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A STUDY OF PHARMACOLOGICAL SCREENING FOR ANTIDIABETIC ACTIVITY

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ABSTRACT
The current study will try to develop new Pharmacological and phytochemical quality criteria for traditional anti-diabetic herbs such as Helicteres isora Linn. and Lagerstroemia speciosa (L.) Pers. In the Konkan area of India, the roots of H. isora (Family: Streculiaceae) known as 'Murdasing' are utilized as an anti-diabetic. People in the Philippines utilize the leaves of L. speciosa (Family: Lythraceae) known as 'Banaba' in the form of herbal anti-diabetic tea. These two plants are said to have anti-diabetic properties. However, no full systematic Pharmacological examination has been provided. As a result, the current research sought to establish quality criteria for H. isora and L. speciosa. H. isora roots and L. speciosa leaves were collected from three different states in India and evaluated for complete Pharmacological parameters such as macroscopy, microscopy, ash values, extractive values, phytochemical screening, and marker compound estimation using HPLC and HPTLC methods.

KEYWORDS: Pharmacological Screening, Antidiabetic Activity, phytochemical quality, Lagerstroemia speciosa, HPLC and HPTLC methods

INTRODUCTION

Traditional medicine is the result of the therapeutic experience of generations of indigenous medicine practitioners. For thousands of years, plants have been the foundation of many traditional medical systems across the globe, and they continue to give humans with new solutions. Plant-based medications, which were first delivered as crude pharmaceuticals such as tinctures, teas, poultices, powders, and other herbal formulations (Samuelsson, 2004), are now the foundation for innovative drug development. Drug development is a multidisciplinary and transdisciplinary process. Apart from the fundamental disciplines of pharmaceutical research, ancient sciences like as taxonomy and the emerging study ethno botany have now become an essential aspect of plant medicine development. Plant-based indigenous knowledge has been handed down from generation to generation throughout history in many regions of the globe, and it has considerably contributed to the development of numerous traditional systems of medicine. The earliest evidence of its usage by Indians, Chinese, Egyptians, Greeks, Romans, and Syrians goes back around 5000 years. over 500 therapeutic plants are referenced in ancient literature, and over 800 plants have been employed in indigenous medical systems. The Indian subcontinent is home to a broad array of medicinal plants utilized in traditional medical treatments. Several plant species are used to cure various

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illnesses in indigenous systems such as Siddha, Ayurveda, Unani, and Homeopathy.

Drug discovery from higher plants

Plant-based drug development has expanded to incorporate multiple multidisciplinary domains and analytical approaches. A botanist, ethnobotanist, ethnopharmacologist, or plant ecologist generally gathers and identifies the plants of interest. Collection may include species with known biological activity whose active compound(s) have yet to be extracted, or taxa gathered at random for a massive screening run. Phytochemists (natural product chemists) create extracts from plant materials, put them to biological screening in pharmacologically relevant tests, and begin the process of isolating and characterizing the active compound(s) using bioassay-directed fractionations. As a result, natural products, especially medicinal plants, continue to be a major source of novel medications, drug leads, and new chemical entities (NCEs). Natural products were said to have inspired 61% of the 877 small-molecule NCEs launched as medicines globally between 1981 and 2002. Natural products (6%), natural product derivatives (27%), synthetic compounds having natural product-derived pharmacophores (5%), and synthetic compounds created from natural products (23%; Newman et al., 2003; Butler, 2004). Some instances of effective plant-based medications are briefly given below. Arteether is a very effective antimalarial medication produced from artemisinin, a sesquiterpene lactone obtained from the herb Artemisia annua L. (Asteraceae), which is utilized in traditional Chinese medicine (Vanagtmael et al., 1999; Graul, 2001). Galanthamine is a natural substance obtained from Galanthus woronowii Losinsk (Amaryllidaceae) in Russia via an ethnobotanical approach. Galanthamine is licensed for the treatment of Alzheimer's disease, and it works by blocking acetylcholine esterase and attaching to and modifying the nicotinic acetylcholine receptor (Heinrich and Teoh, 2004; Prittila et al., 2004). Tiotropium was recently approved in the United States for the treatment of chronic obstructive pulmonary disease (Frantz, 2005; Mundy and Kirkpatrick, 2004). Tiotropium is an inhaled anticholinergic bronchodilator derived from ipratropium, an atropine derivative obtained from Atropa belladonna L. (Solanaceae) and other Solanaceae members

Morphine-6-glucuronide, a morphine metabolite derived from Papaver somniferum L. (Papaveraceae), has been described as a safer alternative to morphine (Lotsch and Geisslinger, 2001). Exatecan is a camptothecin analogue isolated from Camptotheca acuminata Decne. (Nyssaceae) as an anticancer drug is being researched (Butler, 2004; Cragg and Newman 2004). Vinflunine is an enhanced version of vinblastine from Catharanthus roseus G. Don (Apocynaceae) for use as an anticancer drug (Okouneva, 2003). All of these drugs are now undergoing phase III clinical studies (Butler, 2005). Thus, it is clear from these three instances that modifying existing natural products may result in NCEs and potential therapeutic leads from medicinal plants.

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Challenges in drug discovery from medicinal plants

Despite the success of plant-based drug development programs in the last 2-3 decades, future attempts confront several hurdles. To stay up with other drug discovery efforts, natural product scientists and pharmaceutical businesses will need to consistently increase the quality and quantity of molecules that reach the drug development phase. The drug development process is anticipated to take 10 years and cost more than 800 million dollars (Dickson and Gagnon, 2004). Much of this time and money is spent on abandoned leads throughout the drug development process. It is expected that just one in every 5000 lead compounds will make it through clinical studies and be licensed for usage.

The approach to herbal medication development is fraught with complications. Crude herbs and plants (different plant components and exudates) are generally produced as tablet and capsule preparations, with some oral liquid formulations as well. These dose forms are ineffective owing to issues with absorption, therapeutic effectiveness, and poor compliance. The powdering of crude herbs is required for tablet or capsule dosage form, and particle size impacts the mixing, compression, and filling processes. Furthermore, owing to the handling of huge bulk quantities, high moisture content, and intrinsic character of raw materials (crude medicine), uniformity is difficult to obtain. Because of their hygroscopic nature, low solubility, and stickiness, crude extracts are challenging to produce in solid dosage forms.

Because plant-based drug discovery has historically been time-consuming, quicker and improved approaches for plant collecting, bioassay screening, chemical isolation, and compound development must be used (Koehn and carter, 2005). Innovative plant collecting tactics are required, particularly in light of the legal and political concerns surrounding benefitsharing agreements (Rosenthal, 2002; Soejarto, 2004). All drug discovery programs have challenges in designing, determining, and implementing effective, therapeutically relevant, highthroughput bioassays (Knowles and Gromo 2003; Kramer and Cohen 2004). Although designing high-throughput screening assays may be difficult (Walters and Namchuk, 2003), chemical and extract libraries can be evaluated for biological activity once a screening assay is in place. The most typical challenge encountered during extract screening is solubility, and screening of extract libraries is often challenging, however emerging approaches such as extract prefractionation may ease some of these concerns (Butler, 2004; Koehn and carter, 2005). Bioassay screening challenges will continue to be a concern in the future of drug development from medicinal plants. Using hyphenated methods such as LC-NMR and LC-MS, the speed of active compound separation may be enhanced. Drug development from lead compounds derived from plants has distinct hurdles.

In general, natural products are separated in tiny amounts that are inadequate for lead optimization, lead development, and clinical trials. Thus, cooperation between synthetic and medicinal chemists are needed to investigate the possibility of

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semi-synthesis or total synthesis (Lombardino and Lowe, 2004; Ley and Baxendale, 2002; Federsel, 2003). Natural product compound creation may also be improved by building natural product libraries that combine natural product properties with combinatorial chemistry.

Worldwide herbal trade

The worldwide market for herbal medicines is presently worth more than $60 billion each year. Herbal medicine sales are predicted to increase at a 6.4% annual growth rate (Inamdar et al., 2008). Because millions of people all over the world have been using herbal medicines for thousands of years; great interest in alternative medicines; population preference for preventive medicine due to increasing population age; the belief that herbal medicines may be of effective benefit in the treatment of certain diseases where conventional therapies and medicines have proven ineffective; According to a 1991 estimate, the European herbal medicine industry was worth around $ 6 billion, with Germany accounting for $ 3 billion, France accounting for $ 1.6 billion, and Italy accounting for $ 0.6 billion, while other nations accounted for 0.8 billion. The herbal medicine market in Europe was around $ 10 billion in 1996, approximately $ 4 million in the United States, approximately $ 1.0 billion in India, and approximately $ 5.0 billion in other countries (Prajapti et al., 2003). In 1997, the European market alone was worth over $ 7.0 billion. The German market accounts for over half of the European market, or around $ 3.5 billion. Following this market are France ($1.8 billion), Italy ($700 million), the United Kingdom ($400 million), Spain ($300 million), and the Netherlands ($100 million) (Calixto, 2000). In the year 2000, the worldwide market for herbal medical goods was projected to be worth roughly US $ 60 billion. Herbal product demand has been expanding at a 7% annual pace and is predicted to reach $5 trillion by 2050. On the worldwide market, more than 50 therapeutic plants are sold extensively.

Indian herbal trade in world scenario

In recent years, India has exported a significant amount of medical plants and herbs. Isabgol, opium alkaloids, senna derivatives, vinca extract, cinchona alkaloids, ipecac root alkaloids, solasodine, diosgenine, menthol, gudmar herb, mehndi leaves, papain, rauwolfia guar gum, jasmine oil, agar wood oil, sandal wood oil, etc. The yearly turnover of the Indian herbal sector was projected to be roughly US $ 300 million, with Ayurvedic and Unani medicine accounting for around US $ 27.7 million. In 1998-1999, the overall sales of Ayurvedic and herbal goods increased to US $ 31.7 million, and in 1999-2000, the total turnover was US $ 48.9 million. The value of herbal medication exports in India is estimated to be over $ 80 million

Quality control of herbal drugs

The most difficult task in bringing any traditional medicine or contemporary phytomedicine to the approval of concerned people is quality monitoring of plant raw materials. The biggest issue in quality control is the variance in medicinal plant quality from batch to batch. This is due mostly to the presence of ecotype pharmacological differences in many therapeutic plants. Medicinal plants'

therapeutic efficacy may vary based on soil conditions, nutritional state, climatic circumstances, seasonal fluctuations, diurnal variations, and their connection with other species.

India has a significant role to play as a provider of herbal goods, not only to suit local demands, but also to capitalize on the enormous export potential. To be a worldwide provider of herbal medicines that meet international standards, the following elements must be addressed:

All therapeutic plants in the Indian System of Medicine must be identified botanically. In addition to their popular/common names, all herbal substances in preparation must be mentioned by their botanical names.

Processing medicinal plants in a scientific, economical, and safe manner utilizing methods similar to those used in contemporary pharmaceuticals.

Wherever feasible, isolate and chemically characterize acute components, including inorganic elements. Pharmacological and clinical trials are being conducted to determine their effectiveness and safety.

Standardization is used to guarantee consistency. To enable analysis and to apply quality control and standardization standards to herbal medication formulations, the use of medicinal plants in combination should be restricted.

CONCLUSION

Phytochemical analysis of H. isora root samples reveals the presence of saponins, sterols, tannins, polyphenols, flavonoids, proteins, carbohydrates, and starch. The amounts of phenolic, tannins, flavonoids, and sugar in three samples of H. isora roots are 17.58-18.22%, 15.23-16.84%, 0.218-0.272%, and 4.05-4.45%w/w, respectively. The findings of qualitative and quantitative phytochemical screening of three H. isora root samples were determined to be identical. Sapogenins were extracted from the roots of H. isora and utilized to create HPLC and HPTLC methods. This is the first report of oleanolic acid determination from H. isora roots using HPLC and HPTLC. The level of oleanolic acid in extracts of H. isora roots collected from Gujarat, Maharashtra, and Punjab by HPLC technique was 0.072%, 0.078%, and 0.022%, respectively. The variance in oleanolic acid concentration might be related to regional variation. The amount of oleanolic acid in extracts of H. isora roots collected from Gujarat, Maharashtra, and Punjab using the HPTLC technique was 0.075%, 0.076%, and 0.020%, respectively. Both procedures are easy, accurate, sensitive, and repeatable, which may explain the difference in oleanolic acid content. Both strategies provide outcomes that are quite near to one other. Leaves of L. speciosa from various states have identical morphological and microscopical traits, as well as physicochemical values. Phytochemical analysis of three L. speciosa leaf samples reveals the presence of saponins, sterols, tannins, polyphenols, flavonoids, alkaloids, proteins, and sugar. The amounts of phenolic, tannins, flavonoids, and sugar content in L. speciosa leaves were determined to be 19.53-20.22, 12.9-14.5, 0.102-0.110, and 4.70-5.39%w/w, respectively.

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