



vol. 16 / 2023



The 7th International Conference on Science Technology

organized by
Faculty of Social Science and
Law Universitas Negeri Manado and
Consortium of International Conference
on Science and Technology

The Innovation Breakthrough in Digital and Disruptive Era

SakeraHerbDB: Proposing an Integrated Indonesian Traditional Herbal Medicine Database (IITHM-DB) for Madura Island's Herbs

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Abstract. Indonesian Traditional Herbal Medicine Databases are crucial for maintaining indigenous knowledge, bridging traditional medicine with modern healthcare, and promoting evidence-based research. These databases help identify therapeutic compounds and modernize traditional medicine practices. However, Traditional herbal medicine databases in Indonesia need to be improved in dissemination, documentation, safety, quality, and research on COVID-19. This research aims to create SakeraHerbDB, an integrated Indonesian Traditional Herbal Medicine Database for Madura Island botanicals. The database will integrate traditional and modern medicine by combining traditional knowledge, scientific facts, and ecological factors. The study reviews Indonesian traditional herbal medicine literature, focusing on Madura Island botanicals. Ethnobotanical research, local knowledge holders, and herbal medicine practitioners will collect data. A structured database and data entry processes will be created for accuracy and consistency. The database will have an easy-to-use interface. This study produced six submissions for the Integrated Indonesian Traditional Herbal Medicine Database (IITHM-DB) for Madura Island's herbs: Use Case Diagram, Database Attribute, System Architecture, Decision Tree Flowchart, SakeraHerbDB Web-based application, and Searching SakeraHerbDB with Decision Tree algorithm. This research improves traditional knowledge, integrates traditional and contemporary medicine, advances herbal medicine research, empowers local populations, and promotes sustainable resource management. SakeraHerbDB will unify data, fill knowledge gaps, and promote interdisciplinary collaboration. The database will benefit healthcare workers, researchers, policymakers, and innovators.

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1 Introduction

Indonesian Traditional Herbal Medicine Databases are significant for several reasons. First, they provide a complete database of Indonesian traditional herbal medicine plants[1], [2]. This comprises species, botanical traits, chemical makeup, and traditional usage of these plants[3]. These databases help researchers, healthcare professionals, and traditional healers conduct evidence-based research and use herbal medicines safely and effectively[4], [5]. Second, researching Indonesia's Traditional Herbal Medicine Databases is essential for maintaining indigenous knowledge about traditional medicine[6]. This information is often passed down and contributes to Indonesia's cultural legacy[6]. Research and documentation can preserve this knowledge for future research and development. Indonesian Traditional Herbal Medicine Database research bridges traditional medicine and modern healthcare. It allows researchers to test traditional herbal remedies for diverse health issues and develop new pharmaceuticals and treatments[3], [4]. This research can also help identify therapeutic compounds by analyzing medicinal plant genetic diversity and chemical profiling[3]. Traditional Herbal Medicine Databases in Indonesia preserve indigenous knowledge, promote evidence-based research, and explore the possibilities of traditional herbal treatments. This research helps modernize traditional medicine and provide safe and effective healthcare practices.

However, Traditional Herbal Medicine Databases in Indonesia face issues such as limited dissemination of information[7], inadequate recording and documentation[5], and inadequate data on herbal medicine utilization[5]. Safety and quality concerns arise from the addition of chemical drugs[8], and genetic and chemical profiling data is limited[3]. Indigenous knowledge preservation is also limited[9], and research on herbal medicine and COVID-19 is limited[10]. Further research is needed to understand herbal medicine utilization in specific populations and evaluate classification and evaluation[11].

Several previous research about Traditional Herbal Medicine Databases had been done, there were New approaches in developing medicinal herbs databases[12], TCMSID: a simplified integrated database for drug discovery from traditional Chinese medicine[13], Traditional herbal medicine: overview of research indexed in the scopus database[14], Global Pharmacopoeia Genome Database is an integrated and mineable genomic database for traditional medicines from eight international pharmacopeias[15], HERB: a high-throughput experiment- and reference-guided database of traditional Chinese medicine[16], TCMIO: A Comprehensive Database of Traditional Chinese Medicine on Immuno-Oncology[17], Traditional Herbal Medicine in Mesoamerica: Toward Its Evidence Base for Improving Universal Health Coverage[18], ETM-DB: integrated Ethiopian traditional herbal medicine and phytochemicals database[19], Agraph convolution-based classification model for traditional

Vietnamese herbal medicine database anticancer metabolites[20], CEMTDD: Chinese ethnic minority traditional drug herb, chemical, target, and illness database[21], TCMID: traditional Chinese medicine integrative database for herb molecular mechanism analysis[22], Database of Traditional Chinese Medicinal herbs: A bridge between TCM and modern science[23], Structure-Based Computational Screening of a Traditional Herbal Medicine Discovers Embelin, a Cell-Permeable, Small-Molecular Weight XIAP Inhibitor. 3D Structure Database[24] and A 3D Structure Database of Components from Chinese Traditional Medicinal Herbs[25].

The research on the Indonesian Traditional Herbal Medicine Database herbs highlights gaps in inclusion, quality assessment, standardization of data entry, integration of traditional and scientific knowledge, long-term sustainability, and ethical considerations. Addressing these gaps can improve the database's comprehensiveness, inclusivity, and sustainability while respecting the cultural context and authenticity of Madura Island's traditional herbal medicine.

This study aims to develop SakeraHerbDB, an integrated database of Indonesian traditional herbal medicines for Madura Island plants. By applying traditional knowledge, scientific facts, and ecological factors, the database will integrate traditional and contemporary medicine. This study explores the literature on Indonesian traditional herbal medicine, that focuses on Madura Island herbs. Data will be collected by ethnobotanical research, local knowledge holders, and herbal medicine practitioners. For precision and standardization, a structured database and data entry processes will be developed. The database's interface will be easy to use.

This research enhances traditional knowledge, integrates traditional and modern medicine, advances the study of herbal medicine, empowers local populations, and promotes sustainable resource management. SakeraHerbDB is going to consolidate data, close knowledge gaps, and foster interdisciplinary cooperation. The database will be useful to healthcare personnel, researchers, developers, stakeholders, and policymakers in the health sector.

2 Research Methods

Research on Integrated Indonesian Traditional Herbal Medicine Information System for Madura Island's Herbs is done through a series of steps as follows:

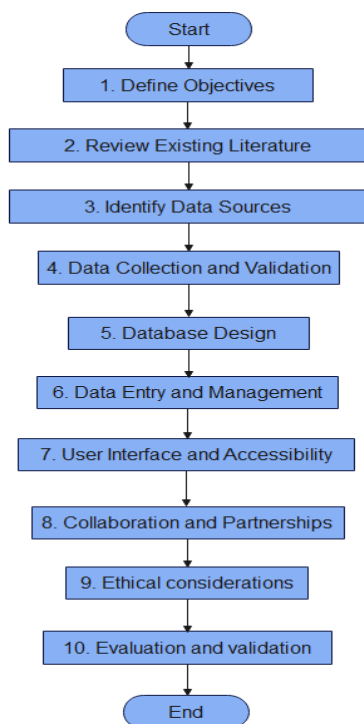


Fig. 1. The steps of Research

Table 1. Explanation and details of the stages of the research

No	Research Steps	Explanation and details
1	Define objectives	Clearly define the goals and objectives of the research, specifying the focus on Madura Island's herbs and the purpose of the integrated database
2	Review existing literature	Do a thorough review of the available literature on traditional herbal medicine in Indonesia, paying special attention to the herbs on Madura Island. Check the current level of knowledge and look for gaps that your study can fill.
3	Identify data sources	Identify the data sources that will be utilized to populate the database, such as traditional medicine literature, ethnobotanical studies, scientific publications, local knowledge holders, and herbal medicine practitioners.
4	Data collection and validation	Collect essential information on the herbs of Madura Island, including their names, botanical classifications, descriptions, traditional uses, chemical composition, and preparation methods. Cross-reference multiple sources and consult traditional herbal medicine experts to verify the data.

5	Database design	Determine the organization and structure of the integrated database. Define the specific fields, relationships between data elements, and any other required features or functionalities. Consider utilizing a relational or NoSQL database depending on the needs of the research.
6	Data entry and management	Ensure accuracy and consistency as you enter the collected data into the database. Create protocols for data entry, quality assurance, and regular updates as new data becomes available. Consider incorporating standardized classifications or terminologies for herbs and their applications
7	User interface and accessibility	Create a database interface that allows users to search, peruse, and retrieve information with ease. To improve the user experience, including advanced search options, filters, and interactive visualizations.
8	Collaboration and partnerships	Collaborate with Madura Island's local herbal medicine practitioners, traditional physicians, and researchers. Seek partnerships with pertinent institutions to guarantee the incorporation of indigenous knowledge and the promotion and maintenance of the database's use.
9	Ethical considerations	Consider the ethical implications of data collection, use, and dissemination. Obtain informed consent, respect intellectual property rights, and protect the privacy and anonymity of individuals and communities involved.
10	Evaluation and validation	Continuously evaluate and validate the database's content, precision, and utility. Solicit feedback from users, experts, and stakeholders to identify areas for database enhancement and possible expansion. Document the research methodology, data sources, and any database development-related assumptions.

3 Results and Discussion

This investigation produced six key findings: (1)Use Case Diagram, (2)Database Attribute, (3)System Architecture, (4)Decision Tree Flowchart, (5)SakeraHerbDB Web-based application, and

(6) Searching SakeraHerbDB using Decision Tree algorithm. This Madura Herb database system can be accessed through <https://jamu-madura.id> will be integrated through API with another database system which can be opened through <https://sijabasa.com>. The database of <https://Jamu-madura.id> contains herb data collected in Pamekasan and Sumenep. Moreover, <https://sijabasa.com> contains data from Bangkalan and Sampang. Those four cities are located in Madura.

This database will be merged with <http://sijabasa.com>, which gathers SakeraHerbDB data from the cities of Bangkalan and Sampang. In addition, Fig.2 illustrates a use-case diagram for the herb database system. It includes administrator and user actors. The system also has some use cases, such as adding herb data, updating herb data, deleting herb data, adding user data, updating user data, removing user data, see user data, login in, upgrading account data, and seeing herb data. As only three shops in Pamekasan and three shops in Sumenep were sampled, the data on Madura's botanicals are still limited.

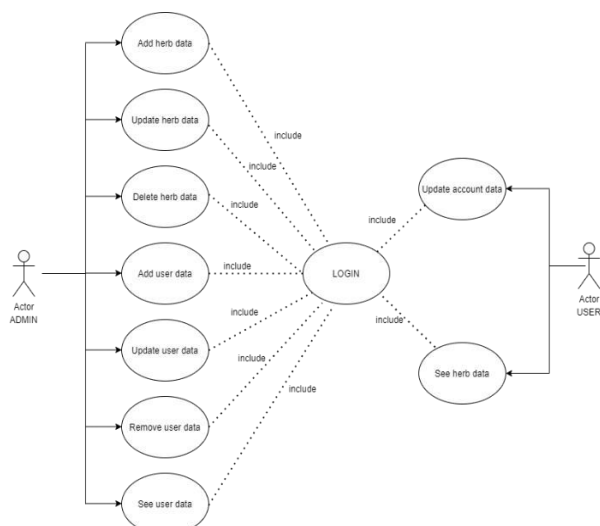


Fig. 2. Use Case Diagram of SakeraHerbDB

Moreover, the attributes of the data presented in Table 2 consist of Herb name, benefit, ingredients, consumption rule, producer, and production permit. Therefore, the herb data collection is based on these attributes.

Table 2. Database Attributes of SakeraHerbDB

Number	Attributes
1	Herb name
2	Benefits
3	Ingredients
4	Consumption rule
5	Producer

6	Production permit
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Furthermore, the system architecture is illustrated in Fig. 3 below. The architecture comprises sijabasa.com, the Bangkalan and Sampang herb database, and Jammu-madura. id, the Pamekasan, and Sumenep herb database. Through API, these two databases are integrated. Consequently, these can communicate data with one another. These databases are accessible via customer computers. In addition, the API is incorporated into the web system the user accesses via the client's computer.

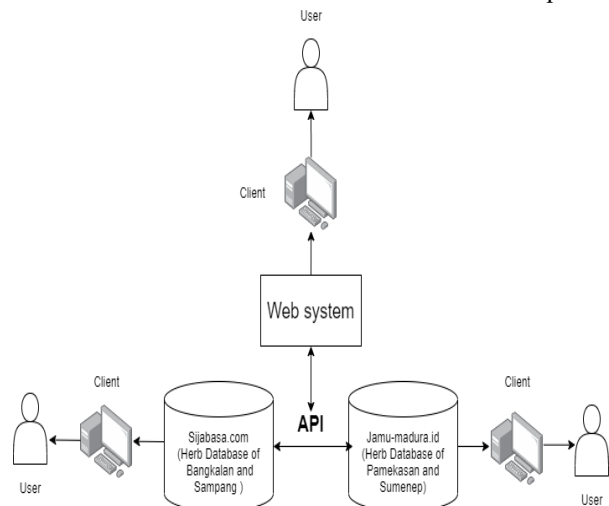


Fig. 3. System Architecture of SakeraHerbDB

Furthermore, the rule of the decision tree C4.5 is presented in Fig. 4 and can be explained as follows:

1. Are the symptoms suitable for the user? If no, do not choose and consume the herb.
2. If the symptoms are suitable, check the benefits of the herb. Are these suitable for the user ?, If No, then cancel to choose and consume the herb.
3. If the benefits are suitable, then check the herb name. Is the name right for the user ?, If No, then cancel to choose and consume the herb.
4. If the name is suitable, then check the expiration date. Is it still OK to drink for the user ?, If No, then cancel to choose and consume the herb.
5. If the expired date is acceptable, check with the producer. Is the producer suitable for the user? If No, then cancel to choose and consume the herb.
6. If the producer is suitable, then check the consumption rules, are the regulations appropriate for the user? If No, then cancel to choose and consume the herb. If yes, then the user can select and consume the herb.

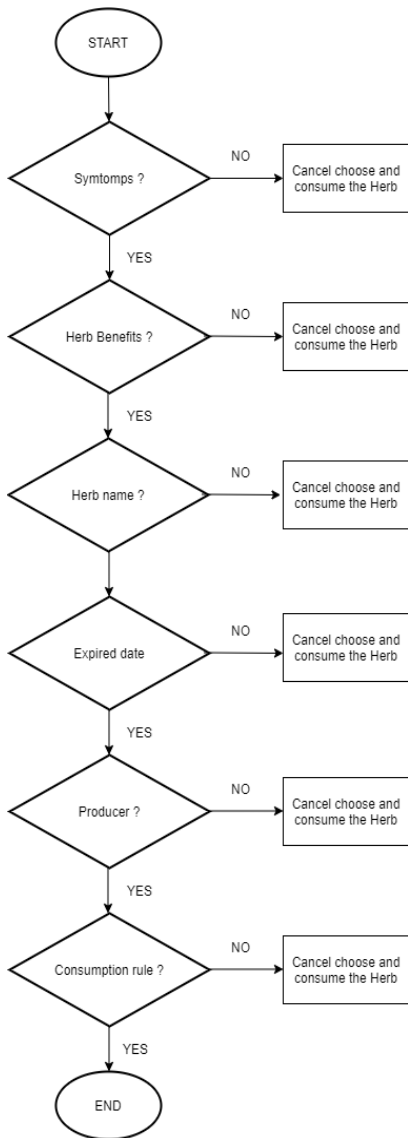


Fig. 4. Decision Tree flowchart on SakeraHerbDB

Furthermore, The SakeraHerbDB database system has been developed as shown in Fig. 5,6,7, and 8. Fig. 5 presents the SakeraHerbDB system front page in Bahasa, and Fig. 6 shows the front page in the Madura language. Moreover, Fig. 7 identifies the SakeraHerbDB database, and Fig. 8 identifies the search result.

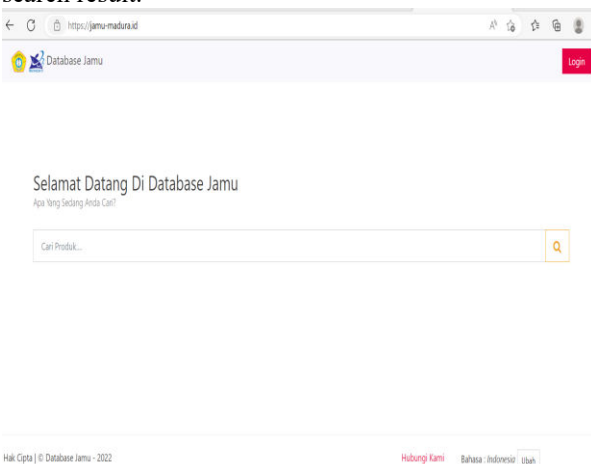


Fig. 5. Front page of SakeraHerbDB

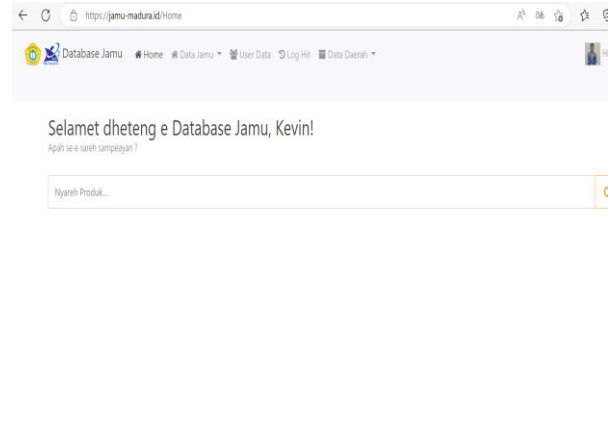


Fig. 6. SakeraHerbDB Website in Madura Language

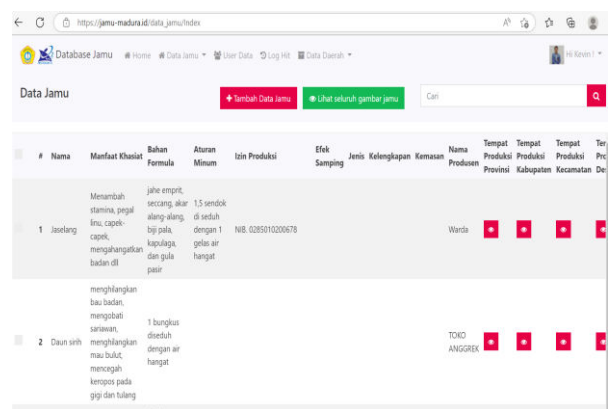


Fig. 7. SakeraHerbDB Database

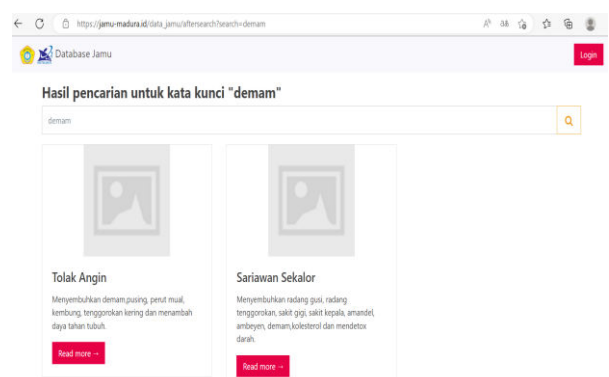


Fig. 8. Searching result of SakeraHerbDB

4 Conclusions

This research aims to develop SakeraHerbDB, an integrated Indonesian Traditional Herbal Medicine Database specifically focused on Madura Island's herbs. The database will serve as a comprehensive resource that consolidates traditional knowledge, scientific evidence, and ecological aspects, promoting the integration of traditional and modern medical practices. This study resulted in six submissions for the Integrated Indonesian Traditional Herbal Medicine Database (IITHM-DB) for Madura Island's Herbs, namely (1) Use Case Diagram, (2) Database Attribute, (3) System Architecture, (4) Decision Tree Flowchart,

(5) SakeraHerbDB Web base application, (6) Searching SakeraHerbDB with Decision Tree algorithm. This SakeraHerbDB database system, which can be found at <https://jamu-madura.id>, will be connected to another database system, which can be found at <https://sijabasa.com>, through an API. The <https://Jamumadura.id> database has information about herbs that were taken in Pamekasan and Sumenep. Moreover, <https://sijabasa.com> includes data from Bangkalan and Sampang. Madura is where these four cities are.

This research contributes to the preservation of traditional knowledge, integration of traditional and modern medicine, advancement of herbal medicine research, empowerment of local communities, and promotion of sustainable resource management. SakeraHerbDB will consolidate scattered information, bridge gaps in knowledge, and foster interdisciplinary collaboration. The database's availability will empower healthcare professionals, facilitate research and innovation, and promote the recognition of Madura Island's herbal traditions as valuable cultural heritage.

However, this paper is a research in progress that still needs a lot of improvement as stated in the research method. This research still requires further processes to be carried out, namely User interface and accessibility, Collaboration and partnerships, Ethical considerations and finally Evaluation and validation. Equations should be centered and should be numbered with the number on the right-hand side.

The Research and Community Development Body of the University of Trunojoyo Madura, Indonesia, deserves our gratitude. Additionally, I would like to thank our research team, Kevin Maulana, Desi Damayanti, and Syahril Mobin, as well as our partner Madura herb store and producers in Pamekasan and Sumenep.

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