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Short Communication

Active ingredients of herbal drugs

Jyotsana Shakkarpude[1],*, Archana Jain[1], Amrapali Bhimte[1]

[1]*Dept. of Veterinary Physiology and Biochemistry, College of Veterinary Science And Animal Husbandry Mhow, Borkhedi, Madhya Pradesh, India*

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ABSTRACT

There are several examples of active plant ingredients that provide medicinal plant uses for humans and animals. Alkaloids are insoluble in water but easily soluble in ether, chloroform and oil. They form water soluble crystalline salt with acids. Cardiac glycosides such as digitoxin, digoxin, and convallotoxin support heart strength and rates of contraction when failing. Flavonoids found in many plants like lemon and buckwheat are known to strengthen capillaries and prevent leakage into tissues. Many plants contain high levels of useful vitamins.

1. Introduction

Medicinal value of plants or crude preperations of medicinal plants is due to presence of a variety of pharmacologically active principles in plants. They produce many chemicals that are biologically active, not just in themselves, but also in other organisms. There are several examples of active plant ingredients that provide medicinal plant uses for humans and animals.

2. Alkaloids

Alkaloids are among the most important drugs in human history. The isolation of the alkaloid morphine by Friedrich Wilhelm Sert€urner in 1806 is regarded as the “formal” start of plant secondary metabolism (Hartmann, 2007).[1] Alkaloids are among the largest groups of secondary metabolites, being extremely diverse in terms of structure and biosynthetic pathways, including more than 20,000 different molecules distributed throughout approximately 20% of known vascular plants (Yang and Stockigt, 2010).[2] This group is comprised of a wide variety of plants that contain nitrogen-bearing molecules that make them very active. They are insoluble in water but easily soluble in in ether, chloroform and oil. They form water soluble crystalline salt with acids. Many of these plants have been used to create well-known drugs used for medicinal purposes. One such example, vincristine, which was derived from the Madagascar periwinkle (Catharanthus roseus), is used to treat some types of cancer. Another example is atropine (sympathomimetic), morphine (Narcotic analgesic).

3. Bitters

This group is comprised of a variety of plants that are lumped together because of their very bitter taste. This bitterness causes stimulation of the salivary glands and digestive organs. As such, bitters can be used to improve appetite and strengthen the digestive system. Examples of bitters include wormwood and hops.

4. Cardiac Glycosides

These compounds are found in various medicinal plants (Foxglove, Lily of the Valley) and have strong direct action on the heart. Cardiac glycosides such as digitoxin, digoxin, and convallotoxin support heart strength and rates

* *Corresponding author*.
E-mail address: jyots.vets@gmail.com (J. Shakkarpude).

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of contraction when failing. Digoxin like cardiac glycosides having the ability to exert specific powerful action on the cardiac muscle. A very small amount can exert a beneficial simulation on diseased heart. These compounds are primarily valuable in the treatment of congestive heart failure. They increase the force of heart contraction without a concomitant increase on oxygen consumption. Consequently, the myocardium becomes more efficient pump and is able to meet the demands of circulatory system (Farnsworth, 1966).[3] These compounds also have a diuretic effect that stimulates urine production and aids in removal of fluid from tissues and the circulatory system.

5. Cyanogenic Glycosides

These glycocides are based upon cyanide, a very deadly poison, but in small doses, they can serve as a muscle relaxant. The bark of wild cherry and the leaves of elderberry (Sambucus racemosa) contain cyanogenic glycocides, which can be used to suppress and soothe dry coughs. Another example is Dhurrin, Linamarin, Amygdalin.

6. Flavonoids

Flavonoids are found widely throughout the plant world and they have a wide range of medicinal uses and actions. They often act as pigments giving a yellow or white color to flowers and fruits. Some flavonoids have anti-viral and anti-inflammatory properties. Flavonoids found in many plants like lemon and buckwheat are known to strengthen capillaries and prevent leakage into tissues.

7. Minerals

Many plants have high levels of minerals because they can draw minerals from the soil and can convert them into a form that is more easily used by the human body. Mineral content is often the key factor in a plant's effectiveness as a medicine. One example of a plant high in minerals is horsetail. The high silica content in horsetail plants is used for arthritis because it supports the repair of connective tissue.

8. Phenols

Phenols are plant compounds that are thought to be produced to protect against infection and herbivory by insects. They are often anti-inflammatory and antiseptic and can have anti-viral properties. Phenols vary in structure and range from salicylic acid (similar to aspirin) to complex sugar-containing phenolic acids. Wintergreen and willow contain salicylates. Members of the mint family often contain phenols. Natural phenolic compounds play an important role in cancer prevention and treatment. Phenolic compounds from medicinal herbs and dietary plants include phenolic acids, flavonoids, tannins, stilbenes, curcuminoids, coumarins, lignans, quinones, and others. Various bioactivities of phenolic compounds are responsible for their chemopreventive properties (e.g., antioxidant, anticarcinogenic, or antimutagenic and anti-inflammatory effects) and also contribute to their inducing apoptosis by arresting cell cycle, regulating carcinogen metabolism and ontogenesis expression, inhibiting DNA binding and cell adhesion, migration, proliferation or differentiation, and blocking signaling pathways (Huang et al., 2010).[4]

9. Polysaccharides

Polysaccharides are found in all plants and comprised of multiple units of sugar molecules linked together. For medicinal purposes, the "sticky" polysaccharides produce mucilage or gums that are commonly found in bark, roots, leaves, and seeds. These sticky polysaccharides are able to soak up large quantities of water and form jelly like masses that can be used to treat dry or irritated tissues such as skin and mucous membranes.

10. Proanthocyanins

These compounds are pigments, which give fruits and flowers red, purple, or blue hues and are closely related to tannins and flavonoids. These compounds have been documented to be valuable in protection of circulation specifically in the heart, eyes, and feet. Red grapes, blackberries, and hawthorn berries all have high levels of proanthocyanins.

11. Saponins

This group of active compounds obtains its name from the fact that like soap, they produce lather when placed in water. Structurally saponins are having one or more hydrophilic glycoside sugar moieties combined with a lipophilic triterpene molecule (Vasudeva et al., 2015).[5] Upon hydrolysis split into a sugar and nonsugar part. There are two main forms of saponins: steroidal and triterpenoid. Steroidal saponins are very similar to the chemical structures of many of the human body's hormones including estrogen and cortisol. Examples plants containing saponins include agave, wild yam, and several members of the lily family. Several native plants are used in a process to produce synthetic hormones for humans. saponins can also be used as emulsifiers. They cause hamolysis of RBCs (quillaria senega).

12. Tannins

Most plants produce tannins. Tannins serve as a deterrent to herbivory by insects and grazing animals given that that they provide a harsh unpalatable flavor. Tannins are also useful in curing leather because of their tendency to contract

and astringe tissues by binding with precipitating proteins. Examples of plants high in tannins include oak bark and black catechu.

13. Vitamins

Many plants contain high levels of useful vitamins. Many well-known fruits and vegetables have high levels of vitamin C and beta-carotene. Lesser-known vitamin containing plants like watercress, rose hips, and sea buckthorn have high levels of vitamins B, C, and E.

14. Volatile oils

Volatile oils are extracted from plants and are used to produce essential oils that play a very important role in medicinal botany. These oils are often very complex and can be comprised of 100 or more compounds. These oils have many uses. For example, tea tree oil is a strong antiseptic. Resins and gums are often linked with essential oils, however these are not volatile.

15. Conclusion

According to Ayurveda, most of the commonly used active ingredients i.e. plant derived materials (alkaloids, glycosides, proteins, lectins, polysaccharides, etc.) are extracted from indian medicinal plants for the treatment of various ailments and have so many advantages over the conventionally used drugs, which are so expensive and known to have harmful side effects.

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17. Conflict of Interest

The authors declare they have no conflict of interest.

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Author biography

Jyotsana Shakkarpude, Assistant Professor

Archana Jain, Professor

Amrapali Bhimte, Assistant Professor

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