Bioactive compounds to combat corona virus: A review.

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Abstract

This review article is intended to emphasize the relevance of natural products in the drug discovery particulary, Indian medicinal plants with numerous biological potential. A literature survey led to the collection of major immunity development plant species. To support sustainable processes with minimum impact these compounds must be designed in the laboratory by synthetic technique to strengthen the immune system of human to combat the newly emerging and harmful virus like novel corona. Nature has gifted with diverse species of plants rich in biologically active compounds which serves as a cure for all the living creatures in an efficient and safe manner. The diverse climatic conditions of India have been afforded with various plant species. The bioactivities of tannins, phenols, terpenoids, flavonoids, esters and other minor compounds and its uses in Indian traditional medicine are reviewed.

Keywords: Biologically active compounds, Immunity, Traditional medicine, Novel corona, Sustainable process, Synthetic method.

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Introduction

India is renowned as the land of spices historicaly. Rig Veda has depicited the values of medicinal spices since 6000 BC. The medicinal nature of black pepper and turmeric is specified in Ramayana (Great Indian Epic), Yajur and Atharva Veda. From India many herbs, spices have been exported to Arabia, China, England and Greece and many historial evidences are seen in literature. Mother Nature has been the resource of numerous medicinal agents since the evolution of Earth and many of contemporary drugs have been isolated [1]. The medicines, antimicrobials from natural products are being researched by many pharmaceutical industries, pharmacists, chemical engineers and chemists. Although the progression in science and technology is enhanced, many infectious, pandemic diseases kill thousands of people worldwide. Today the world is facing lockdown due to the pandemic COVID-19 disease caused by corona virus, where no medicines or vaccine is known. The individuals have to protect themselves by developing and strengthening their immune system by following the traditional medicines specified in Vedas and practised by our ancestors [2].

The major respiratory disorders such as asthma, sarcoidosis, pulmonary fibrosis and chronic obstructive pulmonary disease, known as COPD are responsible for morbidity or impairment and deaths. The breathing problems is witnessed in numerous people due to allergic conditions, pollution, lung disorders, life-style choice, obesity, unbalanced food practice, smoking habits etc. The developed country like America approximately have patients around 13 million with breathing problems like asthma and developing nation like India have victims of 42 million asthma patients according to Word Health Organisation [3].

The early phase reaction of allergic asthma leads to bronchoconstriction by the release histamine, reactive oxygen species, eicosanoids that induce contraction of airway smooth muscle, vasodilatation and mucus secretion. Inflammatory mediators induce micro vascular leakage with exudation of plasma in the airways and together these contribute to airflow obstruction. The irritation of the airways and hyper responsiveness occurs after the allergen contact (within 8-24hrs) called as delayed response or second phase response since it activates the eosinophil, basophils macrophages, neutrophils and CD4* T cells. The immune system is strengthened by the balanced food, breating exercise, medicinal herbs intake insisted by Ayurvedha and Siddha. The other respiratory illness is due to the limitation in the air flow which is not fully reversed, called as COPD or Chronic Obstructive Pulmonary Disease. It is originated due to extended usage of irritants, toxins like cigarette smoke that inflammate the alveolar structures of the lungs [4].

Literature Review

Adhatoda vasica nees

In the traditional Ayurveda practice, Adhatoda has been used in many parts of India and worldwide for the past two thousand five hundred years. Yogis or sadhus worshiped in India have explored the medicinal values of the leaves of adosa. The leaves are chewed with ginger to stimulate the respiration of the lungs. It is also known by the name adosa mainly employed in curing respiratory ailments. The antispasmodic nature of the plant plays a vital role in curing chronic bronchitis, respiratory illness and asthma due to its enriched level of alkaloids present in the plant called as vasicine. The structure of (a) Adhatodine, (b) Vasicinone (c) Peganidine is given in the (Figure 1).

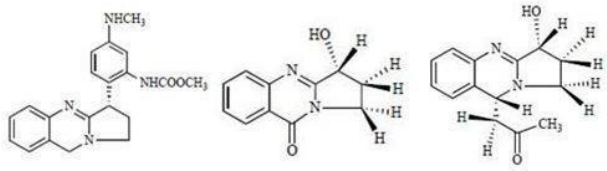

Figure 1. *1a: Chemical structure of Adhatodine; 1b: Vasicinone; 1c: Peganidine.*

The presence of primary alkaloid components such as vasicine and vasicinone are the active compounds to treat asthma, respiratory problems. The roots and leaves are mainly used as the cure for healing bronchiole disorders, common cold, dry cough, and bronchitis and lung disorders. The irritation in the throat is releaved by the juice of the adhatoda leaf [5].

The major bioactive compounds isolated from the leaves of adhatoda includes Epitaraxerol, Peganidine, Adhatodine, Vasicinone, Proline, Sitiosterol, Daucosterol, Vasicine from the roots, Vitamin C about 1.5% from leaves and 5.2 % from its roots and Valine. The fatal disease called tuberculosis is treated by the major chemical component called as ambroxol and bromhexine obtained from vasicine. The growth of the bacteria mycobacterium tuberculosis is resisted in acidic condition of these chemical components. The secretion of rifampicin and lysozyme levels is induced in the lung tissue, sputum and bronchtitis indirectly to cure tuberculosis [6].

Anacyclus pyrethrum

Akarkara or Anacyclus pyrethrum used in Ayurvedic medicine is exposed to danger or risk due to over-exploitiation of the herb because of the medicinal values, insecticidal nature of the flower. The pyrethrum drug secreted from the roots contains ester pyrethrine, pellitorine (N-alkylamides), triterpenes, coumarins, gallic acids, sterols, tannins, holosids and mucilage. The anti-inflammatory activity, anti-catarrh, analgesic, antiviral, vermifuge, improve digestion, mollusidal and febrifuge. The active metals like iron, nickel, zinc and traces of cadmium, chromium are found. The ethanolix extract of the leaves are rich in polyphenols and flavanoids, antraquinones, aminoacids, reducing sugar. The neuralgic infections, tooth pain, headache, local stimulant in epalsy of the throat or tonuge are recovered by chewing the root. Nasal mucous flow, chronic catarrh of nostrils and head pain is cured by the finely powdered root of Akarkara. The ethanolic extract of the plant is rich in Sitosterol-5.49%, Benzofuran-2- carboxaldehyde-5.50%, Palmitic acid-13.39%, Naphthalene, 7- Tetradecenal, (Z)-7.08%.

Andrographis paniculata nee

The bioactive compounds present in the plant have made a promising conditions to cure Human Immuno Virus causing disease AIDS. The medium sized bioactive molecules enclosed in the plant matrices contain (diterpenoid lactones) deoxyandrographolide, andrographolide (Figure 1) and neoandrographolide. The presence of polyphenols, diterpenoids and flavonoids in Andrographis paniculata Nee are indulged to cure lung infections, sore throat, fever, heart ailments and contagious infections. The andrographolide (diterpenoid) contributes 4% in the entire plant, leaf extract approximately 0.6%, stem 12%.

Anisochilus carnosus

Karpooravalli or Lamiaceae is a medicinal plant found in major parts of India, Malaysia, Myanmar and Srilanka. It is an annual herb which grows with gel like contents in the leaves. The chemical components like α -cis bergamotene, carvacrol and camphor plays a key role to cure liver disorders, common cold, sore throat, stomach disorders. The plant is a traditional medicine employed to heal fever, symptoms of influenza, poisonous bites, respiratory problems and gastrointestinal disorders. The plant extract is more effective against K. pneumoniae, gram negative bacteria [7].

Terminalia chebula

The different bioactive compounds like flavins, steroids, polyphenols, flavonoids, glycosides are the main ingredients to treat fever, dry cough, diarrhea, candidiasis, wound, skin impairments, urinary infections. This is one among the medicinal plant practised for the past three thousand years in India and described in vedas for its immense value. This plant is also found in parts of China, Tibet, Pakistan. The presence of Eugenol, terflavin A, B, C, D, casuarinin, Punicalagin ((2,3-(S)-hexahydroxydiphenoy l-4,6-(S,S)-gallagyl-D-glucose), pyragallol, trihydroxybenzene, phloroglucinol brings cure during the treatment [8].

Clerodendrum serratum

In India Bharngi is used for variety of ailments since five thousand years. There are eight thousand remedies coded in ancient Ayurveda [9]. The drug obtained from this plant is used for breathlessness, swelling, wound, cough, cold, neurological problems according to Samhita kala. The minerals like sodium, aluminium, potassium, magnesium, calcium, vanadium, manganese, iron, nickel, cobalt is rich in this plant. The structure of (a) Punicalin, (b) Chebulinic acid (c) Shikimic acid is given in the (Figure 2).

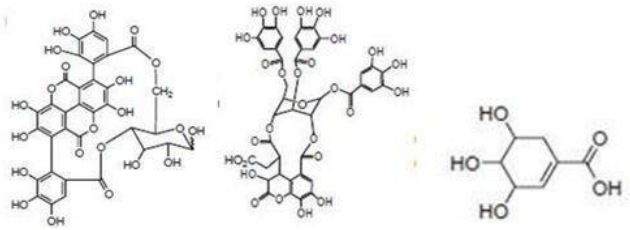

Figure 2. *2a: Chemical structure of Punicalin; 2b: Chebulinic acid; 2c: Shik imic acid*.

The presence of Clerosterol, Stigmasterol, Saponins, Queretaroic acid, B-sitosterol from the roots, 7-o-gluconoids of hispidulin, Catchin, Luteoline, Diterpin–clerodin and carbohydrate from the plant leaf. The cleroflavone and hispidulin flavonoids have potential against microbes, asthama,

tumors and binding agets of carbon, nitrogen and sulphur. The isolated flavonoids include pectolinarigenin, scutellarein and apigenin [10]. The phenols like acteoside, verbascoside, serratagenic acid and indolizine are potential againts microbes, hypertension, anti-inflammatory etc. Strong mulluscidal and fungitoxid activities are reported due to the isolated terpenes like clerodermic acid, friedelin, betulin, clerosterol and campesterol. The species is having antiasthmatic potential proved in guinea pig lung. Icosahydropicenic acid a new compound isolated from the roots found to protect mast cell degeneration around 59.62%.

Costus speciosus

The plant Crepe ginger is known by the name Shura, Kushta, Kottam or Koshtam in various parts of India. The tribes of south India consume in their food due to its medicinal nature. It increases the immune system against common cold, cough and antidote for sanke bite, arthritis, wounds and jaundice. Also it is relief for skin infections, bronchitis, anemia, constipation, anemia. Ayurveda defines Crepe ginger as acidic, anthelmintic, febrifuge, cooling, purgative and aphrodisiac. The plant is a good cure for anemic patients and respiratory disorders (asthma, inflammations). A yellow coloured pigment called as Curcumin isolated from turmeric (Andrographolide) is used to treat cancer (colon, breast, lung cancer) (Figure 3).

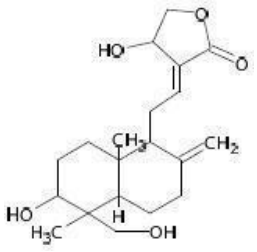

Figure 3. *Chemical structure of andrographolide.*

Tinosporia serratum

Many species of Tinospora are used as domestic folk medicine for healing pharyngitis, cold, ulcer, respiratory diseases, fever, digestion, arthritis, diabetes. The upper respiratory disease is prevented by the genus Tinospora in the powdered form, as antioxidant, anti-inflammation antitumor, immunostimulation effect. Pneumonia, bronchitis, asthma are cured by the fine powder of Tinosporia capillipes [11].

Zingiber ocinale roscoe

The root ginger has been used as medicine from the Vedic period due to the presence of polyphenols like gingerol, zingerone, 6-dehydrogingerdione and quercetin. The root ginger belongs to Zingiberaceae family is the major spice in the Indian food as it is able to fight cold, emesis, headpain respiratory problems, anti-inflammatory, cardiovascular diseases, antioxidant anti-inflammatory activity in albino rats, immunomodulatory effect and antimicrobial [12]. The indispensable oil of ginger helps to build immunity due to the components of terpenes like curacumene (Figure 4), sesquiphellandrene, zingiberene (Figure 5) and farnesene.

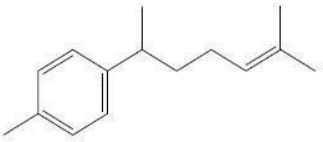

Figure 4. *Chemical structure of curacumene.*

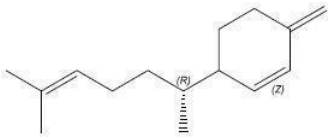

Figure 5. *Chemical structure of Zingiberene.*

Piper longum

The long pepper (1- piperoyl piperidine) falls under the family Piperaceae is the extensively used spice in Indian cooking due to its well-known medicinal nature explored since three thousand years. It is mainly scattered in SriLanka, Tropical regions of Indian subcontinent, Eastern countries and America. Various chemical components present in the roots of pepper are piperlongumine, tetrahydropiperlongumine and trimethoxycinnamoyl-piperidine. The alkaloids like piperine, brachystamide, piperettine, pellitorine, refractomide A, pipercide, methyl piperine, brachystine (Figure 6) [13].

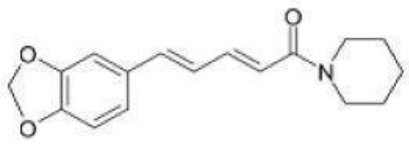

Figure 6. *Structure of Piper longum.*

The fruit of the pepper contains fargesin, sesamin lignans and esters like and Z-12-octandecenoic–glycerol-monoester and tridecyl-dihydro-pcoumaarate. The respiratory depressions induced by morphine were annoyed by piperine [14]. The decrease of lymphocytes and cytokine levels was observed due to the peperinic acid obtained from the Piper longum and it is the sign of immunoregulatory activity.

Yogasana

The blood circulation of the lungs is accelerated by following Savasana, Paschimotasana, Bhujangasana, and Shalabhasana. Pranayama purifies the Nadi and the flow of pranic energy many be rised or reduced in one or more of the Nadi. The volume of the air passing through the lungs on intake and expulsion can be increased by easy diaphragmatic breathing [15].

Conclusion

The importance of the traditional medicine practised from the Vedic period specified in Ayurvedha and Siddha provides a

helping hand during this pandemic stage of world-wide lockdown. We have to build a strong immune system to fight this harmful corona virus and not become a prey to this virus. Numerous lives of people have been lost and we should no longer rely on the vaccine or medicine to be discovered. By then, we should walk by the way of our traditional, sacred herbs which has been discussed above and the biological potential has been revealed by many investigators. Let's all combat COVID-19 by practicing the traditional medicinal herbs of India.

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