

## Antioxidant Activity Test of Purified Extract of Gedong Mangga Leaves (*Mangifera Indica* L. Var)

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### ABSTRACT

People have believed in the efficacy of herbal medicine for generations. People use herbs as treatment therapy and maintain the health of the body. Some herbs mix medicinal chemical materials illegally. The addition of medicinal chemicals to herbal medicine has an impact on public perception. This research is a descriptive observational study using a questionnaire instrument containing respondents' sociodemographic data and ten statements to measure public perception about using herbs. The public perception profile was measured in three aspects, there were efficacy aspect, accessibility aspect and safety aspect. Data was taken by using purposive sampling. This research uses 320 respondents as the sample who belong to the inclusion criteria. Characteristics of respondents who filled out the questionnaire are 36-45 years old (35%), high school educated (43,8%), female (63,4%), and have a job (66,5%). The highest aspect that had a high percentage was the efficacy aspect, and the lowest was the safety aspect (28,46%). The result indicates the public perception of herbs used in Rowobelang Village is in the Food perception category (72,5%).

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## **INTRODUCTION**

The World Health Organization reports that 80% of the global population uses herbal medicine. Out of 194 countries worldwide, 179 still utilize traditional medicine (WHO, 2022). Jamu, a category of traditional medicine, is believed to have hereditary benefits and is most commonly consumed in developing countries. Indonesia is a country where the population has a strong connection with the use of traditional medicine. Approximately 49.5% of the population still uses jamu, and 4.5% of them consume it daily (Sembiring et al., 2015). In Indonesia, 61.3% of the population regularly consumes traditional medicine, and more than 50% maintain their immune system through jamu consumption. The most commonly consumed form of jamu is in liquid form (55.3%) (Andriati and Wahyudi, 2016). In 2018, survey results showed that ready-to-use traditional medicine was the most preferred form, at 48%, compared to self-made concoctions at 31.8% and the utilization of Traditional Health Services (YANKESTRAD) at 31.4% (Balitbangkes, 2018).

The development of jamu contributes to the national economy through the growth of the traditional medicine industry, making it a prioritized sector. There are 1,247 registered jamu industries with the Ministry of Industry, consisting of 129 Traditional Medicine Industries (IOT), Medium Traditional Medicine Enterprises (UMOT), and Small Traditional Medicine Enterprises (UKOT) (Ministry of Industry RI, 2018). As of June 2022, there were more than 12,000 types of jamu, 86 types of Standardized Herbal Medicines (OHT), and 24 types of Phytopharmaca in Indonesia (BKPK, 2022). Despite government support for jamu use, there are still violations in the jamu manufacturing process (BPOM, 2022).

In 2020, 1 out of 3 antidiabetic jamu samples was found to contain illegal chemical substances (BKO), such as glibenclamide (Mulkin et al., 2020). Between October 2021 and August 2022, 41 types of traditional medicines containing BKO were identified. The most common BKOs found were sildenafil citrate, dexamethasone, phenylbutazone, paracetamol, ephedrine, and pseudoephedrine HCl (BPOM, 2022). The presence of BKO in jamu mixtures can pose health risks if used long-term. Health issues arising from BKOs in traditional medicines include gastric ulcers, kidney failure, and liver disorders (Ministry of Health RI, 2015).

Such misuse can influence public perceptions of the efficacy and safety of jamu. Perception is a response or conclusion resulting from the process of understanding stimuli received by an individual (Rahma, 2018). Research on public perception in Simpang Baru Village, Tampan District, Pekanbaru City, regarding the use of traditional medicine showed that 87.8% of the population believes traditional medicine is safe (halal) to use, and 85.3% trust its indications due to long-standing traditional beliefs (Dewi et al., 2019). Another study indicated that traditional medicine is believed to have potential as a treatment method (Handayani et al., 2019). Supporting research also states that the public has a positive response to the potential of jamu in boosting immunity (50% of respondents) (Mahawikan et al., 2022).

Rowobelang Village is located in the Batang District, Batang Regency, Central Java. The area of Rowobelang Village covers approximately 203,060 hectares. Based on preliminary studies, the population aged 17-65 years in Rowobelang Village is 1,519 people. The village does not have healthcare facilities such as pharmacies, leading the community to tend to use jamu for self-medication. Initial interviews conducted during the early stages of the study revealed that the residents of Rowobelang Village use jamu in simple homemade decoctions and ready-to-use forms. Ready-to-use jamu is obtained from grocery stores, herbal shops, and direct sales through Multi-Level Marketing. Since no prior research has been conducted on public perceptions regarding the use of jamu in Rowobelang Village, it is essential to study the community's perceptions of jamu usage in this area.

## **THEORETICAL REVIEW**

Gedong mangga (*Mangifera indica* L. var) leaves have been widely studied for their potential antioxidant properties due to their rich phytochemical content, including flavonoids, phenolics, and tannins. Antioxidants play a crucial role in neutralizing free radicals, which can cause oxidative stress leading to various chronic diseases such as cancer, cardiovascular disorders, and neurodegenerative conditions. Several studies have highlighted that the purification of plant extracts enhances their antioxidant activity by increasing the concentration of bioactive compounds. Various methods, such as DPPH (2,2-diphenyl-1-picrylhydrazyl) and FRAP (Ferric Reducing Antioxidant Power) assays, are commonly used to evaluate antioxidant potential, providing insights into the effectiveness of natural antioxidants. The antioxidant activity of Gedong mangga leaves suggests their potential use in pharmaceuticals, nutraceuticals, and functional foods, reinforcing the importance of further research into their bioactive properties and applications.

## **METHODOLOGY**

This research is a descriptive observational study using a purposive sampling method based on inclusion criteria. Respondents who meet the inclusion criteria are individuals aged 17-65 years, able to read and write, willing to fill out an informed consent form, and not employed as healthcare workers. The measurement of respondents' perception was conducted using a questionnaire as the research instrument. The questionnaire contains questions about respondents' demographic data and 10 statements related to perceptions of herbal medicine usage.

There are three aspects covered in the questionnaire: efficacy, safety, and accessibility. Before being distributed to respondents, the questionnaire underwent validity and reliability testing using Pearson Product Moment and Cronbach's Alpha techniques. The number of respondents was determined using Slovin's formula. Based on the preliminary study, the number of people who met the criteria was 1,519, resulting in a minimum sample size of 317 respondents.

The data obtained from respondents' answers were scored using a Likert Scale (Sugiyono, 2012). Each question had four (4) response options: Strongly Agree (SA), Agree (A), Disagree (D), and Strongly Disagree (SD). The scoring ranged from 1 for SD responses to 4 for SA responses. The collected data were analyzed both qualitatively and quantitatively according to respondents' answers and converted into percentages to describe public perceptions. Public perceptions were categorized as poor (25–40%), fair (41–60%), good (61–80%), and excellent (81–100%)

## RESULTS

The results of the study testing the validity of the questionnaire show that the value of  $r$  table is smaller than  $r$  count, which is  $> 0.361$ , while the reliability test shows the Cronbach Alpha value of 0.859. This value means that the questionnaire to be used is valid and reliable. Questionnaires that have passed the validity and reliability tests are used in research.

The results showed that of the 355 questionnaires distributed, 25 respondents refused to fill out the questionnaire and 10 questionnaires were not filled in completely, so that the total sample used was 320 respondents. The study shows results about the demographics of respondents and the description of respondents' perceptions. Respondent demographics are divided based on gender, age, education history, and work history. The characteristics of respondents who have filled out the questionnaire can be seen in table 1.

Table 1. Demographics of Respondents in Rowobelang Village

No	Variable	n	%
1	Gender		
	Man	117	36,6
	Woman	203	63,4
2	Age		
	17 - 25	32	10,0
	26 - 35	102	31,9
	36 - 45	112	35,0
	46 - 55	52	16,3
	56 - 65	22	6,9
3	Education		
	SD - SMP	119	37,2
	SMA	140	43,8
	PT	61	19,1
4	Work		
	Working	213	66,5
	Not working	107	33,5

n=total of respondent

The results of the questionnaire also showed the community's perception of the use of herbal medicine in Rowobelang Village. The resulting perceptions include three aspects, namely efficacy, accessibility, and safety (table 2).

Table 2. Overview of Respondents' Perceptions in Rowobelang Village on Each Aspect of Herbal Medicine Use

No	Aspects measured	Score	Total	%
1	Efficacy			
	Herbs can be used to increase endurance	1065		
	Herbs can be used to treat hypertension, sugar, hemorrhoids, or other severe diseases	827		
	Jamu can be used to treat minor diseases, such as coughs, diarrhea, ulcers, dizziness	862	3608	39,00
	Herbs are more efficacious than chemical drugs	854		
2	Accessibility			
	Herbs are easy to obtain compared to chemical drugs	967		
	Herbs have a more affordable price than chemical drugs	1009	3011	32,54
	Jamu is easy to make at home independently	1035		
3	Safety			
	Safer than chemical drugs	1073		
	Herbs are safe for consumption by pregnant women	865	2633	28,46
	Jamu can cure pain in less than 60 minutes	695		
Amount			9252	100

Of the three aspects measured, Rowobelang villagers' perceptions of the use of herbal medicine were highest in the efficacy aspect (39%), and lowest in the safety aspect (28.46%). Overall, an overview of Rowobelang villagers' perceptions of the use of herbal medicine is presented in the following table:

Table 3. Categories of Rowobelang Village Community Perceptions of the Use of Herbs

Category	Amount	Percentage (%)
Not good enough	1	0,3
Good enough	35	10,9
Good	232	72,5
Very Good	52	16,3
Total	320	100

The picture of community perceptions in Rowobelang Village about the use of herbal medicine is included in the Good category. A total of 232 (72.5%) respondents had a good perception of the use of herbal medicine.

## DISCUSSION

The demographic data shows that female respondents outnumber male respondents, accounting for 63.4%. This finding aligns with research conducted in RW 014, Totosari Village, Surakarta, which also had more female respondents. Women tend to show greater willingness to participate in research. Gender differences do not affect questionnaire completion (Mahawikan et al., 2022).

The number of respondents is also categorized based on age. Age is a factor that influences a person's thinking and cognitive abilities. As age increases,

individuals acquire more information and experiences related to work. The information and experiences gained enhance one's knowledge (Merdekawati et al., 2016). The majority of respondents who completed the questionnaire were aged 36-45 years (35%). In Indonesia, traditional herbal medicine (jamu) is predominantly used by individuals aged 30-45 years (Wijaya, 2017). Besides the high usage, this age range falls within the productive age category. Productive age refers to individuals engaged in active work and possessing strong cognitive abilities (Pedro et al., 2015). Good cognitive abilities, supported by advanced technology, make it easier for people of productive age to access information from various sources. Information spreads rapidly to remote areas thanks to technological advancements, including information about the benefits of herbal plants, which influences public perception regarding the use of jamu (Perdani et al., 2021).

Education plays a key role in shaping an individual's mindset. Through education, a person gains broad knowledge, becomes more independent in thinking, and develops analytical skills (Patut, 2024). The level of education influences public perception (Pramawidya, 2019). The study results indicate that the highest number of respondents had completed secondary education (high school), with 140 respondents (43.8%). This data is consistent with the 2022 Central Statistics Agency (BPS) report, showing that the number of Indonesians who completed high school (61.73%) is higher than those who pursued higher education (20.84%).

According to Dewi et al. (2019), employment significantly influences perception. The work environment affects interactions with colleagues, providing opportunities to exchange experiences and knowledge, including traditional medicine use. The information obtained also influences public perception of traditional medicine, including jamu. In Rowobelang Village, the majority of respondents were employed (66.4%), consistent with the village's demographic profile, where many residents work as farmers and livestock breeders. Additionally, some residents run home businesses in food and clothing. According to Widodo (2017), individuals who can identify business opportunities, utilize resources, and achieve success are considered entrepreneurs.

Employment type also affects income levels or economic status. Economic status has a significant relationship with the use of traditional medicines for chronic diseases such as diabetes mellitus (Leonita et al., 2015). This aligns with the research by Andriati and Wahyudi (2016) in Surabaya, Bangkalan, and Magetan, which showed that jamu consumption was higher among low-income communities (income < Rp. 1,000,000/month) with 93 people (58%), compared to high-income groups (income > Rp. 5,000,000/month) with 27 people (17%). This indicates that jamu is more commonly consumed by low to middle-income communities.

The study on perceptions of jamu usage focused on three aspects. Respondents had the highest perception of efficacy, at 39%. According to the 2018 Basic Health Research Survey, 85% of people who use jamu acknowledge its health benefits (Balitbangkes, 2018). Over 75% of the population uses jamu to

boost their immune system and prevent illnesses (Mahawikan, 2022; Ermawati, 2022). The study also revealed that the highest perception regarding efficacy was that jamu functions as an immunostimulant, at 11.51% (Table 2).

The second-highest perception after efficacy was accessibility, at 32.54%. Accessibility measures public perception regarding the ease of obtaining jamu. The people of Rowobelang stated that jamu is preferred because it can be easily prepared at home (11.19%) using plants found in their surroundings (Merdekawati et al., 2016). Besides its availability, cost was the second most significant factor in terms of accessibility, at 10.91%. Due to its easy availability, jamu is more affordable than chemical medicines. According to Wardana et al. (2022), price influences people's decisions to consume traditional medicine. Respondents indicated that the accessibility of jamu in Rowobelang is not an issue, as it can be made at home and is considered more affordable than chemical drugs.

The last aspect measured was safety, with the lowest perception rate at 28.46% (Table 2). This aspect evaluates the safety of jamu compared to chemical medicines, its safety for pregnant women, and its onset of action. The people of Rowobelang believe that jamu is safer than chemical medicines, with 11.60% holding this view. Regarding jamu's safety for pregnant women, the perception was 9.35%. While teratogenic effects in humans have not been clinically proven, animal testing has shown that some medicinal plants used in jamu can have oxytocic effects (stimulating the uterus). Test animals experienced uterine and intestinal bleeding, slow fetal growth, and even fetal death. Therefore, the use of herbal medicines during pregnancy is not recommended (Purnamawati et al., 2012). The lowest perception was related to the onset of jamu, with only 7.51% believing it works within 60 minutes. Healing with jamu generally takes longer (Marwati and Amidi, 2018).

In recent years, the use of herbal medicines, including jamu, has increased. Besides being consumed alone, jamu is often used alongside chemical medicines. Jamu is relatively safe when used at recommended doses and durations (Pane et al., 2021). However, the presence of chemical drug additives in jamu raises safety concerns. In 2020, one in three samples of anti-diabetic jamu was found to contain glibenclamide (Mulkin et al., 2020). Agustin et al. (2021) also detected phenylbutazone in samples of jamu for muscle pain circulating in Malang. The presence of chemical drug additives in jamu can pose health risks.

This finding aligns with Dewi et al. (2019), who found that public perception in Simpang Baru Village, Pekanbaru, was generally positive. Supported by Andriati and Wahyudi (2016), jamu usage among the communities of Surabaya, Bangkalan, and Magetan was high (58%). A positive perception is one factor influencing people's behavior in consuming jamu. Perception is a psychological factor that affects consumer decisions (Marwati and Amadi, 2018).

## CONCLUSIONS AND RECOMMENDATIONS

The overview of public perception regarding the use of herbal medicine (jamu) in Rowobelang Village, Batang Regency, shows that the community has a positive perception (72.5%), with the highest percentage in the efficacy aspect (39%) and the lowest in the safety aspect (28.46%).

## FURTHER STUDY

Further study can explore the factors influencing the community's positive perception of herbal medicine (jamu), particularly in terms of its efficacy. Additionally, research can be conducted to understand the reasons behind the lower perception of safety, such as concerns about side effects, production standards, or lack of official certifications. Future studies could also compare perceptions across different age groups or educational backgrounds to identify patterns and potential gaps in public knowledge. These insights can help formulate targeted educational campaigns to improve awareness and promote the safe use of herbal medicine.

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