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EFFECT OF *CISSUS QUADRANGULARIS* LINN.ON HAEMTOLOGICAL PARAMETERS OF CONTROL AND ARTHRITIS INDUCED RATS

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ABSTRACT

Arthritis is a chronic, inflammatory, systemic autoimmune disease characterized by pain, swelling and stiffness. Allopathic medications have been prescribed to this disease which results into associated side effects like gastrointestinal bleeding. The popularity of the herbal medicine is due to less toxic and minimal side effects. Medicinal plants play an important role in the development of potent therapeutic agents. In this research work an attempt has been done to highlight the effect of the *Cissus quadrangularis Linn.* on haematological parameters of FCA induced arthritic rats. The arthritic condition of the experimental rats was induced by the administration of Freund's complete adjuvant (FCA). The haematological parameters such as RBC, WBC, Hb, ESR and Platelet assessment were carried out. This work stimulate the researchers for further research on the potential use of *Cissus quadrangularis*.

KEYWORDS: Arthritis, FCA, Haematological parameter, *Cissus quadrangularis Linn.*

INTRODUCTION

Plants have been an important source of precursors and products used in a variety of industries, including those of pharmaceuticals, food, cosmetics and agrochemicals. The traditional medicines are enjoying an upsurge in popularity due to their low or no residual toxicity.[1]

There is an urgent need to systematically evaluate the plants used in traditional medicine. Such research could lead to new drug discovery or advance the use of indigenous herbal medicines for orthodox treatment. Recently there is a renewed interest in traditional medicine observed and there has been an increasing demand for more and more drugs from plant sources. This revival of interest in plant derived drugs is mainly due to the current widespread belief that green medicine is safe and more dependable than the costly synthetic drugs many of them have adverse side effects.[2]

The World Health Organization (WHO) defined health as "a complete state of physical, mental, and social well-being and not merely the absence of disease or infirmity." So during the past decade, traditional systems of medicine have become a topic of global importance. Current estimate suggest that, in many developing countries a large proportion of the population relies heavily on traditional practitioners and medicinal plants to meet primary health care needs. Although modern medicine may be available in these countries, herbal medicines (phytomedicines) have often maintained popularity for historical and cultural reasons. Concurrently, many people in developed countries have begun to turn to alternative or complementary therapies, including medicinal herbs.[3]

Rheumatoid arthritis (RA) is an autoimmune disease that results in a chronic, systemic inflammatory disorder that may affect many tissues and organs, but principally attacks flexible synovial joints. It can be a disabling and painful condition, which can lead to substantial loss of functioning and mobility if not adequately treated. The process involves an inflammatory response of the capsule around the joints, synovium secondary to swelling, excess synovial fluid, and the development of fibrous tissue (pannus) in the synovium. The pathology of the disease process often leads to the destruction of articular cartilage and ankylosis (fusion) of the joints. RA can also produce diffuse inflammation in the lungs, the membrane around the heart (pericardium), the membranes of the lung, and white of the eye (sclera), and also nodular lesions, most common in subcutaneous tissue. Although the cause of RA is unknown, autoimmunity plays an important role. The clinical diagnose is made on the basis of symptoms, physical examination, radiographs (X-rays) and laboratory tasks.

Rheumatoid arthritis is characterised by persistent synovitis, systemic inflammation and auto-antibodies (particularly to rheumatoid factor and citrullinated peptide.

Rheumatoid arthritis (RA) is a chronic inflammatory autoimmune disease affecting about 1% of the population in developed countries. Although the disease can start at any age, the peak of onset is between 25 and 55 years, women being affected about three times more frequently than men. RA primarily affects the synovial joints of all extremities and less often the spinal column and is pathologically characterized by severe inflammation and progressive destruction of cartilage and sub-chondral bone. Recent data have shown that pathological changes occur early during the disease. Rheumatoid arthritis is characterized by a series of pathological processes of the joints, such as leukocyte infiltration, pannus formation and extensive destruction of the articular cartilage and bone. The most commonly prescribed medication for RA treatment is steroidal, non-steroidal anti inflammatory drugs (NSAIDs), disease modifying antirheumatic drugs (DMARDs) and immunosuppressant drugs. The goal of these drugs has been to relieve pain, decrease joint inflammation, and prevent joint destruction and to restore function of disabled joints. However, the side effects of currently available drugs include gastric ulcer, renal damage, bronchospasm and cardiac abnormalities have limited their use. Many researchers have focused in recent years on medicinal plants derived natural products such as flavonoids, steroids, polyphenols, coumarins, terpenes and alkaloids due to their wide range of pharmacological significance including analgesics, anti-inflammatory and antiarthritic activities with lesser side effects.[4]

Amongst the various experimental animal models of arthritis, induction of arthritis by Freund's complete adjuvant (FCA) is one of the standardized methods which mimics the human pathophysiological state including chronic swelling in multiple joints due to accumulation of inflammatory cells, joint cartilage erosion, bone destruction and used to investigate the activity of various potent anti-inflammatory and anti-arthritic agents.

Fig 1: *Cissus quadrangularis Linn.*

Cissus quadrangularis Linn. (Fig 1)is a succulent perennial climber scattered all over India particularly in tropical regions, usually called as 'Asthisamdhani' in Sanskrit, Kandvel in Marathi, Haddjor in Punjabi, Hadbhanga in Oria, Vedhari in Gujrati, Perandai in Tamil and Nalleru in Telugu. Based on morphological characters three different variants have been identified, they are square - stemmed, round-stemmed and flat stemmed. Frequently available varieties are square stemmed and round-stemmed. These are rich in source of ascorbic acid, steroids and calcium.[5]

It requires warm tropical climate and propagated by stem cuttings in the months of June and July. It is a climbing herb, tendrils simple with opposite leaves, leafless when old. Leaves simple or lobed, cordate, broadly ovate or reniform, serrate, dentate, sometimes 3-foliate and glabrous. Flowers small, greenish white, bisexual, tetramerous, in umbellate cymes, opposite to the leaves. Calyx is cup shaped. Fruit globose or obovoid fleshy berries, succulent, very acrid, dark purple to black, one seeded; seeds ellipsoid or pyriform. Stem is buff colored with greenish ting, dichotomously branched, sub- angular, glabrous, fibrous and smooth.[6]

MATERIALS AND METHOD

1. Collection of Cissus quadrangularis Linn.

Cissus quadrangularis Linn. stem were collected in the month of September 2010 from Sulur area of Coimbatore district, Tamilnadu, India. The plant was identified and authenticated by taxonomist Dr.K.Arumugasamy, Associate Professor, Department of Botany, Kongunadu Arts and Science College, Coimbatore. The stem collected were washed with distilled water, shade dried and powdered.

2. Selection of Animals

Female albino rats of wistar strain weighing about (150-200 g) was taken for the study. Animals were housed at 25 ± 1°C and at standard environmental conditions in the institutional animal house.

3. PHARMACOLOGICAL STUDY

FCA induced arthritis

Arthritis was induced by a single intra-dermal injection (0.1 ml) of Freund's complete adjuvant (FCA) containing 1.0 mg dry heat-killed *Mycobacterium tuberculosis* per milliliter sterile paraffin oil into a foot pad of the left hind paw of rats. The animals were divided into 5 groups of 6 animals each.

4. Colection of sample

After the experimental regimen, the animals were sacrificied by cervical decapitation under light ether anesthesia. Blood was collected and then used for the determination of haematological parameters.

Statistical analysis

Results were expressed as mean± standard deviation(S.D.).Statistical significance was determined by SPSS Package.

RESULTS AND DISCUSSION

Rheumatoid arthritis (RA) is a ravaging inflammatory and autoimmune illness that affects the joints. This disease also affects the tissues surrounding the joints such as skin, blood vessels and muscles.

The results pertaining to the present study are as follows.

The table 1 depicts the effect of *Cissus quadrangularis* Linn.on haemtological parameters of control and experimental rats

Table. 1: EFFECT OF *Cissus quadrangularis* Linn. ON HAEMTOLOGICAL PARAMETERS OF CONTROL AND EXPERIMENTAL RATS

Parameter	Group I	Group II	Group III	Group IV	Group V
RBC$^{\$}$	8.35±0.61	7.85±0.33a*	8.28±0.58b*	8.14±0.18c*e^{ns}	8.43±0.07d^{ns}
WBC$^{\Omega}$	5.62±0.53	6.58±0.52a*	5.55±0.44b*	5.43±0.08c*e^{ns}	5.53±0.52d^{ns}
Hb$^{\Psi}$	12.65±0.56	10.54±0.48a*	11.28±0.43b*	11.05±0.08c*e^{ns}	12.33±1.03d^{ns}

Values are expressed as Mean ± SD for six animals

Experimental design

Group I: Control rats

Group II: Freund's complete adjuvant induced arthritic rats (0.1 ml of adjuvant as single dose)

Group III: Freund's complete adjuvant induced arthritis rats treated with the standard drug indomethacin (5 mg/kg b.wt.)

Group IV: Freund's complete adjuvant induced arthritis rats treated with the leaf extract of *Cissus quadrangularis Linn.* (250 mg/kg b.wt.)

Group V: Rats fed with the leaf extract of *Cissus quadrangulari Linn.* (250 mg/kg b.wt.)

Comparsion between the groups

a- Comparsion between group II and group I

b- Comparsion between group III and group II

c- Comparsion between group IV and group II

d- Comparsion between group V and group I

e- Comparsion between group IV and group III

Units

$^{\$}$millions/mm^3; $^{\Omega}$thousands/ mm^3; $^{\Psi}$ g/dl.

The **symbols** represent statistical significance p*<0.05, ns- Not Significant.

The level of RBC and Hb were found to be significantly decreased in group II rats treated with Freund's complete adjuvant (FCA) when compared with group I rats. The administration of the methanolic stem extract of *Cissus quadrangularis Linn*. is significantly increased the levels in the group IV rats and Indomethacin induced rats (group III) which were equal near normal.

The levels of RBC and Hb in group I and group V rats were found to be same and there is no significant change in the values noted between the Groups.

The adjuvant induced arthritis model helps to study pathological changes in tissues other than joints. According to present study there is a decrease in the levels of Hb and RBC and increase in the levels of WBC in group II rats was observed. The reduction in Hb and RBC levels in arthritic rats indicates the presence of anemia in group II rats.[7]

Anemia is the most common extracellular manifestation found in Rheumatoid arthritis.[8] The important cause might be the decreased level of plasma iron due to sequestering of iron in the reticuloendothelial system and synovial tissue which would lead to failure of bone marrow to respond to anemia.[4] The results are in concordance with the study which reported the antiarthritic activity of ethanol extract of *Diplocyclos palmatus* (L) C. Jeffrey was investigated using the FCA induced arthritis model.[4]

The results which depicts a decrease in the levels of RBC and Hb in arthritic rats were found similar in Evaluation of anti-arthritic activity of *Caesalpinia pulcherrima* in freund's

complete adjuvant induced arthritic condition. These symptoms indicate an anemic condition.[9]

The WBC count had prominently increased ($p<0.05$) in group II rats when compared with Group I rats and this was normalised in group III and group IV rats. Group V showed the protective effect of the methanolic stem extract of *Cissus quadrangularis Linn*. This increase in the WBC count is due to the dissemination of the *Mycobacterium tuberculosis* in Freund's complete adjuvant. The increase in WBC count might be due to the stimulation of immune system against the invading pathogenic microorganism.[10]

Our result increase in WBC count in arthritic condition in group II rats and significant decrease in group IV showed its immunomodulation effect. It agrees well with the result shown in Evaluation of anti-arthritic activity of *Caesalpinia pulcherrima* in freund's complete adjuvant induced arthritic rat model. The significant increase in leukocyte count in adjuvant induced arthritic rats may be due to the stimulation of immune system against the invading antigens.[9]

Table. 2: EFFECT OF *Cissus quadrangularis Linn.* ON HEAMTOLOGICAL PARAMETERS OF NORMAL AND EXPERIMENTAL RATS

Parameter	Group I	Group II	Group III	Group IV	Group V
ESR[ч]	12.95±0.63	14.14±0.28a*	13.58±0.27b**	13.47±0.05c*e^{ns}	12.74±0.27d^{ns}
Platelet[®]	372.55±0.57	442.37±0.93a*	402.26±0.78b*	403.89±0.13c*e^{ns}	373.18±0.64d^{ns}

Values are expressed as Mean ± SD for six animals

Experimental design and comparsion is done as in the table 1.

Units:

[ч]mm/hr; [®]thousands/cm.

The symbols represent statistical significance p*<0.05; ns- Not Significant.

The haematological parameter ESR showed a significant increase($p<0.05$) in Group II rats, which agrees with the findings in Effect of Biochemical Parameters in Cetylmyristeolate treatment against freund's adjuvant induced arthritis model.[11]

The level was reverted to normal in group III and group IV due to administration of the standard drug and the stem extract of *Cissus quadrangularis* Linn. There is no change in the values of group IV rats. The platelet level was found to be significantly increased ($p<0.05$) in

group II rats compared to the normal rats. There was a decrease in the level to near normal value in group III and group IV due to administration of the standard drug and methanolic extract of *Cissus quadrangularis Linn*. Group V showed normal values for all the parameters which showed the protective effect of the stem of the Cissus *quadrangularis Linn* There is no significant change in the values noted between the rats group III and group IV.

The results are similar with Antiarthritic activity of ethanolic seed extracts of *Diplocyclos palmatus* (L) C ; Jeffrey in experimental animals.[4] The increase in platelet counts might be due to the stimulation of immune system against the invading pathogenic microorganism.[10]

Increased level of ESR in arthritis induced rats was found similar in Anti-arthritic activity of *Tribulus terrestris* studied in Freund's Adjuvant induced arthritic rats.[12] The study was similar which states that migration of leucocytes into the inflamed area of arthritic rats were significantly prevented by plant extract.

Rheumatoid Arthritis is a common autoimmune disorder, the immunologically mediated Freunds complete adjuvant induced arthritic model is said to be one of the outstanding animal model of Rheumatoid arthritis.[9] The investigations validate the use of *Cissus quadrangularis Linn.*as a herbal drug in the Ayurvedic system of medicine and capable of counteracting the toxic effect caused by FCA in arthritic rats. The potent effect of *Cissus quadrangularis Linn.* states it as an anti-arthritic activity of the plant.

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