

A Review on *Echinacea Purpurea* L. (Purple Coneflower) Bioactive Compounds used as Belligerent

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ABSTRACT

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

KEYWORDS: Antiviral, Anti inflammatory, Phenolic compounds, Alkamides

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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 nature (AGPIII, 2009). The name *Echinacea* comes from the Greek "echinos" meaning "hedgehog" that is called spiny center cone. It is propagated from seeds (Midgley JW., 1999). *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 (Grimm W, Muller HH., 1999; Patel T, Crouch A., 2008). It also affect on the upper respiratory tract infection. It grows from a short caudex with fibrous roots and has erect stems (Efloras.org., 2010). Its roots, stems, leaves and flower heads are used to stimulate the immune system and reduces the length of severity of cold, flu, sore throats, coughs, fever and infections (Gwaltney JM., 2002; See H, Wark P., 2008; Nichols WG 2008; Ruuskanen O., 2011).

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 medicine (Echinacea: NCCIH, 2015). The generic name is derived from the greek word is "sea urchin" due to the spiny central disk. There are three species are used mainly in medicinal purposes these species are *E. purpurea*, *E. angustifolia* and *E. pallida* (Block and Mead 2003).

Traditional use of *Echinacea purpurea* L.

It is used to treat the 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 auto immune diseases to destroy the germs, bacteria and various microorganisms and used as 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, nitrogenous compounds and other constituents (Barnes J., Anderson LA, Gibbons and Philipson J. D 2005; Bauer R., 1998; Binns S. E, 2002).

1. Anti-inflammatory Effects:-

Echinacea purpurea L. has immunoenhancing properties such as antibacterial effects (Burger et al., 1997; Stimpel et al., 1984; Steinmuller et al., 1993). Its immune function is very benefited as physiological significance and in various severe health conditions such as Asthma, cancer, diabetes and in normal ageing (Caruso et al., 2004; Ware., 2005). The lipophilic alkamides of *Echinacea* play important role in herbal anti-inflammatory activities (Woelkart and Bauer,

2007). The alkaloids from its roots extract help in formation of human neuroglioma cells through decreased cyclooxygenase-2 activity but alkaloids increased COX-3 mRNA and protein expression. They also play important role in regulation of signal transduction pathways and inflammatory responses (Hinz et al., 2007). It also acts as immune stimulating properties to stimulate the macrophages and neutrophils to produce inflammatory cytokines and reactive oxygen species (Luettig et al., 1989; Burger et al., 1997; Stimpel et al., 1984; Rininger et al., 2000). The alkaloids enhanced the physiological parameters such as blood pressure, increased the tolerance against pathogens, it modulate the immune response (Vos AP et al., 2007; Delgado GTC et al., 2010).

2. Antiviral properties:-

Echinacea has 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 replication (Kumar et al., 2011). The derivatives of *Echinacea* has potent activity against Influenza virus and Anti-herpes virus activity (Vimalanatham et al., 2005; Hudson., 2012). *Echinacea* has strong inhibitory activity against HIV that is caused by caffeic acid derivatives and Cichoric acid helps to inhibits the HIV replication (Birt et al., 2008).

There is the viral respiratory disease of zoonotic origin that is caused by SARS that is called Severe acute respiratory syndrome. *Echinacea* prevents Coronavirus (SARS-CoV) due to its veridical properties effectively because it has calicivirus is sensitive to *Echinacea* (Hudson., 2012). Its preparation effective as 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 effect (Liu Q, Zhou YH et al., 2015).

There are other viruses which is involved in the generation of respiratory symptoms these viruses are metapneumoviruses and baculoviruses (Nichols WG et al., 2008). Some diseases are pandemics that is accompanied by innate immune response with the secretion of cytokines and inflammatory mediators (Suzuki Y. 2009; Michaelis M et al., 2009; Neumann G et al., 2009). *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 compounds (Hudson J. et al., 2005; Vimalanathan S et al., 2005). Mostly *E. purpurea* were able to complete stimulation of Rhinoviruses cytokines. These cytokines are IL-1, 6, 8 and TNF- α (Sharma M., 2009; Hudson JB., 2010; Sharma M et al., 2006).

In human 18 mucin genes are highly glycosylated macromolecules to constitute the part of innate defense system against respiratory pathogens (Vimalanathan S., 2009). Certain chronic conditions of rhinovirus induce hyper secrete mucins one or more genes These genes are MUC5A (Sharma M, Schoop R et al., 2010).

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 responses (Bany Jetal., 2003). *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 fibroblasts (RoeslerJ et al., 1991).

E. purpurea alkaloids also help inhibition of the growth of several yeasts such as *Saccharomyces cerevisiae*, *Candida shehata*, *C. albicans*, *C.tropicalis*. These alkaloids disrupt the cell walls and cell membranes of fungal pathogens (Cruz I., 2014).

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 cancer (Cech NB et al., 2010).

5. Antifungal Properties:-

The extract of *E. purpurea* show antifungal activity against *Candida* species and *S. cerevisiae* (Binns SE et al., 2000). The polysaccharides of this extract help to decrease the infection and death of *Candida* stains that is found in vaginal infection. (Coegniet et al., 1986).

6. Antioxidant Properties:-

It is the most potent antioxidant activity. Arachidonic acid metabolism and prostaglandin E2 production was reduced. Caffeic acid derivatives are effective for antioxidants in free radical systems and antihyaluronidase activity (Dalby-BrownL. et al., 2002).

7. Conclusion:-

Echinacea is the most important species that has more herbal medicinal value that is used in treatment of various diseases. These plants possess several pharmacological properties and has huge amount of phytochemical compounds that is used in pharmaceutical industries to produce more drugs for the treatment of several diseases. It is 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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