

A Short Review On Therapeutic Applications Of Some Phytochemicals.

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Abstract:

Present review focuses on preliminary phytochemical analysis of twelve medicinally important plants. Medicinal plants have contributed to health practices since a long time, because of their inherent therapeutic properties. It is important to understand their phytochemicals as the popularity of plant-based therapies develops. Phytochemicals are naturally occurring plant substances that provide health benefits such as anti-inflammatory, anticancer, and cardiovascular support.

Keywords: Medicinal plants, Phytochemical analysis, Plant-based therapies, Health benefits.

Introduction:

Medicinal plants have been used in health care since ancient times, and they are revered for their inherent therapeutic properties across cultures. Traditional plant treatments have traditionally served as a guiding light for scientists looking for new medications to sustain and promote healthy lives for humans and domestic animals alike[1]. Plant-based medicines remain a primary source of health maintenance in many developing countries, and industrialized cultures are increasingly relying on these natural cures as research has led to the extraction and manufacturing of plant-derived medications and therapies. Phytochemicals are naturally occurring compounds found in plants that can protect humans against a wide range of illnesses. They have biological properties such as antiapoptosis, anti-aging, anticarcinogen, anti-inflammatory, anti-atherosclerosis, cardiovascular protection, improved endothelial function, and inhibition of angiogenesis and cell proliferation[2]. Secondary metabolites are chemically and taxonomically diverse compounds with unidentified activities. They are widely used in human therapy, veterinary medicine, agriculture, scientific research, and a variety of other areas[3]. Plant products have been employed as phytomedicines since antiquity.

This can be obtained by bark, leaves, flowers, roots, fruits, and seeds[4]. In vitro, numerous phytochemicals from various chemical classes have been shown to inhibit all species of bacteria[5]. Chemical investigations revealed that rosmarinic acid is the primary phenolic acid found in both the flower and leaf tissues of the *Ocimum basilicum* plant[6]. Lamiaceae herbs include compounds that have anti-proliferative actions against several cancers. In terms of immuno-modifying activity, rosemary extract was found to be largely anti-inflammatory[7]. The antibacterial properties of peppermint essential oils (*Mentha piperita* L.) used in flavors, fragrances, and medications were investigated against 21 human and plant pathogenic pathogens [8]. Approximately 80% of people in developed nations utilize traditional medicines, which contain substances derived from medicinal plants. However, such plants should be studied in order to better understand their features, safety, and efficiency [9]. The purpose of this review is to discuss the applications of several medicinally important plants and to contribute to ongoing research in both traditional and modern medicine.

Saponins:

Saponins are a group of secondary metabolites found widely distributed in the plant kingdom.

They form a stable foam in aqueous solutions such as soap, hence the name "saponin". Chemically, saponins as a group include compounds that are glycosylated steroids, triterpenoids, and steroid

alkaloids. Two main types of steroid aglycones are known, spirostan and furostan derivatives. The main triterpene aglycone is a derivative of oleanane[10]. The carbohydrate component is made up of one or more sugar moieties containing glucose, galactose, xylose, arabinose, rhamnose, or glucuronic acid glycosidically connected to a sapogenin (aglycone). Saponins with one sugar molecule connected at the C-3 position are called monodesmoside saponins, whereas those with at least two sugars, one at the C-3 and one at the C-22, are called bidesmoside saponins[11].

Phenolics:

Phenolic phytochemicals are the most abundant and extensively dispersed phytochemicals in the plant kingdom. The three most important types of dietary phenols are flavonoids, phenolic acids, and polyphenols. Phenolic compounds have hydroxyl groups that are directly linked to aromatic hydrocarbons. Phenol is the simplest class of natural chemicals. Phenolic compounds are a broad and complicated class of chemical components found in plants[12]. They are plant secondary metabolites that play an important role as defence compounds. Phenolics have a number of positive qualities for humans, including antioxidant capabilities, which are significant in establishing their role as protective agents against free radical-mediated disease processes. Flavonoids are the most abundant and extensively researched class of plant phenols[13].

Flavonoids

Flavonoids are polyphenolic chemicals that are found throughout nature. Over 4,000 flavonoids have been identified, many of which present in vegetables, fruits, and beverages such as tea, coffee, and fruit drinks[14]. Flavonoids appear to have played an important role in successful medical therapies in antiquity, and their use has continued to this day. Flavonoids are found in all vascular plants as aglycones, glucosides, and methylated derivatives. More than 4000 flavonoids have been identified in plant parts often consumed by humans, with an estimated 650 flavones and 1030 flavanols known[15].

Tannins:

Tannins are difficult to characterize chemically because the term refers to a wide range of oligomers and polymers[16,17]. Tannins can be defined as a diverse group of high molecular weight polyphenolic compounds capable of forming reversible and irreversible complexes with proteins (primarily), polysaccharides (cellulose, hemicellulose, pectin, etc.), alkaloids, nucleic acids, and minerals, among other things [18, 19, 20]. Tannins can be classified into four primary classes based on their structural properties: gallotannins, ellagitannins, complex tannins, and condensed tannins [21,22,23].

Terpenoids:

Terpenoids are a family of natural compounds generated from isoprene units with five carbons. Most terpenoids have multicyclic structures that differ from one another in terms of functional groups and basic carbon skeletons. These natural lipids can be found in all classes of living beings, making them the most common natural product[24]. Many terpenoids are commercially interesting because they are used as flavours and fragrances in foods and cosmetics, such as menthol and sclareol, or because they are important for the quality of agricultural products, such as fruit flavor and flower fragrance, such as linalool[25].

Alkaloids:

Alkaloids are naturally produced by a wide range of species, including mammals, plants, bacteria, and fungus. When alkaloids were initially isolated from medicinal plants in the early nineteenth century, it was discovered that they were nitrogen-containing bases that formed salts with acid. As a result, they became known as vegetable alkalis or alkaloids, and they are employed as a local anesthetic and stimulant in the same way as cocaine[26]. Almost every alkaloid has a bitter taste. Quinine, for example, is one of the most bitter-tasting compounds known, with a molar concentration of 1×10^{-5} [27]. Alkaloids are so numerous and have such a diverse range of molecular structures that reasonable classification is impossible. However, the simplest way to approach the problem is to categorize them into families based on the type of heterocyclic ring system contained in the molecule[28]

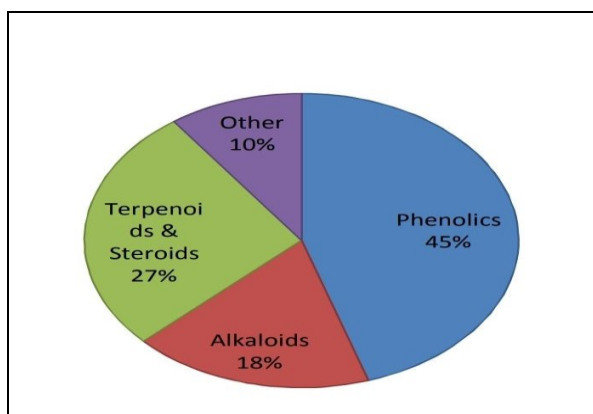


Fig: Pie chart representing the major groups of plant Phytochemicals. (Saxena et. al., 2013)

Discussion:

Medicinal plants contain chemical compounds that have a specific physiological function on the human body, such as tannins, alkaloids, carbohydrates, terpenoids, steroids, and flavonoids [29,30]. Saponins have the ability to precipitate and coagulate red blood cells. Saponins' characteristics include the generation of foams in aqueous solutions, hemolytic activity, cholesterol binding capabilities, and bitterness [31, 32]. Steroids have been shown to have bactericidal effects [33], and they are extremely essential chemicals, particularly because of their interactions with sex hormones [34]. For millennia, alkaloids have been used medicinally, and one of its most prevalent biological features is cytotoxicity [35]. Several studies have revealed that alkaloids have analgesic [36, 37], antispasmodic, and bactericidal effects [38, 39]. Many studies have shown that glycosides can reduce blood pressure [40]. Tannins bind to proline-rich proteins and inhibit protein synthesis. Flavonoids are hydroxylated phenolic compounds that plants produce in response to microbial infection, and they have been shown to be antibacterial against a wide range of pathogens in vitro. Their ability to interact with extracellular and soluble proteins, as well as the bacterial cell wall, is most likely responsible for their activity [41]. Phenolic chemicals are one of the largest and most common classes of plant metabolites [42]. They have biological features such as antiapoptosis, antiaging, anti carcinogenicity, anti inflammation, anti atherosclerosis, cardiovascular protection, endothelial function enhancement, and suppression of angiogenesis and cell proliferation [43]. Several

research have investigated the antioxidant effects of medicinal plants high in phenolic compounds [44].

Conclusion:

Medicinal plants are essential to both traditional and modern medicine, providing medicinal chemicals such as alkaloids, tannins, saponins, steroids, and flavonoids that have antibacterial, antioxidant, anti-inflammatory, and cardiovascular properties. Plant phytochemicals and secondary metabolites, such as *Ocimum basilicum* and *Mentha piperita*, have shown promise in treating infections and chronic disorders. Traditional medicines inspire current drug development, but further research is required to understand their mechanisms, safety and efficacy. These plants continue to play an important role in world health, integrating historic practices with modern innovation.

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