Review Article

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A Review on Analgesic Herbals

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Abstract

The ethnic and rural population of India depends on medicinal plants for their health care as well as for their livestock. This attracted the interest of several botanists that lead to an array of reports on ethno-medicine. Analgesics are the substances that are used in pain, without losing consciousness. Drugs which are used at present for the management of pain and inflammatory conditions are either steroidal like corticosteroids or non-steroidal like aspirin. All of these drugs possess more or less side and toxic effects like renal failure, allergic reactions, hearing loss or they may increase the risk of hemorrhage by affecting platelet function.

Various sources of analgesic drugs synthetic analgesic and natural analgesic, natural analgesics like Sterculia foetida, Opioid Analgesics, Aloe Vera, Manilkara Zapota, Glycyrrhiza Glabra, Zingiber Officinale, Eugenia Caryophyllata, Cinnamomum camphora. Studies have shown that opiates because of physical dependency, tolerance, and addiction while NSAID's usually cause gastrointestinal disorders. For that, the discovery of other alternatives to treat pain is crucial. Herbal therapy could be an interesting option for the treatment of opioid dependence and withdrawal. This review gives information regarding different analgesic obtained from natural sources. This article reviews such medicinal plants with anti-inflammatory and analgesic properties that have been used by our ancestors to heal many of their ailments.

Keywords: NSAIDs; Natural Analgesics; Aloe Vera; Eugenia Caryophyllata; Cinnamomum camphora; Bougainvillea.

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Introduction

Human beings have depended on nature for their simple requirements as being the sources for medicines, shelters, food stuffs, fragrances, clothing, flavours, fertilizers and means of transportation throughout the ages. For the large proportions of world's population medicinal plants continue to show a dominant role in the health care system and this is mainly true in developing countries, where herbal medicine has continuous history of long use. The development and recognition of medicinal and financial aids of these plants are on rise in both industrialized and developing nations.

An analgesic, or painkiller, is any member of the group of drugs used to achieve analgesia-relief from pain. Analgesic drugs act in various ways on the peripheral and central nervous systems. Pain is defined by the International Association for the study of Pain (IASP) as "an unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage". Pain can be divided into two types according to the duration of acute and chronic pain, in chronic pain duration of time more than 6 months and acute pain less than 6 months.[1]

An analgesic is a drug that selectively relieves pain by acting in the CNS or on peripheral pain mechanisms, without significantly altering consciousness. Pain is a warning signal, primarily protective, but causes discomfort and suffering; may

even be unbearable and incapacitating. Excessive pain may produce other effects sinking sensation, apprehension, sweating, nausea, palpitation, and rise or fall in BP, tachypnoea. Analgesics relieve pain as a symptom, without affecting its cause. Studies have shown that opiates cause physical dependency, tolerance, and addiction while NSAIDs usually cause gastrointestinal disorders. For that, the discovery of other alternatives to treat pain is crucial. Herbal therapy could be an interesting option for the treatment of opioid dependence and withdrawal.

Acute pain: Acute pain "Is arising due to damage to the tissue. Acute pain is short-term or can easily identify pain causes. Pain occurs due to inflammation and inflammation occurs due to damage of tissue or nervous, nerve damage due to surgery, cancer, infection, cancer, fracture, diabetes and chemotherapy.[1, 2]

Chronic Pain: Chronic pain these are long term pain. Chronic pain intermittent and is generally difficult to treat and harder than acute pain.

Analgesic these are the agents that are used to relieve pain without loss of consciousness. Analgesic is Greek word an ("Without") and algos ("Pain"). Analgesic agents act various forms of the central nervous system and peripheral nervous system. Prostaglandins are formed from Cyclooxygenase-2 (COX-2) enzymes. The cyclooxygenase-2 enzyme is secreted from damaged cells and produces pain sensation associating with the receptors connected to G-proteins and an increasing amount of CAMP in the cells. Nowadays use non-steroid anti-inflammatory drugs to control the pain. Their analgesic action is produced fast but their side effect is the main disadvantage using them. These drugs cause stomach dysfunction, blurred vision, dizziness, skin rash, and liver damage. Non-steroidal anti-inflammatory drugs are more expensive,to minimize their side effects and costs, researches are looking to natural medicines obtained from herbs. Herbal active pharmaceutical ingredients lowering pain sensation include volatile oils (monoterpenes and sesquiterpene), Coumarin, alkaloid ingredients, organic acids, glycoside steroids, Limonenes, Cineols, Saponins, Phenol ingredients such as Thymol and Carvacrol, flavonoids (Quercetin). Herb containing flavonoids performed many effects by blocking the cyclooxygenase enzyme, tannins. The chemical constitute iridoid and flavonoid in extracts of the herb is responsible for analgesic activity. Monoterpene ingredients linalool present in the cinnamon extracts that act on pain receptors and produces an analgesic action. Phenols like eugenol block calcium from into the cell and thus lose the pain sensation. In rhizome, ginger (gingerol) is an active chemical constituent it has a strong activity to inhibiting prostaglandins. And produced mechanisms that lower vascular permeability and induce pain mediators, is the main analgesic agent of ginger herb. Analgesic activity of Ziziphoraclin Opodioiedes obtained from the Lamiaceae family that produced analgesic activity by inhibiting acid and prostaglandins synthesis and arachidonic affecting opioids.[2]

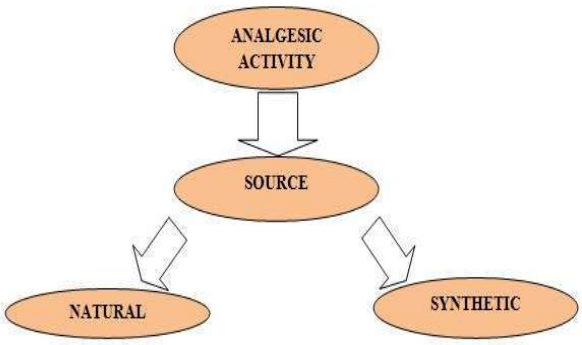

Fig. 1 Analgesics Source

Synthetic drugs: various drugs have analgesic activity like Paracetamol, Diclofenac, NSAIDs, Ibuprofen, COX-2 inhibitors, etc.

Natural analgesic drugs: many herbs having an analgesic activity which is obtained from nature. This is as follows:

Opioid Analgesics: Opioids drugs are narcotics derived from Opium. Opium is obtained from the dried latex of the opium poppy, (Biological source: Papaver somniferum). Opioids are drug which acts on opioid receptors in the (CNS) Central nervous system and opioids used as an analgesic activity. Opioids used in chronic diseases like cancer to relieve severe pain.[2]

Common methods for determination of analgesic activity-

- Acetic Acid-Induced Writhing Test
- Hot Plate Test
- Tail Flick Test
- Tail Pressure Test
- Tail Formalin Test
- Formalin Test

Fig. 2: Aloe Vera plant

Fig. 3: Ricinus communis plant

Fig. 4: Calotropis procera plant

Fig. 5: Bougainvillea glabra Flower.

Aloe Vera

Scientific name: Aloe Vera

Family: Asphodelaceae

Hindi: Ghikanwar

Local: Gwar-patha

Morphology

Plant

Aloe Vera plant has fibrous stems, which are very short. Some Aloe Vera plants do not even have a stem. The stems are hard to see because it is covered by dense leaves. It is also partially coated by the soil.

Other species of Aloe Vera are trees, which can reach 3 to 5 meters. These species are to be found in North African deserts.[3]

Leaves

Aloe Vera leaves are lance-shaped with serrated edges. The leaves are:

- Fleshy thick
- Green or grey-greenish
- Waxy coated on the surface
- Equity succulent, meaning they can keep their shape due to the moist. The leaves contain water (the gel) and are flat on the top side, and rounded at the bottom side. In young leaves of Aloe Vera spots are pale green to white. When the Aloe Vera grows up, the spots disappear. However, some species will not lose their spots, which is due to genetic factors.[3]

Flowering

The Aloe Vera flowers are trumpet-shaped or tube-shaped of about 2-3 cm long. The color of the flower is yellow to orange and the flowers are hanging down. The flowers are hanging down at the end of the shaft, but the more you go up, the less they are hanging.[3]

Roots

Aloe Vera has a fibrous root system. The root system of Aloe Vera is short with root fibers that can reach 30-40 cm.[3]

Chemical Constituents

The ten main areas of chemical constituents of Aloe Vera include amino acids, anthraquinones, enzymes, minerals, vitamins, lignins, monosaccharides, polysaccharides, salicylic acid, Saponins, and sterols. The amino acids in Aloe Vera are the building blocks of protein and influence our brain function. Humans require 22 amino acids and the body will make all of them except for eight essential amino acids that our body gets from the food/drinks that we take in. Every one of the essential amino acids is available in Aloe Vera and they include isoleucine, leucine, lysine, methionine, phenylalanine, threonine, valine, and tryptophan. Some of the other non-essential amino acids found in Aloe Vera include- alanine, arginine, asparagine, cysteine, glutamic acid, glycine, histidine, proline, serine, tyrosine, glutamine, and aspartic acid.[4]

Located in the sap of the leaves you will find twelve anthraquinones, a phenolic compound that has stimulating effects on the bowels and antibiotic properties. In small amounts, the anthraquinones do not have a purgative effect. They help with absorption from the gastrointestinal tract and have anti-microbial and painkilling effects. Too many anthraquinones can produce abdominal pain and diarrhea. The most important anthraquinones are aloin and emodin. They are anti-bacterial, anti-viral, and analgesic. The anthraquinones in Aloe Vera breakup residue, pus, and lifeless cells, bring blood to the region and flush out material from the wounds and ulcers.[4]

Enzymes act as biochemical catalysts that break down the proteins we eat into amino acids. The enzymes turn the food we eat into fuel for every cell in our body, enabling the cells to function and work efficiently. "The main enzymes found in Aloe Vera include Amylase (breaks down sugars and starches), Bradykinase (stimulates immune system, analgesic, anti-inflammatory), Catalase (prevents accumulation of water in the body), Cellulase (aids digestion-cellulose), Lipase (aids digestion-fats), Oxidase, Alkaline Phosphatase, Proteolytiase (hydrolyzes proteins intotheir constituent elements), Creatine Phosphokinase (aids metabolism), and Carboxypeptidase.[4]

It also contains Vitamins B1, B2, B3, B5, B6, and B12 along with calcium (teeth and bone formation, muscle contractions and heart health), magnesium(strengthens teeth and bones, maintains healthy muscles and nervous system, activates enzymes), zinc (speeds up wound healing, mental quickness assists with healthy teeth, bones, skin, immune system, and digestive aid), manganese (activates enzymes, builds healthy bones, nerves and tissues), chromium (assists with protein metabolism and balancing of blood sugars), selenium which all influence our brain performance.[4]

Other constituents of Aloe Vera would include prostaglandins, tannins, magnesium lactate, resins, lignins, tannins, proteins such as lectins, minerals, monosulfonic acid and gibberlin.[4]

Uses

Fresh juice of leaves is cooling, cathartic and treats dermatitis, burns and other skin problems. It is a hair conditioner and additive in skin creams. A yellowish colored juice from the cut leaves is concentrated to make commercial drug "aloes". The juice of roasted leaves is valuable in colds, coughs, sciatica, rheumatism and stomach disorders. Aloe is externally applied to inflamed painful parts of the body. The pulp of leaves is applied externally to expel the guinea worms. It also cures jaundice, disturbed menstruation, earache, eye diseases, liver and spleen problems. A poultice of pulp tied overboils and tumor hastens suppuration. Toothpaste containing the Aloe gel has been prepared for preventing gingivitis and other bacterial infections. Leaves are eaten as a vegetable and as pickle.[4, 5]

Ricinus Communis Linn.

Scientific name: Ricinus communis
Family: Euphorbiaceae
Hindi: Arandi
Local: Indi

Morphology

The castor oil plant is a fast-growing, suckering perennial shrub or occasionally a soft wooded small tree up to 6 meters or more, but it is not hardy. This plant was cultivated for leaf and flower colors and for oil production. Leaves are green or reddish and about 30-60cm. in diameter. The leaves contain 5-12

deep lobes with coarsely toothed segments which are alternate and palmate. The stems are varying in pigmentation. The flowers are monoecious and about 30-60cm. long. The fruit is a three-celled thorny capsule.

The capsule of fruit covered with soft spins like processes and dehiscing into three 2-valved cocci. The seeds are considerable differences in size and color. They are oval, somewhat compressed, 8-18 mm long and 4-12 mm broad. The testa is very smooth, thin and brittle. Castor seeds have a warty appendage called the caruncle, which present usually at one end from which runs the raphe to terminate in a slightly raised chalaza at the opposite end of the seed.[6]

Chemical Constituents

Chemical constituents of Ricinus communis Linn. are followings

Fatty acid

The seed oil of castor-plant showed the presence of fatty acid, ricinoleic acid (12-hydroxyoctadec-9-enoic acid). Ricinoleic acid comprises over 84% while other fatty acids present were linoleic (7.3%), oleic (5.5%), palmitic (1.3%), stearic (1.2%) and linolenic (0.5%), respectively.[7]

Essential oil

The GC-MS analyses of R. Communis essential oil using capillary columns have shown compounds like @-thujone (31.71%), @-pinene (16.88%), camphor (12.92%) and camphene (7.48%).

Triterpenoid saponin

The Seeds of Ricinus communis showed the presence of Triterpenoid Saponin, 3-O-[β-D-glucoronopyranosyl-(1→3)-α–L-rhamnopyranosyl-(1→2)β- D-glucopyranosyl]-4α,20α-hydroxy methyl Olean-12-ene-28-oic acid.[7]

Triacylglycerols

Five types of castor bean seed oil triacylglycerols were identified as triricinolein, RRR (84.1%),diricinoleoylstearoylglycerol, RRS (8.2%), diricinoleoyloleoyl-glycerol, RRO (5.6%), diricinoleoyllinoleoylglycerol, RRL (1.2%) and diricinoleoylpalmitoyl-glycerol, RRP (0.9%) respectively.[7]

Flavonoid

The dried leaves of R. communis showed the presence of six flavones glycosides kaempferol-3-Oβ-D-xylopyranoside,kaempferol-3-O-β-D-glucopyranoside, quercetin-3-O-β-D xylopyranoside, quercetin-3-O-β-D-glucopyranoside,kaempferol-3-O-β-rutinosideandquercetin-3-O-β-rutinoside. Seed and leaf of R. Communis also showed the presence of flavonoids like prunin 2′-o-para coumaroyl, prunin 6″-o-para coumaroyl.

Protein

Seeds of Ricinus communis contain three toxic proteins Ricin A, B and C, and one ricinus agglutinin.

Steroid

The entire plant of Ricinus communis showed the presence of steroid Brassicasterol and Campesterol.[7]

Uses

Leaves are considered useful for treating intestinal worms, night blindness, and earache. Leaves warmed and smeared with oil are applied to the abdomen to relieve postnatal pains, on the knee, and on affected parts to get relief in pain. A poultice of castor leaves cures boils and swellings. A decoction of the roots is also useful in the treatment of lumbago, rheumatism, and sciatica. The root bark is effective in skin diseases. The fruit is used for piles and diseases of the liver and spleen. Seed paste is used as a poultice for boils, sores, gouty or rheumatic swellings. Castor oil is a safe purgative and drug for reducing irritation of the skin. Oil cures dandruff, dermatitis, and other skin affections.[7, 8]

Calotropis Procera

Scientific name: Calotropis procera

Family: Apocynaceae

Hindi: Aak, Madar

Local: Aak, Akara

Morphology

Flower: Flowers consist of 5 small triangular dirty white sepals, 5 thick ovate petals (1cm x 1cm) which are white at the base and purple at the tips and 5 purple-tipped stamens, which surround a white 5 lobed stigma.[9]

Fruit: Fruits consist of green, spongy ovoid fruits (follicles), up to 15 cm long by 10 cm wide. They split open to release plumed, papery light brown seeds with a pappus of white filaments up to 6 cm long on one side.[9]

Root: The root occurs in the entire condition. The bark is separated from the wood 0.5-2.0 cm. in diameter bearing rootlets with a diameter varying from 0.2 to 0.5 cm. externally whitish-grey, wrinkled in the fresh condition, plenty of whitish latex exudes from cuts or wounds in the bark. Fracture is incomplete.[9]

Leaf: Simple, opposite, sub-sessile, slightly thick, fleshy, coriaceous, 10-15 cm. long and 4.5 to 6.5 cm. broad, broadly cuneate, obovate or obovate oblong, slightly cordate and auricled at the base with a tuff of short simple hairs on the upper side near the place of the attachment to the petiole.[9]

Chemical Constituents

Plant contained 18.3-23.38% ash, 1.6-5.08 % acid insoluble ash, 1.9% water soluble ash, 33.38% water-soluble extractive and 6.66% alcohol soluble extractive. The leaves contained cardenolides, steroids, tannins, glycosides, phenols, terpenoids, sugars, flavonoids, alkaloids and saponins. Leaf and stem of Calotropis procera, gave 0.133% and 0.09% essential oils. Leaf oil is dominated by tyranton (54.4%), 1-pentadecene (9.5%) and 1-heptadecene (8.2%).

Most abundant compounds in stem oil are Z-13-docosenamide (31.8%), isobutyl nonane (13.7%) and 2, 7, 10-trimethyldodecane (12.3%). Both leaf and stem volatile oils contain octadecenamide and its saturated form in appreciable amounts. Also characterized by the presence of long-chain fatty acids, amides, sulfurate, halogen compounds and carbonyls like ketones. The root bark contained benzoyllineolone, benzoylisolineolone, alotropterpenyl ester, calotropursenyl acetate, and calotropfriedelenyl acetate. The protein content was found lowest in the winter sample of flowers (6.50g %) and the maximum was reported in the summer sample of the mature leaf (19.99g %). The latex contained two distinct cysteine peptidase; however, new cysteine peptidases were purified from C. procera latex.[10]

Uses

All parts of plants are used as anti-periodic, antidote and expectorant. The root paste is applied to snake and scorpion bite. Root bark diaphoretic used in dysentery, expectorant, and emetic. The inner bark of the stem is tied over cuts for early healing. Powdered flowers or gynostegium are used in cold, cough and asthma. Gynostegium is eaten for the cure of cancer. The latex is applied externally over the swollen portion to reduce pain in piles and boils. The latex is also applied on the knee with the help of the camel's pellet to cure the knee pain. The extract of leaves is relieved earache. Fresh or warm leaf applied over painful rheumatic joints, swellings, sores, and wounds.[10, 11]

Bougainvillea Glabra

Scientific name: Bougainvillea glabra

Family: Nyctaginaceae

Hindi: Baganvilas

Local: Booganbel

The vine species grow anywhere from 1 to 12 m (3 to 40 ft.) tall, scrambling over other plants with their spiky thorns. The thorns are tipped with a black, waxy substance. They are evergreen where rainfall occurs all year, or deciduous if there is a dry season. The leaves are alternate, simple ovate-acuminate, 4–13 cm long and 2–6 cm broad. The actual flower of the plant is small and generally white, but each cluster of three flowers is surrounded by three or six bracts with the bright colors associated with the plant, including pink, magenta, purple, red, orange, white, or yellow. Bougainvillea glabra is sometimes referred to as "paper flower" because the bracts are thin and papery. The fruit is a narrow five-lobed achene.[12]

Bougainvillea is a genus of thorny ornamental vines, bushes, and trees with flower-like spring leave near its flowers. The bracts' range of colors includes the classic red, purple, orange, apricot, white, pink, cream, yellow and bi-color mutations.[12]

Chemical Constituents

The chemical constituents of the genus Bougainvillea have been extensively studied since 1970. The phytochemical analyses were carried out to identify different kinds of components using extracts of different polarities from stems, leaves, or bracts with or without flowers, bark stems, and roots of the species. It has been possible to isolate, identify, and elucidate chemical compounds for species or hybrids. Some common chemical constituents of Bougainvillea are followed:

Aliphatic Hydrocarbons

In Bougainvillea genus the presence of aliphatic hydrocarbons including alkanes, alkenes, and cycloalkanes has been described. For ethanolic extracts from bracts with flowers from B. x buttiana seven of these compounds were found and identified. The presence of this type of compounds, B. x buttiana, could be considered as an alternative source of energy.[13]

Fatty Acids and Fatty Alcohols

Fatty acids and fatty alcohols are very common compounds in plants, especially in aerial parts. For the genus of Bougainvillea, the presence of 13 of these compounds was verified. Eight compounds were identified in ethanolic extracts from the bracts with flowers from B. x buttiana and 5 in ethanolic extracts of the leaves, branches, and roots from B. spectabilis.[13]

Volatile Composites

Volatile compounds are compounds that are commonly found in the plant kingdom. Their chemical structures contain some functional groups, including aldehydes, ketones, phenols, oxides, esters, and alcohols. In the leaves and branches of B. spectabilis ethanol extract were identified 35 of these compounds. In ethanol, ethanol: water, and ethyl acetate extracts of bracts with flowers of B. x buttiana the presence of 9 of these compounds was identified. Only one compound was similar as is the case of the ethyl hexadecanoate compound observed in both extracts B. x buttiana and B. spectabilis.[13]

Phenolic Compounds

Phenolic compounds are also widely distributed in the plant kingdom. Fourteen of these compounds have been identified. In the ethanolic extract of bracts with flowers from B. x buttiana researchers identified 4 of these compounds. In ethanolic extracts of flowers from B. glabra there were 11 phenolic compounds. Compounds 76 and 77 are not common in plants; however, their presence is reported in hybrid B. x buttiana.[13]

Peltogynoids and Flavonoids

The peltogynoids are restricted in their distribution. In extracts of stem bark from B. spectabilis were identified eight peltogynoids. The flavonoids, however, are a group of compounds widely distributed in the plant kingdom, 21 compounds have been identified in B. glabra and B. spectabilis.[13]

Phytosterols, Terpenes, and Carbohydrates

Carbohydrates are chemical compounds that mainly derive from the primary metabolism of vegetables. Sterols and terpenes are secondary metabolites. Out of thirteen compounds identified in the genus Bougainvillea, 6 of them were identified from the ethanolic extracts of bracts with flowers from B. x buttiana. Four different compounds were identified from extracts of leaves and bracts from B. glabra. Three in B. spectabilis in stem bark, leaves, and branches. Only one compound was similar as is the case of the squalene compound observed in both extracts B. glabra and B. x buttiana.[13]

Uses: Bougainvillea leaves are used to cure a variety of disorders like diarrhea, and to reduce stomach acidity. It is used for cough and sore throat, Infusion of flowers used as a treatment for low blood pressure. Leaves are used to cure diabetes 2 and Stems help in hepatitis.[13, 14]

Conclusion and Future Aspects

There is a promising future of medicinal plants as there are about half million plants around the world, and most of them are not investigated yet for their medical activities and their hidden potential of medical activities could be decisive in the treatment of present and future studies. The importance of traditional medicine has also recognized by World Health Organization (WHO) and has created strategies, guidelines and standards for botanical medicines. For the cultivation, processing of medicinal plants and the manufacture of herbal medicines agro-industrial technologies need to be applied. Medicinal plants are resources of new drugs and many of the modern medicines are produced indirectly from plants. Studying medicinal plants helps to understand plant toxicity and protect human and animals from natural poisons. The medicinal effects of plants are due to secondary metabolite production of the plants. Keeping this in consideration there have been increased waves of interest in the field of research in natural product chemistry.

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