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MEDICINAL PLANTS: FROM INDIGENOUS KNOWLEDGE TO POTENTIAL NATURAL PRODUCTS

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A. An Introduction to Medicinal Plants

As one of the major natural landscape, forests act as the most important natural resource of the world. A recent finding indicates that the world's forests covered 3,869 million hectares in 2000, about 30 percent of the world's land area (FAO 2001). They do not only serve habitats for plants and animals but also perform all kinds of practical services that benefit for human and animal life, such as producing wood and non wood products, biodiversity, water protection, land protection and recreation (Gluck 2000). Forests play role in regulation of climate by producing oxygen and sucking up air pollution. Forests also take part in water resource control by purifying water and refilling underground aquifers, absorbing rain, slowing down floods and water runoff. Forests also provide a huge source of essential goods such as wood, food, fodder and medicines, in addition to opportunities for recreation, and other services.

Following the Amazon rain forests, Indonesia has the second biggest biodiversity in the world expressed by a high number of indigenous medicinal plants. Based on this rich source, the use of medicinal plants is very important, and in the rural areas medicinal plants are even the first choices to treat diseases.

Application of traditional medicines is in increase globally and become more popular during the last decades. It has not only continued to be used for primary health care of the poor in developing countries, but has also been used in countries where conventional medicine is predominant in the national health care system. With the tremendous expansion in the use of traditional medicine worldwide, safety and efficacy as well as quality control of herbal medicines and traditional procedure-based therapies have become important concerns for both health authorities and the public. Various practices of traditional medicine have been developed in different cultures in different regions without a parallel development of international standards and appropriate methods for evaluating traditional medicine. The challenge now is to ensure that traditional medicine is used properly and to determine how research and evaluation of traditional medicine should be carried out.

B. Natural products

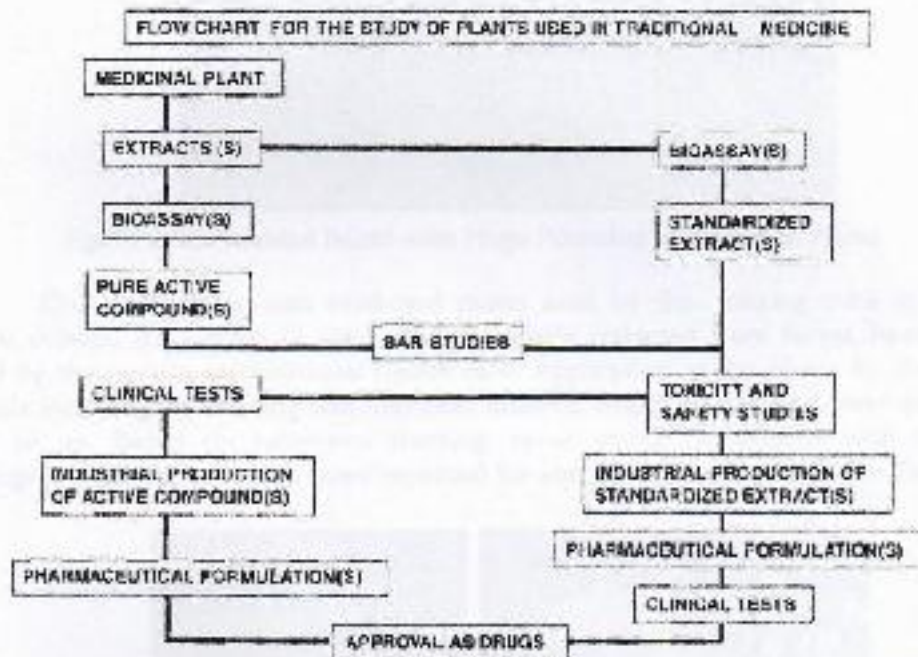
An extraordinary reservoir of novel molecules exists in the plant kingdom. However, only a small percentage of the estimated 400,000-500,000 plant species around the world has been investigated phytochemically and the fraction submitted to biological or pharmacological screening is even lower. Hundreds or thousands of metabolites and any phytochemical investigation of a given plant will expose only a very narrow spectrum of its constituents. Therefore, when screening for some biological activities of a plant extract is conducted, it will still have to be considered as "uninvestigated" with respect to any other pharmacological activity. The potential of higher plants as sources for new drugs is thus still largely unexplored. When screening for biologically active plant constituents, the selection of the plant species

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to be studied is obviously a crucial factor for the ultimate success of the investigation.

Besides random collection of plant material, targeted collection based on consideration of chemotaxonomic relationships and exploitation of ethnomedical information is currently performed. Plants used in traditional medicine are more likely to yield pharmacologically active compounds.

Useful characteristics of the natural products, for instant: plant terpenoids as toxins and feeding deterrents or attractants to herbivores, phenolic compounds with their important roles in plants, as well as allelopathic activity to the growth of neighboring plants, tannins, lignans, flavonoids, and some simple phenolic compounds as defenses against herbivores and pathogens and the roles of many flavonoid pigments as important attractants for pollinators, attract researchers to extend a variety of investigation. Although almost 20,000 microbial metabolites and approximately 100,000 plant products have been described so far, including at least 119 chemical substances derived from 90 plant species that are in use as important drugs, new natural bioactive agents are still needed (Newman et al. 2000; Vicente et al. 2003). Secondary metabolites isolated from medicinal plants can also serve as precursors or models for the preparation of effective agents through semi-synthesis or lead-based total synthesis. Other drugs have been produced chemically, using the natural product as a template, e.g.: butylmorphine and sodium chromoglycate. In general, search for new drugs is conducted with several steps as described in Figure 1.



Source: Pieters and Vlietinck (2005)

Figure 1. Flow Chart for the Study of Plants Used in Traditional Medicine.

C. Medicinal Plants of Kalimantan

Medicinal plants refer to the class of plants applied for therapy or to possess pharmacology for human and animal. In morphological aspect, there is no difference

between medicinal and others plants, except characteristic of certain plant to possess medicinal purposes. Indonesia comprises about 110 million hectares and serve about 80% world medicinal plants. It is estimated that 28,000 plant species exist in Indonesian forest. Of these, 7,000 species are medicinal plants, which is equal to 90% of medicinal plants in Asia. So far, 1,000 species have been known and utilized as traditional medicine (Pramono 2002).

Chaniago (1998) reported that more than 250 medicinal plant species from 165 genera and 75 family have been used by Dayak Ransa tribe in West Kalimantan, Indonesia. Punan tribe in Malinau, East Kalimantan recognizes and uses more than 95 plant species derived from the surrounding forest as traditional medicines. While, kenyah tribe at the same area uses at least 81 forest plant species as to cure some diseases, including herbs, climber, rattan, epiphytes and palms.



Figure 2. Kalimantan Island with Huge Potential of Medicinal Plants

Our exploration into medicinal plants used by the Tunjung tribe in West Kutai showed that about 72 plant species, mostly collected from forest, have been used by the people as traditional health care. Application of the plants by the local people including for treating skin infection, diabetic, health supplement, liver diseases and so on. Based on reference tracking, some active compounds with several biological activities have also been reported for some plants, as described in Table 1.



Figure 3. *Helminthostachys zeylanica* (left) and *Eurycoma longifolia* (right). Two Medicinal Plants of Kalimantan.

Table 1. Some Medicinal Plants of Kalimantan and Bioactivities

Common name	Botanical name	Part used	General uses	Active compounds	Biological activities	References
Akar kuning	<i>Arongelasia flava</i>	Root and stem	Malaria, stomachache	20-hydroxyecdysone, berberine	Antiparasitic, anticancer	Chi et al. 1994
Bawang tiwai	<i>Eliczerine omiensana</i>	Rhizome	Gastric infection, dysentery, cardiac disorder	Elicansin, eleutherin, hongconin	Anticancer, antiviral	Hara et al. (1957)
Karamunting	<i>Melastoma melastrobium</i>	Leaves and flower	Skin inflammation, anti wound	Some triterpenoid and flavonoids	Antioxidant, cytotoxic	Susanti et al. (2006)
Ketepeng	<i>Cassia alata</i>	Root, leaves	Skin treatment, liver diseases	Kaempferol derivatives, amodin	Antimicrobial	Hasni et al. 2008
Langsat	<i>Lansium domesticum</i>	Stem bark	Malaria, stomachache	Lansioides	Antimalaria	Kardono et al. 1991; Omar et al. 2003
Fasak bumi	<i>Eurycoma longifolia</i>	Roots	Malaria, fever, aphrodisiac	Quassinoid, Eurycomanone, 7-methoxy- β -carbolyne-propionic acid	Antiplasmodial	Kardono et al. 1991
Pulai	<i>Albizia scleroloma</i>	Stem bark	Fever, toothache, skin infection	Echitamin	Anticancer, hepatoprotector	Lin et al. 1996; Jagetia and Baliga 2004
Sahang burung	<i>Brucea javanica</i>	Fruit	Diabetic, malaria	Quassinoid, lignan	Antitumor, antimalaria	Ivyer et al. 1996
Sereh wangi	<i>Cymbopogon citratus</i>	Leaves	Fever, rheumatoid	Limonene, geraniol	Gastric inflammation	Zheng et al. 1993
Sungka	<i>Persea conspersa</i>	Leaves	To stop bleeding, anti wound	Unknown	Unknown	-
unjuk langit	<i>Helminthostachys zeylanica</i>	Root, leaves	Health supplement, skin treatment	Ugonins (flavonoid derivatives)	Antioxidant	Huang et al. 2003
Kemiri	<i>Aleurites moluccana</i>	Bark	Lips care, diarrhea	Mulucanins, triterpenoids	Cytotoxic, hepatoprotector	Liu et al. 2008

Conclusion

Nature is and will still serve as the human primary source for the cure of their ailments. However, the potential of higher plants as sources for new drugs and other natural products is still largely unexplored. Knowledge on the traditional uses of medicinal plants as implemented by people who lives in forest-surrounding and rural areas is a valuable wealth to support the discovery of potential natural products for human benefits.

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Phenolic acids, flavonoids, medicinal plants, antioxidant, cytotoxic, natural products, antimicrobial, anticarcinogenic, traditional knowledge, Indonesia, BRAC Centre for Development Management, Rajendrapur, Bangladesh.

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