

Analysis of
phytochemical
constituents of
syzygium aromaticum
biology essay



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Alternative method to drug discovery is likely through the medicinal plants and greater parts of the people have assurance in traditional medicine, particularly plant drugs for their initial healthcare. Recently, responsiveness has been paid in public to consume eco-friendly and bio-friendly plant-based products for the prevention and cure of distinctive human diseases. Several number of people looking for medicine and health approaches which excuse side effects caused by synthetic chemicals (Remington, 1995).

Herbal drugs are having less considerable side effects than the other classes of synthetic drugs and most of the medicinal uses of plants seem to have been developed by trial and error and by interpretation of wild animals. Herbs had been utilized by all cultures all the way through history. Ancients observed and respected the great variety of plants available to him. The plants afford a number of basic essentials in human day to day life such as food, clothing, shelter and medicine etc, and as time went on, every tribe supplements the medicinal power of herbs in their area to its awareness base. It was a primary part of the development of modern civilization and In fact, well into the 20th century to a remarkable scope of the pharmacopoeia of scientific medicine was ensuring from the herbal knowledge of native peoples. They gathered information accurately on herbs and developed well described herbal pharmacopoeias. Pharmacopoeia includes at least 25% drugs ensuring from plants and rests of other are synthetic analogues developed on model compounds isolated from plants. Today several drugs are commonly used basically derived from herbal origin. In fact, in the United States about 25% of the prescription drugs dispensed contain at least one active ingredient derived from plant material in which some are made from

plant extracts and rest are synthesized to imitate a natural plant compound. At present there are a number of plant materials belong to different family have been used in the treatment of a variety of diseases like bacterial, fungal and dermatophytic infections (Rajshekharan, 2002).

Herbal medicine is extensively practiced from ancient period all over the world. These medicines are safe as well as eco-friendly and bio-friendly. According to WHO, about 80% of the world's population relies on traditional medicine for their primary health care and medicinal plant division has usually an important position in the religious, socio cultural and medicinal arena of rural and tribal lives of millions of rural households use medicinal plants in a self-help mode (Remington, 1995).

The Greater part of the traditional plant based remedies is back in use and finds the right application.

Direct sources of therapeutic agent

A model for new synthetic compound

A lead molecule for the discovery of new drug.

PHYTOTHERAPY

To outline the history of Phytotherapy is to outline the history of humanity itself. The discovery of medicinal properties of certified plants must have sprung from nature. Ancient peoples first use plants as food and, as results of this ingestion, the link with some plant property would have been learned. Medicinal plants were the main source of products used to maintained health

until the nineteenth century, when the German chemist Friedrich Wohler in 1828, try to prepare ammonium cyanate from silver cyanide and ammonium chloride, by mistake synthesized urea. This was considered as the first organic synthesis in history and signed the era of the synthetic compounds (Ahmad, 2006).

A multidisciplinary capillary science, research in the phytosciences is more or less unlimited, which composes it impossible to talk about all aspects of this up-and-coming science in just one chapter. Consequently, we have paying attention here chiefly on the antibacterial activity of bioactive phytochemicals, conversing their use against multidrug-resistant (MDR) bacteria and fungi, their mechanisms of action, and their interactions with macromolecules and possible for toxicity in mammalian cells. Technical features concerning the advancement of fast and consistent methods of extraction, high output screening systems, and bioautography of essential oils and crude extracts and divisions have also been discussed. Problems associated to the efficacy, stability, drug delivery systems and quality control are also analyzed (Ahmad, 2006).

HISTORY OF PHYTOTHERAPY

During the 100 years of Wohler's discovery Phytomedicine was forgotten by western science and in the early 1980's, though, there was a reappearance of attention in the use of natural substances commonly known today as bioactive phytochemicals. This interest can be simply understood in the light of questions relating to the safety, cytotoxicity, and side-effects of synthetic compounds, and the essential to find new medicines, comprising

new antibiotics to supervise infectious diseases caused by multiresistant pathogens and substances to treat chronic diseases (Heinrich, 2004).

Today, the use of medicinal plants and their bioactive phytochemicals and our scientific knowledge about them consist of the modern field of the phytosciences. This is a science fashioned from the combination of a range of disciplines that have never been linked before, combining several different areas of economic, social, and political fields, chemistry, biochemistry, physiology, microbiology, medicine, and agriculture (Schulz, 2004).

The phytosciences are distinctive from the other biomedical sciences in that as a substitute of testing a hypothesis, researchers evaluate to find out whether plants generally used in traditional medicine bring benefits for health and, if so, what are their mechanisms of action. Although the common conviction that bioactive phytochemicals are safe, they have natural risks just like all active chemical compounds. Researchers within the phytosciences are working to illuminate the side-effects, calculate proper dosages, isolate the bioactive compounds, and define the superlative methods of extraction and conservation. As well these, legal aspects concerning the prescription and trade in medicinal plants are a matter of discuss all around the world (Heinrich, 2004).

As a multidisciplinary science the research in this field is virtually unlimited, this makes it impractical to converse all the aspects of this promising science in just one chapter. So, this review discusses the antimicrobial activity of bioactive phytochemicals, particularly their use against multidrug-resistant bacteria and fungi, their mechanisms of action, and their interactions with

macromolecules and potential toxicity for mammalian cells. It also discusses technical aspects concerning the development of fast and consistent methods of extraction, high output screening systems and bioautography of essential oils and crude extracts and fractions. Problems associated to efficacy, stability, drug delivery systems and quality control will also be discussed (Schulz, 2004).

SCREENING OF CRUDE PLANT EXTRACTS: NEW CHALLENGES

Medicinal plants have fashioned the establishment of health care all over the world as the early days of humanity and are yet now widely used and have considerable value in international trade. Recognition of their economic, pharmaceutical and clinical value is still rising, although this difference is comprehensively between countries. Plants are essential for pharmacological research and drug development, not only when bioactive phytochemicals are used promptly as therapeutic agents, but also as preliminary materials for the synthesis of drugs or as models for pharmacologically active compounds. Regulation of their misuse is therefore essential to ensure their availability for the future (Heinrich, 2004).

Plant preparations have a very special characteristic that differentiates them from chemical drugs. A single plant may enclose a number of bioactive phytochemicals and a combination of plants even more. This difficulty is one of the major significant challenges to phytoscientists attempting to recognize a single bioactive phytochemical or chemical group in the massive universe that encompasses a single crude extract (Heinrich, 2004).

Biotechnology in the 1970s and 1980s made incredible progress and accompanied in a new era for the pharmaceutical industry. Many enzymes and receptor proteins of therapeutic interest were made existing in great quantities by recombinant expression, although signal transduction pathways could be interrogated by reported gene carrying cellular constructs. Such mechanism-based invitro assays are agreeable to significant scales of operations, and the concept of high-throughput screening rapidly became the standard for lead discovery (Heinrich, 2004).

PROCESS STANDARDIZATION OF BIOACTIVE PHYTOCOMPOUNDS HAVING ANTIMICROBIAL ACTIVITY

Different methods to drug discovery using higher plants can be discriminated: Random selection followed by chemical screening; random selection followed by one or more biological assays; biological activity reports and ethno medical use of plants. The second approach comprises of plants used in traditional medical systems; herbalism, folklore, and shamanism; and the use of databases. The purpose is the targeted isolation of bioactive phytochemicals and once an active extract has been identified, the first to be taken is the identification of the bioactive phytochemicals, and this can signify either a full identification of bioactive phytochemicals after purification or partial identification to the level of a family of known compounds (Schulz, 2004).

For screening selection, plants are collected either randomly or by following leads supplied by local healers in geographical areas where the plants are found. Primary screening of plants for possible antimicrobial activity usually

begins by using crude aqueous or alcoholic extractions followed by different organic extraction procedures. Plant material can be used fresh or dried and other significant plant materials related to antimicrobial activity are the essential oils. Essential oils are complex natural mixtures of volatile secondary metabolites, isolated from plants by hydro or steam distillation and by expression (citrus peel oils). The chief constituents of essential oils (mono and sesquiterpenes), along with carbohydrates, alcohols, ethers, aldehydes, and ketones, are responsible for the fragrant and biological properties of aromatic and medicinal plants (Schulz, 2004).

Due to these properties, since ancient time's species and herbs have been added to food, not only as flavoring agents but also as preservatives. For centuries essential oils have been isolated from different parts of plants and are also used for related purposes (Blumenthal, 2000).

The activities of essential oils cover a broad spectrum and various essential oils produce pharmacological effects, representing anti-inflammatory, antioxidant, and anticancerogenic properties. Others are biocides against a broad range of organisms such as bacteria, fungi, protozoa, insects, plants and viruses (Heinrich, 2004).

Therefore medicinal plants have been used for centuries as therapy for human diseases because they contain therapeutic value components. Recently, the acceptance of traditional medicine as an alternative form of health care and advancement of microbial resistance to existing antibiotics has lead authors to investigate the antimicrobial activity of medicinal plants. Moreover, the increasing use of plant extract in the food, cosmetic and

pharmaceutical industries recommend that, in order to find active compounds a systematic activity of medicinal plants is significant (Heinrich, 2004).

SCOPE

The scope of this Research is based on the fact that “ Clove (*Syzygium aromaticum*)” is available easily in anywhere and is cultivated largely. Based on the literature survey as it is showing so many bioactive components and is of medicinal value without side effects, I have selected Clove for my Research work.

Clove buds selection

Extraction by using Soxhlet

Antimicrobial Screening

MIC

Chemical analysis presence or absence of phytoconstituents

Chromatography techniques (GC) Compound Identification.

OBJECTIVES

To Extract Clove buds (*Syzygium aromaticum*) using organic solvents.

To study the Antimicrobial activity of the extracted solution.

To study the chemical analysis of the extracted solution.

To identify the components within the extracted solution using Gas Chromatography.

REVIEW OF LITERATURE

PLANT HISTORY

The Clove, a Malucca Islands native, is one of the oldest fruits known to man. The word Clove gets its name from the Latin word “ nail” – clavus, as the buds looks like small irregular nails in shape and the word made its way to English via Old French “ clou”. Originally thought to be native to China, Cloves were actually brought to China about 266 B. C. and was one of the first spices to be traded by Arab traders transported to the Romans (Evans, 1996).

Taxonomical Classification:

Kingdom : plantae-plants

Subkingdom : tracheobionata-vascular plants

Super division : spermatophyta-seed plants

Division : magnoliophyta-flowering plants

Class : Magnoliopsida-dicotyledons

Sub class : Rosidae

Order : Myrtales

Family : Myrtaceae-Myrtle family

Genus : Syzygium P. Br. Ex Gaertn.-syzygium

Species : Syzygium aromaticum (L.) Merr. &

L. M. Perry – clove (Cronquist, 1981).

PLANT DESCRIPTION

Syzygium aromaticum Linn. Is considered as the “ Golden current”.

VERNACULAR NAMES

French Clou de girofle

Indonesia Cengkeh

The Philippines Klabong pako

Dutch Kruidnagel

German Nelke

India Lavang

China Ding xiang, etc (Kokate, 2007).

BIOLOGICAL SOURCE

Cloves are the aromatic dried flower buds of a plant “ Syzygium aromaticum” belonging to family Myrtaceae (Gokhale, 2008).

ORIGIN AND DISTRIBUTION

The Clove plant is native from Malucca Islands by itself Bachian, Mutir, Makyan, Ternate and Tidore, where natural clove trees can be found. The

Clove buds are said to be one of the oldest fruits known to man and has been cultivated since ancient times. The buds was used in many ways as it is today and was one of the first spices to be traded by Arab traders transported to the Romans. Cloves were actually brought to China about 266 B. C. It has been widely cultivated throughout the Indonesia, Madagascar, Pakistan, Sri Lanka, India, and Zanzibar and china (Claus, 1965).

CULTIVATION

Climate and soil

Clove is a tropical plant which requires warm humid climate, rich loamy soil and Annual rainfall of about 150-30mm and Altitude-1500m above the sea level. Cool climate with good rainfall is ideal for flowering. And also requires good drainage because crop can't withstand water logging (Murty, and Subramanyam, 1989).

Planting and material

Seeds collected from fully ripe fruits and soaked in water overnight. Fully developed and uniform sized seeds are used for sowing and the pericarp is removed before sowing (Murty, and Subramanyam, 1989).

Nursery rising

Nursery beds to be prepared for sowing seeds of about 15-20cm height, 1mt width and convenient length. Made of loose soil-sand mixture over a layer of sand may be spread. Then seeds are sown at 2-3cm spacing and depth of 2cm and allowed for germination about 10-15 days, precaution to be taken for seed beds have to be protected from direct sunlight. The germinated seeds are then transplanted in polybags containing a mixture of soil, sand

and decomposed cow dung and these are ready for transplanting after 18-24 months old (De Guzman and Simonsma, 1999).

Preparation of land and planting

The selection of area for plantations should clear of wild growth before monsoon. The pits of about 75cm 75cm 75cm are dug at a spacing of 6-7mts and are partially filled with compost, green leaf and mixed with top soil. Then followed by transplantation of seedlings in the main field during beginning of the rainy season (De Guzman and Simonsma, 1999).

Manuring and fertilizer application

Manuring is necessary for proper growth and flowering of the plant and can be done by applying cattle manure and bone meal for one plant in the initial years. This can be increased gradually. Dead and diseased shoots should be removed once or twice a year.

Inorganic fertilizer is about 40gm urea, 110gm super phosphate and 80gm murate of potash of fertilizer dose can be usually recommended in the initial stage. This can be increased gradually (De Guzman and Simonsma, 1999).

HARVESTING AND YIELD

The flowering of the plant can be starts from the fourth year but full bearing stage is attained after 15 to 20 yrs. harvesting is done by the unopened buds when they are plump and rounded and carefully done without damaging the branches. The buds after separation are allowed to dry in the sun. The well dried buds are then processed for packaging (De Guzman and Simonsma, 1999).