

A STRATEGY FOR PLANT CONSERVATION IN JOHOR PLANT CHEMICAL LIBRARY

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Abstract

Malaysian tropical forests harbor about 6% of the world's plant species. Most of this huge array of plant species has not been widely studied. The uses of each plant species bogs down to the properties of chemicals embedded in it. Therefore, a library of chemicals found in these plants must be developed. A Plant Chemical Library (PCL) has several benefits and were discussed in this paper. It will be a database for natural heritage and a source for future effort in herbal remedies or drug development in Malaysia. It also has potential to be useful for the global community through pharmaceutical, cosmetic and nutraceutical industries. These benefits would also incur monetary arrangement. However, issues and challenges are expected which include the development of dedicated laboratory facilities, training of human resources, and a special storage system for the chemical extracts. Selection of plants can be done based on plant groupings, disease of interests, and collaboration with the particular ethnic and selection of plants according to its traditional use. This effort would at the same time cater for the need to document traditional knowledge (TK) in an effort to conserve them. Hence, issues of PIC and ABS prior to bioprospecting have to be made clear. Stakeholders are suggested to come out with a legislation that will govern how best to go about doing bioprospecting in Johor to facilitate scientific endeavors and biodiversity conservation.

Keywords: Plant chemical library, bioprospecting, traditional knowledge, legislations, stakeholders

Abstrak

Hutan tropika Malaysia menyimpan kira-kira 6% daripada spesies tumbuhan di dunia. Kebanyakan spesies tumbuhan tersebut masih belum dikaji secara meluas. Kegunaan spesies tumbuh-tumbuhan tersebut terselindung di sebalik sifat-sifat kimia di dalamnya. Oleh itu, pustaka senarai kimia yang terkandung dalam tumbuh-tumbuhan tersebut haruslah dibangunkan seiring dengan perkembangannya. Pustaka Kimia Tumbuhan (PKT) mempunyai beberapa manfaat dan dibincangkan dalam kertas kerja ini. Ia akan menjadi sebuah pangkalan data bagi warisan semulajadi dan sebagai sumber untuk pembangunan ubat-ubatan di Malaysia pada masa hadapan. Ia juga berpotensi untuk digunakan dalam industri farmaseutikal, kosmetik dan nutraseutikal. Manfaat-manfaat ini akan melibatkan kewangan. Walau bagaimanapun, isu dan cabaran akan wujud; termasuklah dalam membangunkan kemudahan makmal, melatih sumber manusia yang berdedikasi dan mewujudkan sistem penyimpanan khusus untuk ekstrak tumbuhan tersebut. Pemilihan jenis tumbuhan boleh dilakukan berdasarkan kumpulan tumbuhan, penyakit berkepentingan dan kerjasama dengan kumpulan etnik tertentu yang mahir menggunakan herba tradisional. Dengan itu, keperluan untuk mendokumentasikan pengetahuan tradisional (TK) adalah penting dalam usaha untuk memulihkannya. Oleh itu, isu PIC dan ABS haruslah jelas sebelum menjalankan penerokaan bio. Tidak keterlaluan jika dicadangkan pihak-pihak berkepentingan mungkin perlu menggubal undang-undang untuk mengawal aktiviti

penerokaan bio di Johor supaya memudahkan penyelidikan saintifik dan melaksanakan pemuliharaan biodiversiti sebaiknya.

Kata kunci: Pustaka kimia tumbuhan, penerokaan bio, pengetahuan tradisional, perundangan, pihak berkepentingan

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1.0 INTRODUCTION

Despite having the size of only 0.2% of global land mass, Malaysia has an estimated 15,000 plant species; 6% of global flora.¹ These plants form the huge and largely variable forest ecosystems of Malaysia. Most of this huge array of plants species had not been widely studied and thus, their potential uses remained as secrets within the forests. With the current increasing trend of complementary medicine and herbal remedies, the need to know more uses, and of such plants becomes a reality. The traditional knowledge (TK) is stored within the cultures of the various ethnics in Malaysia and had not been documented well. There is a need for this knowledge to be documented and efforts are made to increase the documentation process.

In the southern part of Peninsula Malaysia, the forest of Endau-Rompin that lies between the states of Johor and Pahang has been gazetted as one of the national parks of Malaysia. The part belonging to Johor is known as the Taman Negara Johor Endau Rompin (TNJER) comprising of 49,000 ha.² This forest has a global significance as it is the largest tract of protected area of southern most part of mainland Asia. A study showed there were 50 flowering plant species in the southwestern part of Endau-Rompin,³ and in total some 151 species of Pteridophytes (ferns and its allies) had been reported.^{3,4}

Plants had been the key factor to survival of human. Plants are used as food and medicines. In addition, they provide construction materials for houses and transportation such as boats. Besides its utilitarian values, plants are used in rituals and have values culturally. Ecologically, plants are providers of oxygen, sequester carbon dioxide and provide for water. People, since ancient time, had been plant dependent and had developed TK on the uses of plants in their daily life and culture.

Increased interest in herbal remedies worldwide comes about due to several weaknesses of modern drugs such as producing side effects, unavailable and being expensive. On the other hand, there are five factors pushing the growth of natural products among consumers: health (prevention is better than cure concept), religious and lifestyle values, environment (such as organic option), variety of selection (plant diversity) and current rate of medical research on natural products.⁵ These factors had contributed to making the herbal industries very lucrative with values of trillions of US dollars and encouraging involvement

of many more private sectors both in Malaysia and internationally.

2.0 PLANT CHEMICAL LIBRARY

From a molecular perspective, the uses of each plant species bog down to the properties of chemicals embedded in it. Although, plants had been useful for traditional uses, for the modern society some forms of evidence are needed before herbs can be readily accepted for consumption. Elaborate chemical studies are essential to provide for the evidence of the usefulness and efficacy of the plants.⁶ Since for every plant there are multitudes of chemical compounds, it is essential that a systematic approach be adopted to carry out chemical analyses from plants. Extracts of plants are raw materials that are invaluable and have to be kept well and systematically. Thus, besides documenting TK, a process that precedes bioprospecting of important plants, a library of chemicals found in extracts of each of these plants must be essentially developed. A Plant Chemical Library (PCL) has several benefits and includes:

2.1 Database for Natural Heritage

Under the Convention on Biological Diversity (1992) which Malaysia is a signatory, the government is obliged to inventory all plant species in the country.⁷ To add value to this effort, exploration of chemical constituents in each plant species and categorically databasing them would be the logical thing to do. Thus, by creating and systematically building up a PCL Malaysia would be seen as being ahead and visionary in realizing one of the objectives of CBD. As for the overall impact, this effort will inculcate a feeling of pride and patriotism among Malaysians, to know and realize just how rich we are in terms of plant biodiversity, both at species and chemical composition levels.

2.2 A Resource to Promote Future Effort in Herbal Remedies/Drug Development in Malaysia

In an evident-based society, in order for herbs to be acceptable for people, they will have to be chemically studied to verify for its usefulness as well as avoiding toxicity issues. By having a well maintained and documented chemical library, it will jump start herbal remedies and drug development researches. For the Malaysian scientists knowing a PCL exists will

definitely prompt further studies to be carried out on the plant extracts and thus revealing useful properties of the plants, otherwise remained as secrets.

2.3 Useful for the Global Community Through Product Developments of Pharmaceutical, Cosmetic and Nutraceutical Industries

Cases in several parts of the world showed that collaboration between giant pharmaceutical companies and intermediaries maybe necessary to go forward in using natural resources in drug development while respecting and abiding to the CBD.⁸ Kate and Laird (1999) also noted that these industries are going into the process of bioprospecting to find new materials for development of products.⁸ Industries will find it more convenient and time saving if they could just get plant extracts instead of having to go through the long process of obtaining PIC and ABS to do bioprospecting for potential plants and herbs. Having a PCL would open up opportunities for Malaysia to assist and facilitate development of herbal products globally which will benefit the global human community.

3.0 COLLABORATION AND NETWORKING

Realizing the importance of documenting TK and possibility of building a PCL for the state of Johor, Universiti Tun Hussein Onn Malaysia (UTHM), Johor National Parks Corporation (JNPC) and Johor Biotechnology and Biodiversity Corporation (J-Biotech) had signed a Memorandum of Understanding (MOU) to work together at TNJER. The MOU allows for the documenting and bioprospecting processes to happen in TNJER. To begin with, a research to study how the Jakun of TNJER treats tuberculosis and its symptoms was initiated. On a small scale, UTHM, PTNJ and J-Biotech had initiated a collaborative documentation process where 22 plants species used by the Jakun ethnic of TNJER were documented to be useful in elevating tuberculosis and its symptoms. Seven species had been extracted and awaiting to be bio-assayed and chemically profiled. The second effort was to explore other plant species for curing malaria, cancer and other diseases.

4.0 ISSUES AND CHALLENGES

To develop a PCL requires an intensive structural development and dedicated expert commitment; and for that, issues and challenges are expected. Some issues include development of dedicated laboratory facilities and training of human resources specializing on phytochemistry, chemical profiling and bio-assaying. A special storage system for the chemical extracts has to be installed in agreed locations. As to how plants are to be chosen and tested, can be done based on plant groupings or types of disease. Perhaps the smart way is to

collaborate with a particular ethnic and select plant according to its traditional use.

Legislatively, working with Orang Asli will need special permission from Jabatan Kemajuan Orang Asli (JAKOA). Next a Prior Informed Consent (PIC) process has to be carried out. To follow immediately is the Access and Benefit Sharing (ABS) agreement. In some states like Sabah and Sarawak, at least PIC had been made compulsory and somewhat fairly understood by all involved. In the states of Peninsula Malaysia, PIC and ABS have not been well practiced. However, with the ABS legislation awaiting the Malaysian Government approval, things will be better for the Orang Asli in the near future. This effort would at the same time cater for the need to document TK in an effort to conserve them. If this is the desired pathway, issues of PIC and ABS prior to bioprospecting have to be made clear.

Looking into the future, some forms of regulated agreement have to be in place if any financial arrangement is to happen. Individuals or private sectors from within and outside Malaysia, who are interested with these chemical extracts may need to agree with the amount of monetary exchange for the use of these chemical extracts. Certain fee may be imposed on a lending basis while the extracts are further tested in a user's laboratory. It could also be on profit sharing basis when products had been developed.

5.0 CONCLUSION AND RECOMMENDATION

While on the scientists agenda is providing evidence for the plants used as remedies, the social obligations are for PIC and ABS. Pertaining to PIC, at least two states in Malaysia, Sabah and Sarawak had come out with their own version included in: Sarawak Biodiversity Enactment 1998 and Sabah Biodiversity Enactment 2000. In those documents they clearly spelt out PIC processes with some indication of ABS. The federal government has drafted an enactment for ABS and currently awaiting for Malaysian Cabinet's approval. As Johor is also a sovereign state and governed its own natural resources, this paper would like to recommend that Johor initiates the move to implement a clear cut regulation on how its biodiversity shall be used and how the benefits derived from it must be equally shared. This will also take into account in rich-biodiversity areas where there are still ethnics living in or around them. Some lessons may be learned from references such as Borrini-Feyerabend *et al.*, 2004.⁹ Although, the stage when the PCL will be of demand seems far ahead, the three organizations that have embarked on this project will have to start thinking and determining several things including: facilities and technology to be used, human resources to be trained, the siting, maintenance and regulation on the uses of the PCL. The sharing of benefits from the uses of plant extracts in PCL between the three components and the owner of knowledge ie. the Orang Asli has also to be considered as early as

possible. Discussions must involve these stakeholders. The state of Johor has plenty to offer with her rich biodiversity. Perhaps if it is not too provocative to suggest, to facilitate scientific endeavors and provide for security, the state may want to come out with a legislation that will govern how best to go about doing bioprospecting including processes of PIC and ABS in Johor. When all stakeholders and the public realize the values of this effort, it is hoped that together they will appreciate the value of plants in particular and biodiversity in general. When there is a sense of appreciation there will be the will to conserve. Anyway, conservation does have three aspects to it: rehabilitation, protection and sustainable use.

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References

- [1] Ministry of Science, Technology and the Environment, Malaysia. 1997. Assessment of Biological Diversity in Malaysia. 45.
- [2] Perbadanan Bioteknologi dan Biodiversiti Negeri Johor (J-Biotech). 2007. *Khazanah Endau Rompin Herba*. Kuala Lumpur: Utusan Publications & Distributors Sdn. Bhd.
- [3] Haron, N. W. and Lim, A. L. 2006. Notes on the Flora of the Southwestern Endau-Rompin National Park, Johor, Malaysia In: Mohamed, H. & Zakaria-Ismail, M. (eds). *The Forest and Biodiversity of Selai Endau-Rompin*. Perbadanan Taman Negara Johor, Johor Baru, Johor, Malaysia. 95-97.
- [4] Maideen, H., Nur-Adibah, N., Damanhuri, A., Jaman, R., Miran, S. and Nazre, M. 2006. Pteridophytes of the Southwestern Endau-Rompin National Park, Johor, Malaysia In: Mohamed, H. & Zakaria-Ismail, M. (eds). *The Forest and Biodiversity of Selai Endau-Rompin*. Perbadanan Taman Negara Johor, Johor Baru, Johor, Malaysia. 91-95.
- [5] Kraisintu, K. 1999. Herbal Medicine—The Next Step. Herbal Medicine Into The New Millennium. *Conference Proceeding*. Lismore, Australia 16-18 June 1999. 203-234.
- [6] Lajis, N. H. 2010. Realizing the Values of Rainforests: The Role of Chemistry In: Manurung, R., Zaliha C. Abdullah, Fasihuddin Badruddin Ahmad & Clem Kuek (eds). *Biodiversity—Biotechnology: Gateways To Discoveries, Sustainable Utilization And Wealth Generation. Proceedings of the International Symposium held in Kuching Sarawak, Malaysia*. 21 November 2008. 203-220.
- [7] United Nations. 1992. *Convention on Biological Diversity*. <https://www.cbd.int/doc/legal/cbd-en.pdf>.
- [8] Kate, K. t. & Laird, S. A. 1999. *The Commercial Use Of Biodiversity: Access To Genetic Resources And Benefit Sharing*. Earthscan.
- [9] Borrini-Feyerabend, G., Pimbert, M., Farvar, M.T., Kothari, A. and Renard, Y. 2004. *Sharing Power, Learning By Doing In Co-Management Of Natural Resources Throughout The World*. IIED and IUCN/CEESP/CMWG, Cenesta, Tehran.