

USES OF MEDICINAL PLANTS FOR ANTI-INFLAMMATORY ACTIVITY - A REVIEW

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ABSTRACT:

Inflammation is a natural immune process caused by physiological disturbance in the body. The characteristic signs of inflammation are redness, heat, swelling, pain and loss of function. This whole process is a protection mechanism produced by the body following any injury.

But sometimes this also ends up harming the body. For such times drugs are needed to suppress this condition, they are called anti-inflammatory drugs. NSAIDs are the widely used drugs of choice. Examples are aspirin, diclofenac, mefenamic acid etc. But the prolonged use of these drugs is also known to produce side effects. Many plants are said to contain phytoconstituents that possess anti-inflammatory activity. Since plants are natural, easily available and produce little to no side effects, they are believed to be a safer source of cures or drugs.

The aim of this review is to determine the state of knowledge on medicinal plants and their anti-inflammatory activity. This review discusses how plants may be used in medicine for their anti-inflammatory activity.

Keywords: Anti-inflammatory, Inflammation, Phytoconstituents, Plants, Protection.

INTRODUCTION:

Inflammation is the body's immune response to trauma or injury. The signs indicating inflammation are calor, dolor, tumor, rubor. The process is stimulated to protect the body against pathogens or irritants. Generally the role of inflammation is to heal and protect the body but at times it can also have a negative impact (Medzhitov, 2010). They represent inflammatory disorders like rheumatoid arthritis, multiple sclerosis, osteoarthritis, retinitis etc. Hence Anti-inflammatory drugs were made like Aspirin, Diclofenac etc. These are called Nonsteroidal Anti-inflammatory drugs or NSAIDs. They are COX inhibitors. However prolonged use of these drugs are known to have adverse effects and end up damaging the human biological system. Plants are found to synthesize certain phytochemical compounds that are shown to have anti-inflammatory activity (Hostettmann and Marston, 2002; Karou et al., 2011). According to WHO, 80% of plant-based drugs are used in medicine. Ayurveda, Siddha, and Unani use medicinal plants to treat various kinds of human diseases (Kumar et al., 2017). According to them more than 20,000 species of medicinal plants have been listed. A research was conducted on Anti-inflammatory properties in plants and among the plants identified to possess this activity were Aegle marmelos, Bryophyllum pinnatum, Moringa olifera, Cassia fistula, Hibiscus rosa etc, (Vishal et al., 2014). Because of easy availability, feasibility, accessibility, less harm etc, Plants appear to be an important source of medicine till date. Further research on use of medicinal plants for anti-inflammatory property should be encouraged.

Inflammation process:

Inflammation starts with the cardinal signs (heat, redness, pain, swelling) and results in the dilation of the blood vessels. This enables increased blood flow and intercellular spaces in the blood vessels leading to 'leaky vessels'. Thus allowing movement of plasma proteins, leukocytes and fluids into the injured area undergoing inflammation (Medzhitov, 2008). Another important mechanism is the release of chemical signals by the injured tissue cells and mast cells called chemokines. These chemicals, also called chemo-attractants, create a chemical gradient along which the leukocytes move to reach the inflamed region (Parham, 2000). Some other functions of these chemicals are inducing pain, increasing vascular permeability, producing heat, increasing enzyme activity, etc, (Coleman, 2002). Some examples of these chemokines are :Leukotrienes, Cytokines, Histamine, Prostaglandins, etc.

Classification:

Inflammation is broadly divided into Acute and Chronic inflammation.

Acute inflammation: This type of inflammation appears and lasts for a few seconds, minutes or rarely hours. It presents all classical signs of inflammation and is associated with exudation. Exudates generally comprise of the leaked out plasma fluid, proteins and leukocytes. Acute inflammation mainly shows neutrophil infiltration into the injured site. This process involves defensive and repairative activities.

Chronic inflammation: It lasts longer than acute inflammation. It is a slow, long term condition lasting months or years. The key feature is the change in the composition of the white blood cells. Neutrophils are replaced by macrophages and lymphocytes. The processes involved are tissue damage and secondary repair leading to fibrosis (Serhan and Savill, 2005). The Prolonged state of inflammation results in degenerative chronic diseases like rheumatoid arthritis, multiple sclerosis, retinitis, bowel inflammatory disorders, etc, (Sugimoto et al., 2016). It has been stated that 3 out of 5 people worldwide die due to chronic inflammatory diseases (Barcelos et al., 2019).

Plants and anti-inflammatory activity:

Plants are known to contain various phytochemicals that have been playing an important role in medicine since the ancient times. These constituents possess numerous potentials that help in curing various human ailments (Akinmoladun et al., 2007; Anitha and Ashwini, 2017; Ashwini et al., 2017; Ezhilarasan, 2018; Ezhilarasan et al., 2018; Lakshmi, Ezhilarasan, Nagaich, et al., 2017; Lakshmi, Ezhilarasan, Vijayaragavan, et al., 2017; Mehta et al., 2019). One such example is the Anti-inflammatory activity possessed by some plants. They mainly function by causing a decline in the pro-inflammatory cytokines and nitrous oxide production, thereby blocking the inflammatory process (Bakovic, 2015; Kim et al., 2009). However the exact mechanism of action of these phytochemicals still requires further research. Plant and seed extracts are being studied in the level of nanoparticles for the development of advanced medicine (Gheena and Ezhilarasan, 2019; Karthiga et al., 2018; Lakshmi et al., 2015; Menon et al., 2018; Perumalsamy et al., 2018; Rajeshkumar, Agarwal, et al., 2018; Rajeshkumar, Kumar, et al., 2018; Sharma et al., 2019).

EXAMPLES OF PLANTS

Some of the plants discussed are Aeglemarmelos, Bryophyllumpinnatum, Ricinuscommunis, Cassia occidentalis, Sidacordiflia and Aconitum heterophyllum.

- ***Aegelemarmelos***

The extract taken from the bark of the Bilwa tree was tested for anti-inflammatory property. It was tested on albino rats with the paw edema model. Standard drug used was Indomethacin. The result confirmed anti-inflammatory activity of *Aegelemarmelos* bark extract (Benni et al., 2011).

- ***Bryophyllumpinnatum***

Ojewole et al. studied the anti-inflammatory property of the *Bryophyllumpinnatum* plant. Leaves extract was used to test the egg albumin induced pedal edema in animals. The standard drug used was Diclofenac. The obtained results proved the anti-inflammatory activity of the species (Ojewole, 2005).

- ***Ricinuscommunis***

A study conducted by Ilavarasan et al. 2006, on methanolic extract of *Ricinuscommunis* root using albino rats and carrageenan induced paw edema showed that *Ricinuscommunis* roots possessed incredible anti-inflammatory potential (Ilavarasan et al., 2006).

- ***Cassia occidentalis***

On evaluating the anti-inflammatory activity of *Cassia occidentalis* ethanol extract, using Carrageenan induced paw edema in mice, Sreejith et al. found that it greatly decreased the inflammation, confirming its anti-inflammatory potential (Sreejith et al., 2010).

- ***Sidacordifolia***

Sidacordifolia aqueous extract was first studied by Franzotti EM et al. in 2000. It was tested on carrageenan induced rat paw edema and showed limited anti-inflammatory activity (Franzotti et al., 2000).

- ***Aconitum heterophyllum***

Root extracts from *Aconitum heterophyllum* were investigated by Verma et al. on cotton pellet induced granuloma in paws of rats. The standard drug used was Diclofenac. The results showed that the extract displayed anti-inflammatory property (Verma et al., 2010).

Inflammation is a natural, protective, healing mechanism adopted by the body following an injury. However a prolonged state of inflammation, ie. Chronic inflammation can cause harm to the body. Rheumatoid arthritis, multiple sclerosis, retinitis etc are such manifestations of chronic inflammatory diseases (Libby, 2007). To prevent this, anti-inflammatory drugs are required. NSAIDs are the widely used drugs of choice. Examples are aspirin, diclofenac, mefenamic acid etc. (Wongrakpanich et al., 2018). But prolonged use of NSAIDs is also known to produce side effects. Hence an alternate approach, through plants was made.

CONCLUSION:

Since plants are natural, easily available and produce little to no side effects, they were believed to be a safer source of cures or drugs. The phytochemicals in plants were tested for their various medicinal values. From which anti-inflammatory potential happens to be an important discovery. This article highlights the possibility of incorporating phytochemicals from plants into novel nutraceuticals or pharmaceuticals for future use. Since there is a lack of studies on anti inflammatory activity of plants and their mechanism of action, this article encourages further research on this topic as it has a good scope in future biomedicine.

AUTHOR CONTRIBUTIONS:

Author1 (FarhatYaasmeen.S) analysed the data, reviewed other articles and wrote the paper. Author2 (Dr.Rajesh Kumar) supervised the study and co-wrote the paper. Author3 (Dr.SamuelRaj.S) verified the data and contributed towards the final version of the manuscript.

CONFLICTS OF INTERESTS:

None declared.

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