

## Scoping Review: Study of Herbs Consumption for Self-Medication in Indonesia 2019-2022

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### ABSTRACT

Indonesia is a country that has high biodiversity and is rich in traditional medicine from natural ingredients or herbs. One use of these natural ingredients is as a treatment for self-medication. Many previous studies have been carried out but none has reviewed it systematically, especially during the Covid-19 pandemic. This research was carried out systematically using the PRISMA statement approach using the Google Scholar data bank. Out of 2,214 papers in the 2019-2022 period, 45 articles/scientific papers met the criteria, including inclusion and exclusion criteria, for a description/profile of the use of natural ingredients or herbs as self-medication for traditional medicine. The central region of Java (D.I.Y Yogyakarta and Central Java) is the region with the largest number of articles. The distinctiveness of Indonesia's approach to self-medication lies in its utilization of various natural elements to address similar ailments, which can be attributed to geographical factors, cultural beliefs, and diverse knowledge across different regions. Meanwhile, Covid-related studies were very limited due to the availability or the preference for chemical self-medication.

**Keywords:** covid; natural ingredients; self-medication; traditional medicine

### INTRODUCTION

Indonesia is one of the countries with the highest biodiversity in the world which also uses natural or herbal ingredients for medication. People who prefer treatment using natural ingredients do so because of the belief that natural ingredients are safer to consume and have minimal side effects. Apart from that, people can easily get these natural ingredients both in the kitchen (as kitchen spices) and in the yard where they are planted as Family Medicinal Plants (*Tanaman Obat Keluarga*, TOGA). Among the purposes of community use of natural or herbal ingredients is self-medication.

Self-medication is a form of community behavior in the form of consuming a medicine without a physician or doctor's prescription. The consumption could be based on empirical knowledge or information widely spread in society. Based on data from the Indonesian Statistics (*Badan Pusat Statistik*, BPS), from 2020 when the pandemic was occurring until 2022, the percentage of the Indonesian population who self-medicated increased from 72.19% to 84.34%. However, this data does not clearly show whether

self-medication uses modern medicine, traditional medicine, both, or others were used in self-medication. In contrast, in 2012-2014, the use of modern medicine declined from 91% to 90.54%, the use of traditional medicine decreased from 24.42% to 20.99%, and others from 4.36% to 4.06%. Data from BPS since 2016 no longer distinguish self-medication using natural ingredients or otherwise, so the level of self-medication in the community using natural ingredients, especially in health promotion efforts, cannot be ascertained.

The use of natural ingredients for self-medication is still relatively uncommon even though the potential for Indonesian natural ingredients is enormous. Several studies related to self-medication using natural ingredients have also been carried out, but no review has systematically examined this issue. Therefore, this study aims to re-evaluate the usage of natural ingredients, whether in fresh form, packaged form accredited by Indonesia National Agency of Drug and Food Control (*Badan Pengawas Obat dan Makanan*, BPOM), or in Indonesian concoction form (*jamu gendong*) for self-medication purposes. This study also included the reported side effects as additional information. The years 2019-2022 were chosen due to the pandemic conditions which caused

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limited space for movement in treatment so it was assumed that self-medication constituted one of the community's efforts to maintain health.

This study could provide information regarding the potential of traditional medicines to improve public health, the reported side effects of these natural ingredients, as well as evaluation of several studies related to natural ingredients that have been used by the community to further maintain the rationality of using natural ingredients in self-medication. This study could potentially show Indonesian herbs that could be utilized optimally in the economic sector and could also serve as source of information for further exploration.

## METHODS

This study was conducted in March 2024. The review method used is a scoping review using Google Scholar as a database. The search was carried out by typing the keywords "self-medication from natural ingredients (*swamedikasi bahan alam*)", "self-medication using herbs (*swamedikasi menggunakan herbal*)", "use of natural ingredients for self-medication (*penggunaan bahan alam untuk swamedikasi*)", and "TOGA self-medication (*swamedikasi TOGA*)" in the 2019-2022 time period using the Indonesian language to obtain local results. Search results were collected using Publish or Perish and resulting in 2,196 results for all keywords and 18 additional studies from previous searches or private databases. In full, the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement scheme for this study is as follows (Figure 1).

### Inclusion criteria

This review was conducted to evaluate the use of natural materials for self-medication in society. Therefore, research articles were selected based on inclusion criteria, namely: 1) the article title and/or abstract provides an overview that is relevant to the topic of discussion of this article, 2) the article or scientific work can be accessed in its entirety (full-text) for data extraction purposes, 3) is a non-treatment (pre-/post experiment) research, because the desired result is to obtain the regular uses of natural ingredients for self-medication that are generally applicable in respondents, not in the context of researching the pre-post effects/benefits, 4) the article or scientific work contains/mentions the names of natural ingredients used in self-medication efforts in the form of single natural ingredients, packaged form (jamu category), or in the form of jamu gendong, because jamu gendong or the packaged form is

generally still prepared independently from natural ingredients and its contents can generally be traced, 5) for articles that combine users of natural ingredients and non-natural ingredients, the articles detail the number of respondents who use natural ingredients and non-natural ingredients as self-medication so as to allow for more accurate respondent data, 7) the selected articles were not knowledge inventory which refers to the native beliefs without real application by the selected respondents, 8) the articles or papers were not review, theoretical articles, educational activity reports, or books, 9) the language chosen was Indonesian or English.

### Search strategy

The search was carried out using the Publish or Perish 8 application by typing keywords related to the topic of discussion, namely "self-medication from natural ingredients (*swamedikasi bahan alam*)", "self-medication using herbs (*swamedikasi menggunakan herbal*)", "use of natural ingredients for self-medication (*penggunaan bahan alam untuk swamedikasi*)", and "TOGA self-medication (*swamedikasi TOGA*)" in the 2019-2022 time period using Indonesian language to obtain local results. Each search result was then saved as a Bibtext file and then imported into the Zotero application.

### Selection of Studies

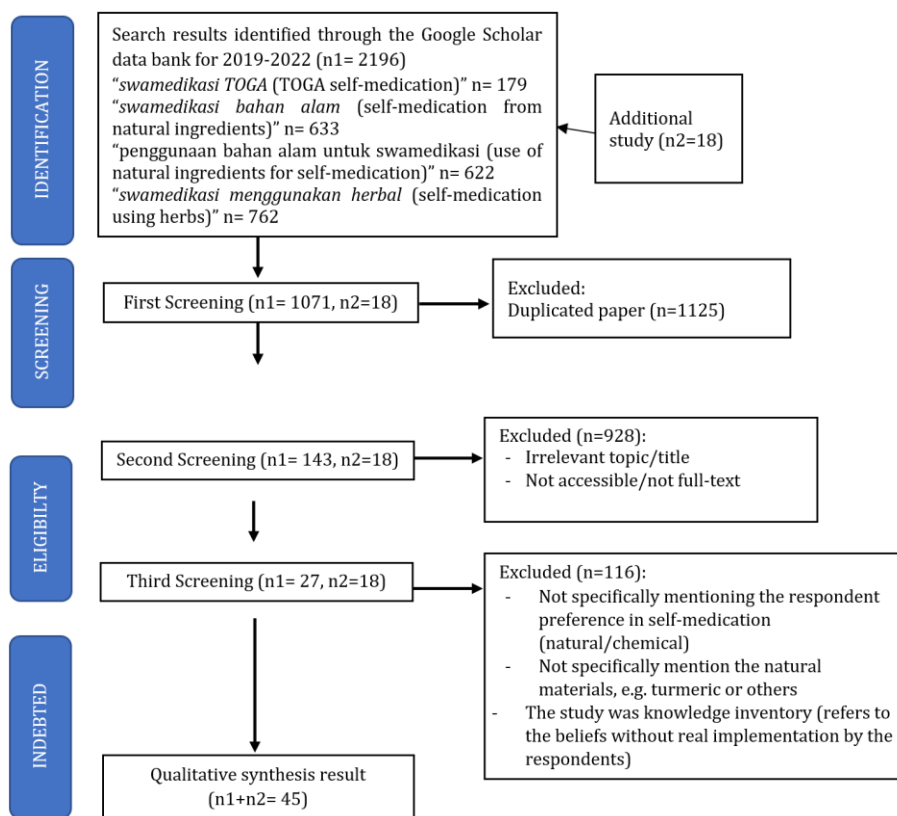
Study selection was managed using the Zotero application. Files that had been imported into Zotero were then merged and then duplicate articles/scientific works were screened based on title and grouped into 2 categories: 1) Yes and 2) No. Studies that fall into the first category were processed further by screening the abstract and research results. Studies met the inclusion criteria requirements and then had their data synthesized/extracted.

### Data synthesis

Data synthesis was carried out by taking the data that is needed and relevant to the topic of discussion, namely: name of region/area, the purpose of using natural materials, name of natural materials used, type of research method, number of research respondents, and as well as year and author's name. After synthesized, the data was then processed using Microsoft Excel for graphs/diagrams.

## RESULTS

From a total of 2,196+18 or 2,214 search results, we found and reviewed 45 articles that met the inclusion criteria. Based on the synthesized



**Figure 1. Research paper extraction scheme by using PRISMA flowchart for review (Processed by the author, 2023)**

data, we identified 45 regions which we grouped into 3 large regions of Indonesia, namely West, Central, and East. The Western Region of Indonesia includes Aceh (3 regions), North Sumatra (4 regions), D.I Yogyakarta (6 regions), Central Java (8 regions), DKI Jakarta (1 region), West Java (5 regions), East Java (4 regions), and Jambi (1 region). The Central Indonesia region encompasses East Nusa Tenggara (5 regions), West Kalimantan (2 regions), South Sulawesi (1 region), Southeast Sulawesi (2 region), and North Sulawesi (2 regions). Lastly, East Indonesia comprises Papua (2 regions). These divisions can be seen in the following Figure 2.

## DISCUSSION

Self-medication is defined as the selection and use of medication by an individual to treat a known disease themselves (Wardani & Muhlis, 2020). According to WHO's definition, self-medication is the use of drugs to treat self-occurring disorders or symptoms, or the periodic or continuous use of prescription drugs for chronic or recurrent diseases or symptoms (Lukovic et al., 2014). In Indonesia, which is rich in natural resources and where people are familiar with various spices and natural ingredients, self-

medication is carried out not only with chemical drugs but also with traditional medicines (Prabandari et al., 2021).

Based on BPOM Regulation no. 32 of 2019, traditional medicines are ingredients or concoctions of ingredients in the form of plant materials, animal materials, mineral materials, extract preparations (galenic) or mixtures of these materials which have been used for generations for treatment, and can be applied in accordance with the norms applicable in community (Badan Pengawas Obat dan Makanan RI, 2019). The uniqueness of Indonesia is the term traditional medicine which has been approved by UNESCO as Indonesia's intangible cultural heritage, namely "jamu". "Jamu Wellness Culture" includes traditional skills and cultural values related to traditional natural medicines made from plants and spices as well as traditional treatment methods that aim to improve health by increasing immunity (Kemenlu RI, 2023).

Based on the same BPOM regulation, the term herbal medicine is broader, encompassing simple processing such as boiling, steeping, infusion, and the like, as well as pharmaceutical preparations such as capsules, tablets, tapel, parem, etc. Therefore, in this study, the authors

Number of Studies Based on The Regions in Indonesia

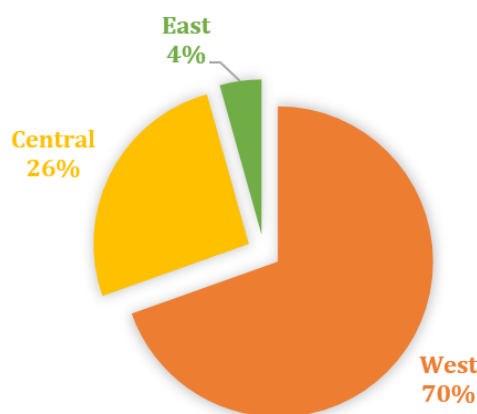


Figure 2. number of studies based on the regions in Indonesia

Table I. List of Regions, Types of Disease, Natural Ingredients, and Total Respondents who meet the final inclusion criteria (Processed by the Authors, 2023)

No	Regions	Type Of Herbs/Traditional Medicine	Herbs/Natural Ingredients	Self-Medication Purposes	Respondents	Ref.
1	Pidie Village, Aceh, Aceh Province	empirical jamu	turmeric ( <i>Curcuma domestica</i> ) Temulawak ( <i>Curcuma xanthorrhiza</i> ) Ginger ( <i>Zingiber officinale</i> Rose) Galangal ( <i>Alpinia galanga</i> L) Aromatic ginger ( <i>Kaempferia galanga</i> L) Jarak pagar ( <i>Jatropha curcas</i> L.) Coral plant ( <i>Jatropha multifida</i> L.) Cassava ( <i>Manihot esculenta</i> ) Meniran ( <i>Phyllanthus niruri</i> L)	Gastric pain, wounds, and appetite enhancer Liver function, digestion, and appetite Coughing, headaches, colds, and nausea Medication for diarrhea, asthma and sore throat Cough, diarrhea Tooth ache wound Hot fever Pain, inflammation	1280	(Hardiana et al., 2019)
2	Karegesan Village, Kauditan sub-district, North Sulawesi	Categorical jamu*	antangan JRG®, tolak angin®, diabet®, lelap®	fever, diarrhea, stomach-ache	52	(Agaatzs & Sitompul, 2021)

Notes: \*Categorical jamu refers to licensed traditional medicine, \*\*Jamu refers to either empirical or categorical as the study did not clearly state which is which

**Table I. (Continued)**

No	Regions	Type Of Herbs/Traditional Medicine	Herbs/Natural Ingredients	Self-Medication Purposes	Respo-ndents	Ref.
3	DKI Jakarta	Empirical Jamu	Ginger, Turmeric, Honey, Betel, Cat's whiskers ,Garlic, Temulawak, Worm water, Coconut water, etc	Covid-19 prevention/medication	100	(Wardiyah et al., 2022)
		Categorical jamu*	Tolak angin®, Qistal hindi®, Sari kurma®, Lianhua Qingwen®, Habbatussauda®, Jamu pegal linu, <i>Zingiber officinale</i> <i>Rose</i>			
4	Ngabean Village, Magelang Regency, Central Java	Empirical Jamu	<i>Curcuma longa linn</i>	immunity, colds, aches and pains, heating	78	(Puspitadewi et al., 2021)
			<i>Psidium guajava</i>	kidney stones, immunity, menstruation, ulcers, aches and pains, fever, stomach ache, constipation		
			<i>Annona muricata</i>	dengue fever, diarrhea, heart disease		
			<i>Cymbopogon citratus</i>	gout, diabetes, hypertension, rheumatic pain, stroke		
				gout, cough, hypertension, aches and pains, fever		
5	Kauman Nganjuk, Nganjuk Regency, East Java	Empirical Jamu	Bay leaf	cholesterol, uric acid, gout	190	(Susandy et al., 2022)
			Pandan leaves bitter melon celery herb mangosteen peel	diabetes hypertension diabetes		
6	Condongcatur urban village, Yogyakarta city, D.I.Y Yogyakarta	Categorical jamu*	imboost® (echinaceae extract) diapet® ( <i>Psidium guajava</i> ) ambeven® ( <i>Graphthophyllum pictum</i> )	coughs, colds, fever, pain, skin diseases	20	(ANGGRA YNI, 2020)

Notes: \*Categorical jamu refers to licensed traditional medicine, \*\*Jamu refers to either empirical or categorical as the study did not clearly state which is which

divide the term herbal medicine into empirical herbal medicine and categorical herbal medicine. Empirical herbal medicine refers to the use of

natural ingredients that are processed fresh or simply, such as boiling, pounding, brewing, or in the form of herbal medicine or concoctions.

Table I. (Continued)

No	Regions	Type Of Herbs/Traditional Medicine	Herbs/Natural Ingredients	Self-Medication Purposes	Respondents	Ref.
7	Teladan Vocational School Demak, Demak Regency, Central Java	Empirical Jamu	<i>Jamu gendong</i> (kencur rice, tamarind turmeric), <i>jamu godog</i>	colds, motion/travel sickness, diarrhea, sore throat, and menstrual pain	78	(Abadi & Widayati, 2022)
8	Grogol Village, Kediri Regency, East Java	Jamu**	ginger, turmeric, honey, aromatic ginger, curcuma, lemongrass	To increase the body's resistance so as not to infected from a disease, to reduce the symptoms of the disease, To treat illness, To treat the body from diseases that have been / are being suffered	100	(Hakim et al., 2022)
9	Health Office of South Sulawesi	Jamu**	ginger, turmeric, ginger, galangal, lemon betel	consumed in pandemic condition	260	(Amelia AP et al., 2021)
10	Tembok Lor Village, Tegal Regency, Central Java	Empirical Jamu	guava starfruit aromatic ginger turmeric galangal lemongrass Bay leaf papaya leaf pandan Aloe vera Curcuma ginger lime	Overcoming vaginal discharge, stopping nosebleeds diarrhea fever, cold indigestion overcome vaginal discharge itching due to fungus reduce pain hypertension reduce pain diabetes Burns increases appetite cough, catch a cold cough	97	(Rahmi et al., 2021)
11	Gondokusuman I Health center, D.I.Y Yogyakarta	Empirical Jamu	garlic, celery, ginger, herbal medicine kencur rice, binahong, noni, cucumber, turmeric, herbal medicine paitan ( <i>sambiloto/brotowali</i> ), black ginger	hypertension	71	(Utami, 2021)

Notes: \*Categorical jamu refers to licensed traditional medicine, \*\*Jamu refers to either empirical or categorical as the study did not clearly state which is which

Categorical herbal medicine refers to the term licensed herbal medicine issued by BPOM. Licensed herbal medicine is a traditional medicine categorized based on scientific evidence or clinical trials and has a certain logo or symbol and is

processed by a traditional medicine industry or factory. Apart from that, these licensed herbal medicines are usually in the form of pharmaceutical preparations, whether in the form of simple preparations such as pilis, tapel, parem to

Table I. (Continued)

No	Regions	Type Of Herbs/Traditional Medicine	Herbs/Natural Ingredients	Self-Medication Purposes	Respondents	Ref.
11	Gondokusuman I Health center, D.I.Y Yogyakarta	Categorical jamu*	madu®, ekstrak kulit manggis®, habbatussauda®, afiapro® (Cinnamon, Javanese chilies, sedge grass, white ginger, temulawak, temu mangga, gotu kola, bitter, meniran)	hypertension	71	(Utami, 2021)
12	Mulyajaya Village, Karawang Regency, West Java	Categorical jamu*	diapet® (psidium guajava) laserin® pilkita® kukubima® antangin mint® kunyit asam sirih® tolak angin® kiranti® antangin JRG®	diarrhea cough stamina stamina have a cold stamina have a cold menstrual pain have a cold	108	(Habsoh & Salman, 2022)
13	Benyom Jaya urban village, Jayapura Regency, Papua	Empirical Jamu	papaya leaves, turmeric, bitter leaves, bay leaves	malaria	87	(Saleh et al., 2020)
14	Tanamon village, Sout Minahasa Regency, North Sulawesi	Empirical Jamu	saraba drink (with basic ingredients, namely boiled red ginger, brown sugar or palm sugar and lemongrass)	Immune booster	92	(Katili et al., 2022)
15	Semesta Bumiayu Vocational School, Brebes Regency, Central Java	Empirical Jamu Categorical jamu*	jamu turmeric kiranti®	dysmenorrhea	92	(Trimajaya et al., 2021)
16	UMP Faculty of Medicine, Purwokerto, Central Java	Jamu**	<i>Citrus sp., Allium sativum, Psidium guajava, Zingiber officinale</i>	increasing immunity during a pandemic	19	(Septiana wati et al., 2020)
17	Batu Belerang village, Kabupaten Sinjai, South Celebes	Empirical Jamu	ginger, miana leaves, cat's whiskers, soursop leaves, alang-alang, moringa leaves, sugar apple leaves, noni, pepper, papaya leaves, temulawak, eucalyptus, turmeric, guava leaves, bitter melon leaves, and black wood	increasing immunity during a pandemic	88	(Ramadhani et al., 2022)

Notes: \*Categorical jamu refers to licensed traditional medicine, \*\*Jamu refers to either empirical or categorical as the study did not clearly state which is which

Table I. (Continued)

No	Regions	Type Of Herbs/Traditional Medicine	Herbs/Natural Ingredients	Self-Medication Purposes	Respondents	Ref.
18	Yandu Wredasari 07, Warungboto, Umbulharjo, D.I.Y Yogyakarta	Empirical Jamu  Categorical jamu*	Chinese betel, noni fruit, lemongrass and ginger, on, bitter herbal medicine, lime bitter honey, longan honey, thousand flower honey, etc	hypertension, cholesterol, diabetes	31	(Wardani & Muhlis, 2020)
19	Pakualaman, D.I.Y Yogyakarta	Categorical jamu*	diapet® ( <i>Psidium guajava</i> ) immunos® (echinaceae), imboost® (echinaceae)	diarrhoea  Immune booster	15	(Sari, 2020)
20	Balapulang Wetan village, Central Java	Empirical Jamu	jamu turmeric tamarind, jamu suruh, jamu turmeric suruh, turmeric matah	vaginal discharge	74	(Nufus et al., 2021)
21	Pacul urban village, Tegal Regency, Center Java	Jamu**	turmeric tamarind,	dysmenorrhea	51	(Ayuningtiyas et al., 2021)
22	Bahorok urban village, Langkat Regency, North Sumatera	Empirical Jamu	snake fruit, nutmeg, guava leaves	diarrhoea	92	(Ginting, 2019)
23	Ujung Bandar village, Langkat Regency, North Sumatera	Empirical Jamu	temulawak, galangal, turmeric, ginger, tamarind, young coconut, shallots, winged beans, turi onion skin, noni	chicken pox	75	(Apriani, 2019)
24	Puskesmas Sukaramai Medan, North Sumatera	Empirical Jamu	Turmeric, ginger, temulawak	prevention and treatment of Covid 19	43	(Batubara & Anshari, 2022)

Notes: \*Categorical jamu refers to licensed traditional medicine, \*\*Jamu refers to either empirical or categorical as the study did not clearly state which is which

more complex preparations such as effervescent tablets, chewable gummies, etc.

Based on the results obtained, studies that met the inclusion criteria mostly discussed herbal medicine empirically, namely the direct use of natural ingredients for self-medication. This could be due to the limitations of this study which cannot access many self-medication studies or it could

also be because many self-medication studies focus more on self-medication using chemical drugs. This trend of self-medication with chemical drugs is shown in data from the Indonesian Statistics which states that the use of chemical drugs for self-medication reached about 90% while traditional medicine only about 20% (Badan Pusat Statistik, n.d.). Supriadi & Hafin (2022) also stated that as



**Table I. (Continued)**

No	Regions	Type Of Herbs/Traditional Medicine	Herbs/Natural Ingredients	Self-Medication Purposes	Respondents	Ref.
25	Puskesmas Jambi city, Jambi Province	Empirical Jamu	coconut water, cat's whiskers, shallots, guava leaves, crown of God leaves, mint leaves, papaya leaves, rambutan leaves, bay leaves, betel leaves, ginger, lime, cardamom, turmeric, lemongrass, temulawak, cucumber	ulcers, coughs, measles, fever, diabetes, itching, hypertension, vaginal discharge, cholesterol, bloating, menstrual pain, joint pain, aches and pains, runny nose, toothache, headache, stomach ache, sore throat, canker sores	133	(Supriadi & Haflin, 2022)
26	Wasur Village, Merauke Regency, Papua	Empirical Jamu	bitter, meniran, ginger, papaya leaves, haliyah leaves, banana leaves, eucalyptus leaves, turmeric, anthill	prevention and treatment of Covid 19	100	(Silaban et al., 2022)
27	Plembutan village, Playen, Gunungkidul, Yogyakarta	Empirical Jamu  Categorical Jamu*	daun jambu biji sambiloto, kunyit kuning, kunyit putih, daun sirih merah Diapet®	diarrhea	95	(Novila, 2020)
28	Langsa city, Aceh Province	Empirical Jamu	aloe vera, sambiloto, turmeric, bay leaf	diabetes mellitus	100	(Hamzah, 2019)
29	Randudongka 1 sub-district, Pemalang Regency, Central Java	Empirical Jamu	turmeric, <i>wuluh</i> starfruit	Increases appetite, relieves symptoms of colds or feeling unwell, hypertension	100	(Zahrotun nisa et al., 2021)
30	Sumba Island, East Nusa Tenggara Province	Empirical Jamu	Ginger, lemongrass, moringa, turmeric, temulawak, aromatic ginger/kencur, guava, sambiloto, meniran, lime, betel leaf	prevention and treatment of Covid 19 (immune booster)	58	(Kalle & Fernandez, 2022)

Notes: \*Categorical jamu refers to licensed traditional medicine, \*\*Jamu refers to either empirical or categorical as the study did not clearly state which is which

many as 86% of Yogyakarta city residents bought modern medicine for self-medication, while 14% bought traditional medicine.

The richness of Indonesia's herbal medicine heritage can be seen from research results which show that there are differences in the use of natural

Table I. (Continued)

No	Regions	Type Of Herbs/Traditional Medicine	Herbs/Natural Ingredients	Self-Medication Purposes	Respo-ndents	Ref.
31	Wae Ia Village, Golewa sub-district, Ngada Regency, East Nusa Tenggara Province	Empirical Jamu	ginger, lime, turmeric, curcuma, aromatic ginger/kencur, lemongrass, shallots, bitter melon leaves, damar leaves, red ginger.	cough, heat/fever, stomach, wound, hypertension, malaria, headache, postpartum, backache	30	(Maja, 2021)
32	Pantura Coast, West Java	Empirical Jamu	binahong	Medication (unspecified)	57	(Dewi & Fikri, 2021)
33	Lamongan Regency, East Java	Empirical Jamu	Uric acid	uric acid jamu (cat's whiskers leaves)	85	(Kusumo, 2021)
34	Pulo Village, Aceh Province	Empirical Jamu	Betel leaf, guava leaf, turmeric, galangal, nutmeg, bay leaf, lime	toothache, diarrhea, cough, fever, diabetes, ulcers, rheumatism, high blood pressure, gout, etc.	140	(Maghfirah, 2021)
35	Ploso Village, Sidoharjo sub-district, Polanharjo sub-district, Klaten, Central Java	Empirical Jamu	red ginger, aromatic ginger, ginger, <i>jamu gendong</i> , guava leaves, turmeric, honey, nima leaves, and lime.	colds, aches, flu, coughs, colds and diarrhea	80	(Amalia & Dewi, 2021)
36	Campus III of Sanata Dharma University, D.I.Y Yogyakarta	Empirical Jamu	<i>Jamu gendong</i> , guava leaves, ginger, turmeric, honey, and nima and lime leaves	colds, coughs, flu, stomach aches, colds and menstrual pains, as well as muscle injuries, asthma, and sore throats	97	(Joru, 2019)
37	Banyumas Stabat Village, North Sumatra	Categorical Jamu*	Stomach tap/ <i>tapel</i> (whiting and lime infused/juice)	postnatal care/rehabilitation	19	(Laili, 2019)

Notes: \*Categorical jamu refers to licensed traditional medicine, \*\*Jamu refers to either empirical or categorical as the study did not clearly state which is which

ingredients for the same type of disease, even though several plants known and proven to be efficacious are also used simultaneously. For example, the Pidie people use cassava to overcome fevers, while the people of Ngabean village use turmeric, the people of Batas Lor Village use starfruit, and so on. An example of the same natural ingredient used for the same disease is guava which is used to treat diarrhea.

The abundant use of natural materials could be caused by different geographical locations so that the materials used are those often found in the community, certain beliefs, or knowledge passed down from generation to generation. Kristianto et al. (2022) surveyed to determine the influence of mystical beliefs and public knowledge on the choice of herbal medicine. The results showed that mystical beliefs, holistic health beliefs, knowledge,

Table I. (Continued)

No	Regions	Type Of Herbs/Traditional Medicine	Herbs/Natural Ingredients	Self-Medication Purposes	Respo-ndents	Ref.
38	Rantau Panjang, Simpang Hilir sub-district, North Kayong Regency, West Kalimantan	Empirical jamu	<i>Simpur</i> , coriander, sapodilla, <i>leban</i> , <i>pulai</i> , banana heart, <i>raye</i> flower, reeds, durian, taro, coffee, beef cello, <i>nipah</i> , fish spikes, soursop, coconut, <i>api-api</i> , noni, liver, shallots, mustache cat, shy daughter, crown of gods, <i>belange</i> , <i>wuluh</i> starfruits, tamarind, <i>andong</i> , lime chili, cassava, guava, aloe vera, areca nut, <i>bimban</i> , red betel, spicy betel, cassava, papaya, bay leaf, bitter melon, cucumber, <i>bajakah</i> , <i>cempedak</i> , peanuts, water gourd, red ginger, lemongrass, fragrant <i>pandanus</i> , <i>brotowali</i> , red sugarcane, jengkol, <i>cengkodok</i> , orchids, <i>ketepeng</i>	postpartum, abdominal pain, toothache, menstruation, fever, wound, acne, cholesterol, tuberculosis, headache, cough, swelling, eye pain, lower blood pressure, cancer, malaria, typhus, vaginal discharge, sprains, body aches, strengthen teeth, thrush, earache, ringworm	333	(Saupi et al., 2021)
39	Mamek Village, Menyuke sub-district, Landak Regency, West Kalimantan	Empirical jamu	Cogon grass, shallots, garlic, porcupine flower, galangal, perujan flowers, cherries, kesum leaves, papaya, kedondong, cucumber, yellow coconut, crown of gods, fragrant pandanus, puring, lokop,	internal sores, swelling, canker sores, diarrhea, kidney stones, measles, body odor, menstruation, bladder stones, asthma, hepatitis, bleeding, strengthening teeth, tuberculosis, ulcers, tonsils, typhoid, diabetes	100	(Riadi et al., 2019)

Notes: \*Categorical jamu refers to licensed traditional medicine, \*\*Jamu refers to either empirical or categorical as the study did not clearly state which is which

Table I. (Continued)

No	Regions	Type Of Herbs/Traditional Medicine	Herbs/Natural Ingredients	Self-Medication Purposes	Respo-ndents	Ref.
40	Pattallassang Health Center (Puskesmas), Pattallassang sub-district, Gowa Regency, South Sulawesi	Empirical jamu	soursop, starfruit leaves, celery leaves, cat's whiskers leaves, bay leaves, cucumber, noni leaves	hypertension	45	(Thahir et al., 2021)
41	Nangapanda subdistrict, Ende Regency, East Nusa Tenggara	Empirical jamu	<i>sambiloto</i> leaf, turmeric, tamarind, light green Japanese pumpkin, candlenut, bay leaf, noni leaf, papaya leaf, lime fruit, noni fruit, <i>ende</i> leaf, lemongrass, garlic, cat's whiskers, guava leaves, soursop leaves, curcuma , betel leaf, <i>Genoa/kaliraga</i> , African leaf, ginger, galangal, red onion	UTI, fever, cold cough, diabetes, menstrual pain, hypertension, malaria, gout, aches, rheumatism, lumbago, itching, difficulty urinating, cholesterol, headaches, stomach acid, diarrhea,	100	(Tunda, 2022)
42	Bettet Village, Pamekasan Regency, East Java Province.	Empirical jamu	Turmeric, Ginger, Lemongrass, <i>kencur</i> , garlic, black cumin	influenza	31	(Zabadi & Kurniasari , 2022)
43	The area of Mata Redi Village, Central Sumba, East Nusa Tenggara Province	Empirical jamu	Ginger, red onion, aloe vera, cat's whiskers, bitter, betel leaf, cinnamon, lime, turmeric, basil leaves, <i>kencur</i> , galangal	headaches, fever, hemorrhoids, stomachaches, toothaches, muscle aches, nausea, allergies, menstrual acne, ulcers, and coughs	90	(Wedu, 2021)
44	Malinjak Village, South Katikutana sub-district, Central Sumba Regency, East Nusa Tenggara Province	Empirical jamu	turmeric, temulawak, ginger and <i>kencur</i> , lemongrass, galangal, and Moringa leaves	diarrhea, fever, flu, cough, boost immunity	100	(Yaka, 2022)

Notes: \*Categorical jamu refers to licensed traditional medicine, \*\*Jamu refers to either empirical or categorical as the study did not clearly state which is which

Table I. (Continued)

No	Regions	Type Of Herbs/Traditional Medicine	Herbs/Natural Ingredients	Self-Medication Purposes	Respondents	Ref.
45	Imbanagara Village, Ciamis Regency, West Java	Empirical jamu	<i>Jamu gendong</i>	curing sudden/mild illnesses, curing chronic (chronic) illnesses, preventing illnesses, curing severe illnesses. <b>(not specifically mention the illnesses)</b>	103	Khoirurifa et al., 2020)

Notes: \*Categorical jamu refers to licensed traditional medicine, \*\*Jamu refers to either empirical or categorical as the study did not clearly state which is which

Number of studies Reported Side Effects

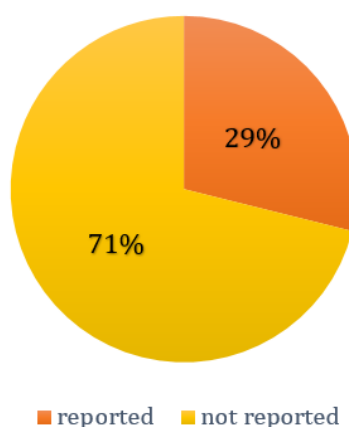


Figure 3. Number of studies that stated the side effects

and attitudes were key factors in determining the use of herbal medicine.

**Relationship between Traditional Medicine Studies by Region**

Based on filtered studies, Central Java and its surroundings (D.I.Y. Yogyakarta) are the regions with the largest number of studies concerning the profile of the use of natural ingredients as traditional medicine. Generally, studies are motivated by people’s habits that arouse curiosity. This is supported by the Cultural Development Division of Central Java Province (arts, n.d.), stating that traditional medicine that has been passed down for generations in Indonesia, namely herbal medicine, is closely related to the traditions of Javanese society. Onda (2020), in his review, stated that herbal medicine ingredients were obtained on the island of Java because it has fertile soil and a

tropical climate as well as various types of plants constituting the basis for the Javanese people's experience in medicine.

Many studies were conducted in West Java probably due to educational environment and the habits there. But, overall, the bias in this number of studies might have happened as fulltexts are not available for many institutions. After Central and West Java, the highest number on studies on the profile of the use of natural materials was carried out in East Nusa Tenggara. Sambara et al. (2018) stated that various medicinal plants exist in the East Nusa Tenggara region and can be used as traditional medicine. The appeal to the people of NTT to always preserve medicinal plants around their homes is one form of preserving the culture and local wisdom of the community.

After Central Java which represents West Indonesia and NTT from East Indonesia, other

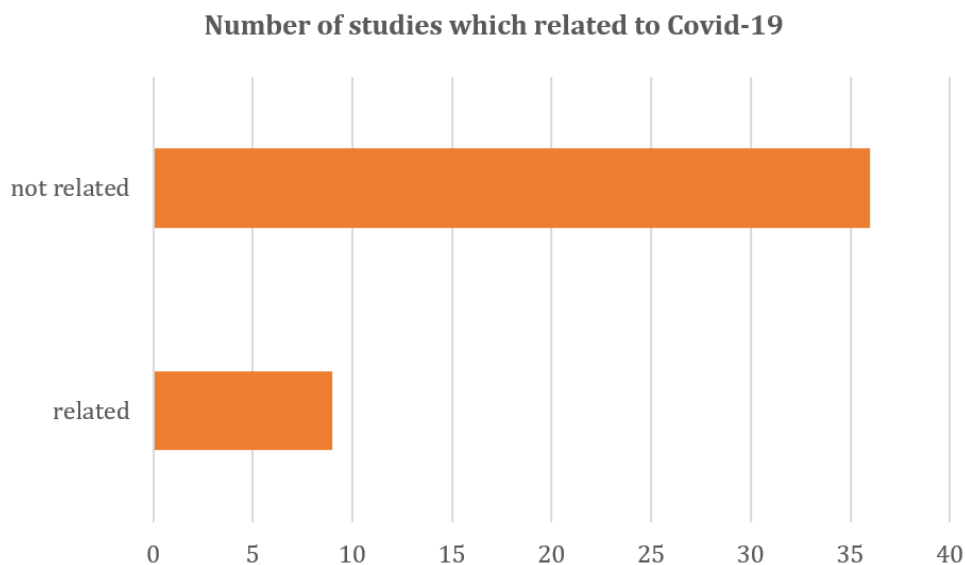


Figure 4. number of studies related to Covid-19

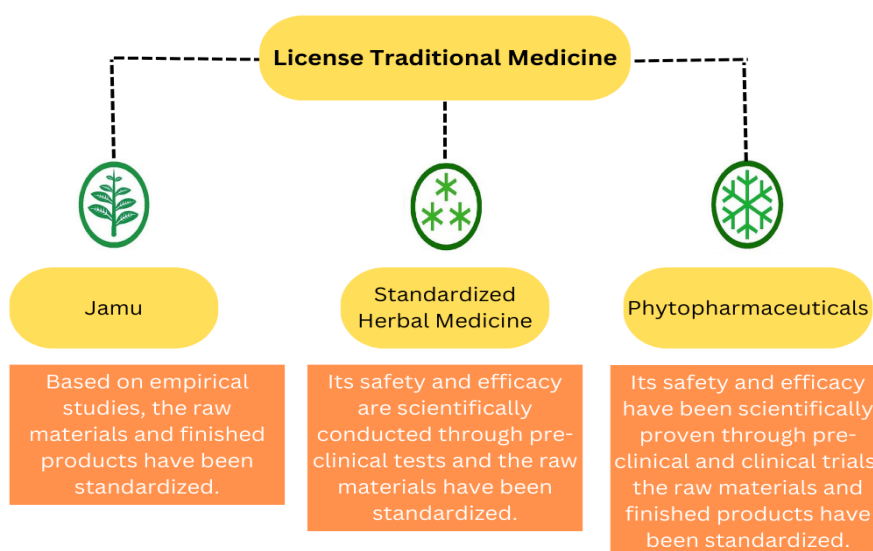


Figure 5. License Traditional Medicine Classification by BPOM

regions that have conducted studies include: North Sumatra, Jambi Province, Aceh,, DKI Jakarta, East Java, South Sulawesi, Southeast Sulawesi, North Sulawesi, West Kalimantan, and Papua. Apart from the areas mentioned, the use of natural materials has actually spread to various regions in Indonesia, especially areas that are still steeped in customs and culture. Even in urban areas there is also a very large trend in using natural materials. This is supported by the WHO (World Health Organization) statement quoted by Sukandar (2022) that up to 65% of the population of developed countries and 80% of the population of developing countries have used herbal medicine.

However, there is still very few specific studies and documentation regarding the use of traditional medicine per region in Indonesia.

According to Afandi et al., (2022) research trends regarding medicinal plant research in Indonesia have increased since 2019-2021. The Ministry of Agriculture (2019) stated that currently there is a change in the tendency of Indonesian people's behavior to maintain body health by using natural and traditional ingredients or "Back to Nature". However, studies on self-medication using natural ingredients in various regions of Indonesia are not yet comprehensive.

## Natural Ingredients Used by Indonesian

### Turmeric

Turmeric (*Curcuma longa*) is a natural ingredient that most often appears in the use of self-medication with traditional medicine. Turmeric is a traditional medicinal plant that has been used since ancient times to cure various diseases. *Curcuma longa* is a plant that grows to a height of 60 cm to 90 cm. Turmeric has very large, frilled leaves up to 1.2 m or more including leaf stalks that resemble blades, are oval and taper towards the base (Ansari et al, 2020).

The main content of turmeric is curcuminoid which was further researched by Srinivasan (1953) who mentioned three curcuminoid compounds as the main content of turmeric, namely the compound 1,7-bis(4-hydroxy-3-methoxyphenyl)-1,6-heptadiene-3,6-dione referred to as curcumin (1) which plays a role in many biological activities, then its derivative compound 1-(4-hydroxy-3-methoxyphenyl)-7-(4-hydroxyphenyl)-1,6-heptadiene-3,5-dione or demethoxy curcumin (2) and 1,7-bis(4-hydroxyphenyl)-1,6-heptadiene-3,5-dione or bisdemethoxy curcumin (3). Other studies have also found other derivatives of curcumin in *Curcuma longa*. Apart from curcuminoids, according to Ardhani (2020), turmeric is also known to contain around 5% essential oil consisting of sesquiterpenes (zingiberene 25%), sesquiterpene alcohol, ketones and monoterpenes. Turmeric rhizomes also contain about 1% free arabinose, fructose (12%), and glucose (2%).

Simanjuntak (2015) summarizes the pharmacological potential of turmeric, namely anti-inflammatory, antioxidant, antiprotozoal, nematocidal, antibacterial, antivenom, anti-HIV, antitumor, hepatoprotective activity, and protective properties for the stomach. (Ardhani, 2020) added that turmeric also has anti-diabetic, anti-allergic, anti-dematophytic and anti-drug resistant activities. (Ahmad et al., 2020) stated that the neuroprotective activity of turmeric can prevent Alzheimer's disease. Curcumin can also be used to reduce oxidative injury and amyloid in pathological pathways related to Alzheimer's.

Curcumin has a long-standing safety record. For example, according to the JECFA (The Joint United Nations and World Health Organization Expert Committee on Food Additives) and EFSA (European Food Safety Authority) reports, the Allowable Daily Intake (ADI) value of curcumin is 0-3 mg/kg body weight. Several trials in healthy subjects have supported the safety and efficacy of curcumin. Despite its guaranteed safety, some negative side effects have been reported. Seven subjects who received 500-12,000 mg in a dose-

response study and were followed for 72 hours experienced diarrhea, headache, rash, and yellow stools. In another study, some subjects who received 0.45 to 3.6 g/day of curcumin for one to four months reported nausea and diarrhea as well as increased serum alkaline phosphatase and lactate dehydrogenase levels (Hewlings & Kalman, 2017). It was concluded that the no observed adverse effect level (NOAEL) for reproductive toxicity of curcumin, administered for two consecutive generations in the diet of mice in this study was 847 and 959 mg/kg body weight (bw) per day for male mice and 1043 and 1076 mg/kg bw for females in the F0 and F1 generations respectively (European Medicines Agency, 2018).

Based on the Original Indonesian Herbal Medicine Formulary and WHO, consumption of turmeric, especially high doses, is contraindicated in sufferers of bile duct obstruction, cholecystitis, hypersensitivity, acute kidney failure, children < 12 years (Ministry of Health of the Republic of Indonesia, 2016; World Health Organization et al., 2006). For gallstones, consultation to a doctor is recommended. In addition, curcumin is known to increase the activity of anticoagulant, antiplatelet, heparin, and thrombolytic drugs, thereby increasing the risk of bleeding. Interaction of curcumin with other herbs: Healthy people were given 2 g of curcumin combined with 20 mg of piperine, and the bioavailability of curcumin increased 20 times. Green tea increases the effects of curcumin (Indonesian Ministry of Health, 2016).

### Ginger

The second most common type of natural ingredient is ginger (*Zingiber officinale*). (Dhanik et al., 2017) stated that Indonesia is one of the 10 largest ginger producing countries in the world. Ginger is part of the Zingiberaceae family which is known as a medicinal plant in Ayurvedic, Siddha, traditional Chinese medicine, Arabic, African, Caribbean and other countries. Ginger is a perennial aromatic rhizome herb that can reach a height of up to 90 cm in cultivation. The ginger rhizome is aromatic and has thick, pale yellowish lobes with alternate narrow oval lanceolate leaves with a dark green color and slender tips. (Mukti & Sari, 2020).

Ginger contains essential oils, phenolic compounds, flavonoids, carbohydrates, proteins, alkaloids, glycosides, saponins, steroids, terpenoids and tannins as the largest phytochemical components. The aroma and taste of ginger come from essential oil vapors consisting of sesquiterpene hydrocarbons, monoterpene hydrocarbons and oxygenated monoterpenes. Most essential oils consist of the monoterpene and

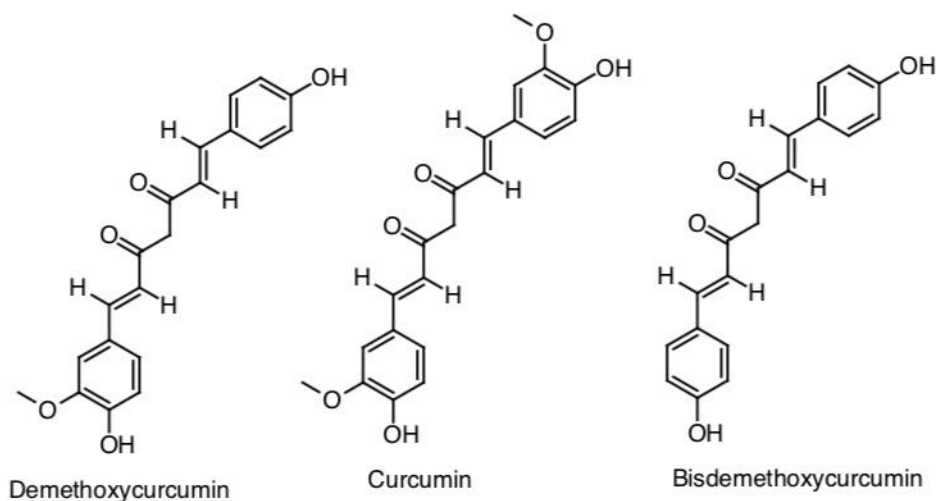


Figure 6. Major bioactive in turmeric

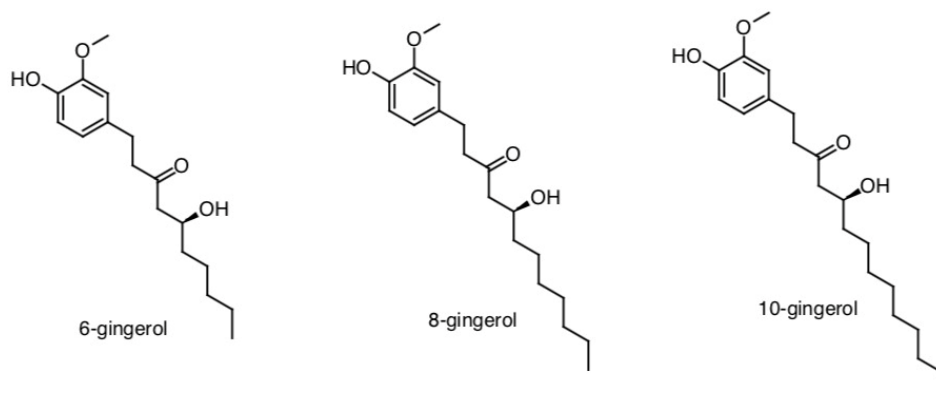


Figure 7. Major bioactive in ginger

sesquiterpenes; camphene,  $\beta$ -phellandrene, curcumene, cineole, geranyl acetate, terphineol, terpene, borneol, geraniol, limonene,  $\beta$ -elemene, zingiberol, linalool,  $\alpha$ -zingiberene,  $\beta$ -sesquiphellandrene,  $\beta$ -bisabolene, zingiberenol and  $\alpha$ -farnesene. Zingiberol is the main aroma affecting the aroma of ginger rhizome. Ginger has been studied to have several pharmacological activities such as antioxidant activity, antimicrobial, antidiabetic, anti-cancer, anti-inflammatory, analgesic activity, antipyretic, immunomodulatory, anti-atherosclerotic, anti-obesity, renoprotective, anti-platelet aggregation activity, anti-angiogenic, hepatoprotective, larvicidal, anti-emetic, neuroprotective, anthelmintic, gastroprotective, and cardiovascular activity (Dhanik et al., 2017).

A study by Anh et al. (2020) mentions several safety concerns for consuming ginger because of its side effects. The results obtained were that 17 studies presented information about the side effects of ginger, most of which were considered not too dangerous for the participants.

These side effects include gastrointestinal symptoms such as stomach ulcers, common in gastroesophageal reflux, reported in sixteen studies. Five studies noted nausea as a side effect, which was the main focus of evaluating ginger's clinical effects. Diarrhea was reported in two studies in groups of patients with heavy menstrual bleeding and after elective caesarean section. Other GI symptoms include abdominal pain, bloating, gas, and epigastric pressure. Side effects also involve cardiovascular and respiratory symptoms in patients undergoing laparoscopic surgery.

The results of the cosmetic ingredient evaluation included ginger toxicity data and reported no side effects recorded in several oral toxicity tests on *Zingiber officinale* (ginger) extract carried out on mice up to 5000 mg/kg. Similarly, no adverse effects were reported in acute oral toxicity tests involving Sprague-Dawley rats receiving up to 5000 mg/kg of *Zingiber officinale* (ginger) rhizome powder. Reversible gastric irritation was observed in an acute oral toxicity test conducted on



Syrian golden hamsters treated with *Zingiber officinale* (ginger) root powder. No other toxic effects were observed. However, in extract form, the stated NOAEL is 500 mg/kg/day (Cosmetic Ingredient Review, 2021).

When administered orally to mice, 6-gingerol is easily conjugated in the intestinal and liver epithelium to (S)-[6]-gingerol-4'-O- $\beta$ -glucuronide, and excreted via bile. Six minor metabolites (vanillic acid, ferulic acid, (S)-(+)-hydroxy-6-oxo-8-(4-hydroxy-3-methoxyphenyl), octanoic acid, 4-(4-hydroxy-3-methoxyphenyl)butanoic acid, 9-hydroxy[6]-gingerol) has also been detected in urine. Zick et al., (2008) examined the main strong-smelling constituents of ginger, 6-, 8-, 10-gingerol and 6-shogaol, which were rapidly absorbed and detected in serum as glucuronide and sulfate conjugates with the majority detected as glucuronide metabolites. These constituents at concentrations normally found in ginger (0.5 to 2.5%) can be detected in serum starting from a dose of 1.0 g with the exception of 6-gingerol which can be detected at a dose of 250 mg with a maximum concentration ranging from 0.1 up to 1.7  $\mu\text{g}/\text{mL}$ . In this experiment, no serious side effects were reported after consuming up to 2.0 g of standardized ginger extract. All reported toxicities were mild and corresponded to Grade 1 on the NCI general toxicity scale. Consistent with previous clinical studies, most of the side effects that appeared were temporary digestive disorders such as gas and bloating. Although this experiment was small in scale and did not allow for formal safety endpoint analysis and statistical certainty regarding safety, the safety profile observed here is consistent with previous clinical and preclinical data.

#### *Jamu Gendong*

After turmeric and ginger, *Jamu Gendong* is the most widely used natural product. *Jamu gendong* is included in the category of natural ingredients as it is generally prepared from natural ingredients. The types of *jamu gendong* are *Beras Kencur* (rice and galangal), *Sinom* (tamarind and turmeric), *Cabe Puyang* (herbal chili and lempuyang), *Kudu Laos* (noni and laos/galangal), *Kunyit Asam* (turmeric and tamarind), *Kunci sirih* (*temu kunci* and *suruh*) and *Pahitan* (*sampiloto* and *brotowali*). Apart from this herbal medicine, there are 3 other types of *jamu gendong* that are still consumed by the general public, namely *Uyupuyup/Gejahan/Gepyokan*, *Temulawak*, and *Sari Rapet*. Generally, the natural ingredient content of *Jamu Gendong* is represented by the natural ingredients mentioned (Wulandari & Azrianingsih, 2014). Several other plants such as

betel leaves, bay leaves, guava leaves, kencur, ginger, and lemongrass are also widely used in various regions in Indonesia, while only a few regional respondents use them on a small scale.

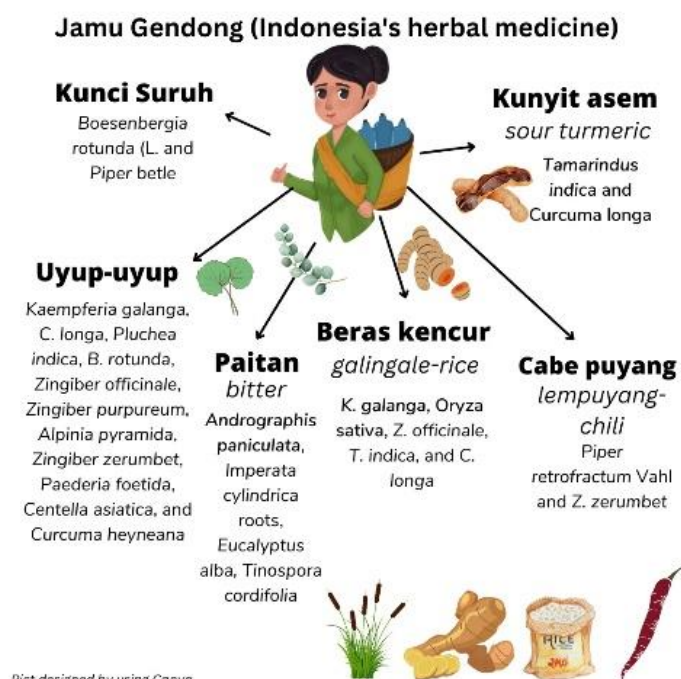
The use of turmeric, ginger, betel leaves, bay leaves, kencur, and natural ingredients in many areas/regions can be caused by information spread about these natural ingredients both from inheritance (hereditary), media (TV and social media), or other more than information about some of the less used natural ingredients such as aloe vera. Apart from that, *Jamu Gendong* also contains these natural ingredients, thus increasing the level of familiarity or familiarity of the public with them as herbal medicine ingredients. Judging from demographic factors and plant characteristics, the majority of natural ingredients are used because they are easy to obtain as spices/kitchen ingredients, easy to breed/plant, and affordable compared to other types of natural ingredients that do not grow in all places such as mangosteen, soursop and cat's whiskers.

The use of natural ingredients in self-medication by society still varies, either as a complement or as a monotherapy. Based on study conducted by Yaka (2022), there has been a change in the pattern of intensity of the use of natural ingredients or traditional medicine for self-medication before and during the Covid-19 pandemic, namely from 41% to 55% in terms of people who frequently consume traditional medicine. The high rate of use of natural ingredients as self-medication should be researched more widely so that there are guidelines or guidance structurally disseminated to the public regarding the consumption of herbal/traditional medicines as self-medication, both monotherapy and complementary therapy, so that natural ingredients can play a maximum role in public health promotion efforts.

Puspita (2019) quotes several things that need to be considered when using traditional medicine, namely the right choice of ingredients, the right dose, the right time of use, the right way of use, the right review of information, no misuse, and the right choice of medicine for certain indications. Unfortunately, scientific data regarding safety, toxicity or safe limits for the consumption of *Jamu Gendong* has not been found because so far the use of *Jamu Gendong* remains empirical and there has been no comprehensive research on *Jamu Gendong* in Indonesia.

#### Betel Leaves

*Piper betle* L., or known as betel, belongs to the Piperaceae family and has been widely used in Indonesia or even on the Asian continent. There is



**Figure 8. Jamu gendong and its content**

a habitual practice of chewing betel leaves in many countries which is believed to be beneficial for avoiding bad breath, strengthening gums, protecting teeth, and stimulating the digestive system (Nayaka et al., 2021). The part of the plant most often used is the leaves. Preliminary photochemical studies of aqueous and methanol extracts of betel leaves revealed the presence of alkaloids, flavonoids, tannins, sterols, phenols, glycosides, saponins and terpenoids (Biswas et al., 2022). Azahar et al., (2020) stated that the main bioactive components of betel are chavibetol, eugenol, hydroxychavicol, quercetin, and tannic acid.

Among the best known pharmacological activities of betel are its antimicrobial and antifungal effects (Azahar et al., 2020; Biswas et al., 2022). However, in a review combining several preclinical and clinical studies, other activities of betel leaf have been mentioned, namely as antioxidant, antidiabetic, anti-inflammatory, antidepressant, anti-anxiety, anti-stress, nootropic effects, antiasthmatic, cardioprotective, antifertility, and others (Biswas et al., 2022; Shah et al., 2016).

Nayaka et al. (2021) evaluated the safety of betel leaves and found that acute toxicity studies in male and female ICR rats demonstrated the safety of methanol extract of betel leaves orally. The LD<sub>50</sub> of the extract is higher than 5000 mg/kg body weight. There was also an evaluation of acute and sub-acute oral toxicity (28 days) and genotoxicity

of herbal formulations containing alcoholic betel leaf extract in mice and cellular models. This study revealed no major side effects. In addition, betel leaves are considered safe in terms of hematotoxicity, hepatotoxicity, genotoxicity, organ weight, gross morphology, stress, or aversive behavior in mice. Another study found nontoxicity of ethanol extract of betel leaves on normal human dermal fibroblasts (HDFn).

#### Bay leaf

*Syzygium polyanthum* (Wight) walp. var. *Polyanthum* belongs to the Myrtaceae family which is geographically distributed in Myanmar, Indo-China, Thailand, Malaysia, and Indonesia. *S. polyanthum* is traditionally used as a medicine for various diseases such as diarrhea, ulcers, hypertension, hypercholesterolemia, cataracts, diabetes mellitus, and skin diseases (Harun et al., 2021). It is known that every 100 mg of dry powder of *S. polyanthum* leaves contains 1.24 mg riboflavin (Vitamin B2), 0.58 mg niacin (Vitamin B3), and 0.40 mg ascorbic acid (Vitamin C), with a total vitamin content of 2.22 mg (Ismail & Wan Ahmad, 2019).

Apart from nutritional content, according to research, bay leaves contain various bioactive compounds such as caffeic acid, gallic acid, other phenolic compounds, terpenes, and fatty acids (Ismail & Wan Ahmad, 2019). Uddin et al., (2022) reviewed several ingredients in the genus *Syzygium* and mentioned several flavonoid

contents from bay leaf extract, including water extract containing 9-octadecenoic and eicosanoic acid, hexane extract containing squalene; phytol;  $\alpha$ -pinene; and  $\alpha$ -tocopherol, ethyl acetate extract containing squalene; phytol;  $\beta$ -sitosterol, and methanol extracts containing squalene;  $\beta$ -sitosterol; pyrogallol; phytol.

Ramli et al. (2020) examined the level of toxicity of *S. polyanthum* determined using the shrimp lethality assay. As a result, the antimicrobial activity of *S. polyanthum* extract was not affected by differences in pH and temperature, while toxicity studies showed that *S. polyanthum* extract was not toxic to *Artemia salina* with an  $LC_{50}$  of 75.85 mg/mL. This shows the safety of bay leaf extract and its potential as a natural preservative. Sumiwi et al., (2019) tested the toxicity of ethanol extract of bay leaves up to a dose of 1000 mg/kg in mice and found that *S. polyanthum* extract did not show toxicity on body weight, hematology, creatinine, and serum glutamic pyruvic transaminase (SGPT), but fatty liver and necrosis were observed in female mice. Harun et al., (2021) researched that oral administration of methanol extract of *Syzygium polyanthum* leaves (MESP), especially the high dose group (1000 and 2000 mg/kg/day) showed an increase in aspartate aminotransferase (AST) levels and damage to the liver histoarchitecture of male animals. All female mice treated with MESP had no definite toxicological effects and it was concluded that MESP leaves may show varying effects by sex. Djamiludin et al. (2021) also examined the toxicity of bay leaves in mice and found that the results showed that bay leaves did not cause the death of mice, changes in behavior, changes in body weight, and changes in organ indexes in mice and concluded that bay leaves were in the category of practically not toxic. However, according to them, dosage must still be considered during usage as according to their results, all female treatment groups affected the lungs.

### Research Limitations

Based on the research results obtained, there are still many limitations in this study, including the limited number of studies obtained, and the fact that many data were not large or complete. It is possible that the number of Covid-related studies was very limited due to the availability or the preference for chemical self-medication. In addition, this study was only conducted qualitatively, so quantitative studies could be carried out to discover Indonesia's natural potential. Also, the natural ingredients were mentioned in most studies using Indonesian or local languages so there could be a possibility of

different variety with the same species which need more validation. Explorations related to this study can still be developed further.

### CONCLUSION

Of the 2,214 papers obtained from the Google Scholar data bank in 2019-2022 by including inclusion and exclusion criteria, 45 articles/scientific papers met the description/profile criteria for the use of natural ingredients in self-medication using traditional medicine. The central region of Java (D.I.Y Yogyakarta and Central Java) is the region with the largest number of articles. The uniqueness of Indonesian way of self-medication by using different natural ingredients to treat the same disease could be caused by the geographical, beliefs, or knowledge within different regions. Some of the natural ingredients consumed in unison for some disease are, like guajava for diarrhea, most leaves or turmeric, ginger, and temulawak as frequently mentioned. It is possible that the number of Covid-related studies was very limited due to the availability or the preference for chemical self-medication.

### CONFLICT OF INTEREST

The authors declare that there is no conflict of interest in this study.

### GLOSSARY

TOGA : Family Medicinal Plants (TOGA) are nutritious plants planted in the yard managed by the family. Planted to meet the family's need for traditional medicines that can be made by yourself. Self-medication: the selection and use of modern, herbal or traditional medicine by an individual to treat disease or symptoms of disease without consulting a doctor.

NOAEL: No-observed-adverse-effect-level, the largest concentration or amount of a substance that does not cause detectable side effects in the exposed population.

ADI: Acceptable daily intake, the maximum amount of a substance in milligrams per kilogram of body weight that can be consumed every day throughout life without causing adverse effects on health.

$LD_{50}$ : the amount of a chemical required to kill 50% of a given test population

Jamu: Jamu is a term referring to traditional Indonesian medicine and could refer to the first of Indonesia's herbs category with Standardized Herbal Medicine (2<sup>nd</sup> category) and Phytopharmaceuticals (3<sup>rd</sup> category)

Jamu gendong : traditional medicinal ingredients in liquid form that are made fresh to be sold directly to consumers.

Standardized Herbal Medicines (*Obat Herbal Terstandar*): Indonesian's label of natural medicinal preparations whose safety and efficacy have been scientifically proven using preclinical tests and whose raw materials have been standardized.

Phytopharmaceuticals (Fitofarmaka): Indonesian's label of natural medicinal preparations whose safety and efficacy have been scientifically proven through pre-clinical and clinical trials, raw materials and finished products have been standardized.

URI's: Upper respiratory tract infection (upper respiratory tract infection) is an acute respiratory infection caused by viruses or bacteria

Tapel: one of Jamu's products which is a solid preparation of traditional medicine, made from *Simplicia* powder and/or extract and used as an external medicine for use in the stomach.

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