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Review on traditional knowledge and utilisation of medicinal plants

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Plants with medicinal potentials have contributed significantly in the history and evolution of modern health care system. Medicinal plants remain the only way forward and due to the non-reported side effect as compared to synthetics drugs, the medicinal plant is gaining more recognition all over the world. As a result of population growth, development and lack of comprehensive written document have made traditional medicinal knowledge disappearing. This necessitate written document of the comprehensive valuable knowledge of medicinal plants with regard to the utilization. The review provides insight into the world perception and Malaysia ethnobotany. It also provides comprehensive knowledge of ethnobotany with respect to possible exploration of Malaysian Medicinal Plants toward ethnopharmacology. The information provided here is the baseline for natural product development in order to avoid future over-sampling and extinction of medicinal plants species in Peninsular Malaysia. There is a need for the updated checklist of medicinal plants used in Peninsular Malaysia.

Keywords: Traditional; Medicinal Plants; Biodiversity; Malaysia

INTRODUCTION

Medicinal and Aromatic Plants (MAP) have played a key role as therapeutic agents for a long time and thus hold great economic value (Abdulrahman et al., 2018b). The diverse varieties of plant have been studied, analysed and characterized for their medicinal values based on their major biological compounds present (Kumar et al., 2007; Mahwasane et al., 2013). Living things depend relatively on the plant, so as to meet their basic need for survival. All over the world, 85% of the modern medicines used for healthcare are derived either directly or indirectly from the plants (Fabricant & Farnsworth, 2001). Medicinal plants are the major sources of medication of about 70 to 80% of people all over

the world (Shelley, 2009). Medicinal plants play a significant role in the upliftment of cultural diversity around the globe (Ong et al., 2014). The use of medicinal plants and herbal medicine around the world serve as the basis for having cheap and good medical care system (McRae et al., 2007). Traditional medication is the most ancient and the most accepted form of medication today because it has been accepted by all cultures and tribes of the different faith (Abdulrahman et al., 2018a). The healing value of herbal plants has since been exploited for the treatments of various diseases and conditions in traditional practice (Van Andel & Carvalheiro, 2013). This tradition has gained considerable recognition in health care delivery in developed nations (Uprety et al., 2012).

Nevertheless, despite its acceptability, the traditional medicinal system faces numerous difficulties all over the world (Fig. 1). Moreover, medicinal plants are also utilized as sources of income generation and livelihood improvement (Adams et al., 2007). The exploration for endless health drives early man to investigate his immediate natural surrounding which led to the use of many plants (Torres et al., 2016). Through millennia of trial and error, native people has acquired substantial knowledge of herbal plants which has been transmitted from one group to another group of generation as part of oral traditions (Abdulrahman et al., 2018b). Presently the world is witnessing an immense deal of public interest in the use of herbal remedy (Bhana et al., 2010). Out of the total number of higher plant species on earth, more than 80,000 of the plants are medicinal species (Bhana et al., 2010). As reported by the World Health Organisation (WHO) in 2004, approximately 20,000 plant families were reported having medicinal value. Around 70, 0000 plants species have been utilized as the folk medicine of which majority are originated in the Asia-Pacific region (Bhana et al., 2010). In Asian countries, the practice of herbal medicines is very well recognized and acknowledged resulting of most of their herbal medicine are recognized internationally . Malaysia has plenty of species of plants that comprises of flowering and non-flowering types, with a variety of medicinal value, and widely utilized for the treatments of many ailments within their society (Van Wyk and Gorelik, 2017)

Malaysia is a tropical region with two main terrains or landscape in between the South China Sea (Van Wyk and Gorelik, 2017). Malaysian Peninsular is the tip of mainland Asia that is located in Neo Southeast Asia while the remaining state are Sabah and Sarawak located in Borneo Island (Robinson, 2017). Malaysia has a total land mass of three hundred and thirty thousand square meters with Sabah and Sarawak having one hundred and ninety two thousand square meters and remaining area is the Peninsular Malaysia (Jaafar and Ashraf, 2017). During the day Malaysia has an almost uniform temperature with the equatorial climate. Temperatures range from 30° C in lowland with 85 to 95 % relative humidity (Yule, 2010). The temperature falls off to 15° C in the highland region with rainfall throughout the year. Malaysia has over 18,000,000 population with diverse culture and race. The Malay ethnic group has the highest number of populace at more than 50% (Seet et

al., 2004). In Peninsular Malaysia, 1,200 species of higher plants 2,000 species in Sabah and Sarawak, are reported to have medicinal value and have been used from one generation to another generation in various traditional health care systems (Abdulrahman et al., 2018b). Research is increasingly turning in the area of natural products and looking for a new compound to develop better drugs that do not have any synthetic effect (Abdulrahman et al., 2018b).

Ethnopharmacology provides a substitute approaches for the innovation of antibacterial agents, namely the study of medicinal plants with a history of traditional use as a potential source of substances with significant pharmacological and biological activities (Mahomoodally and Ramalingum, 2015). Phyto constituents are the natural bioactive compounds found in plants (Malla et al., 2015). These phyto constituents work with nutrients and fibre to form an integrated part of a defence system against various diseases and stress Medicinal plant has the enormous number of bioactive compounds responsible for the treatments of man ailments. The informational knowledge of the plant, methods of preparation and conditioned managed are passes from one era to another era with high confidentiality and verbally, this information is, therefore, misinterpreted and lost because of the oral method of transferring of the knowledge (O'Neill et al., 2017). For this reason, there is a need for systematic documentation of such useful informational knowledge through ethnobotanical study. Today, ethnobotany has become an interdisciplinary science (Fig. 2).

World health organisation (who)

The World Health Organization (WHO) as a statutory organization describes traditional or local medicine as the summation of knowledgeable information used in the treatments of any physiological imbalance or any physical disorder based on trial and error experiment. Acquired skill and the information that had been obtained from one era to another era in the form of observation, verbally or documented (Epstein et al., 2010). World Health Organisation (WHO) has called the usage of plants for medication as the traditional medicinal system, folk medicine, local or native medicine and ethnomedicine (Qi & Kelley, 2014). WHO estimated that approximately 75-85% of world population depend on the folk medicine to meet their primary health care, this is because individuals want to substitute the various available synthetic products available in the market (Qi and

Kelley, 2014). The major benefit of traditional medicinal plants over contemporary medicine is the considerable absence of serious side effects of the plants as compared with synthetic medicines (WHO, 2002). As reported (WHO) in 2010 continual research on medicinal plants is important as a product from plants origin would continue to be demanded. The whole idea and the utilization of plants as a remedy for health care system will forever be of importance because of their conveniences, no difficulty, availability, affordability, and satisfaction (Qi & Kelley, 2014). The criteria used for the administration of the folk medicine are not standard which include appearances of the patient and age (Abdulrahman et al., 2018b). Effective usage of traditional medicinal plants through merging the traditional medicinal knowledge and complementary medicine, which will result in product formulation to give free access care to the rural community (Atakpama et al., 2015).

Regulations of traditional medicines

The law guiding the operation of traditional medicine varies from country to country due to religion and cultural diversity. The report from World Health Organisation WHO, (1993) sets guidelines for assessing efficiency, quality and safety of herbal supplement with the aim of regulating industries, researchers and regulatory bodies. WHO (2005) reported many nations have in cooperated the WHO 2002-2005 implementation policy by further developing policy in order to make traditional medicinal health care system effective and safe. World Health Organisation, (2010) gave the following rules on quality appraisal; such as preparation of plants extracts from the field to the consumption, lifespan of the herbal product, reports of the site effect (toxicity), and efficiency of the supplement or folk medicine. In cooperating traditional medicinal knowledge into the health care system, WHO thereby encourages the local people to accept the modern health care system (WHO, 20014-2023).

Historical baground of ethnobotany

Ethnobotany is the scientific way of studying plants and the way man is utilizing it for its own benefit (Van Wyk & Gorelik, 2017). It also looks at the dynamic relationships between peoples, biota, and environments, from the distant past to the immediate present (Halberstein, 2005). It is the interdisciplinary studies of how human culture interacts and uses their native plants (Fig. 1). Therefore, it can simply be defined as the

scientific and humanistic study of the complex set of relationships of the biota, to the present and the past human societies (Negbenebor et al., 2017). Ethnobotany studies are very important in keeping, analyzing and passing knowledgeable information, the relationship among the plant world, and individual within their environment (Abdelgadir & Van Staden, 2013). It gives emphasis to how diversity have been utilized in nature and subjective to human activities, how they can be classify, manage and use plants that are available around them (Bhat & Karim, 2010). Ethnobotany studies are often important in revealing locally important plant species particularly for finding the crude drugs (Table.1) (Abbasi et al., 2013). Ethnobotany is the backbone of preservation of human culture in relation to their community (Abo et al., 2008).The information which is due to the experience as a result of a time-tested practice that metamorphoses by the activities of human being around their Habitat (Adams et al., 2007). For that reason, it is the result of the experiences of many generations, vigilant observations and trial and error experiment (Adams et al., 2007).

Ethnopharmacology

The term ethnopharmacology is a field of multidisciplinary science aimed at studying clinically (pharmacologically) active ingredients of plants contents that have been used by man in their daily activities (Table 1 and Fig. 2). The concept or idea of ethnopharmacology was brought to the frame of science in the year 1967 (Zaid et al., 2017). Ethnopharmacology provides a substitute approaches for the innovation of antibacterial agents, namely the study of medicinal plants with a history of traditional use as a potential source of substances with significant pharmacological and biological activities (Table 2).The idea was defined as a multidisciplinary scientific investigation or exploration of chemically active ingredients of plants content that are traditionally utilized by the human being (Makbul et al., 2017). Ethnopharmacology has been described as the concept used for exploration of active ingredients biological compounds from the traditionally utilized plants by man for his medical benefits (Ong & Kim, 2014). It has also been defined as a marriage between modern medicine and traditional therapeutic action of plants against ailments from the two words ethno (Culture) and pharmacology (Drugs) (Fig. 1).

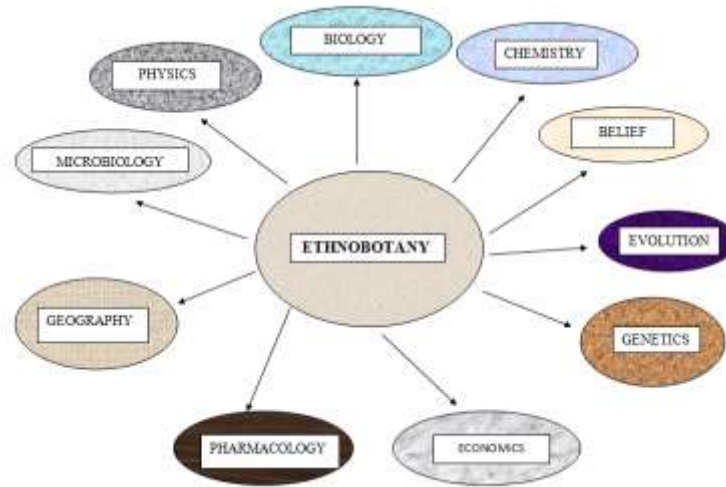


Figure 1: Schematic Diagram of Ethnobotany with subbranches

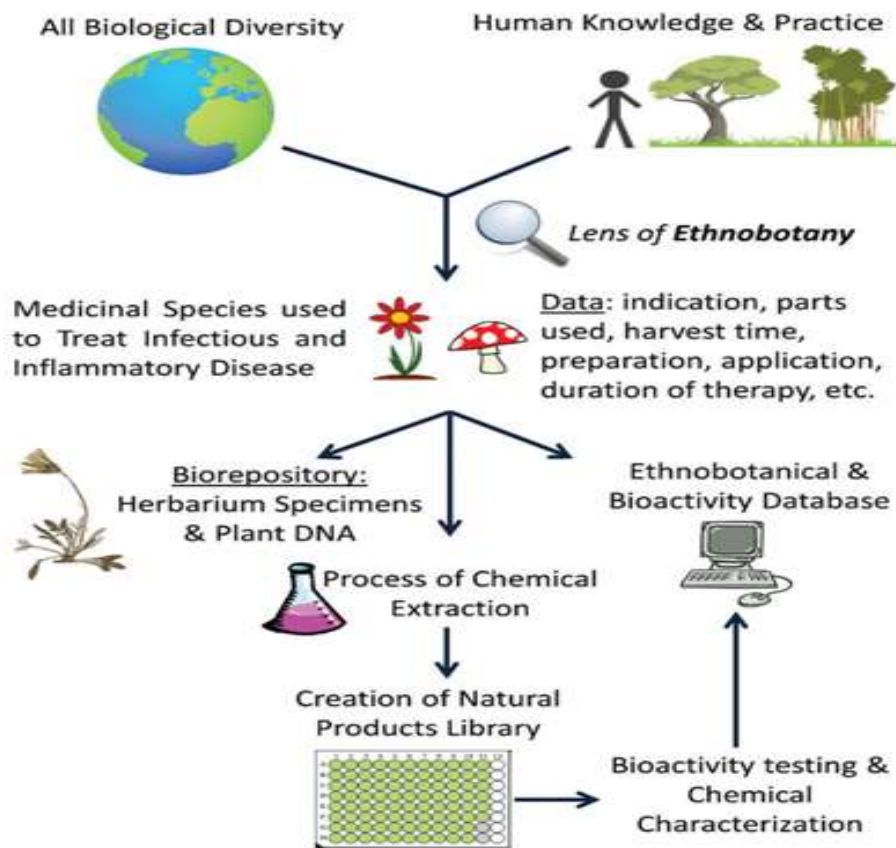


Figure 2: Brief description of drug discovery from Ethnobotany (Internet)

Table 1: Brief History of Ethnobotany

Contribution	References
Reported by foundation of the Science of Life and the Art of Hindu Culture Cured idea of plants documentation started since 2500 BC	(Walters et al., 2008)
Documentation of 67 medicinal plants in the year 4500-1600 BC by Malla Shakya	(Rahman et al., 2018)
The concept of ethnobotany begins in the year 1492 with a scientist called Christopher Columbus with some plants species which include tobacco, maize	(Smith Jr, 2006)
Immigrants documented medicine, food along together with some useful plants. Documentation of plants species started in 1492	(Luoga et al., 2000)
In the 19 th century public organisation such as World Health Organisation put more interest on medicinal plants.	(Svanberg et al., 2011)
Charles Darwin collected exotic plants for the purpose of development of garden and museum in the year 1831	(Egea et al., 2015)
A Botanist from America called Edward Palmer documents Botanical specimen from North America in 1860-1890 in his book title Food Products of the North American Indians	(Walters et al., 2008)
The first report on the worlds perspective toward plant was documented by a German Scientist called Leopold Glueck in 1896, reported to be the earliest modern medicine	(Sheng-Ji, 2008)
The term ethnobotany was given many definitions in the year 1895 by Hershberger John	(Van Wyk & Gorelik, 2017)
The term ethnobotany was coined in 1895-1954	(Pieroni et al., 2004)
In 1927, Adam Maurizio documented edible food in order to analyse wild plants	(Bennett & Prance, 2000)
In the 1944 Castetter defined the term Ethno-biology	(Sheng-Ji, 2008)
European introduced numbers of medicinal plants in Asia during the year 1755-1947	(Bennett & Prance, 2000)
An extensive survey was launched in Poland to document edible plants 1964-1969	(Svanberg et al., 2011)
The concept or idea of ethno-pharmacology was brought to the frame of science in the year 1967	(Hurrell & Albuquerque, 2012)
Paleo-ethnobotany emerged with the innovations of new concept of archaeology in 1970s	(Kunwar & Bussmann, 2008)
By the 1990 the idea of ethnobotany has encompassed all aspects of plants and its relation to the human and environments	(R. C. Clarke & Merlin, 2013)
Since 1880's there are Books of ethnobotany in Malaysia but only written in Malay language	(Salleh et al., 2001)
In order to have full understanding of Malaysian Medicinal plants; Gopinathan Kusalah, initiated the 1 st survey in 1994 which was compiled and published by Mat-Salleh, Kusalah & Latiff (2000)	(Salleh et al., 2001)
Safety, efficacy and quality of the most local herbal supplement in Malaysia was yet to established	(J. A. Jamal, 2006)
Several studies of ethnobotany were carried in Malaysia	(Abdulrahman et al., 2018b)

Selection of ethnopharmacological data from field to lab

For the pharmacological or clinical investigation, research or a prior knowledge must be obtained to comprehend or understand the concept or uses of traditional medicinal plants similar to all other relevant areas of biomedical (Reyes et al., 2007). Currently, the ethnopharmacology is widely accepted worldwide as an investigation of biological traditional active ingredients from a natural product with the intention to explore their healing potentials in a modern approach (Reyes et al., 2006). There is a need to provide biomedical lab based researchers with an idea and concept to determine quantitative data from the qualitative data be obtained from the field (Vogl et al., 2004).

Relative frequency of citation (RFC) was used in a quite number of researches in order to determine the most popular plants species in a community which will give a guide towards the selection of the plant for phytochemical and pharmacological studies with values ranging from 0 to 1 (da Silva et al., 2014). Fidelity level (FL)% is a technique of analysis in the quantitative ethnobotany in order to know the potential healing of particular plants towards certain ailment based on the agreement of the informants (Atakpama et al., 2015).

level which he described as the ration of the respondents who individually assigned a plant species for the diagnosis of same particular ailments and divide by the total number of respondents who cited the plant species for the diagnosis of any other ailments, although fidelity level has its own limitations (Andrade & Heinrich, 2011).

Information consensus factor (ICF) is one of the mainly extensively utilized tool in quantitative ethnobotany that was first proposed by Trotter and Logan (1986), and currently in used as modified by Heinrich (1998) (Leonti & Weckerle, 2015). It is used in order to identify the plant species intercultural value and the consensus agreements between the informants or respondents interviewed.

Used value (UV) index was used to determine some quantitative data in order to know the most popular species within a community (Leonti & Weckerle, 2015). For the past ten years, approximately 10,000 ethnobotanical surveys of medicinal plants have been documented quantitatively and analyzed. The aim of ethnopharmacology is to select and identify plants

species for further laboratory investigation (Shelley, 2009).

Pharmaceutical from plants

Natural products play a significant roles in the aspect of drugs discovery, this has started in the early 19th century and researchers discover the active compositions of medicinal plants one of which is quinine the one identified by Caventou and Pelletier in 1820 from the *Cinchona* (Abdulrahman et al., 2018b). Phytoconstituents are the natural bioactive compounds found in plants. These phytoconstituents work with nutrients and fiber to form an integrated part of a defense system against various diseases and stress. Medicinal plant has a substantial number of bioactive compounds responsible for the treatments of many ailments (Table 2). Phytochemicals are basically divided into two groups, i.e. primary and secondary constituents; according to their functions in plant metabolism (Malla et al., 2015). Primary constituents comprise of common sugars, amino acid, proteins and chlorophyll, while secondary constituents consist of alkaloids, terpenoids, saponins, phenolics compounds, flavonoids, and tannins. In the early development of modern medicine, biologically active compounds from higher plant contribute a major fundamental role in providing medicines to combat pain and diseases (Philip et al., 2009).

Before world war two, a number of compounds with medicinal value have been isolated from plants (Philip et al., 2009). A lot of secondary plant metabolites are constitutive compounds that appear in normal healthy plants in their biologically active form, while some appear only if there is an attack or damage to the plant tissue (Malla et al., 2015) The format which secondary plant metabolites are produced by the plant is due to responsible to a variety of biological, physical and chemical activities that are taking place within the plant (Pan et al., 2014). Researchers are putting more interest in response to a search for a modern medicine from plants origin (Wang et al., 2016). A wide varieties of secondary plants metabolites having been tested on anti-diabetic, anti-microbes and anti-cancer bioactivities have been reported to have a wide range of biological activities (Wang et al., 2016). A compound from a plant named Taxol has been used in the treatment of cancer from ovaries and breast (Abdulrahman et al., 2018). Triterpenes have also been used in the treatment of tumor cells from a human being (Singha et al., 2003).

Table 2: Pharmacognostic Evaluation of some Selected Malaysian Medicinal Plants 2009-To 2018

Scientific Name	Findings	References
<i>Curcuma manga</i>	Antimicrobial	(Philip et al., 2009)
<i>Acacia auriculiformis, Bauhinia kockiana and Calliandra tergemina</i>	Antimicrobial	(Chew et al., 2011)
<i>Curcuma aeruginosa, Curcuma mangga and Zingiber cassumunar</i>	Antimicrobial	(Kamazeri et al., 2012)
<i>Calotropis gigantean, Centella asiatica, Chromolaena odorata, Colubrina asiatica, Cosmos caudatus, Cymbopogon citratus, Melastoma malabathricum, Neptunia oleracea and Parkia speciose</i>	Antimicrobial	(Uyub et al., 2010)
<i>Andrographis paniculata, Polygonum minus, Strobilanthes crispus, Curcuma xanthorrhiza and Momordica charantia</i>	Antimicrobial	(Singha et al., 2003)
<i>Zingiber zerumbet</i>	Antimicrobial	(Kader et al., 2011)
<i>Pistia stratiotes, Piper sarmentosum, Selaginella plana, Averrhoa bilimbi, Cananga odorata, Flemingia strobilifera, Jasminum sambac, Cymbopogon citratus and Justicia gendarussa</i>	Anti-tuberculosis bacteria	(Mohamad et al., 2011)
<i>Eurycoma longifolia</i>	Antioxidant and anti-inflammatory activities.	(Varghese et al., 2013)
<i>Bauhinia kockiana, Peltophorum petrocarpum and Arachis hypogea</i>	Antioxidant	(Varghese et al., 2013)
<i>Ficus deltoidei</i>	Antimicrobial activity.	(Abdsamah et al., 2012)
<i>Psidium guajava Orthosiphon aristatus and Polygonum minus,</i>	Antimicrobial activity.	(Jamal et al., 2011)
<i>Ficus deltoidei</i>	Wound healing.	(Abdulla et al., 2010)
<i>Syzygium aromaticum</i>	Antimicrobial activity.	(Lee et al., 2009)
<i>Quercus infectoria (galls),</i>	Antimicrobial activity.	(Basri et al., 2012)
<i>Borreria latifolia Apama tricorntum, Alternanthera sessilis, Eclipta alba, Euphorbia hirta, Calotropis gigantean and Borreria articularis</i>	Antioxidants.	(Clarke et al., 2013)

Quite a number of studies was carried out on Malaysian medicinal plants with the sole aim of exploring the chemical constituents of these plants for the development of synthetic drugs (Table 2).

Authentication of plants before herbal supplement

The herbal supplement is produced by the manufacturing industries and must undergo clinical assessment (Asadi et al., 2015). This include, the process of handling the plants material from the time of collection to consumption that might lead to changes in their chemical composition, part of the plants used for the processing of the herbal supplement, methods of storage and drying process (Bhat & Karim, 2010). The above-said variation has a significant impact on the ethnobotanical activity of the processed products or final products (Shinkafi et al., 2015). Dey et al. (2014) reported the process of converting plant parts or the whole plants to a medicine through the modern technique by ensuring quality control and standardization must be fully taken into consideration in amalgamation with knowledge of traditional medicine. In quality control of the herbal product, the following scientific techniques were employed to achieve better results FTIR, HPTLC, HPLC, and GC/MS (Lykke et al., 2010). It would of significant importance if a standard method be adopted for the standardization of every herbal supplement before its commercialization in the market for consumption (Kayani et al., 2015). The adhered principle has to be followed to have a non-toxic and qualitative herbal supplement (Atanasov et al., 2015; Abdulrahman et al., 2018b). Plants should be authenticated by certified registered botanist which will confirm that the right plant has been collected, is free from any pathogenic diseases and not collected from a contaminated place (Angmo et al., 2012).

The sources and quality of the plant parts collected and acceptable process of developing the products are the basic principles of having a standardized herbal supplement (Lykke et al., 2010). Research should be conducted to confirm plant parts before it been process to herbal supplement (Table 3) (Abdulrahman et al., 2018b). Folk medicines are widely available in the market with vendors that have no prescription which is the similar all over the world (Ong & Kim, 2014). Production of effective and safe traditional

or herbal supplement will be the basic tool to enhance affordable health care to the remaining populace of the world that cannot afford the current modern health care system (Abdulrahman et al., 2018b).

Herbal supplement

Folk medicine, herbal or phyto-pharmaceuticals is any form of medicine (tea, extracts, capsules) from medicinal or aromatic plants (Kala et al., 2006). Herbal medicine incorporates single or many plants in order to address, diagnose or improve health status (Abdulrahman et al., 2018b). In the developed countries, the term herbal medicine or traditional medicine have been coined to CAM (Complementary Alternative Medicine) (Kankara et al., 2015). Access to modern health care system is only available sufficiently to a small number of the world population (Kankara et al., 2015). Ailments like heart attacks, depression are one of such many have been regulated and controlled through supplements of herbal medicine (Lee et al., 2009). As soon as it was added to the food for consumption the herbal supplements are considered to be called as a nutraceutical (Ali et al., 2000). Remedies of herbs are substance considered to be a non purified extract that are obtained from plants or plants part that contain a diverse number of constituents that synergistically worked together as a team (Ali et al., 2000). Example of Malaysian herbal supplements are Tonkat Ali, Kacip Fatimah. e.t.c.

Market potentials of herbal supplement

With the increase in population, growth and development in herbal industries are found to be growing exponentially all over the world due to the awareness and better understating of traditional herbal supplement (Yule et al., 2010). 23% of the American populace was reportedly using a traditional herbal supplement (Yule et al., 2010). It has been reported in 2013 in China the realization of eleven billion dollar in the herbal supplement market and an analogous situation was reported in traditional Ayurvedic Indian where three billion dollar was realized and greatly helped in boosting their economy (Mohamad et al., 2011). At present, the market for herbal supplement globally is over sixty billion dollar annually with the expectation of growth increment of six point four percent in the sales of herbal supplement yearly (Yule et al., 2010). These supplements are sold in various

forms; drugs, oil, lotion and others. It has been approximated that there are more than 8,400 companies in herbal supplement worldwide (Yule et al., 2010). The herbal supplement is now having a scientific backup, moral and commercialization benefits in the developed and developing countries (Yule et al., 2010). It has been reported that over 75% of recent drugs that are now in the modern medicinal health care system are originated from plants (Jaafar et al., 2017). Acceptability of herbal supplement is increasing every day due to its effectiveness and affordability. Herbal industries in Malaysia are one of the agricultural developmental sectors that are taking part in economic development and transformation (Jaafar et al., 2017). Asia is the second largest continent of the herbal industry according to the reports of the global industry analysis. It has been reported in Asia that the yearly turnover is higher than the modern medicinal industry (Jaafar et al., 2017). In 2002 it has been reported from the Malaysian herbal industry, the increase in the traditional herbal supplements of Malaysian dollar was 4.5 billion

dollar as compared to the year 1981 at 1 billion Malaysia dollar. It has been projected to have exponential growth of 500 million Malaysian dollars in 2005 to 2.5 billion Malaysian dollars, in the year 2010. Malaysian traditional medicinal system, herbal products make up a significant component. In the year 1999 medicinal and aromatic plants were approximate to have net worth RM 4.6 billion in the Malaysian herbal product market with an annual projected growth rate of fifteen to twenty percent (15-20) %. In the year 2014 and 2015, a survey was carried out by Abdulrahman et al., (2018b) and reports that the traditional herbal medicinal plants utilized the available plants in Malaysia.

Medicinal plants in malaysia

Thousands of years ago, Malaysia had an extensive variety of plant species and traditional medical systems (van and Carvalheiro 2013). More than one thousand three hundred (1,300) medicinal plant species have been identified in Peninsular Malaysia alone (Table 4)

Table 3: List of Morpho-anatomical Studies carried out in Malaysia in between 1991-2018 for Authentication and Identification Purposes

Plants	Description	References
<i>Eugenia</i>	Identification based on midrib and stomata type	(Hussain et al., 1991)
<i>Macaranga</i> (Euphorbiaceae)	Comparison of morphological studies	(Fiala et al., 1991)
<i>Eugenia</i>	The taxonomic significance of micromorphology of leaf.	(Haron & Moore, 1996)
<i>Icacinaeae</i>	Anatomical studies	(Teo & Haron, 1998)
<i>Sterculia</i> . species	Identification based on leaf anatomical studies	(Hussin & Sani, 1998)
Oil palm frond, Coconut, pineapple leaf and Banana stem	Chemical composition and anatomical evaluation	(Khalil et al., 2007)
<i>Dipterocarp seedlings</i>	Leaf morphological and physiological studies in Sarawak	(Kenzo et al., 2007)
<i>Elaeis guineensis</i>	Chemical composition, morphological and cell wall studies	(Abdul Khalil 2008)
<i>Murraya paniculata</i>	Morphological and anatomical studies of leaves and flower	(Taha & Haron, 2008)
<i>Hibiscus cannabinus</i>	Cell wall, anatomy and chemical composition	(Khalil et al., 2010)
<i>Platycerium coronarium</i>	Morphological and tissue culture studies	(Taha et al., 2011)
<i>Ficus deltoidea</i>	Variation in leaf morphology and heterophylly observation	(Mat et al., 2012)
<i>Byttneria</i> and <i>Pterocymbium</i>	Taxonomic value of venation and trichome Characteristics in leaf	(Nurshahidah et al., 2013)
<i>Dioscorea hispida</i>	Anatomical investigation of stem, leaf, petiole, tuber, root and flower	(Tajuddin et al., 2013)
<i>Ficus deltoidea</i>	Leaf morphological and anatomical variation among the seven varieties	(Fatimah et al., 2014)
<i>Bouea</i> , <i>Mangifera</i> and <i>Spondias</i>	Comparative leaves anatomical evaluation	(Ghazalli & Mohammad, 2014)
<i>Ficus deltoidea</i>	Phylogenetic analysis using morphological data set	(Fatimah et al., 2014)
<i>Melastoma malabathricum</i>	Leaf micromorphology on its taxonomic significance	(Haron et al., 2015)
<i>Passiflora</i> species	Macromorphology and micromorphological Studies in Peninsular Malaysia	(Veeramohan & Haron, 2015)
<i>Ficus deltoidea</i>	Leaf venations for taxonomic identification	(Siti-Khaulah & Noraini, 2016)
<i>Sapindaceae</i> species	Leaf venation for taxonomic identification	(Norfaizal et al., 2017a)
<i>Cardiospermum halicacabum</i>	Anatomy and micromorphology of leaf	(Norfaizal et al., 2017b)
<i>Firmiana malayana</i> Kostem	Pollen features is off taxonomic significance	(Amirul et al., 2018)

(Abdulrahman et al., 2018a). History has shown that Malaysian traditional medicine was originated from Unani systems of medicine, which in turn had Hellenic roots, and the Malaysian system has been affected by Indonesian, Chinese, Indian, and Orang Asli traditional practices. Roughly 7,411 plants species (excluding Bryophyta, Algae, and Fungi) have been documented in Sabah and about eighty percent (80%) of the indigenous plants were utilized by local people health and other purposes. Adding to that about 1,200 species were used statewide for medicinal purposes. Several medicinal plants were reported to be rationally in used in state Malaysia such as *Allophylus cobb*, *Aloe vera*, *Allium sativum*, *Albizia myriophylla*, *Acorus calamus*, *Azadirachta indica*, *Andrographis paniculata*, *Citrus aurantifolia*, *Citrus hytrix*, *Carica papaya*, *Cyombopogon citrates*, *Cinnamomum canphora*, *Claoxylon longifolium*, *Centella asiatica*, *Cananga odorata*, *Cosmos caudatus*, *Drographis paniculata*, *Artocarpus heterophyllus*, *Biophytum longifolia*, *Brucea javanica*, *Cassia alata* L., *Cocos nucifera*, *Crinum defixum*, *Cympopogon nardus*, *Dianella ensifolia*, *Eleusine indica*, *Gossypium herbaceum*, *Gossypium herbaceum*, *Gossypium herbaceum*, *Tinomiscium petiolare*, *Urena lobata*, *Phyllanthus niruri*, *Polyalthia microtus*, *Lygodium microphyllum* and *Sida rhombifolia*, *Syzygium polyanthum* (Asadi et al 2015; Abdulrahman et al., 2018a; Abdulrahman et al., 2018b).

Malaysian traditional medicinal plants as *ulam*

Ulam is defined as the traditional plants consumed by the Malay people in their daily diet either processed or raw plants material (Ali et al., 2000).

Several researchers have documented medicinal plants that are used by the Malay people to cultivating plants at their homes for medicine, improvement of health status and for consumption purposes (Seet et al., 2004; Abdulrahman et al., 2018b; Rahman et al., 2018).

Threats to medicinal plants

Despite plants play a significant role in addressing human ailments, they presently under danger and pressure. Agricultural expansion, environmental degradation, infrastructural development, and deforestation are factors that lead to the species and rapid habitat lost. Destructive harvesting and overuse of medicinal plants species have made them be at conservation risk. Collection of the root and bark

of the plant regularly might result in the death of the plant. The serious decline in utilization of traditional knowledge of medicinal plants is as a result of constant environmental deforestation. Modern civilization also has a negative impact on the availability and diversity of medicinal plants (Kankara et al., 2014).

Table 4: Some Tradition medicinal plants consumed in Peninsular Malaysia as *Ulam*

Botanical name	Common name
<i>Andrographis paniculata</i>	<i>Hempedu bumi</i>
<i>Kaempferia galanga</i>	<i>Cekur, Kencur</i>
<i>Centella asiatica</i>	<i>Pegaga</i>
<i>Piper betle</i>	<i>Sireh</i>
<i>Areca catechu</i>	<i>Betel Nut</i>
<i>Cinnamomum verum</i>	<i>Kayu manis</i>
<i>Kaempferia galanga</i>	<i>Finger root</i>
<i>Oroxylum indicum</i>	<i>Beko</i>
<i>Morinda citrifolia</i>	<i>Mengkudu</i>
<i>Neptunia prostrate</i>	<i>Tangki</i>
<i>Cymbopogon nardus</i>	<i>Serai wangi</i>
<i>Alpinia galanga</i>	<i>Lengkuas</i>
<i>Pluchea indica</i>	<i>Beluntas</i>
<i>Piper sarmentosum</i>	<i>Kaduk</i>
<i>Pithecellobium bubalinum</i>	<i>Kerdas</i>
<i>Curcuma xanthorrhiza</i>	<i>Temu lawak</i>
<i>Citrus hystrix</i>	<i>Limau Purut</i>
<i>Gynura procumbens</i>	<i>Akar sebiak</i>
<i>Oenanthe javanica</i>	<i>Selom</i>
<i>Euodia redlevi</i>	<i>Tenggek burung</i>
<i>Averrhoa bilimbi</i>	<i>Belimbing</i>
<i>Sauropus androgynous</i>	<i>Cekur manis</i>
<i>Oenanthe javanica</i>	<i>Selom</i>
<i>Barringtonia racemose</i>	<i>Putat</i>
<i>Diplazium esculentum</i>	<i>Pucuk Paku</i>
<i>Cosmos caudatus</i>	<i>Ulam Raja</i>
<i>Pluchea indica</i>	<i>Beluntas</i>
<i>Anacardium occidentale</i>	<i>Pucuk gajus</i>
<i>Polygonum minus</i>	<i>Kesum</i>
<i>Pithecellobium jiringa</i>	<i>Jering</i>
<i>Polygonum minus</i>	<i>Kesom</i>
<i>Sesbania grandiflora</i>	<i>Turi</i>
<i>Syzygium aqueum</i>	<i>Jambu air</i>
<i>Syzygium malaccense</i>	<i>Jambu bol</i>
<i>Mangifera pentandra</i>	<i>Becang</i>
<i>Garcinia mangostana</i>	<i>Manggis</i>
<i>Etlingera elatior</i>	<i>Kantan</i>
<i>Syzygium polyanthum</i>	<i>Serai kayu</i>
<i>Gnetum gnemon</i>	<i>Belinjau, Melinjau</i>

Conservation of medicinal plants

Conservation can simply be described as the sustainable use of biological resources. The term sustainability is the guiding principle of biological resources in terms of economic and social development. Medicinal plants are considered to

be at conservation risk as a result of overused and destructive harvesting of parts. Traditional medicinal preparations that are based on the usage of roots, stem and bark would lead to successfully annihilate the endangered plants (Ong & Kim, 2014). Parts of the plant are utilized to make plant remedy (Abdulrahman et al., 2018b). Conservation is actualised by means of in-vivo and in-vitro. Conservation of species in their natural habitats. Some traditional medicinal plants have to be conserved in-vivo as a result of the challenges to their management and domestication. Furthermore, a number of medicinal plants are unsuccessful to make the needed quality, and quantity of the active compounds required when cultivated out of their natural habitat. Traditionally, conservation of Medicinal plants can be done at home, mosque, garden, worship places and other places so as to domesticate for future generation use. Botanical garden and gene bank can be utilised for the maximum conservation of medicinal plant (Asadi et al., 2015).

Conservation of indigenous traditional knowledge

Traditional Indigenous people are originally residing within the forest but with increasing deforestation of the forest area and turning the forest into an urban city, the culture and indigenous traditional knowledge of medicinal plants are rapidly losing (Abdulrahman et al., 2018a). The loss of indigenous knowledge and biodiversity to the urbanization is very worrisome. Certainly, documentation of the world traditional indigenous knowledge and culture toward medicinal plants will play a significant role in the conservation of the knowledge and the forest that has not been cut down (Shinkafi et al., 2015; Abdulrahman et al., 2018b). A research conducted revealed aged people of 50 years old and above has good knowledge of traditional herbal remedies, which have proven that the knowledge of traditional medicine was concentrated at elderly age people only and lack of willingness of the younger generation is making it very difficult to pass this knowledge to the next generation. Modernization of the younger generation is the major threat to the maintenance of traditional knowledge of medicinal plants (Salleh et al., 2000). With the death of aged old people in the community, the traditional herbal medicine might become extinct. Regular documentation of this knowledge will provide solutions and a way forward to the conservation of

traditional knowledge of medicinal plants; which will be enlighten to the populace of the community on how to handle their natural environmental resources generation after generation.

CONCLUSION

From the findings of some selected research articles, this paper has reconfirmed the previous findings that medicinal plants play a vital role for the wellbeing of man on earth through therapeutic value, by healing diverse ailments and other environmental usages such as biodegradation of pollutant, beautification and many other purposes. The review provides information towards understanding of Malaysian traditional knowledge with respect to ethnopharmacology exploration. The data provided here will aid researchers in the field of ethnobotany and ethnopharmacology to furthermore investigations in the field, even though the complete checklist of medicinal plants used by the Malay people has not been provided. For traditional medicinal knowledge to attain more value all over the world in the health scheme, documentation is very necessary and important. This will give an avenue to record the success achieved in treating ailments using traditional herbal medicine as well as failure if there is any. This will give chance to document the efficacy and also become more scientific. In most cases, only the plant usage and processing aspect is only documented but the record of success and failure were not much documented. Training the future generation on traditional herbal medicine and retraining the older herbalist on the modern techniques of hygiene will enhance the value and acceptability of traditional medicinal system all over the world.

CONFLICT OF INTEREST

The authors declared that present study was performed in absence of any conflict of interest.

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AUTHOR CONTRIBUTIONS

All authors contributed equally in all parts of this study.

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