



REGULAR ARTICLE

PRELIMINARY PHYTOCHEMICAL AND ANTI-ARTHRITIC ACTIVITY OF AN AYURVEDIC FORMULATION -YOGARAJA GULGULU

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SUMMARY

Rheumatoid arthritis is a painful and crippling systemic disease for which there is no cure. Ayurveda is becoming popular with more and more people accepting its holistic approach to healing. The anti-arthritis activity of an ayurvedic formulation Yogaraja gulgulu was studied in rats. The formulation was then subjected for preliminary phytochemical studies and pharmacological investigation. The anti-arthritis activity was carried out by Freund's adjuvant arthritis model. The ayurvedic formulation has exhibited significant anti-arthritis activity. The phytoconstituents screening reveals the presence of required component for anti-arthritis activity. The present study concludes that the yogaraja gulgulu can be used as anti-arthritis drug.

Key words: Yogaraja gulgulu, arthritis, adjuvant, indomethacin

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1. Introduction

Ayurveda is becoming popular with more and more people accepting its holistic approach to healing. Ayurveda is a science of life, it is a science of which comprises how to lead to a long healthy life. According to ayurveda health is the maintenance of the balance of the forces in the body. When this balance is upset the body becomes diseased. Ayurveda treats men as whole. This is combination of body, mind and soul. It is one of the oldest scientific medical systems in the world with long record of clinical experience. It divided in to eight branches; its aim is to achieve positive health for individual, protection of masses and ultimate liberation. Ayurveda is effective in the treatment of refractory skin disease, classified as kushta, Psoriasis for instance is a difficult conditions to treat. Eczema, dermatophyte infection of ringworm¹ for fungal infections, pilriasis and other gynecological disorders can be effectively treated by ayurveda practice.

Besides, Ayurveda preparations are safe and do not have any side effects. Dasmula tila ultrabastic is found to be effective in treating in the spermatozoa agglutination from 60%-20% has been observed. Menopausal symptoms can be treated without hormone replacement therapy with ayurveda practice. In to traditional systems of medicine many polyherbal formulations are being prescribed for inflammatory conditions.² Although these preparations have been claimed to have anti-inflammatory activity and some of the individual plant ingredients of the formulations have been shown to have anti-inflammatory activity³ Rheumatoid arthritis (RA) is a chronic autoimmune disease in which there is inflammation of joints, sinovial proliferation and destruction of articular cartilage.⁴ Although a number of drugs such as steroids⁵ and non steroids⁶ being used in the treatment of RA have been developed in the

past few decades, there is still and urgent need for more effective drugs with lower side effects.⁷ With brief literature survey, it found that there were no publications or studies on the formulation which we have used for the study. The aim and objective of the current study was to confirm phytochemical constituents present in the formulations and to investigate the anti-arthritic activity of the formulation comparing with Indomethacine as standard.

2. Materials and Methodology

Ayurvedic Formulation

Yogaraja Gulgulu was purchased from local ayurveda medical shops, Indomethacin sample gifted by (CIPLA Limited, Mumbai) and other solvents Acetone, Ethanol, Methanol, Benzene, Chloroform were supplied by (S.D fine chemicals, Mumbai), all other chemicals and solvents were analytical grade.

Animals

Wistar rats (200-250 g) were used. The animals were housed under standard conditions of temperature (23±1°C), relative humidity (55±10%), 12 hr/12 hr light/dark cycles and fed with standard pellet diet (Amrut, Pranav Agro Industries Ltd., Sangli, India) and tap water ad libitum.

Formulation of Pills of Yogaraja Gulgulu

The *Yogaraja gulgulu* is available as pills in the market and the method of preparation described as follows, kasayam was prepared by using 4 gm of powdered amirthavalli, then the gulgulu was fried with ghee and then grinded well. The grinded gulgulu was added to the Kasyam along with remaining ingredients to it with continuous trituration to make pills. The pills were administered 1-2 pills once or twice a day.

Preliminary Phytochemical Screening

The ayurvedic formulation *Yogaraja gulgulu* was screened for the presence of various phytoconstituents^{8,9} for the presence or absence of various primary or secondary metabolites employing standard screening test Conventional protocol for detecting the presence of glycosides, saponins, flavonoids, and tannins etc.was used.

Solubility Studies

To understand the solubility of the Ayurvedic formulation Yogaraja gulgulu, the solubility studies were carried out by using various solvents, in this method; one part of the formulation was placed in narrow mouthed screw cap container and the each solvent was added in respective container with continuous shaking using thermostatic shaker for 24 hours and found the solubility of the formulation.

Freund's Adjuvant Induced Arthritis

Rheumatoid arthritis is a painful and crippling systemic disease for which there is no cure. The best experimental model for studying rheumatoid arthritis in humans is the adjuvant induced arthritis in rats.¹⁰ The anti-arthritic activity was carried out with modified procedure.^{11,12} Rats were divided into four groups of 6 animals each. Adjuvant arthritis was induced by subcutaneous injection of complete Freund's adjuvant (CFA - 0.1mL of 0.5% w/v suspension of heat killed *Mycobacterium tuberculosis* cells in liquid paraffin) into the plantar tissue of the right hind paw of each rat. Rats in this group were known as inflamed control group I. Group II received the doses of the test drugs 100 mg/kg bw and Group III received the standard drug (2.5 mg/kg bw). Group IV served as the non-inflamed control group consisted of rats injected with 0.1 mL of liquid paraffin. The test groups consisted of complete Freund's adjuvant (CFA)-injected rats challenged with doses of the test drug administered orally 2 h before induction of arthritis. The drug administrations were continued daily at the same time of the day for 9 more days. Development of adjuvant induced swelling in the paws of both the injected and non-injected paws of each rat were monitored daily as the percentage increase in paw volume. The percentage inhibition of paw volume compared with that of the inflamed control was taken as anti-arthritic activity.

$$\text{Percentage inhibition inflammation} = \frac{(A - B)}{A} \times 100$$

Where A represents the paw volume of control group and B is the paw volume of the test group. The dosage details of the arthritis experiment are presented in Table 4.

Table:1 Composition, biological source, parts used and family of Yogaraja gulgulu

S.no.	Ingredients	Biological source	Family	Part used
1	Amurutavalli	<i>Tinospora cordifolia</i>	<i>Menispermaceae</i>	Stem
2	Khurassani	<i>Hyoscyamus niger</i>	<i>Solanaceae</i>	Leaves & seeds
3	Kotuvveli	<i>Plumbago indica</i>	<i>Plumbaginaceae</i>	Roots
4	Aratha	<i>Alpinia galanga</i>	<i>Gingiberaceae</i>	Rhizomes
5	Nerinci	<i>Tribulus terrestris</i>	<i>Zygophyllaceae</i>	Whole plant
6	Kottamalli	<i>Coriandrum staivum</i>	<i>Apiaceae</i>	Leave & Fruits
7	Katukka	<i>Terminalia chebula</i>	<i>Combretaceae</i>	Fruits
8	Nellikka	<i>Phyllanthus emblica</i>	<i>Emphorbiaceae</i>	Bark, leaves & fruits
9	Tannikka	<i>Terminalia bellica</i>	<i>Combretaceae</i>	Bark & fruits
10	Muttanga	<i>Cyperus rotundus</i>	<i>Cyperaceae</i>	Tubers
11	Chukku	<i>Gigiber officinale</i>	<i>Gingiberaceae</i>	Rhizomes
12	Kurumilagu	<i>Piper nigrum</i>	<i>Piperaceae</i>	Fruits
13	Elavangam	<i>Cinnamomum verum</i> , <i>C. Zeylanicum</i>	<i>Lauraceae</i>	Bark & Oil
14	Ramacham-Vettiver	<i>Vetiveria zizanioides</i>	<i>Poaceae</i>	Roots
15	Talispatri	<i>Abies spectabilis</i>	<i>Pinaceae</i>	Leaves
16	Nagappu	<i>Mesua Nagassarium</i>	<i>Clusiaceae</i>	Flower & Oil
17	Kaccoram	<i>Kanpferia galangal</i>	<i>Gingiberaceae</i>	Rhizome, root stock & leaves
18	Nagandanti	<i>Baliospermum montanum</i>	<i>Euphorbiaceae</i>	Roots, leaves & seeds
19	Pakku	<i>Areca catchu</i>	<i>Arecaceae</i>	Roots, leaves & fruits
20	Amukkuram	<i>Withania somnifera</i>	<i>Solanaceae</i>	Roots & leaves
21	Sathavari	<i>Asparagus racemosus</i>	<i>Liliaceae</i>	Tuberous root
22	Gulgulu	<i>Commiphora mukol</i>	<i>Burseraceae</i>	Resinous gum
23	Tippili	<i>Piper longum</i>	<i>Piperaceae</i>	Roots,& Spikes
24	Karinjeeragam	<i>Nigella sativa</i>	<i>Ranunculaceae</i>	Seeds
25	Vidangah	<i>Embelia ribes</i>	<i>Myrsinaceae</i>	Roots, leaves & fruits
26	Ayamodakam	<i>Trachyspermum</i>	<i>Apiaceae</i>	Fruits
27	Jeerakam	<i>Cuminum cyminum</i>	<i>Apiaceae</i>	Fruits
28	Devadaru	<i>Cedrus deodara</i>	<i>Pinaceae</i>	Leaves & oil
29	Kattumilagu	<i>Toddalia Asiatica</i>	<i>Rutaceae</i>	Roots, leaves, fruits & flower
30	Elam	<i>Elettaria cardamomum</i>	<i>Gingiberaceae</i>	Seeds & oil
31	Kottam	<i>Saussurea lappa</i>	<i>Asteraceae</i>	Roots

Table.2: Qualitative analysis of the phytochemicals of Ayurvedic formulation Yogaraja Gulgulu, '+' Indicates Presence of compound, '-' Indicates absence of compound

S.No.	Phytoconstituents	Ayurvedic formulation
1	Alkaloids	+
2	Tannins	+
3	Flavonoids	+
4	Phytosterols	-
5	Sponins	+
6	Proteins & Amino acids	-
7	Phenolic compound	-
8	Carbohydrates	+
9	Glycosides	-
10	Fixed oils & fats	+
11	Gums & Mucilage	-
12	Lignin	+
13	Terpenes	+

Table: 3 Solubility studies of formulation yogaraja gulgulu in various solvents. 'S' Indicates soluble 'NS' indicates not-soluble or insoluble

S. No.	Solvents	Solubility
1	Acetone	NS
2	Benzene	NS
3	Chloroform	NS
4	Carbon tetra chloride	NS
5	Ethanol	S
6	Methanol	NS
7	Petroleum ether	NS
8	Propylene glycol	S
9	Arachis oil	S
10	Castor oil	NS
11	Sesame oil	NS
12	Coconut oil	NS
13	Hot water	S

Table-4 Anti-arthritis activity of Ayurvedic formulation *Yogaraja Gulgulu* against Freund's adjuvant induced arthritis

Group	Treatment	% increase in paw volume				
		Post insult time of assay in days				
		1	3	5	7	9
Group-I	Control (Inflamed)	72.7±1.2	81.3±1.5	95.9±1.2	97.6±1.1	100.1±1.3
Group-II	Test drug (100mg / kg)	50.7±1.7 (30.2)	50.1±1.9 (38.3)	57.7±2.1 (39.8)	53.3±1.2 (45.3)	48.2±1.9 (51.8)
Group-III	Indomethacin (2.5mg/kg)	48.2±1.3 (33.7)	46.8±2.4 (42.4)	45.2±2.1 (52.8)	44.3±2.6 (54.6)	34.3±1.5 (65.7)
Group-IV	Control (non- inflamed)	15.6±2.2	23.5±2.1	29.3±1.8	46.4±2.4	26.7±1.8

Each value is the mean \pm SEM of 6 rats. The number in the parentheses indicates the percentage inhibition of the inflammation

3. Results

Composition, its biological sources, parts used and the family of the evaluated formulation of *Yogaraja gulgulu* given in Table-1. The poly herbal formulation of yogaraja gulgulu which contains more number of medicinal herbs, this may be the reason the ayurvedic formulation is used for multiple therapeutic conditions such as anti-inflammatory, skin diseases, anthelmintic, bronchitis, scabies, nervine stimulant, rheumatoid arthritis, analgesic, antiseptic, flatulence, stomachi, antispasmodic, antibacterial etc., The preliminary phytoconstituents present in the formulation tabulated in Table-2. Which reveals that the presence of alkaloids, terpenes, carbohydrates, flavonoids, saponins, tannins, fixed oils and fats. The solubility of the Ayurvedic formulation were studied in various solvents and indicated in table-3. it was freely soluble in organic solvents like

ethanol and propylene glycol and in arachis oil, and in hot water also. But, it was not soluble in other solvents mentioned in table-3. The anti-arthritis effect of the yogaraja gulgulu started on day 1, which continued till day 9 when compared with that of the control (Table 4). In the case of standard drug maximum inhibition was observed on day 1 itself. Whereas in the case of 100 mg/kg body weight dose of the test drug maximum inhibitions were noticed on day 5. In all the two cases the inhibition started decreasing after day 5.(Table 4).

4. Discussion

In adjuvant induced arthritis model, rats develop a chronic swelling in multiple joints with influence of inflammatory cells, erosion of joint cartilage and bone destruction and remodeling. These inflammatory changes ultimately result in the complete destruction of joint integrity and function in the affected

animals.¹³ Chronic inflammation involves the release of number of mediators like cytokines (IL- β and TNF- α), GM-CSF, interferons and PGDF. These mediators are responsible for the pain, destruction of bone and cartilage that can lead to severe disability.¹⁴ Several phytoconstituents like flavonoids, saponins and glycosides are known to promote anti-arthritis activity due to their antioxidant and antimicrobial activities¹⁵ the yogaraja gulgulu which contains number of herbs in it having the various phytoconstituents may acts on arthritic pain. With help of above data we may conclude that the ayurvedic formulation of Yogaraja gulgulu can be used to treat arthritic pain or rheumatoid arthritis.

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