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Jamoetics: A Web-Based Information System for Indonesian Herbal Database

Jamoetics: Sistem Informasi Berbasis Web untuk Basis Data Herbal Indonesia

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ABSTRACT

This study aimed to develop a web-based information system for herbal plants in Indonesia. This research began with data collection, prototype making, and evaluation. This research was conducted by combining a literature review, simulation, and survey. Literature reviews were used to gather scientific information about various herbal medicines. The website was hosted on a platform-as-a-service cloud service. The web is accessible at https://www.jamoetics.com. All data from the questionnaire were analyzed using descriptive statistics. The data on this website were obtained from various sources grouped into monographs, public databases, and scientific journals. The "Jamoetics" system evaluation survey showed that 98.25% of respondents felt confident and interested in using the "Jamoetics" website because of its ease of access to information, completeness of information, and user-friendly interface. Jamoetics, a web-based information system, can help communities easily access information about herbal plants in Indonesia.

ABSTRAK

Penelitian ini bertujuan untuk mengembangkan sistem informasi berbasis situs web untuk tanaman herbal di Indonesia. Penelitian ini diawali dengan pengumpulan data, pembuatan prototipe, dan evaluasi. Penelitian ini dilakukan dengan menggabungkan tinjauan pustaka, simulasi, dan survei. Tinjauan pustaka digunakan untuk mengumpulkan informasi ilmiah tentang berbagai obat herbal. Web dihosting di layanan cloud Platform as a Service (PaaS). Web dapat diakses di https://www.jamoetics.com. Semua data dari kuesioner dianalisis menggunakan statistik deskriptif. Data di situs web ini diperoleh dari berbagai sumber yang dikelompokkan ke dalam monografi, basis data publik, dan jurnal ilmiah. Survei evaluasi sistem "Jamoetics" menunjukkan bahwa 98,25% responden merasa yakin dan tertarik menggunakan situs web "Jamoetics" karena kemudahan akses informasi, kelengkapan informasi, dan antarmuka situs web Jamoetics. Jamoetics, sebuah sistem informasi berbasis situs web, dapat membantu masyarakat mengakses informasi tentang tanaman herbal di Indonesia dengan mudah.

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1. INTRODUCTION

Indonesia, a tropical country with high biodiversity of spices, herbal supplements, and medicinal plants, has vast forest areas that serve as a primary source for these potential medicinal plants (Rahmat et al., 2021). According to forestry statistics, these forests include 27.4 million ha of conservation areas, 29.6 million ha of protected forests, 26.8 million ha of limited-production forests, 29.2 million ha of permanent-production forests, and 13.1 million ha of conversion-production forests (Nugroho, 2017).

The use of traditional medicine in Indonesia, which has existed for millennia and predates the discovery of modern pharmaceuticals, represents a vital part of the nation's cultural heritage (Putri et al., 2014). In Indonesia, during the coronavirus disease-19 (COVID-19) pandemic, the chemical, pharmaceutical, and traditional medicine industries (Harfiani et al., 2025; Nugraha et al., 2022). It became the third highest positive contributor to the processing industry in 2016–2020 (Central Bureau of Statistics, 2021a). Increased domestic demand is expected to drive the rapid expansion of the chemical, pharmaceutical, and traditional medicine industries during the pandemic, especially regarding the demand for drugs and medical devices (Central Bureau of Statistics, 2021b).

According to recent estimates, the turnover of traditional medicines in the global market currently stands at approximately 138.350 billion US dollars. These products comprise approximately 55% of the total herbal medicines, with the remaining 45% consisting of herbal functional foods, herbal dietary supplements, and herbal beauty products. Product market turnover is anticipated to reach approximately 218.940 billion US dollars by 2026, with an estimated annual growth rate of 6.7 %. This projection covers the next five years (Pratama, 2020).

To harness this potential and safeguard traditional knowledge, structured digital repositories are essential (Shahrezaei et al., 2025). The development of herbal databases serves critical functions: preserving ethnobotanical heritage, supporting scientific research, and informing safe public use. In Indonesia, initiatives such as IJAH Analytics provide valuable scientific data on medicinal plants. Internationally, resources such as the KNApSAcK family databases offer comprehensive phytochemical information. However, many existing systems are designed primarily for academic or research audiences, focusing on botanical or chemical data without integrating practical, consumer-oriented information, such as details on commercially available products or educational articles tailored for the general public (Afendi et al., 2012; Gao et al., 2025). This gap underscores the need for an integrated platform that consolidates authoritative scientific information from monographs and research with consumer-focused applications, thereby bridging the divide between specialized knowledge and public accessibility.

The high market for herbal medicines must be followed by herbal information because information can help people improve their knowledge about health. Therefore, this study aimed to develop a web-based information system based on scientific information for education related to herbal plants.

2. METHODS

2.1. Research Design

This work uses a design-based research strategy to create, implement, and assess a web-based herbal database for educational and informational purposes. The study was conducted in stages, including needs assessment, content curation, database and interface design, and website development. Scientific information about various herbal medicines was gathered using literature reviews. Subsequently, a simulation was conducted using an online database prototype. The prototype results were evaluated using a survey method. The detailed research design is shown in **Figure 1**.

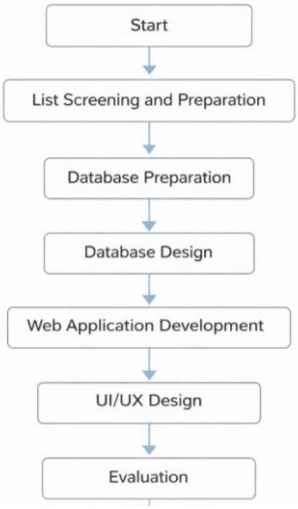

Figure 1. Flowchart of the research procedure

A cross-sectional survey design was employed, utilizing structured, self-administered questionnaires to collect primary data. This study used purposive sampling to encourage herbal therapy users to participate. At the beginning of the study, respondents were informed of the research goals and data protection. Data collection and analysis were conducted in December 2021, and Google form questionnaires were distributed using social media. The respondents in this study were 17–45-year-old consumers of herbal products with a minimum of high school education and had lived in Surabaya for at least one year, including those active internet users for at least 1–1.5 hours daily.

2.2. Data Source Identification and Screening

The foundational data for the system were compiled from authoritative sources on Indonesian medicinal plants, primarily from official books published by the government, such as the pharmacopoeia series from the Ministry of Health of the Republic of Indonesia. Sources were included if they were official monographs from national or international health bodies and peer-reviewed textbooks detailing the phytochemical or ethnopharmacological uses of Indonesian medicinal plants. The final curated list included national monographs from the Indonesian Ministry of Health and the National Agency of Drug

and Food Control (BPOM), international monographs from the World Health Organization (WHO), and textbooks, as fully listed in **Table 1**. The collected information was compiled and organized using Microsoft Excel (.XLS format) to create a master list for further processing.

2.3. Preparation Database

The data obtained from the previous process was further processed, and a MySQL file format was obtained, and a database of Indonesian agricultural products was created. An entity was obtained from this process.

2.4. Database design

When designing an online transaction processing (OLTP) system, relational database design is the most appropriate technique (CFI Team, 2021). The ER diagram was created using MySQL workbench version 6.3. Only the most significant entities and properties are displayed here for brevity. Trivial entities and attributes, such as those related to user credentials, were removed (**Figure 2**).

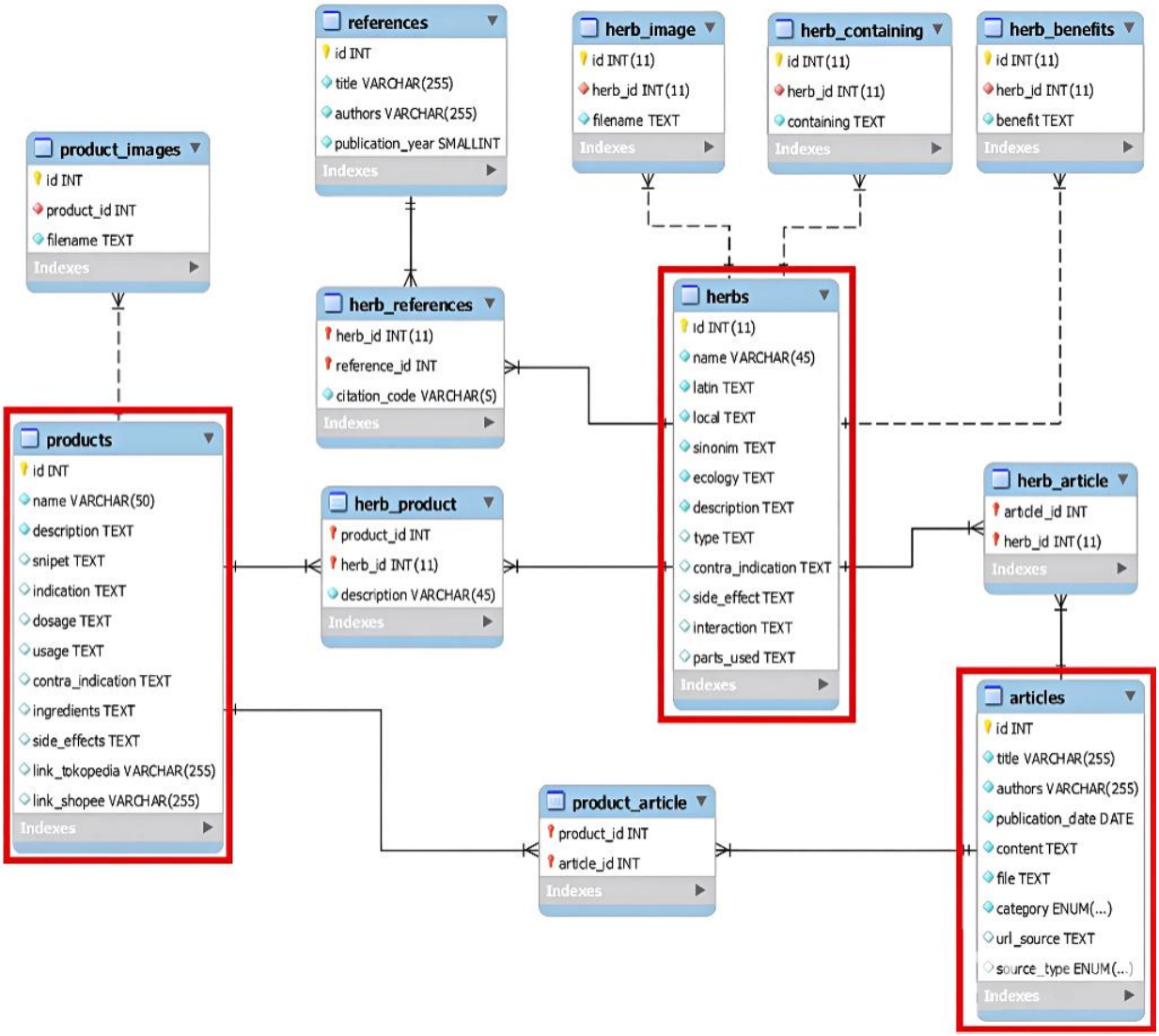

Figure 2. Database design for the web-based information system. The red rectangles represent the three core entities in the web information system.

2.5. Development of a Website-Based Information System

Based on the results of the information needs analysis, a web-based information system was developed to disseminate information on the use of Indonesian natural products for health. The system comprises two sites. The first site is designed to enable system administrators to manage data, and the second site is the front-end that is intended to display information to the general public.

The database was implemented using the latest version of MySQL (version 8.0). For web programming, the latest version of the Laravel PHP framework (version 8) was utilized. The website was hosted in a platform-as-a-service (PaaS) cloud service. The web is accessible at https://www.jamoetics.com.

2.6. User Interface and User Interaction Design (UI/UX design)

The web information system user interface is designed to focus on three core subjects: natural ingredients, products, and articles. **Figure 3** shows the front-end sitemap along with the main menu in the homepage, which reflects the three core subjects of the website.

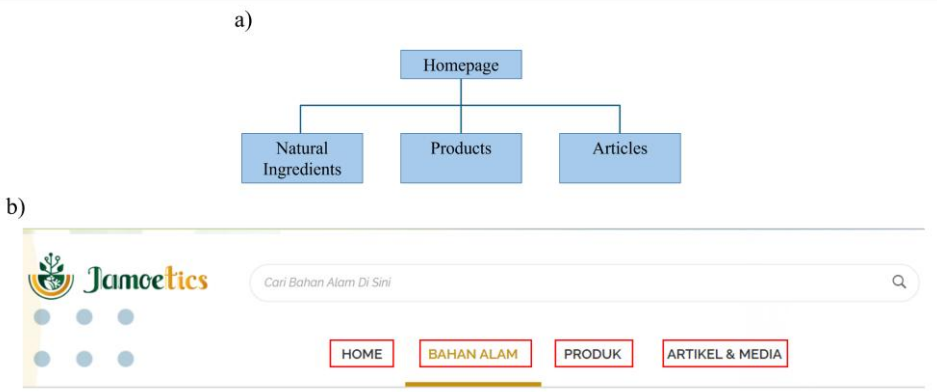

Figure 3. Front-end site map (a) and the main menu of the web-based information system; (b). The red boxes highlight the mappings between the site map and the main menu.

2.7. Evaluation of Information Systems with Survey Method

System evaluation was conducted via a cross-sectional user survey. A structured online questionnaire was developed based on adaptations of various questionnaires used in previous research. It contained nine core closed-ended items (Q1-Q9) assessing two domains: (1) perceived ease of access and use of the website, and (2) interface and display quality. The questionnaire underwent validity tests, including content, appearance, and construct validity tests. Participants were recruited through purposive sampling, targeting herbal product consumers in Surabaya, Indonesia. The eligibility criteria were as follows: age 17–45 years, minimum high school education, residence in Surabaya for over one-year, minimum employment for one year, and active mobile phone use for at least 1–2 hours per day. The questionnaire was distributed via social media platforms in October 2021.

Evaluation was conducted using a questionnaire comprising the following questions (Q):

Q1. Is the Jamoetics website easily accessible via a browser?

Q2. Can the features available on the Jamoetics website be used appropriately?

Q3. Can the “Articles and Media” menu on the Jamoetics website help increase your knowledge about herbs?

Q4. Can the chat function on the Jamoethics website be used to obtain information about health products?

Q5. Are the products on the Jamoetics website equipped with an online shop link (Tokopedia/Shopee)?

Q6. Is the color display on the Jamoetics website interesting?

Q7. Is the language on the Jamoetics website easy to understand?

Q8. Is the information displayed regarding health products on the Jamoetics website educational and easy to understand?

Q9. Are the pictures or photos of natural materials displayed on the Jamoetics website clear and identifiable?

2.8. Statistical analysis

Descriptive statistics were used to summarize the data for the entire sample and for each group of respondents identified. The answer data for each question in the questionnaire are presented as a matrix in an Excel file for further data processing to obtain clean data.

3. RESULTS AND DISCUSSION

3.1. Screening and Preparation of the List of Indonesian Natural Products

All information from numerous sources about Indonesian natural products is compiled, as shown in **Table 1**. The sources of information are national monographs issued by the Ministry of Health, Republic of Indonesia, and the National Agency of Drug and Food Control, Republic of Indonesia, as well as international monographs issued by the World Health Organization. In addition to these sources, several textbooks, public databases, and scientific journals were also used as sources of information.

3.2. Preparation of Indonesian Natural Products Database

The data extracted from various sources for Indonesian natural products were grouped into monographs, public databases, and scientific journals. The data were organized into a matrix in an Excel file (.xlsx format). The results of the initial preparation were verified to confirm the suitability of the data by providing notes or correcting data. Next, a selection of data was encoded on the integrated system website (called Jamoetics website). The data were encoded in stages and re-checked to prevent data input errors (**Figure 4**).

3.3. Database Design

The database design is based on information needs (**Figure 1**), with core entities highlighted in red rectangles: herbs, products, and articles. Other entities are attributes of either one of the core entities (e.g., herb images) or products of many-to-many relationships between core entities.

The herb entity is designed to record all herb information that is heavily demanded by the general public. This information is the core of the web information system for educating the general public on the use of Indonesian herbs to maintain health. The important attributes of an herb recorded in our system are the name (primary name, Latin name, and local name), ecology, description, indication, contraindications, side effects, interactions, and parts used.

Table 1. Numerous sources for Indonesian natural products database in Jamoetics.

No	Textbook	Year	Publisher
1	Indonesian Herbal Pharmacopoeia Edition I		
2	Indonesian Herbal Pharmacopoeia Edition II	2017	
3	Material Medika Indonesia Volume 1	1977	
4	Material Medika Indonesia Volume 2	1978	
5	Material Medika Indonesia Volume 3	1979	
6	Material Medika Indonesia Volume 4	1980	
7	Material Medika Indonesia Volume 5	1989	Ministry of Health Republic of Indonesia
8	Material Medika Indonesia Volume 6	1995	
9	Vademekum Medicinal Plants for Saintification of Herbal Medicine 1	2012	
10	Vademekum Medicinal Plants for Saintification of Herbal Medicine 2	2011	
11	Vademekum Medicinal Plants for Saintification of Herbal Medicine 3	2012	
12	Original Indonesian Herbal Medicine Formulary	2016	
13	Indonesian Traditional Medicinal Formulary	2017	
14	Herbal Volume Reference 2	2006	
15	Herbal Volume Reference 4	2008	National Agency of Drug and Food Control Republic of Indonesia
16	Herbal Volume Reference 5	2010	
17	Herbal Volume Reference 6	2011	
18	Herbal Volume Reference 7	2012	
19	WHO monographs on selected medicinal plants Volume 1	1999	
20	WHO monographs on selected medicinal plants Volume 2	2002	World Health Organization
21	WHO monographs on selected medicinal plants Volume 3	2007	
22	WHO monographs on selected medicinal plants Volume 4	2009	
23	Stockley's Herbal Medicines Interactions	2009	Pharmaceutical Press, UK
24	Medicinal Plants Heritage of Archipelago Tradition for People's Welfare	2019	Ministry of Agriculture Agricultural Research and Development Agency Republic of Indonesia

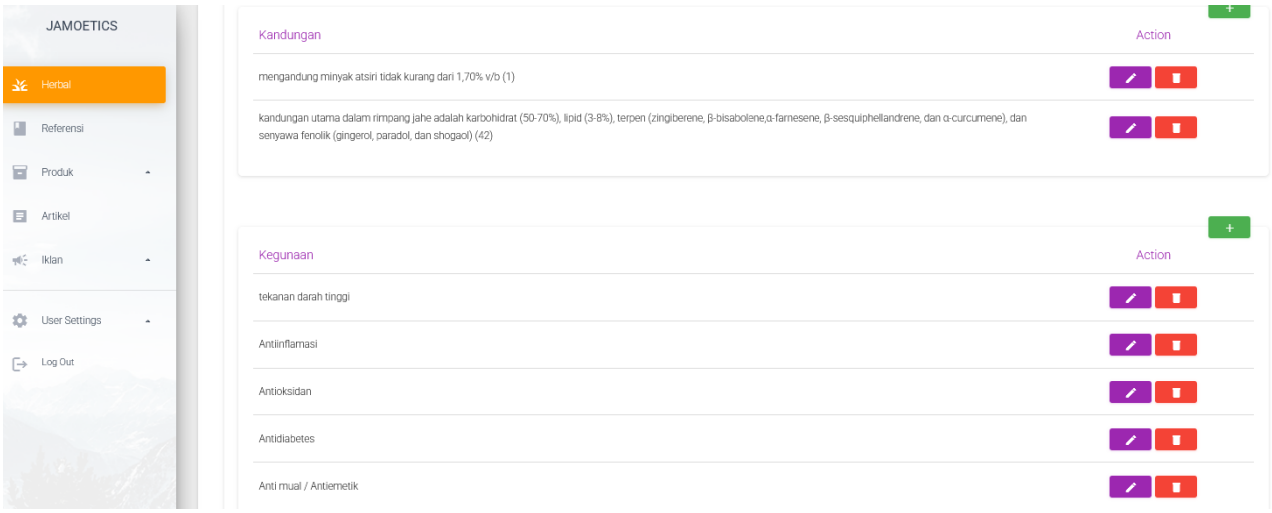

Figure 4. Display of Indonesian natural products data on the Jamoetics website.

3.4. Development of a Web-Based Information System

The application enables easier access to the web-based information system. Unlike web browsers, web applications occupy the user's entire screen (i.e., without a navigation toolbar and web browser frame). This provides better access to the web information system and user experience on mobile devices than on a web browser.

Following a thorough evaluation of the system usability, at the end of September 2021, the web became available for public at https://www.jamoetics.com. To increase our coverage and mobile user usability, the site was also registered as a progressive web application in the Google Play Store under the name Jamoetics.

3.5. User Interface and User Interaction Design (UI/UX design)

To maintain brevity, this section discusses how the creation of a system will present information on herbs to the general public. A user will interact with Jamoetics' database through the front end, called the UI. Therefore, how information is conveyed in the system's front end influences the benefits that the information system provides to the general public.

Regarding user interaction, it is critical to satisfy mobile (with small screens) and computer users (with wide screens). A progressive web application approach was used with the Bootstrap CSS framework to automatically arrange the UI elements based on the user's screen size. This approach is the most efficient way to provide satisfactory user experiences for small- and wide-screen users (Jiang et al., 2014). The system's front-end was implemented as a PWA to ensure optimal usability across both desktop and mobile devices. Figure 5 shows a visual demonstration of this responsive design, showing how the same informational content is automatically and effectively rearranged to fit both wide and small screens. This approach was critical to delivering a satisfactory user experience to the broadest possible audience.

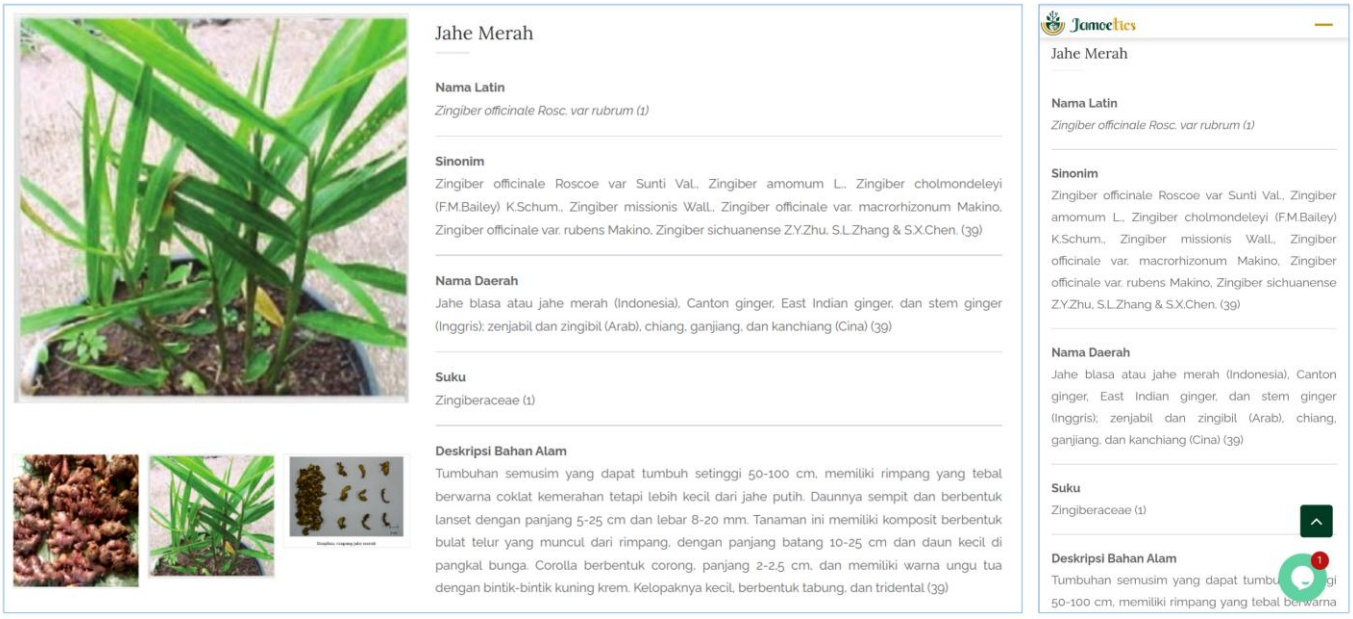

Figure 5. An excerpt of the web user interface on a wide (left) and small (right) screens

3.6. Evaluation of Information Systems with Survey Method

The "Jamoetics" system evaluation survey, an integrated herbal information platform, obtained feedback from responding customers regarding the herbal information system that had been developed. The structure of the questionnaire is divided into five sections. The first section contains a brief explanation regarding the survey conducted, the second section contains questions about the identity (profile) of the respondent, and the third section contains 13 questions regarding the ease of access to the website, completeness of information, and appearance of the "Jamoetics" website. The fourth section contains two questions related to the accuracy of the information obtained by respondents from website search results following the instructions given by the researcher, and the fifth section contains one question regarding the future use of the "Jamoetics" website. **Table 2** presents the demographic data from respondents for the "Jamoetics" system evaluation survey.

The results of the "Jamoetics" system evaluation survey show an evaluation of the ease of access to information, the completeness of the information, and the Jamoetics website's interface (**Figure 5**). The survey results regarding respondents' opinions regarding using the "Jamoetics" system showed that 98.25% of respondents answered "Yes" because they felt confident and interested in using the "Jamoetics" website as a medium for searching information on herbs and herbal products.

Table 2. Sociodemographic characteristics of respondents (N = 57)

Variable	N (57)	Percentage (%)
Age		
17–25 years	6	10.53
26–35 years	31	54.39
36–45 years	20	35.09
Gender		
Male	17	29.82
Female	40	70.18
Educational Level		
Senior High School	30	52.63
Diploma	9	15.79
Bachelor	16	28.07
Magister	2	3.51
Doctor	0	0
Graduates or Work in the Health Sector		
Yes	20	35.09
No	37	64.91

The aggregated responses to the 12 evaluation questions (Q1-Q9) are presented in **Figure 6**. This visualization summarizes the overall positive user feedback, showing a high consensus across all three evaluated parameters: ease of access to the website and its features, completeness of information, and the quality of the website interface. The results of a system evaluation survey conducted on 57 respondents showed positive feedback, wherein most respondents “strongly agreed” that the “Jamoetics” website can be accessed easily via a browser and all existing features can be used properly, a parameter for ease of access, represented by five questions. The parameter for completeness of information with three questions representing, according to respondents, " strongly agreed " (64.91%) has met the information needs of herbal products, and " no " (80.70%) there is information that has not been included on the website. Regarding the website display parameters, most respondents " strongly agreed " that the color display is quite comfortable to look at, the language used is easily understood, the information displayed is educative and easily understood and displays photos or pictures of natural materials are recognizable.

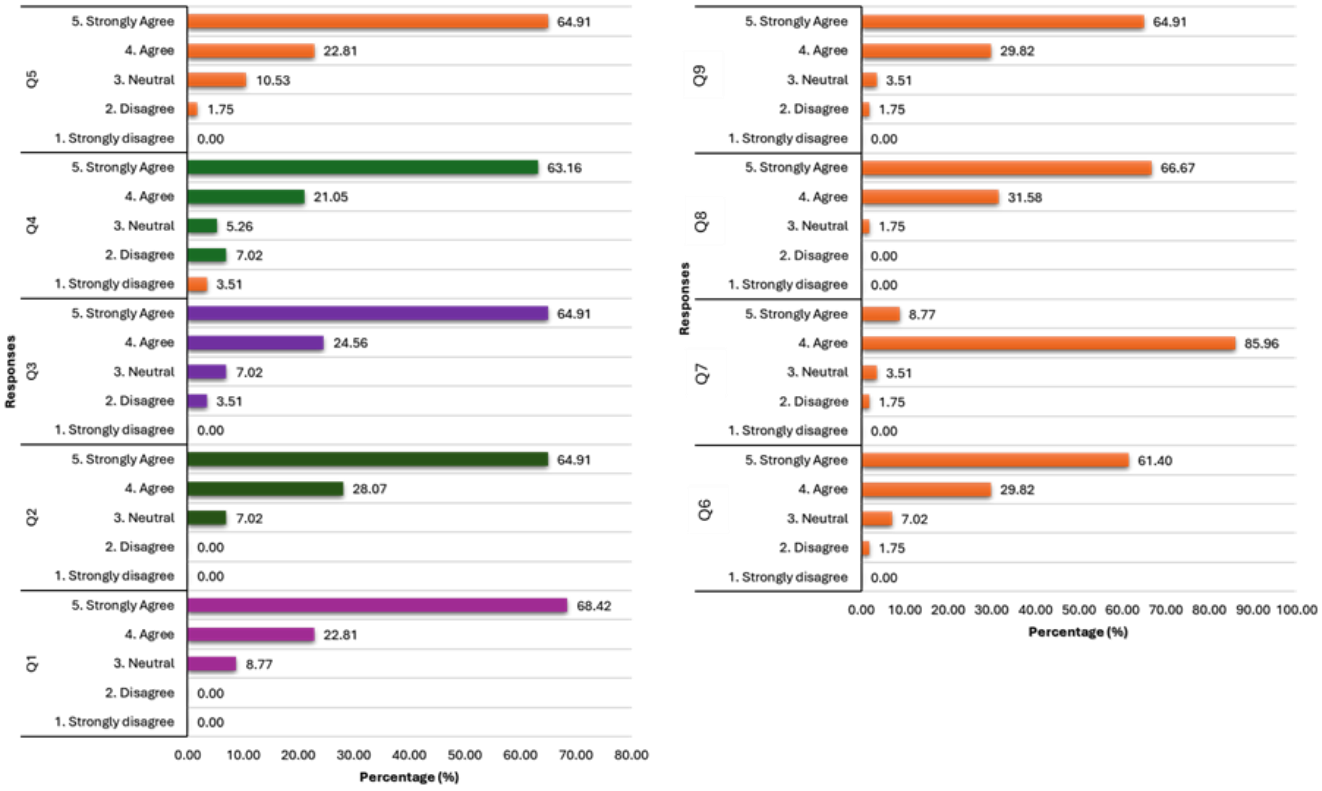

Figure 6. Jamoetics Information System Evaluation Results from Users (N = 57). Q1-Q9 = Questions

The results of a survey conducted on the “Jamoetics” website also showed positive feedback, with most respondents (98.25%) feeling confident and interested in using this website as a medium for seeking information and herbal products. For this reason, the “Jamoetics” system can be developed based on the results of this evaluation survey. Hence, the information needed by consumers can be fulfilled immediately, which could increase trust and interest in buying products.

The analysis results were used as a basis to develop “Jamoetics.com.” “Jamoetics.com” is an online information platform that disseminates empirically proven information on the use of natural ingredients for health. In addition to ensuring that all information is scientifically proven, the site aims to ensure that all information is easily understood by the public, even without a medical background. A similar website has also been developed on the medicinal herb information system in Malaysia. This system makes learning herb identification, herbal language, and medicinal uses through a professional information station possible (Noraziah et al., 2011). The Jamoetics system differentiates itself from existing herbal databases through its integrated, public education-focused design. While other valuable resources exist, such as research-centric phytochemical databases (KNApSAcK), specialized structural databases (Yanuar et al., 2011), or systems focused primarily on herb identification (Noraziah et al., 2011). Jamoetics uniquely structures information around three interconnected core entities: herbs, commercial products, and articles (**Figure 2**). This architecture enables practical pathways for the public, such as tracing a commercial product to its constituent herbs and their scientific profiles or finding products containing a specific herb. Built upon authoritative national and international monographs (**Table 1**) and implemented as a progressive web application for mobile accessibility, Jamoetics is specifically designed to make verified herbal information comprehensible and actionable for non-expert users.

The benefits of the Jamoetics system are based on a full range of natural material entities and references that refer to previously digitized monographs and guidelines. Each piece of information recorded for an herb is based on published research articles;

therefore, citation references were provided for each piece of information. Herb product entity records commercial products containing natural ingredients. This entity is designed to fulfill the information needs of traditional medicinal products. For each product, the plants used, interactions, contraindications, side effects, dosage, and benefits were recorded. In addition, each product was related to the herbs contained therein. This allows users to easily obtain more information on the herbs contained in a product. Observations on similar herbal sites, for example, HerbalDB from UI, were heavily inspired by Japan's Knapsack database, with incomplete information on some plants, and the user must first register as a contributor to complete the information (Parikesit et al., 2018; Yanuar et al., 2011).

The article entity records published information related to natural ingredients for health. The article includes images, videos, social media threads, and press releases. Similar to the product entity, the article entity is also related to the herb entity, enabling users to obtain more information about related herbs in an article. This feature is not found on similar websites displaying articles related to herbs, for example, “Jamudigital” (Jamu Digital, 2023).

UI in Jamoetics is the initial work displaying detailed information about a natural ingredient to the public. An avenue for future work is to display information cards on using natural ingredients to nurture health. An information card (called an entity card) displays brief but rich and comprehensive information about a specific entity (Balog, 2018; Shokouhi & Guo, 2015). Previous work on health has shown that showing entity cards benefits the general public who search for health information and makes health-related decisions (Jimmy et al., 2020). Therefore, the benefits of using information cards can help people understand the use of natural ingredients for health in future work.

The present study showed that most respondents accepted the web-based Indonesian Natural Products Database information system, Jamoetics, based on the website’s ease of access and appearance. Hence, it has the potential to become an educational medium for natural and herbal ingredients for the general public.

4. CONCLUSION

Jamoetics, a web-based information system, can help the community easily access information about herbal plants in Indonesia. Beneficial avenues for future work, including assisting visitors to discover results relevant to their information needs, must be expressed in their queries. Future work avenues must display information cards containing short, meaningful, and easy-to-understand information on using natural products for health.

AUTHOR CONTRIBUTIONS

O. Y.: Conceptualization, methodology, validation, writing original draft preparation. J: data curation, software, writing original draft preparation. J. O.: visualization, investigation. T.H.S: Supervision. E. T.: writing reviewing and editing. All authors have read and agreed to the published version of the manuscript.

INSTITUTIONAL REVIEW BOARD STATEMENT

Not applicable.

INFORMED CONSENT STATEMENT

Not applicable.

DATA AVAILABILITY STATEMENT

Data supporting the findings of this study are available from the corresponding author upon reasonable request.

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CONFLICTS OF INTEREST

The authors declare no conflicts of interest.

DECLARATION OF GENERATIVE ARTIFICIAL INTELLIGENCE (AI) USE

The authors declare that no generative AI or AI-assisted technologies were used in the preparation or writing of this manuscript. All contents were produced entirely by the authors without any automated assistance.

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