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Review Article

Database of Herbal Medicines from Various Scientific Sources

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ABSTRAK

Informasi baru untuk penelitian dan pengembangan obat herbal (jamu) tidak dapat dikumpulkan dari satu database (basis data). Sumber informasi harus lengkap dan menyeluruh sehingga memungkinkan adanya referensi silang untuk memberikan informasi baru dalam penemuan dan pengembangan obat herbal. Pada review ini, kami memberikan gambaran yang komprehensif tentang sumber-sumber informasi herbal, serta deskripsi dari semua basis data yang relevan dengan obat herbal. Basis data PubMed, Science Direct, Google Scholar dan Semantic Scholar ditelusuri dalam rentang waktu antara Juni dan Juli 2021 terkait publikasi yang relevan dengan basis data jamu. Hasil perbandingan menunjukkan bahwa ETM-DB adalah basis data yang paling lengkap dan menyeluruh untuk penelitian terkait penemuan dan pengembangan obat herbal dari semua basis data yang diulas dalam penelitian ini. Ketersediaan dan kelengkapan informasi, kemampuan pengguna atau peneliti untuk melakukan penelitian dan pengembangan tambahan terhadap suatu obat herbal, serta tersedianya fitur untuk mengunduh informasi dan struktur kimia dalam berbagai versi, semuanya dapat memberikan informasi penting bagi pengembangan suatu basis data obat herbal dalam bentuk situs web penelusuran online yang mudah digunakan yang dapat diakses oleh pakar dan masyarakat umum. Pengembangan herbal dapat menggunakan basis data obat herbal, seperti yang termasuk dalam ulasan ini, untuk mengumpulkan informasi herbal yang komprehensif dari berbagai sumber.

Kata Kunci: Database, Herbal, Informasi, Review

ABSTRACT

Multiple databases are utilized since new information for herbal medicine research and development cannot be obtained from a single database. Information sources must be comprehensive and complete in order to allow for cross-referencing and give new information in the discovery and development of herbal medicines. In this review, we provide a comprehensive overview of these resources, as well as descriptions of all databases that are relevant to the subject of herbal medicine. The databases PubMed, Science Direct, Google Scholar and Semantic Scholar were searched between June and July 2021 for publications relevant to herbal medicine databases. Comparison results show that ETM-DB is the most extensive database for herbal medicine drug discovery and development research of all the databases reviewed in this study. The availability and completeness of information, the ability of users or researchers to conduct additional research and development on herbal medicine, and the availability of features for downloading information and chemical structures in various versions, can all provide critical information for the development of herbal database in the form of an easy-to-use query website that is accessible. Herbal medicine development can use databases to collect comprehensive information from a variety of sources.

Keywords: Database, Herbal, Information, Review

I. INTRODUCTION

Herbal medicine has been widely used in the world for the treatment of several symptoms and the prevention of diseases before accessing the hospital for professional help. Herbal Medicine Market size was valued at USD 98.60 Billion in 2020 and is projected to reach USD 391.22 Billion by 2028, growing at a CAGR of 18.8 % from 2021 to 2028 (Verified Market Research, 2021). The high market for herbal medicines cannot be separated from the importance of herbal information because information plays a crucial role in modern society and it helps people to develop their health knowledge (Sørensen et al., 2012).

Our preliminary study about the availability and information needs of

traditional medicine at Surabaya, Indonesia, shows that information of traditional medicine availability was 84%. Most respondents (53%) admitted to having herbal information and their source of information from internet media, mostly (86%) through search engines, health websites, and health applications (Yunita et al., 2022). This preliminary survey provides valuable information how important Herbal Database for Drug Discovery and Development.

Herbal medicines are essential molecules in medical, chemical, and social study because of their unique properties. For the time being, there is no global, community-accepted database for the research and development of herbal medicines. Instead, there is an

extraordinarily large number of databases and datasets that are highly diverse, but not all of them are maintained or open access in 2022, resulting in a significant loss of information.

II. METHODS

A. Materials

To summarize the findings regarding Herbal database; a literature search was conducted using PubMed, Science Direct, Google Scholar, and Semantic Scholar databases especially for the literature of the last 10 years. All databases were downloaded during June-July 2021. The keywords used in the

searches included Herbal AND Information AND Database”.

B. Methods

Only articles reporting single database which contain plant type, composition, recipe, disease type, and daily dose were included in the final review. There were 2.707 papers initially identified. After eliminating titles and abstracts related to the exclusion criteria, 11 selected articles were identified that met the criteria and purpose of this review (Figure 1). All network representations of database overlaps are created with Cytoscape ver. 3.7.1.

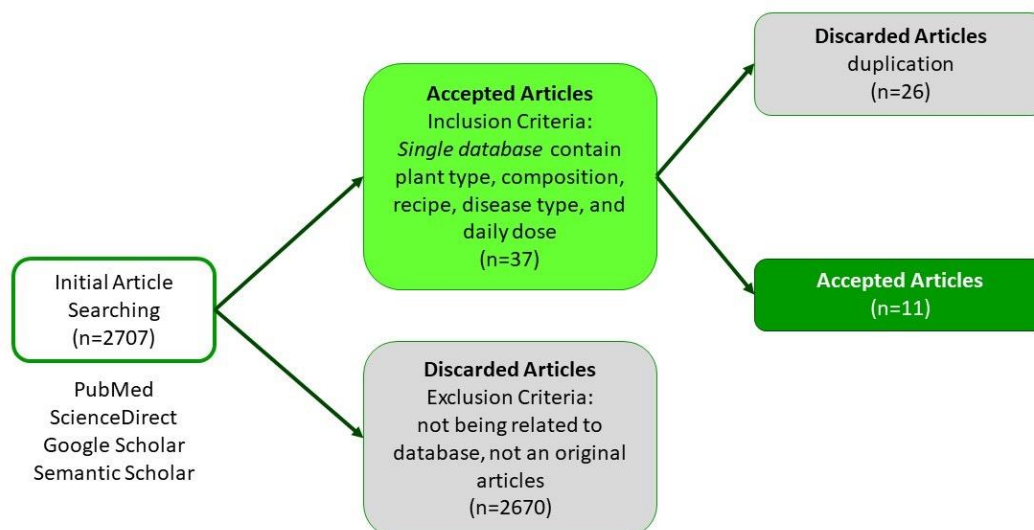


Figure 1. Flowchart for article searching, screening and selection in literature review

III. RESULTS AND DISCUSSION

The original sources of the 11 databases in this review are from various countries such as China, Bangladesh, Saudi Arabia, Ethiopia, and India (Table I). Each database has its own advantages and disadvantages. In addition to other advantages, researchers who visit the website can alter or contribute to the content of the current database by giving the correct citation or the same reference, and the data received or amended by the researcher will be certified by the Saudi Herbal Plant Information System (SHPIS) administration (Syed and Khan, 2017).

The Traditional Chinese Medicine (TCM-Mesh) and Traditional Chinese Medicine System Pharmacology (TCMSP) were created to provide up-to-date information on herbal plants to develop TCM. TCMSP, which is no longer maintained but used to include over 29,000 natural products, is likewise no longer maintained. There are several databases that focus on chemical compounds used in TCM, and the makers of the latter are aware of this database called Yet Another Traditional Chinese Medicine Database (YaTCM), which was established in 2018. The key distinctions between these databases are the amount of chemicals covered, the complexity of their content, and the availability of the datasets they

provide (Ru et al., 2014; Zhang et al., 2017; Sorokina and Steinbeck, 2020).

There are two databases are currently online and open listing natural compounds from plants, insects and animals used in Ayurveda, namely Uttarakhand Medicinal Plants Database (UMPDB) and Indian Medicinal Plants, Phytochemistry and Therapeutics (IMPPAT). The UMPDB includes detailed information on botanical names, common names, taxonomy, genomic taxonomy identification, habit, habitat, location in Uttarakhand, part usage, medicinal use, genomic information (including the number of nucleotides, proteins, and Expressed Sequence Tag/ESTs), chemical information, and scientific literature. The current edition of the database's annotated medicinal plants was compiled from existing books, databases, and literature. The present edition of the UMPDB has 1127 data of medicinal plants from 153 plant families spread over 13 districts in Uttarakhand (Kumar et al., 2018). IMPPAT is a manually curated database including over 10,000 phytochemicals isolated from 1700 Indian medicinal plants, as well as information about their phytochemistry and therapeutic effects. The IMPPAT phytochemicals' physicochemical, profile of absorption, distribution, metabolism, excretion, toxicity (ADMET), and drug-likeness properties were assessed using

cheminformatic approaches. IMPPAT phytochemicals' stereochemical complexity and form complexity differ from commercial compound libraries or diversity-oriented synthetic compounds while being similar to other natural product libraries (Mohanraj et al., 2018).

Medicinal Plant Database of Bangladesh (MPDB) offers information on around 500 of Bangladesh's indigenous medicinal plants. It includes the scientific name of the plant, its family name, regional names, components used, active chemicals, and the PubMed IDs of linked studies. The database was created with reference to indigenous plant medicinal treatments that have been employed since ancient times. The purpose of this database is to decipher the underlying the success of these folk remedies and to identify the primary phytochemical compounds responsible for their efficacy, as well as to uncover innovative treatment approaches for both old and new ailments (Ashraf et al., 2014). Meanwhile, each database has gaps in terms of data on individual medicinal plants, disorders, and their pharmacology, which are still insufficient for each medicinal plant mentioned. And it must be redeveloped for the purpose of identifying therapeutic targets for deadly illnesses. Users continue to encounter issues downloading entire information,

necessitating the improvement of the application system.

Having imported the content type of database, we can map it onto the nodes in the network using the Cytoscape, as seen in Figure 2. Despite its origins in biological research, Cytoscape has evolved into a universal platform for sophisticated network analysis and visualization. The types of contents in the database are depicted in circles with varying colors. The darker the color of the circle, it means that there are more types of herbal databases that contain these contents. The circles on the right in blue are the type of database that contains the various contents in the circles on the left. The larger the circle size, the more complete the database type is.

All databases contain several data such as plant type, scientific classification, organoleptic characteristics, formula, habitat, chemical compound, and disease. Almost all databases (90.90 %) contain part used of the herbal except UMPDB, most databases contain herbal recipe, except Encyclopedia of Traditional Chinese Medicine (ETCM), MPDB, TCM-Mesh, although all of those databases contain the formula.

Only a small proportion of databases contain ADMET data from Pharmacology study results, namely Ethiopia Traditional Herbal Medicine Database (ETM-DB), MPDB, TCM-Mesh

and TCMSP. There are five databases which contain genome information of herbal medicine namely Chinese Ethnic Minority Traditional Drug Database (CEMTDD), ETCM, ETM-DB, IMPPAT, and UMPDB, but only small proportion of databases contain phenotype data, namely

ETM-DB, IMPPAT, and UMPDB. CEMTDD, IMPPAT, TCMSP are three databases which contain almost all type of content except phenotype & ADMET data (CEMTDD), disease target & ADMET data (IMPAT) and phenotype & genome information (TCMSP).

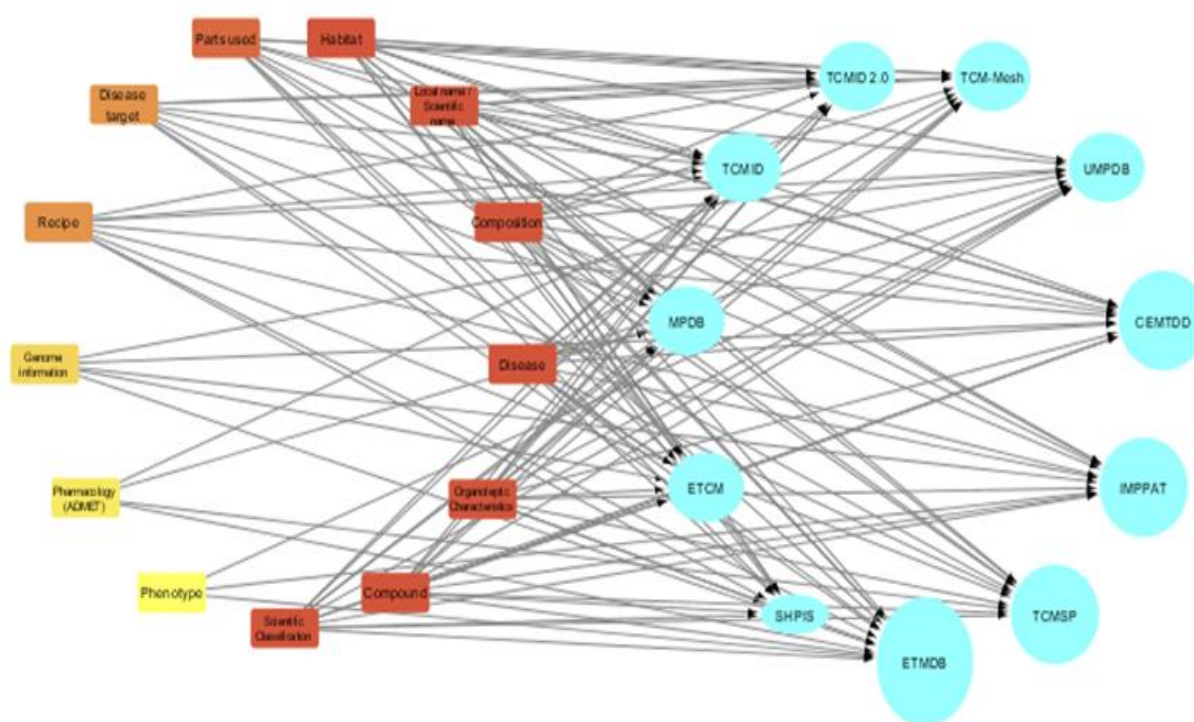


Figure 2. Network analysis of herbal database

Based on this analysis, ETM-DB is the most complete database reviewed. ETM-DB is the most comprehensive online resource on Ethiopian traditional medicine. Traditional herbal medicine entities and their linkages are well-structured with sources cited. Users can search for entities

using the ETM-DB web interface's search menu. This database can assist speed up drug discovery and development studies by providing data on the chemical composition and human target gene/proteins of Ethiopian natural products (Bultum et al., 2019).

Table I. Herbal databases from various countries

| Country | Database Name | Hyperlink |
|--------------|---|---|
| China | CEMTDD Chinese Ethnic Minority Traditional Drug Database | http://www.cemtdd.com/index.html |
| | ETCM Encyclopedia of Traditional Chinese Medicine | http://www.nrc.ac.cn:9090/ETCM/ |
| | TCMID Traditional Chinese Integrated Medicine | http://www.megabionet.org/tcmid/ |
| | TCMIID Traditional Chinese Integrated Medicine 2.0 | http://www.megabionet.org/tcmid/ |
| | TCM-Mesh Traditional Chinese Medicine | http://mesh.tcm.microbioinformatics.org/ |
| | TCMSP Traditional Chinese Medicine System Pharmacology Database | http://sm.nwsuaf.edu.cn/lsp/tcmsp.php |
| Bangladesh | MPDB Medicinal Plant Database of Bangladesh | www.medicinalplantbd.net |
| Saudi Arabia | SHPIS Saudi Herbal Plant Information system | http://www.SHPIS.com |
| Ethiopia | ETM-DB Ethiopia Traditional Herbal Medicine Database | http://biosoft.kaist.ac.kr/etm |
| India | UMPDB Uttarakhand Medicinal Plants Database | http://www.ars-grin.gov/ |
| | IMPPAT Indian Medicinal Plants, Phytochemistry and Therepeutics | https://cb.imsc.res.in/imppat |

To construct ETM-DB, researchers examined internet research papers, theses, books, and public databases for information on Ethiopian herbal medicine and phytochemicals. These resources were extensively reviewed, and the relevant data was obtained manually and using Python/Java scripts. Additionally, ETM-DB utilized cheminformatics methods to determine the phytochemicals' physicochemical and ADMET characteristics. The ETM-DB internet interface enables users to search for entities and relationships by utilizing the search

menu's available choices. This database will aid in the discovery and development of new drugs from Ethiopian natural products since it provides information on the chemical makeup and associated human target genes/proteins (Bultum et al., 2019; Sorokina et al., 2020).

IV. CONCLUSION

Of all the databases considered in this study, ETM-DB is the most extensive in terms of herbal medicine drug discovery and development research, outpacing the comparison. The benefits of various herbal

databases include the availability and completeness of information, the ability for users or researchers to conduct additional research and development on herbal medicine, and the availability of features for downloading information and chemical structures in various versions, can give critical information for the development of a herbal database in the form of an easy-to-use query website that is accessible to both specialists and the general public.

CONFLICT OF INTEREST

No conflict of interest

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