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A REVIEW ON *ECHINACEA PURPUREA* L. (PURPLE CONEFLOWER) BIOACTIVE COMPOUNDS USED AS TRUCULENT

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ABSTRACT: *Echinacea purpurea* L. is an herbaceous flowering plant. It is found in eastern and central North America. *E. purpurea* acts as antiviral and anti-inflammatory components include polyphenols such as polyvinylpolypyrrolidone (PVPP), polysaccharides, glycoproteins, cichoric acid (2, 3-O-dicaffeoyl-tartaric acid), alkylamides and caffeic acid derivatives. These compounds help in a direct virucidal activity such as influenza virus A and B, Parainfluenza viruses, Corona viruses and Adenoviruses and anti-inflammatory effects against several respiratory diseases, affects on the proinflammatory response of epithelial cells and reduction of mucin by airways cells these bioactive compounds are characterized for further, improvements in the efficacy of *Echinacea purpurea*.

INTRODUCTION: *Echinacea purpurea* L. belongs to the family of Asteraceae. Its order is Asterales. It is also called “Bressingham Hybrid” due to its bright rose-red ray florets that are surrounded by a darker central cone. It is cone-shaped flowering heads. These flowers are hermaphroditic in nature¹. The name *Echinacea* comes from the Greek “echinos” meaning “hedgehog” that is called spiny center cone. It is propagated from seeds². *E. purpurea* has 800 products species to stimulate the production of white blood cells to relieve the symptoms of cold and help in wound healing activity^{3,4}. It also affect on the upper respiratory tract infection. It grows from a short caudex with fibrous roots and has erect stems⁵.

Its roots, stems, leaves, and flower heads are used to stimulate the immune system and reduce the length of the severity of colds, flu, sore throats, coughs, fever, and infections⁶⁻⁹.

Occurrence of *Echinacea purpurea* L: It is commonly found in Eastern, Central and Northern America. It is growing in moist to dry prairies and used in folk medicine¹⁰. The generic name is derived from the Greek word is “sea urchin” due to the spiny central disk. There are three species that are used mainly in medicinal purposes these species are *E. purpurea*, *E. angustifolia* and *E. pallida*¹¹.

Traditional use of *Echinacea purpurea* L: It is used to treat infections like pulmonary and respiratory tract infections like bronchitis, pharyngitis, and rhinopharyngitis. It acts as natural antibiotics to prevent the infection of cold, flu, fever, toothache, tooth abscess.

It also help to prevent the cancer and also help to cure autoimmune diseases to destroy the germs, bacteria, and various microorganisms and is used as

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various anti-allergic drugs with the help of *Echinacea purpurea* L.

Constituents of *Echinacea purpurea* L: The main active compounds of *Echinacea* are alkylamides, caffeic acid derivatives, caftaric acid, rosmarinic acid, echinacoside, and cichoric acid, polyacetylenes, polysaccharides, flavonoids, Terpenoid compounds, lipid compounds, nitro-genous compounds and other constituents¹²⁻¹⁴.

1. Anti-inflammatory Effects: *Echinacea purpurea* L. has immunoenhancing properties such as antibacterial effects¹⁵⁻¹⁷. Its immune function is very benefited as the physiological significance and in various severe health conditions such as Asthma, cancer, diabetes and in normal ageing^{18, 19}. The lipophilic alkamides of *Echinacea* play an important role in herbal anti-inflammatory activities²⁰. The alkamides from its roots extract help in formation of human neuroglioma cells through decreased cyclooxygenase-2 activity but alkamides increased COX-3 mRNA and protein expression. They also play an important role in the regulation of signal transduction pathways and inflammatory responses²¹. It also acts as immunostimulating properties to stimulate the macrophages and neutrophils to produce inflammatory cytokines and reactive oxygen species^{22, 23}. The alkamides enhanced the physiological parameters such as blood pressure, increased the tolerance against pathogens, it modulates the immune response^{24, 25}.

2. Antiviral Properties: *Echinacea* has an antiviral activity to increase the rate of viral antigens in cultured cells. *Echinacea* hydrophilic and lipophilic extracts has more inhibitor components of viral infection to prevent viral replication²⁶. The derivatives of *Echinacea* have potent activity against Influenza virus and anti-herpes virus activity^{27, 28}. *Echinacea* has strong inhibitory activity against HIV that is caused by caffeic acid derivatives, and Cichoric acid helps to inhibit the HIV replication²⁹.

There is the viral respiratory disease of zoonotic origin that is caused by SARS that is called a severe acute respiratory syndrome. *Echinacea* prevents Coronavirus (SARS-CoV) due to its veridical properties effectively because it has calicivirus is sensitive to *Echinacea*. Its preparation is effective as a prophylactic treatment for all

COVS. There are seven COVS that have been found to cause disease in humans, in which four of those are non-zoonotic. These are HcoV-229E, HcoV-OC43, HcoV-NL63, and HcoV-HKU1. Antiviral herbal actions required the Haemagglutinin inhibition and Neuraminidase inhibition is to prevent the viral replication, surface spike protein inhibition is to prevent the viral entry, increasing interferon is to boost natural immunity, inhibit the cytokine storm is to prevent the inflammatory cascade effect³⁰.

There are other viruses that are involved in the generation of respiratory symptoms these viruses are metapneumoviruses and baculoviruses³¹. Some diseases are pandemics that are accompanied by the innate immune response with the secretion of cytokines and inflammatory mediators³²⁻³⁴. *E. purpurea* aerial parts or roots has potent antiviral activities against herpes simplex virus and coronavirus were distributed more than one solvent derived fraction to reflect more than antiviral compounds³⁵. Mostly *E. purpurea* were able to complete stimulation of Rhinoviruses cytokines. These cytokines are IL-1, 6, 8, and TNF- α ³⁶⁻³⁸.

In human 18 mucin genes are highly glycosylated macromolecules to constitute the part of innate defense system against respiratory pathogens³⁹. Certain chronic conditions of rhinovirus induce hyper secrete mucins one or more genes; these genes are MUC5A⁴⁰.

3. Antibacterial Properties: The use of *E. purpurea* extract has a prophylactic effect on the development of *Pseudomonas aeruginosa* infection to diminish the bacterial number in livers of C57B1/6 and B6C3F1 stains and stimulation of granulocytes chemiluminescent and lymphocytes proliferative responses⁴¹. *E. purpurea* also help to inactivate the respiratory bacteria in epithelial cells. It also helps in the inhibition of growth of trypanosomatids: these are *Leishmania donovani*, *Leshmania major* and *Trypanosoma brucei* L. These three species are found in human bronchial epithelial cells and skin fibroblasts⁴². *E. purpurea* alkamides also help inhibition of the growth of several yeasts such as *Saccharomyces cerevisiae*, *Candida shehata*, *C. albicans*, *C. tropicalis*. These alkamides disrupt the cell walls and cell membranes of fungal pathogens⁴³.

4. Anticancer Properties: *E. purpurea* hexanic roots help to inhibit the growth of tumour of colon that is COLO320 cancer cell lines. *E. purpurea* flower extract cichoric acid show the inhibitory effect on the proliferation of human colon cancer cells CACO-2 and HCT-116 effectively affect on colon cancer⁴⁴.

5. Antifungal Properties: The extract of *E. purpurea* show antifungal activity against *Candida* species and *S. cerevisiae*⁴⁵. The polysaccharides of this extract help to decrease the infection and death of *Candida* stains that are found in vaginal infection⁴⁶.

6. Antioxidant Properties: It is the most potent antioxidant activity. Arachidonic acid metabolism and prostaglandin E2 production were reduced. Caffeic acid derivatives are effective for antioxidants in free radical systems and anti-hyaluronidase activity⁴⁷.

CONCLUSION: Echinacea is the most important species that have more herbal medicinal value that is used in the treatment of various diseases. These plants possess several pharmacological properties and have a huge amount of phytochemical compounds that are used in pharmaceutical industries to produce more drugs for the treatment of several diseases. It is a highly famous immunostimulant herb taken for the common cold and flu and in SARS diseases. It is also used in macrophage stimulation and producing more antigen-specific immunoglobulins.

The present study encompasses the advantage of using the above plant in further researches and their medicinal value and its pharmacological actions of *Echinacea purpurea* L.

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