview guide to determine the materials used in the process of making *sayur asem*. Interviews were conducted in semi-structured and in-depth interviews so that it was possible to obtain comprehensive information. Some of the questions that

are asked are the local name, the part used, how to use it, the function of the plants used in the making of *sayur asem*..

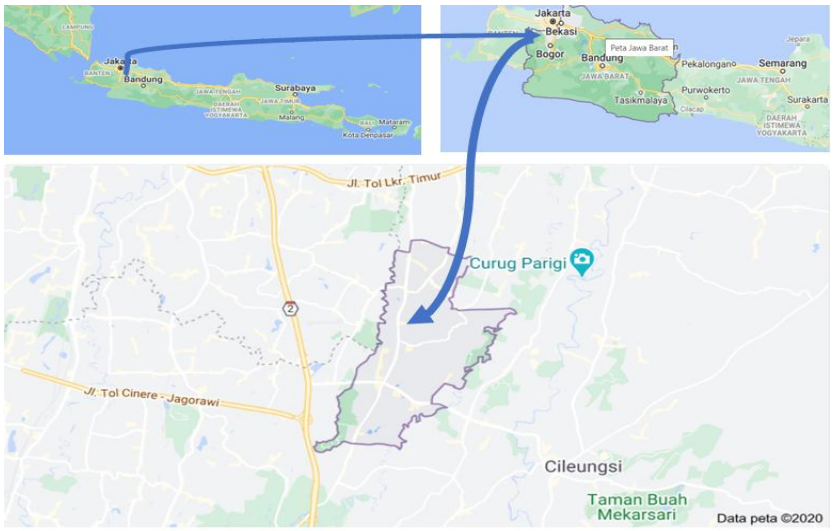

Figure 1. Map of Research Locations in the Kranggan Mas Market, Jatisampurna Sub-District, Bekasi District, West Java.

Procedures

All vegetable traders who sold *sayur asem* were interviewed. To facilitate communication, most of the ingredients used for *sayur asem* ingredients were purchased by researchers. Some of the things that were asked of the respondents were the main ingredients (local name, part used), spices (local name), and processing method. All data obtained were documented by photographing the parts used and then identified to find out the scientific name.

Data Analysis

The data obtained in this study were analyzed qualitatively. Stages of data analysis are carried out by processing the data into an excel table, then creating a bar graph to facilitate its presentation. The data is then described in more detail using primary and secondary data. The qualitative analysis includes grouping plants based on their benefits, families, and parts used. To complement the data on secondary metabolites and plant bioactivity, secondary data was carried out in the form of journals or pre-existing research results.

RESULTS

The *sayur asem* is a type of vegetable soup (similar to the soup) with a sour taste (*asem*) made from various types of plants. A total of 13 species belonging 10 families used to make *sayur asem*, consisting of 7 species as a vegetable ingredient and 6 species as spices (Table 1 and Figure 2). Figure 3 shows the diversity of parts used in the manufacture of tamarind vegetables, dominated by 8 species of fruit, followed by leaves and tubers (each 2 species).

The process of making or cooking *sayur asem* is very simple, through boiling all the components, but the boiling time is adjusted to the structure of the ingredients used along with all the spices. Some of the spices are ground like *C. frutescent, A. cepa* and *A. sativum* first milled until smooth. The ingredient of *sayur asem* (Table 1), which has a hard structure like seeds of *G. gnemon* and fruits of *A. heterophyllus* boiled longer. After the component is soft then other vegetable ingredients are added so that they are cooked.

Table 1. The planst that is used as an ingredient and spice for tamarind vegetables by traders in Kranggan Mas Market, West Java.

Families	Scientific name	Local name	Part of used	Uses
Caricaceae	*Carica papaya*	*Pepaya*	Young fruits	Vegetable
Cucurbitaceae	*Sechium edule*	*Labu siam*	Young fruits	Vegetable
Fabaceae	*Arachis hypogea*	*Kacang tanah*	Seeds	Vegetable
	Tamarindus indica	*Asam jawa*	Fruits	Spices
	Vigna sinensis	*Kacang panjang*	Fruits	Vegetable
Gnetaceae	*Gnetum gnemom*	*Melinjo*	Young bud and fruits	Main ingredient and vegetable
Liliaceae	*Allium cepa*	*Bawang merah*	Bulbs	Spices
	Allium sativum	*Bawang putih*	Bulbs	Spices
Moraceae	*Artocarpus heterophyllus*	*Nangka*	Young fruits	Main ingredient vegetable
Myrtaceae	*Syzygium polianthum*	*Salam*	Leaves	Spices
Poaceae	*Zea mays*	*Jagung*	Leaves	Vegetable
Solanaceae	*Capsicum frutescens*	*Cabe*	Fruits	Spices
Zingiberaceae	*Alpinia galanga*	*Lengkuas*	Rhizomes	Spices

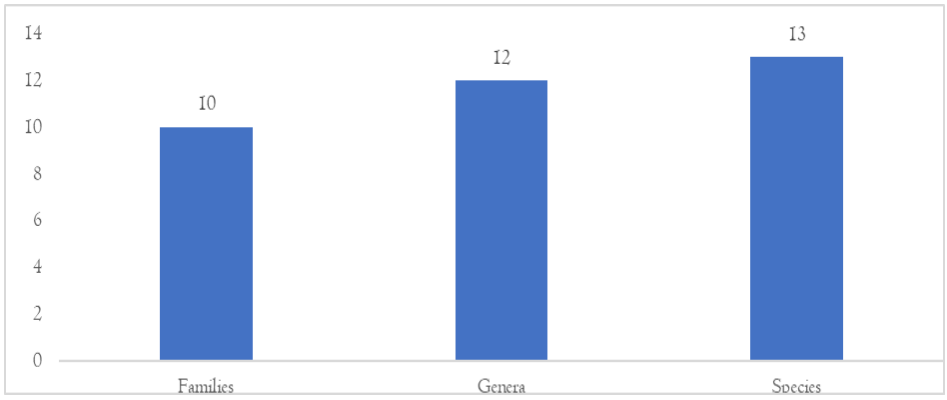

Figure 2. Diversity of species, genus, and species used in the process of sayur asem.

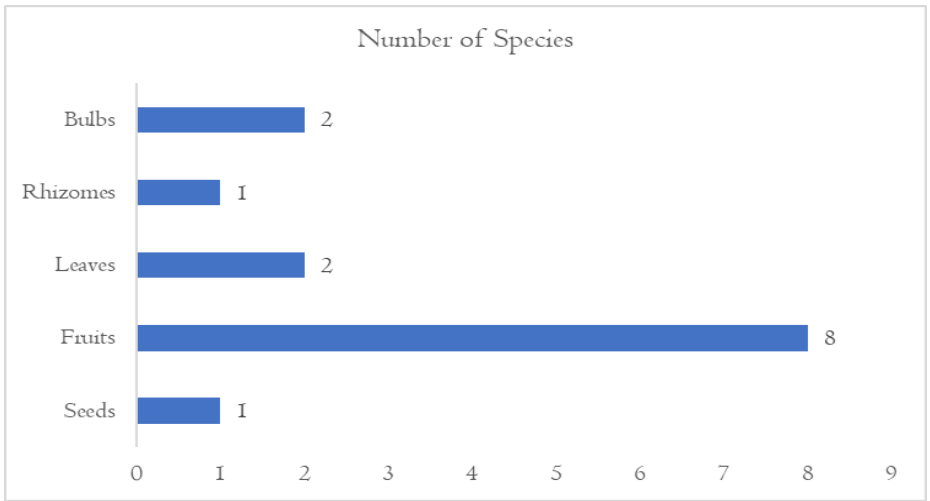

Figure 3. Diversity of parts used and species have been used to processed *sayur asem*.

DISCUSSION

The raw material of *sayur asem* such as *G. gnemon* (leaves and seeds) more than other species so that it can be said to be the its main component. The consuming *sayur asem* is believed to have a healthy effect because the components used have nutritional and contain bioactive compounds that are good for health, therefore it will be discussed further, especially *G. gnemon*. Some of the spices such as *Alphinia galanga* (rhizomes), *S. polyanthum* (leaves), and *T. indica* (fruits) results from a distinctive aroma and flavor to *sayur asem*.

Gnetum gnemon (Figure 4a) is an indigenous Indonesian plant that is easily found in the surrounding environment, especially on the island of Java, and has been processed with various vegetables and snacks (Siregar, Mishima, Kawakami, Ito, Inoue, Hirota, Sharmin, Kato, Harada, Misumi, Orii, Suetsugu, Irie, Mishima, Sakai, Sakai, Kawamura, Zahroh, Nurelela, Riyadahi, Putri & Salim., 2016). By the local community, Indonesia is a multi-functional plant and almost all parts of melinjo are used as food ingredients ranging from leaves, easy fruit, fruit skins, and seeds to use as food ingredients. Use of leaves and seeds *G. gnemon* has a healthy effect because it contains various bioactive compounds. *Gnetum gnemon* has potential as a natural source for resveratrol which has anti-cancer activity as well as a chemopreventive activity for cancer (Raharjo, Rustanti, Ethica, Rizki & Nugroho, 2012). *Gnetum gnemon* It also has antioxidant and anti-hypertensive activity. G is reported to have antioxidant activity (Siswoyo et al., 2011) and anti-hypertension (Matra et al., 2018; Puspitaningrum et al., 2014). The compound 3,4-dimethoxychlorogenic acid, resveratrol, and 3-methoxyresveratrol is a phenolic compound that is isolated from the skin of the fruit, which is a compound that has antioxidant activity (Atun, Arianingruma & Masatake, 2007). Pericarp of *G. gnemon* contains stilbene derivative compounds (isorhapontigenin, resveratrol, gnetin D, gnetifolin K, gnetol) and a lignan compound (+)- lirioresinol B) demonstrated a comparable and slightly lower antioxidant effect of natural stilbene structures and showed moderate activity against murine leukemia b P-388 cells (Cahyana & Ardiansah, 2016).

Figure 4. The plant as main ingredient to processed of *sayur asem*. A. *Melinjo* (*Gnetum gnemon*); B. Tamrind (*Tamarindus indica*); C. Bay leaf (*Syzygium polianthum*).

The *G. gnemon* has invitro antidiabetic and showed α-amylase and α-glucosidase inhibitory activity. The hydrolyzate of green seeds was found to be more effective than yellow seeds and red of old seeds with red color (Supriyadi, Arum, Nugraha, Ratnadewi & Siswoyo, 2019). Those showed that *G. gnemon* young seeds better than older seeds. The seed of *G. gnemon* also has anti-microbial activity against *Bacillus cereus* or Gram-positive bacteria (Soehendro, Manuhara &

Nurhartadi., 2015), so it is the potential to be used as a natural preservative. Parhusip & Sitanggang (2011) reported that seed extract *G. genimon* inhibits bacterial growth of *Aspergillus flavus, Bacillus careus, Staphylococcus aureus,* and *Enterobacter aerogenes*. They further stated that the inhibition of melinjo extract showed almost the same ability as 10 ppm penicillin G against the sample bacteria *Bacillus aureus* and *S. aureus*. On the other hand *G. gnemon* seed flour is also rich in protein (19.0 g / 100 g), crude fiber (8.66 g / 100 g), carbohydrates (64.1%), total dietary fiber (14.5%) and includes adequate amounts of essential, amino acids, fatty acids and minerals (Bhat & Yahya, 2014).

Tamarindus indica (Figure 4b) is commonly found in Indonesia, especially on Java Island. Silalahi & Mustaqim (2020) stated that *T. indica* is a native plant in Africa, but has naturalized in Indonesia, especially in Java. Addition of pericarp extract of *T. indica* in a variety of foods and drinks it gives a refreshing effect and gives a distinctive aroma that enhances the taste. The *T. indica* fruits has a sweet and sour taste associated with a high content of tartaric acid and reducing sugars (De Caluwé, Halamová & Van Damme, 2010). The *T. indica* contains high levels of B vitamins, low carotene, and vitamin C content. The *T. indica* leaves are a source of vitamin C and α-carotene and also have high mineral content, especially P, K, Ca, and Mg (De Caluwé et al., 2010).

The literature review that *T. indica* has anti-microbial activity. Bioactivity as an antimicrobial can be used as a food preservative. Kuru (2014) stated that *T. indica* has long been used to treat various diseases caused by microbes such as stomachache, diarrhea, dysentery, bacterial infections, and wounds. The ethanol and water extracts (hot and cold) of the pulp, bark and leaves of *T. indica* have antibacterial activity, to treat Gram-negative and Gram-positive bacteria (Nwodo, Obiiyeke, Chigor & Okoh, 2011). The *T. indica* pericarp extract inhibits bacterial growth *Staphylococcus aureus, Escherichia coli* (Prabhu & Teli, 2014), while the leaf extract inhibits growth of the *Klebsiella pneumoniae, Micrococcus luteus, Pseudomonas aeruginosa, Staphylococcus aureus* (Gumgumjee, Khedr & Hajar, 2012), fruit extract inhibits *Salmonella paratyphi, Bacillus subtilis, Salmonella typhi* dan *Staphylococcus aureus* (Doughari, 2006). The water extract of *T. indica* fruit pulp has different sensitivity to *Staphylococcus aureus* > *Escherichia coli* > *Pseudomonas aeruginosa* but not sensitive to *Salmonella typhi* (Abubakar, Ukwuani & Shehu, 2008).

Shahraki, Harati & Shahraki (2011) stated that *T. indica* was used as a traditional treatment for diabetes mellitus. The administration of *T. indica* seed aqueous extract prevented an increase in fasting serum insulin, triglycerides, total cholesterol, very low-density lipoproteins, low-density lipoproteins, in the group of rats treated with fructose treated with and *T. indica* extract. The *T. indica* extract supplementation might improve metabolic syndrome due to increased insulin (Shahraki et al., 2011). The single and multidose dose of *T. indica* hydroethanol seed coat extract significantly reduced blood glucose levels in normoglycemic and glucose levels in alloxan-induced hyperglycemic animals. The extract of *T. indica* hydroethanol seed coat exerted a protective effect on pancreatic β cells in experimental animals. Increased hydroethanol extract of *T. indica* seed coat will also increase glucose absorption in rat hemi-diaphragm and prevent weight loss (Bhadoriya Ganeshpurkar, Bhadoriya, Sahu & Patel, 2017).

Dietary modifications can significantly reduce risk factors for cardiovascular disease, including cholesterol and atherosclerosis (Martinello, Soares, Franco, Santos, Sugohara, Garcia, Curti & Uyemura, 2006). Dry pulp and powdered *T. indica* fruit, at a dose of 15 mg/kg body weight, were found to significantly reduce total cholesterol levels and low-density lipoprotein cholesterol levels (Iftekhar, Rayhan, Quadir, Akhteruzzaman & Hasnat, 2006). Treatment of hypercholesterolemic hamsters with the pulp of *T. indica* fruit extract (5%) led to a decrease in

serum total cholesterol (50%), non-high-density lypoprotein cholesterol (73%) and triglycerides (60%), and to increase high-density cholesterol levels. lipoprotein (61%) (Martinello et al., 2006).

Bay leaf or *S. polyanthum* (Figure 4c) is a type of spice that is widely used in various traditional Indonesian dishes including *sayur asem*. The addition of bay leaf to *sayur asem* resulted from a distinctive aroma, thereby enhancing its taste. Based on a survey I conducted in the area around the research, bay leaf plants are very easy to find in the yard and garden near house or home garden. In the Kranggan Mas market, the branch with fresh leaves of *S. polyanthum* in the form of ties or together with other spices. The price for one bunch of bay leaves varies greatly between 1,000 - 3,000 IDR depending on the supply and volume. Before being used, the fresh leaves are dried and aired and it is believed that the aroma of the dry leaves is stronger than the fresh leaves. The dried bay leaves used are generally the result of a wind-dry process (Wartini, Harijono, Susanto, Retnowati & Yunianta, 2007).

The *S. polyanthum* leaves are also the main ingredient for various local Indonesian dishes such as uduk rice, yellow rice, and *rendang*. The food added with *S. polyanthum* has a distinctive aroma. Apart from giving an aroma, it turns out that *S. polianthum* has a healthy effect. As a traditional medicinal ingredient, *S. polyanthum* is used as a medicine for diabetes mellitus (Agoes, 2010), stomach disorders, hypertension, and cholesterol (Suharti, Banowati, Hermana & Wiryawan, 2008).

The bioactivity of *S. polianthum* is related to its secondary metabolite content such as essential oils, tannins, flavonoids, terpenoids (Widyawati, Yusof, Asmawi & Ahmad, 2015). The leaves of *S. polianthum* are estimated to contain about 17% essential oil, with the main content of eugenol and methyl chavicol. Essential oils on the leaves of *S. polyanthum* such as citric acid, eugenol, methyl chavicol (Sumono & Agustin, 2008), cis-4-decenal (27.12%), octanal (11.98%), α-pinene (9.09%), farnesol (8.84%), β-ocimene (7.62%) and nonanal (7.60%) (Wartini, 2009).

The methanol extract of *S. polyanthum* leaves has antihyperglycemic activity by inhibiting glucose absorption from the small intestine and increasing glucose uptake in muscle tissue (Widyawati, Yusof, Asmawi & Ahmad, 2015). Quercetin of the *S. polianthum* leaves inhibit low density lipoprotein (LDL) oxidation by reducing the tocopherol content contained in LDL particles (Michael, 2017). This indicates that the addition of *S. polianthum* leaves to *sayur asem* is thought to reduce human blood cholesterol levels. To lower blood cholesterol levels, 10 - 15 g of bay leaves are used, boiled in 750 ml of water to 250 ml of bay leaf water, consumed 250 ml/day (Khan, Zaman, & Anderson, 2009).

Compounds from *S. polyanthum* leaves can inhibit the growth of pathogenic bacteria such as *Escherichia coli*, *Bacillus cereus* (Setiawan, 2002; Lau & Rukayadi, 2015), *Salmonella* sp., *Staphylococcus aureus*, *Pseudomonas fluorescens and Bacillus subtilis* (Setiawan, 2002), *Candida albicans* (Sumono & Agustin, 2008), *Fusarium oxysporum* (Noveriza & Miftakhurohmah, 2010). The *S. Polianthum* leaf extract has antibacterial activity to Gram-positive bacteria (*Bacillus subtilis, Enterococcus faecalis*) and Gram-negative bacteria (*Escherichia coli, Pseudomonas aeruginosa, Salmonella typhii*) (Ahmad, 2014).

Alpinia galanga is a species belonging to the Zingiberaceae and local names such as laos (Javanese), laja (Sundanese), and kelawas (Karonese). Empirically, the addition of *A. galanga* rhizome will give it a distinctive aroma and a longer dishes, including *sayur asem*. The addition of *A. galanga* rhizome has a healthy and traditionally have been used to treat gastrointestinal disorders such as carminatives and gastric disorders (Pornpimon & Devahastin, 2008). Plants are used to treat digestive tract disorders are associated with their bioactivity as anti-microbial.

The rhizoma of *A. galanga* bioactivity as anti-microbial, associated to its essential oil (Jantan, Ahmad & Ahmad, 2004). The *A. galanga* essential oil has antibacterial properties such as pathogenic bacteria in humans and bacteria that cause food spoilage. *Alpinia galanga* has the

activity of inhibiting the growth of microbes found in foods such as *S. aureus* (Oonmetta-aree, Suzuki, Gasalucka & Eumke, 2006). *Alpinia galanga* contains 1,8-cineole essential oil, β-farnesene, trans-caryophyllene, zingiberene inhibits the growth *Bacillus cereus* (Phanthong, Lomarata, Chomnawang & Bunyapraphatsar, 2013).

The *A. galanga* essential oil, which is the most common in rhizomes is 1,8-cineole (28.4%), α-fenchyl acetate (18.4%), camphor (7.7%), (E)-methyl cinnamate (4.2%), and guaiol (3.3%) are the main essential oil found in its rhizomes (Jirovetz, Buchbauer, Shafi & Leela, 2003). Inhibition of microbial growth of *A. galanga* essential oil results in damage to the inner membrane, outer membrane and the occurrence of cytoplasmic coagulation (Oonmetta-aree et al., 2006). The essential oil of galangal inhibited the growth of microbes that cause food debris in seafood such as *Escherichia coli, Staphylococcus aureus,* and *Salmonella typhimurium*. This indicates that the essential oil found in *A. galanga* has the potential to be developed as a natural food preservative (Sripor & Jinda, 2014).

CONCLUSION

The *sayur asem* is a soup-like vegetable that has a sour taste with the main ingredients of leaves and seeds melinjo (*Gnetum gnemon*) and tamarind fruit (*Tamarindus indica*). A total of 13 species belonging to 12 genera and 10 families used processed *sayur asem*. The part of used to process *sayur asem* is dominated by fruits (8 species), followed by leaves and tubers (each 2 species), which anti-microbial activity. The *sayur asem* is a vegetable that is rich in nutritional value and benefits in health, so it is very good for consumption. It is to develop the presentation of *sayur asem* so that they have a higher economic value.

ACKNOWLEDGMENT

The author would like to thank the vegetable traders at the Kranggan Mas market, Bekasi, who provided the information in this research.

REFERENCES

Abubakar, M.G., Ukwuani, A.N., & Shehu, R.A. (2008). Phytochemical screening and antibacterial activity of *Tamarandus indica* pulp extract. *Asian Journal of Biochemistry, 3*(2), 134-138. Retrieved from https://www.researchgate.net/publication/238346447

Ahmad, N.A.B. (2014). Chemical composition, antioxidant and antibacterial activity of essential oil from leaf of *Syzygium polyanthum* (Wight) Walp.. [*Thesis*]. Faculty of Industrial Sciences and Technology. Universiti Malaysia Pahang.

Agoes, A. (2010). *Tanaman obat indonesia, buku kedua*. Salemba Medika: Jakarta, Indonesia.

Atun, S., Arianingruma, R., & Masatake, N. (2007). Some phenolic compounds from stem bark of melinjo (Gnetum gnemon) and their activity test as antioxidant and uv-b protection. *Proceeding JSChem-ITB-UKM-2007, 14*, 1-4. Retrieved from http://staff.uny.ac.id/sites/default/files/Some%20phenolic%20compounds%20from%20Melinjo.pdf

Bhat, R., & Yahya, N.B. (2014). Evaluating belinjau (*Gnetum gnemon* L.) seed flour quality as a base for development of novel food products and food formulations. *Food Chemistry, 156*, 42-49. Retrieved from http://dx.doi.org/10.1016/j.foodchem.2014.01.063

Bhadoriya, S.S., Ganeshpurkar, A., Bhadoriya, R.P.S., Sahu, S.K., & Patel, J.R. (2017). Antidiabetic potential of polyphenolic-rich fraction of *Tamarindus indica* seed coat in alloxan-induced diabetic rats. *J Basic Clin Physiol Pharmacol, 29*(1), 37-45. http://dx.doi.org/10.1515/jbcpp-2016-0193

Cahyana, A.H. & Ardiansah, B. (2015). Antioxidative and cytotoxic effects of prenylated stilbene derivativerich Melinjo (Gnetum gnemon L.) fruit rind. *AIP Conf Proc.* 1729(1), 020057. Retrieved from https://doi.org/10.1063/1.4946960

Dewiyanti, S., & Suryani, H. (2017). Using componential analysis to evaluate translation results. *Jurnal Bahasa Inggris Terapan, 3*(2), 45-51. Retrieved from https://jurnal.polban.ac.id/ojs-3.1.2/inggris/article/view/1263/1007

De Caluwé, E., Halamová, K., & Van Damme, P. (2010). *Tamarindus indica* L. A review of traditional uses, phytochemistry and pharmacology. *Afrika Focus, 23*(1), 53-83. Retrieved from https://ojs.ugent.be/AF/article/view/5039/4973

Doughari, J.H. (2006). Antimicrobial activity of *Tamarindus indica* Linn. *Tropical Journal of Pharmaceutical Research, 5*(2), 597-603. Retrieved from https://www.ajol.info/index.php/tjpr/article/download/14637/2742

Gumgumjee, N.M., Khedr, A., & Hajar, A.S. (2012). Antimicrobial activities and chemical properties of *Tamarindus indica* L. leaves extract. *African Journal of Microbiology Research, 6*(32), 6172-6181. Retrieved from https://doi.org/10.5897/AJMR12.715

Hariyadi, B., & Ticktin, T. (2012). "Uras" medicinal and ritual plant of Sarampas Jambi, Indonesia. *Ethnobotany Research & Applications* (10), 133-149. Retrieved from http://www.ethnobotanyjournal.org/era/index.php/era/article/viewFile/673/398

Iftekhar, A.S.M.M., Rayhan, I., Quadir, M.A., Akhteruzzaman, S., & Hasnat, A. (2006). Effect of Tamarindus indica fruits on blood pressure and lipid-profile in human model: an in vivo approach. *Pakistan Journal of Pharmaceutical Sciences, 19*(2), 125-129. Retrieved from https://pubmed.ncbi.nlm.nih.gov/16751124/

Jantan, I.B., Ahmad, F.B., & Ahmad, A.S. (2004). Constituents of the rhizome and seed oil of greater galangal *Alpinia galanga* (L) from Malaysia. *Journal Essential Oil Research, 16*, 174-176. Retrieved from https://doi.org/10.1080/10412905.2004.9698687

Jirovetz, L., Buchbauer, G., Shafi, M.P., & Leela, N.K. (2003). Analysis of the essential oil of the leaves, stems, rhizomes and roots of the medicinal plant *Alpinia galanga* from Southern India. *Acta Pharm, 53*, 73-81. Retrieved from http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.321.7946&rep=rep1&type=pdf

Khan, A., Zaman, G. & Anderson, R.A. (2009). Bay leaves improve glocose and lipid profile of people with type diabetes. *J. Clin. Biochem. Nutr., 44*(12), 52-6. Retrieved from https://www.jstage.jst.go.jp/article/jcbn/44/1/44_08-188/_pdf

Kuru, P. (2014). Tamarindus indica and its health related effects. *Asian Pas. J. Trop. Biomed, 4*(9), 676-681. Retrieved from https://doi.org/10.12980/APJTB.4.2014APJTB-2014-0173

Lau, K.Y., & Rukayadi, Y. (2015). Screening of Tropical Medicinal Plants For Sporicidal Activity. *International Food Research Journal, 22*(1), 421-425. Retrieved from http://www.ifrj.upm.edu.my

Matra, N.F., Puspitasari, E., & Siswoyo, T.A. (2018). Hydrolysis of melinjo seed (Gnetum gnemon L.) isolatedprotein using immobilized alcalase and its activity as antihypertensive. *E-Jurnal Pustaka Kesehatan, 6*(1), 18-25. Retrieved from https://jurnal.unej.ac.id/index.php/JPK/article/download/6612/4803

Martinello, F., Soares, S.M., Franco, J.J., Santos, A.C., Sugohara, A., Garcia, S.B., Curti, C., & Uyemura, S.A. (2006). Hypolipemic and antioxidant activities from *Tamarindus indica* L. pulp fruit extract in hypercholesterolemic hamsters. *Food and Chemical Toxicology, 44*, 810-818. Retrieved from https://doi.org/10.1016/j.fct.2005.10.011

Michael, R.P. (2017). Flavonoids Attenuate Cardiovascular Disease, Inhibit Phosphodiesterase, And Modulate Lipid Homeostasis In Adipose Tissue And Liver. *Experimental Biology and Medicine, 231:* 1287-1299. Retrieved from http://ebm.rsmjournals.com/content/231/8/1287

Nurmufida, M., Wangrimen, G.H., Reinalta, R., & Leonardi, K. (2017). Rendang: The treasure of Minangkabau. *J Ethn Foods, 4,* 232-235. Retrieved from https://doi.org/10.1016/j.jef.2017.10.005

Noveriza, R., & Miftakhurohmah. (2010). Efektivitas Ekstrak Metanol Daun Salam (*Eugenia Polyantha*) dan Daun Jeruk Purut (*Cytrus histrix*) Sebagai Antijamur Pada Pertumbuhan *Fusarium Oxysporum. Jurnal Littri, 16*(1), 6 -11. Retrieved from http://perkebunan.litbang.pertanian.go.id/jurnal-littri-vol-16-no-1-2010/

Nwodo, U.U., Obiiyeke, G.E., Chigor, V.N., & Okoh, A.I. (2011). Assessment of *Tamarindus indica* extracts for antibacterial activity. *Int. J. Mol. Sci., 12,* 6385-6396; Retrieved from https://doi.org/10.3390/ijms12106385

Oonmetta-aree, J., Suzuki, T., Gasalucka, P., & Eumke, G. (2006). Antimicrobial properties and action of galangal (*Alpinia galanga* Linn.) on *Staphylococcus aureus. LWT, 39,* 1214-1220; Retrieved from https://doi.org/10.1016/j.lwt.2005.06.015

Parhusip, A.J.N., & Sitanggang, A.B. (2011). Antimicrobial activity of melinjo seed and peel extract (*Gnetum gnemon*) against selected pathogenic bacteria. *Mikrobiologi Indonesia, 5*(3), 103-112. Retrieved from https://doi.org/10.5454/mi.5.3.2

Pawera, L., Khomsan, A., Zuhud, E.A.M., Hunter, D., Ickowitz, A., & Polesny, Z. (2020). Wild food plants and trends in their use: from knowledge and perceptions to drivers of change in West Sumatra, Indonesia. *Foods, 9,* 12-40. Retrieved from https://doi.org/10.3390/foods909124

Phanthong, P., Lomarata, P., Chomnawang, M.T., & Bunyapraphatsar, N. (2013). Antibacterial activity of essential oil and their active components from Thai spices against foodborne pathogens. *Science Asia, 39,* 472-476. Retrieved from https://doi.org/10.2306/scienceasia1513-1874.2013.39.472

Pornpimon, M., & Devahastin, S. (2008). Antimicrobial and antioxidant activities of Indian goosebeery and galangal extracts. *Food Science Technology, 41,* 1153-1159. Retrieved from https://doi.org/10.1016/j.lwt.2007.07.019

Prabhu, K.H., & Teli, M.D. (2014). Eco-dyeing using *Tamarindus indica* L. seed coat tannin as a natural mordant for textiles with antibacterial activity. *Journal of Saudi Chemical Society, 18,* 864-872. Retrieved from https://doi.org/10.1016/j.jscs.2011.10.014

Purba, E.C., Silalahi, M., & Nisyawati. (2018). Gastronomic ethnobiology of "terites"-a tradisional Batak Karo medicinal food: a ruminant's stomach contet as a human food resources. *Journal of Ethnic Food 5*(2), 1-7. Retrieved from https://doi.org/10.1016/j.jef.2018.06.002

Puspitaningrum, Y.T., Efendi, E., & Siswoyo, T.A. (2014). In vivo analysis of antihypertensive activity of melinjo seed (Gnetum gnemon) hydrolyzed-protein. *E-Jurnal Pustaka Kesehatan, 2*(2), 237-41. Retrieved from https://jurnal.unej.ac.id/index.php/JPK/article/download/1902/1550

Raharjo, T.J., Rustanti, E., Ethica, S.N., Rizki, R.A., & Nugroho, L.H. (2012). Characterization of partial cDNA sequence *for Gnetum gnemon* resveratrol synthase encoding gene. *Asian Journal of Chemistry, 24*(10), 4759-4763. Retrieved from http://www.asianjournalofchemistry.co.in/user/journal/viewarticle.aspx?ArticleID=24_10_124

Rianti, A., Novenia, A.E., Christopher, A., Lestari, D. & Parassih, E.K. (2018). Ketupat as traditional food of Indonesian culture. *Journal of Ethnic Foods, 5,* 4-9. Retrieved from https://doi.org/10.1016/j.jef.2018.01.001

Setiawan, C.P. (2002). Pengaruh perlakuan kimia dan fisik terhadap aktivitas antimikroba daun salam (*Syzygium polyanthum* (Wight) Walp). *[Skripsi].* Fakultas Teknologi Pertanian, Institut Pertanian Bogor, Bogor.

Shahraki, M.R., Harati, M., & Shahraki, A.R. (2011). Prevention of high fructose-induced metabolic syndrome in male wistar rats by aqueous extract of *Tamarindus indica* seed. *Acta Medica Iranica, 49*(5), 277-283. Retrieved from https://acta.tums.ac.ir/index.php/acta/article/download/3739/3714

Silalahi, M., & Mustaqim, W.A. (2020). *Tumbuhan berbiji di Jakarta Jilid 1: 100 jenis-jenis pohon terpilih*. UKI Press, Jakarta.

Silalahi, M., Nisyawati, Walujo, E.B., & Supriatna, J. (2015). Local knowledge of medicinal plants in sub-ethnic Batak Simalungun of North Sumatra, Indonesia. *Biodiversitas, 16*(1), 44-54. Retrieved from https://biodiversitas.mipa.uns.ac.id/D/D1601/D160106.pdf

Silalahi, M., Nisyawati, Walujo, E.B., Supriatna, J., & Mangunwardoyo, W. (2015). The local knowledge of medicinal plants trader and diversity of medicinal plants in the Kabanjahe traditional market, North Sumatra, Indonesia. *Journal of Ethnopharmacology, 175*, 432-443. Retrieved from https://doi.org/10.1016/j.jep.2015.09.009

Silalahi, M. (2020). Piper betle L. Piperaceae. In: Franco F.M. (eds) *Ethnobotany of the Mountain Regions of Southeast Asia*. Ethnobotany of Mountain Regions. Springer, Cham. Retrieved from https://doi.org/10.1007/978-3-030-14116-5_92-1

Siregar, Y.D.I., Mishima, K., Kawakami, R., Ito, S., Inoue, Y., Hirota, T., Sharmin, T., Kato, T., Harada, T., Misumi, M., Orii, H., Suetsugu, T., Irie, K., Mishima, K., Sakai, K., Sakai, K., Kawamura, H., Zahroh, H., Nurelela, Riyadahi, A., Putri, L.S.E., & Salim, A. (2016). Extraction of isovitexin from melinjo (Gnetum gnemon L.) leaves using mixtures of liquid carbon dioxide and ethanol. *Int J Biomass Renew*, 5(2), 23-30. Retrieved from http://www.agris.upm.edu.my:8080/dspace/handle/0/17847

Siswoyo, T.A., Mardiana, E., Lee, K.O., & Hoshokawa, K. (2011). Isolation and characterization of antioxidant protein fractions from melinjo (*Gnetum gnemon*) seeds. *J Agric Food Chem, 59*(10), 5648-5656. Retrieved from https://doi.org/10.1021/jf2000647

Soehendro, A.W., Manuhara, G.J., & Nurhartadi, E. (2015.) Pengaruh suhu terhadap aktivitas antioksidan dan antimikrobia ekstrak biji melinjo (*Gnetum gnemon* L.) dengan pelarut etanol dan air. *Jurnal Teknosains Pangan, 4*(4), 15-24. Retrieved from https://jurnal.uns.ac.id/teknosains-pangan/article/download/4688/4072

Sripor, W., & Jinda, N. (2014). Effect of *Alpinia galangal* essential oil on bacteria spoilage. *The 26 th Meeting of the Thai Society for Biotechnology a International Conference. Thailand* : 1-6. Retrieved from http://tsb2014.mfu.ac.th/proceeding/03_PDF

Suharti, S., Banowati, A., Hermana, W., & Wiryawan, K.G. (2008). Komposisi dan kandungan kolesterol karkas ayam broiler diare yang diberi tepung daun salam (*Syzygium polyanthum* Wight) dalam ransum. *Media Peternakan, 31*(2), 138-145. Retrieved from http://medpet.journal.ipb.ac.id/index.php/mediapeternakan/article/view/1095

Sujarwo, W., Arinasa, I.B.K., Salomone, F., Caneva, G., & Fattorini, S. (2014). Cultural erosion of balinese indigenous knowledge of food and nutraceutical plants. *Economic Botany, 68*(4), 426-437. Retrieved from https://doi.org/10. 1007/sl223 1-014-9288-1

Sumono, A., & Agustin, W. (2008). The use of bay leaf (*Eugenia polyantha* Wight) in dentistry. *Dent Jurnal, 41*(3), 147-150. Retrieved from http://www.journal.unair.ac.id/filerPDF/abstrak_26972_tpjua.pdf

Supriyadi, A., Arum, L.S., Nugraha, A.S., Ratnadewi, A.A.I., & Siswoyo, T.A. (2019). Revealing antioxidant and antidiabetic potency of melinjo (Gnetum gnemon) seed protein hydrolysate at different stages of seed maturation. *Curr Res Nutr Food Sci, 7*(2), 479-87. Retrieved from http://dx.doi.org/10.12944/CRNFSJ.7.2.17

Wahyudi, B.A., Octavia, F.A., Hadipraja, M., Isnaeniah, S., & Viriani, V. (2017). Lemang (Rice bamboo) as a representative of typical Malay food in Indonesia. *J. Ethn Foods, 4*, 3-7. Retrieved from https://doi.org/10.1016/j.jef.2017.02.006

Wartini. N. M. (2009). Senyawa penyusun ekstrak flavour daun salam (*Eugenia polyantha* Wight) hasil destilasi uap menggunakan pelarut n-heksana dan tanpa n-heksana. *Agrotekno, 15*(2), 72-77. Retrieved from https://ojs.unud.ac.id/index.php/agrotek/article/view/3132

Wartini, N.M., Harijono, Susanto, T., Retnowati, R., & Yunianta. (2007). Effect of curing process on composition of indonesian bay leaf (eugenia polyantha wight.): Components' profile and preference of flavor extracted by simultaneous distillation-extraction method. *Jurnal Teknologi Pertanian, 8*(1), 10-18. Retrieved from https://jtp.ub.ac.id/index.php/jtp/article/view/227

Widyawati, T., Yusof, N.A., Asmawi, M.Z., & Ahmad, M. (2015). Antihyperglycemic effect of methanol extract of *Syzygium polyanthum* (Wight.) leaf in streptozotocin-induced diabetic rats. *Nutrients, 7,* 7764-7780. Retrieved from https://doi.org/10.3390/nu7095365