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A Comprehensive Analysis Of *Bhallatakadi Churna* In The Management Of *Amavata* w.s.r To Rheumatoid Arthritis

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ABSTRACT: -

The *Amavata* of Ayurveda can be correlated with Rheumatoid Arthritis of contemporary medical science. Rheumatoid Arthritis is a chronic inflammatory systemic disorder triggered by auto-immunity to self-antigens. Its available modern management is still not satisfactory. Hence, majority of the patients are inclined towards the traditional systems of medicine including Ayurveda. *Bhallatakadi Churna* (comprises of 3 herbal drugs i.e., *Bhallataka* (*Semecarpus anacardium* Linn.), *Tila* (*Sesamum indicum* Linn.) & *Haritaki* (*Terminalia chebula* Retz.) is one of the promising herbal formulations, mentioned in *Yogaratnakara* for the management of *Amavata* (Rheumatoid Arthritis). It has capacity to alter basic matrix (*Ama*, *Vata*, *Agnimandya*) of diathesis of *Amavata* (Rheumatoid Arthritis). These drugs impart *Deepana* (appetizer), *Rasayana* (Rejuvenator), *Anulomana* (carminatives), *Pachana* (Digestive), *Ama-doshahara*, *Medhya Prabhva* (Nootropic) & *Shothahara* (anti-inflammatory) effect. So, this formulation used in *Amavata* (Rheumatoid Arthritis) not only pacify and correct the *Ama* & *Vatadosha*, but it also hit on the root cause of disease i.e., *Mandagni* (weak digestive fire). The critical evaluation of pharmacological actions of these drugs reveals its anti-oxidant, anti-inflammatory, anti-nociceptive etc. effects, which is quite enough to modify the root cause of disease i.e., auto-antigen (most correlative with *Ama*) and pacify the chief complaint of the patients of Rheumatoid Arthritis. In this article we will try put an emphasis on *Bhallatakadi Churna* by incorporating the classical and contemporary knowledge.

Key Words – *Amavata*, *Ama* , *Bhallatakadi Churna*, Rheumatoid Arthritis

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INTRODUCTION -

The clinical entity *Amavata* (Rheumatoid Arthritis), first acknowledged by *Acharya Madhavakara* in his narrative *Madhava Nidana*.[1] In Ayurveda a comprehensive description of drug and non-drug treatment modalities of *Amavata* (Rheumatoid Arthritis) with a wide range of herbal and herbo-mineral formulations (Pacificatory measures) as well as *Panchakarma* (Bio - purificatory) measures is available. *Amavata* (Rheumatoid Arthritis) can be harmonized with clinical entity Rheumatoid Arthritis.

The *Samprapti* (pathogenesis) of the disease *Amavata* (Rheumatoid Arthritis) is based on specific *Dosha-Dushya* pattern. The depletion of *Agni* (digestive fire) plays the key role in production of *Ama*, which plays an antigenic role and possibly initiative of an autoimmune diathesis leading to the inflammations of joints and the blockade the channels of the body called *Srotovarodha*, which leads to the vitiation of *Vatadosha*. This *Ama* gets vitiated with *Vata Dosha* and enters into circulation and interacts with respective *Dosha* & *Dushya* at the most suitable place for the disease (*Kha-vaigunya*).[2] This *Samprapti* (Pathogenesis) manifests in the terms of pain, swelling, stiffness of the affected joints along with other constitutional clinical features. *Bhallatakadi Churna* is mentioned as one of the important formulations in *Yogaratnakara* for the management of *Amavata* (Rheumatoid Arthritis). This formulation comprises of total 3 herbal drugs, which have capacity to alter the basic matrix of diathesis i.e., *Ama, Vata, Agnimandya* (weak digestion) etc. in cases of *Amavata* (Rheumatoid Arthritis).

MATERIALS AND METHODS

In this article, comprehensive data was prepared & compiled on *Bhallatakadi Churna* by utilizing the resources as mentioned in the ancient texts of Ayurveda, different international & national journals and other wave based information.

RESULTS -

On the basis of the review carried out, the following information was collected with regard to the individual drug of *Bhallatakadi Churna*.

Bhallatakadi Churna:[3]

Table 1 showing *Bhallatakadi Churna* contents –

Sr. No.	Drug	Used part	Ratio
1.	*Bhallataka (Semecarpus anacardium)*	Fruit	1 part
2.	*Tila (Sesame oil)*	Seed	1 part
3.	*Haritaki (Terminalia chebula)*	Fruit	1 part

Bhallatakadi Churna is used in the form of *Churna* (powder) as oral medication with the *Anupana* (vehicle) of *Guda* (Jaggery).

General description [4, 5]

Botanical Name	***Semecarpus anacardium* Linn.**
Family	Anacardiaceae
English Name	Marking nut
***Hindi* Name**	*Bhilava*
Useful parts	Fruit, gum and oil
***Sanskrita* Names and Synonyms**	*Bhallataka, Arushkara, Agnika, Shophakrita, Agnimukha* etc.

(1) *Bhallataka* *(Semecarpus anacardium* Linn)

Brief botanical description about *Bhallataka* (*Semecarpus anacardium):* is medium size deciduous tree with a rough bark, yielding acrid juice. It is distributed throughout the hotter parts of the country as far east as Assam, Gujarat and in the deciduous forests of all districts in the Tamil nadu. Leaves are large, crowded towards the extremities of the branches, oblong or obovate-oblong, rounded at the apex rounded, cuneate at the base, coriaceous, hispidly pubescent. Pedicels are equal or shorter than the leaves. Flowers are small, greenish white, sub-sessile, fascicles in pubescent pedicels, the female pedicels shorter than the male; pedicel short, bracts lanceolate, pilose. Calyx about 1 mm. long, pilose outside, 5-6 fid segments deciduous. Corolla Petals 4-5mm.long, ovate, acute, 5-6 imbricate. Stamens are 5-6 inserted at the base of the disk which is broad and annular. Filaments subulate, Ovary Subglobose densely pilose, crowned with 3 styles. 1- Celled with ovules pendulous from a basal funicle. Drupe 2.35-5.88 cm. long kidney-shaped, obliquely ovoid, smooth shining black when ripe, seated on a fleshy orange-red receptacle formed of the thickened disk and calyx base. Seed are pendulous; testa coriaceous, inner coat somewhat fleshy. The tree becomes leafless in between month of February and April which appear back with flowers in the month of May.

The fruit is a kidney-shaped, drupaceous nut with a fleshy pear-shaped receptacle. It is 2.35 to 5.88 cm long, obliquely ovoid, smooth, shining and green. When ripe, the nut becomes black, while the receptacle changes to orange. Pericarp is about 4-5 mm. in thickness containing large elliptical ligneous oil cavity.[6, 7]

Table 2 showing Ayurvedic pharmacodynamics of *Bhallataka:*

Rasa	*Katu* (Pungent), *Tikta*(bitter), *Kashaya* (Astringent)
Guna	*Laghu*(light), *Snighdha* (unctuousness), *Tikshna* (Sharp)
Virya	*Ushhna* (hot)
Vipaka	*Madhura* (sweet)
Doshakarma	*Kapha-vata shamaka* and *Pittavardhaka*
Dose	1.2 gm of the drug in *Ksheerapaka* form [5] *Kalka*- 3-6gms, Oil- 10-20drops [4]
***Karma* (action)**	*Deepana* (appetizer), *Kaphahara, Pachana* (digestive), *Vatahara, Medhya* (nootropic drugs) etc.

Chemical constituents of *Bhallataka* (*Semecarpus anacardium)* - The most significant components of the *Semecarpus anacardium* Linn. are bhilwanols, phenolic compounds,[8,9] biflavonoids, sterols and glycosides.[9,10] Bhilwanol from fruits was shown to be a mixture of cis- and trans isomers of ursuhenol; this compound consists mainly of 1,2,dihydroxy-3(pentadecadienyl 8',11')benzene and 1,2,hydroxy-3(pentadecadienyl 8')benzene.[11] Other components isolated are, anacardoside, semecarpetin, nallaflavanone, jeediflavanone, bsemecarpuflavanone, galluflavanone, anacarduflavone, mono-olefin I, diolefin II, bhilawanol-A, bhilawanol-B, amentoflavone tetrahydroamentoflavone semicarpol, tetrahydrobustaflavone, O-trimethyl biflavanone A1, O-trimethyl biflavanone A2, O-tetramethyl bifl avanone A1, O-hexamethyl bichalcone A, O-dimethyl biflavanone B, O-heptamethyl bichalcone B1, O-hexamethyl bichalcone B2, O-tetramethyl biflavanone C., phenolics.[12]

Pharmacological actions of *Bhallataka* (*Semecarpus anacardium)*:

Anti-atherogenic activity: The imbalance between the pro-oxidants and antioxidants is plays main role to development of atherosclerosis. To avoid such conditions, antioxidant therapy is advantageous. *Semecarpus anacardium* shows such antioxidant property. It has potential to scavenge the superoxide and hydroxyl radicals at low concentrations. The process of atherogenesis launched by peroxidation of lipids in low-density lipoproteins was also found inhibited by *Semecarpus anacardium*. As it normally decreases the hyperlipidemia of the tissue and serum by inhibiting the absorption of intestinal cholesterol coupled with peripheral disposal, thus having anti-artherosclerotic activity.[13]

Anti-inflammatory actions- Tetrahydroa mento flavone (THA), the main active principle extracted from the ethyl acetate extract of *Semicarpus anacardium*, is a biflavonoid. The in vitro cyclooxygenase (COX-1)-catalyzed THA prostaglandin biosynthesis assay gave an IC50 value of 29.5 μM (COX-1) and an inhibition of 40.5 percent at 100 g/mLL (COX-2). The dose-dependent anti-inflammatory effect of THA was achieved by the in vivo carrageenan-induced paw oedema assay, and the activity was comparable to that of ibuprofen.

Methanolic, ethanolic, chloroform, ethyl acetate and petroleum ether extracts of *Semecarpus anacardium* fruits are tested for anti-inflammatory activity using carrageenan-induced paw oedema in albino rats. Important anti-inflammatory activity close to the reference standard aspirin was shown in the extract. [14, 15]

Anti-oxidant activity: In various studies, potent antioxidant activity has been reported in *Semecarpus anacardium*. Verma et al. investigated the antioxidant activity of the aqueous extract of nuts of the medicinal plant *Semecarpus anacardium* in the AKR mouse liver during lymphoma growth. The research contributed to a rise in the activity of antioxidant enzymes, while the activity of LDH was significantly decreased, suggesting a decrease in carcinogenesis. [16]

CNS activity: The beneficial effect of *Semecarpus anacardium* nuts was examined primarily for its locomotors and nootropic behavior in various experimental animal models by Farooq et al. With just 150 mg/kg of the extract, the extract was tested but a mild CNS depressant effect was noted and nootropic activity was detected. [17]

Antimicrobial activity: The plant's aqueous and organic solvent extracts were prepared and tested for antimicrobial (disc diffusion method) and phytochemical properties. Inhibitory activity against Staphylococcus aureus (10 mm) and Shigella flexneri (16 mm) was demonstrated by petroleum ether (PEE) and aqueous extract fractions (AQE) at 100 mg/ml respectively. While chloroform extract showed inhibition against Bacillus licheniformis, Vibrio cholerae and Pseudomonas aeruginosa. Pseudomonas aeruginosa and S. aureus were inhibited by ethanol extract. [18]

Hypoglycemic effect: A study was held on ethanolic extract of dried *Semecarpus anacardium* nuts in both normal (hypoglycemic) and streptozotocin-induced diabetic (anti-hyperglycemic) rats. In this study blonde glucose in normal rats was reduced by ethanol extract (100 mg/kg). After treatment, blood glucose levels were assessed at 0, 1, 2 and 3 h and antihyperglycemic activity of *Semecarpus anacardium* was compared with tolbutamide, a derivative of sulfonyl urea used in diabetes mellitus. [19]

Anticarcinogenic activity: Restoration of energy metabolism in leukemic mice treated with *Semecarpus anacardium* nut milk extract has been carried out. Compared to control animals, leukemia-bearing mice showed a significant improvement in LPOs, glycolytic enzymes, a reduction in gluconeogenic enzymes and a significant decrease in TCA cycle and respiratory chain enzyme activity. Treatment with *Semecarpus anacardium* was compared with the standard medicine, imatinib mesylate. The administration of *Semecarpus anacardium* to leukaemic animals resulted in the clearance of leukaemic cells from bone marrow and internal organs. [20]

(2) *Tila* (*Sesamum indicum* Linn.)

Table 3 showing *Tila* general description

Botanical Name	***Sesamum indicum* Linn.**
Family	Pedaliaceae
Common Name	Sesamum, Sesame
Hindi Name	*Tila*
***Sanskrita* Name**	*Tila*
Parts Used	Seeds and oil

Brief botanical description of *Tila* (*Sesamum indicum)*

Sesame is an herb commonly cultivated for its seeds in the plains of India up to 1200 m. Sesame is an annual plant that is 50 to 100 cm tall in height. There are opposite, short, lanceolate leaves. The flowers are yellow, tubular with a length of 3 to 5 cm and a four-lobed mouth. The color of the flowers may vary, with some being white, blue, or purple. Depending on the cultivar, sesame seeds are available in several colors. Off-white colors are the most commonly traded sesame variety. Buff, tan, gold, brown, reddish, green, and black are other typical colors. The hull and the fruit are the same color. Sesame fruit is a capsule, usually pubescent, sectionally rectangular, and generally grooved with a short triangle.

Seed white, brown, grey or black, flattened ovate in shape, smooth or reticulate, 2.5 to 3 mm long and 1.5 mm broad, one side slightly concave with faint marginal lines and an equally faint central line; taste, pleasant and oily. The weight of the seeds is between 20 and 40 mgs.

Ayurvedic pharmacodynamics of *Tila* (*Sesamum indicum*):

Rasa(essence)	***Madhura* (sweet); *Anurasa- Kashaya* (astringent), *Tikta* (bitter)**
Guna(quality)	*Guru* (heavy), *Snigdha* (unctuousness), *Vyavayi* (spreading), *Shukshma* (Subtle)
Virya(potency)	*Ushna* (hot)
Vipaka	*Madhura* (sweet)
Doshakarma	*Vatashamaka, Kapha- Pitta Prakopaka*
Dose	*Churna*- 3-6 gms; Oil- 10-20 mls, *Churna*- 5-10gms
Karma	*Balya* (strength), *Keshya* (Hair tonic), *Rasayana* (Rejuvenator), *Sangrahi*, (anything that holds) *Vrishya* (aphrodisiac), *Vishaghana* (anti-toxic), *Snehana* (Oleation), *Mutrabandhaka* (urine retention), *Medhavardhaka*, (Nootropic drugs), *Agnivardhaka* (to increase digestive power, *Karṇpalivardhaka, Mridurecaka* (soft purgative), *Vrana Shanshodhakaa* (wound cleaner), *Vrana Pachaka, Vrana Dahanashaka* (relive in burning sensation), *Bhagna Prasadhaka, Agnibala Vardhaka* (to increase digestion), *Pittala, Avasadakara, Kasa Vardhaka* etc.

Tila is used externally for actions of *Snehana* (Oleation), *Vedanasthapana* (analgesic), *Sandhaniya* (to join), *Vranashodhana* (wound cleaner), *Vranaropana* (wound healer) and *Keshya*. Seed's oil of *Tila* (*Sesamum indicum)* is used for *Abhyanga* (massage) on dry skin and hairs, *Sanskara Yukta* oil (oil after transformation) is prescribed for paralysis, facial palsy, pain in various joint disorders, wounds, fractures etc. for the purpose of *Abhyanga* (massage), *Parisheka* (Sprinkling), *Avagaha* (Hot sitz bath), *Lepa* (pack), *Ashchyotana* (eye drops) etc. [21, 22, 23]

Chemical Constituents of *Tila*(*Sesamum indicum)*:

Sesame seeds are composed of Sesamolin, Sesamin, Pinoresinol and Lariciresinol ligans. Vitamin A, B and C are also present in seeds. [24, 25]

Pharmacological actions of *Tila* (*Sesamum indicum)*:

Anti-inflammatory effects: Sesamine is one of the active compounds in sesame oil and justifies the antinociceptive and anti-inflammatory properties of the substance, based on recent studies. [26]

Antinociceptive effects: The high content of unsaturated fatty acids (palmitic, stearic, oleic and linoleic acids), lignans (sesamine, asarin, sesamolin and sesamol) and gamma-tocopherol are considered to be responsible for pain relief in sesame oil. Several studies have shown that fatty acids lower prostaglandin and leukotriene levels and thus minimize pain. [26]

Anti-oxidant activity- In *Krishna Tila beeja* (black seeds of sesame), the presence of flavonoids & tannins dominates the antioxidant properties. On molar concentrations of 2 percent & 5 percent, study has shown significant antioxidant activity. [27]

Anti-microbial activity- A study was carried out which documented the antimicrobial activity of sesame oil against gram-positive and gram-negative organisms in this study. The results of this analysis showed a MIC of 10 µl/ml of sesame oil against Salmonella typhi. But the MIC values were within the range of 350-500 µl/ml for other species. Sesame oil has the strongest antimicrobial activity and is also equivalent to standard Kenamucin and has the highest Salmonella typhi inhibition region.[28]

(3) ***Haritaki* (*Terminalia chebula*)**

Botanical Name	***Terminalia chebula* Retz.**
Family	Combretaceae
English Name	Chebulic myrobalan
***Hindi* Name**	*Haritaki*
Parts Used	Fruit
***Sanskrita* Names and Synonyms**	*Haritaki, Himavati, Panchabhadrika, Putana, Pathya, Amrita, Abhaya, Amogha, Avyatha, Vayasya, Chetaki, Rohini, Vijaya, shreyasi* etc.

Brief botanical description about *Haritaki*

Abundant in Northern India, also occurs in Bihar, West Bengal, Assam, Central India and South India. A moderate to large size deciduous tree, found throughout greater part of India, up to 5000 ft. in outer Himalaya and up to 6000 ft. in Travancore.

It is tree of 25 to 30 meter in height with rust colored or silvery hairs over the younger branch lets etc. Its wood is hard and bulky. Leaves are mostly sub opposite, distant, ovate or oblong ovate, 10-20 cm long and deciduous in the cold season. The inferior aspect of leaves showed two small nodules near its attachment with the stalk. Flowers are dull white or yellowish with a strong offensive smell, in spike from the upper axils and in small terminal panicles.

Fruits are ovoid or ellipsoidal from a broad base, glabrous, more or less 5- ribbed when dry. Flowering takes place in the month of April –May and fruiting in the month of November – January.

Ayurvedic Pharmacodynamics of *Haritaki*

Rasa	***Pañca rasa (except lavana), kashāya pradhana***
Guna	*Laghu (light), Ruksha(dry)*
Virya	*Ushna(hot)*
Vipaka	*Madhura (sweet)*
Doshakarma	*Tridoshahara*
Dose	*Churna*- 1gm BID as *a Rasayana* (rejuvenator), 3-6gms for *Shodhana* (purification) and *Vatanulomana* (brings normal *gati* to *vata*)
Karma	*Anulomana* (carminatives), *Rasayana* (rejuvenator), *Prajasthapana* (to enhance reproduction), *Cakshushya* (promoting eyesight), *Hridya* (cardiotonic), *Lekhana* (ability to scrap out), *Deepana* (appetizer) *and Medhya* (nootropic).

Shoothahara (anti-inflammatory), *vedanasthapana* (analgesic), *Vranashodhana* (wound cleaner), and *Vranaropana* (wound healer) properties are used for external purpose on local *Shotha* (inflammation), *vedana* (pain) and *Vrana* (for cleansing). [29, 30]

Chemical constituents of *Haritaki*: In *Terminalia chebula*, hydrolysable tannins (which can range from 20-50 percent) are 33 percent of the total phyto-constituents and are responsible for pharmacological activity. These tannins include phenolic carboxylic acid such as gallic acid, ellagic acid, chebulic acid and gallotannins such as 1,6 di-O-galloyl-β-D-glucose, 3,4,6-tri-O-galloyl-β-D-glucose, 2,3,4,6-tetra-O-galloyl-β-D-glucose, 1,2,3,4,6-penta-O-galloyl-β-D-glucose.
Ellagitannin such as punacalagin, casurarinin, corilagin and terchebulin and others such as chebulanin, neochebulinic acid, chebulagic acid and chebulinic acid are documented in literature. The tannin content varies with the geological variation. Flavonol glycosides, triterpenoids, coumarin conjugated with gallic acid called chebulin, as well as phenolic compounds were also isolated.

Various methods have been reported for extraction of phyto-constituents from *Terminalia chebula* for studying their pharmacological activities. total eight compounds viz. gallic acid, methyl gallate, ethyl gallate, chebulagic acid, tetra-*O*-galloyl-*β*-D-glucose, ellagic acid, chebulinic acid and penta-*O* galloyl-*β*-D-glucose from *Terminalia chebula* were isolated on reverse phase chromatography. [31, 32, 33]

Pharmacological actions:

Antimicrobial activity - The *Terminalia chebula* fruit ethanol extract was evaluated against clinically significant standard reference bacterial strains for its antibacterial activity. Using the disc diffusion process, antimicrobial susceptibility was checked and the minimum inhibitory concentration (MIC) was calculated using the method of broth microdilution. The T. Chebula fruit extract was highly effective against Salmonella typhi, Staphylococcus epidermidis, Staphylococcus aureus, Bacillus subtilis and Pseudomonas aeruginosa and was active against both gram-positive and gram-negative bacteria. The MIC for S. typhi was determined as 1 mg/ml. [34]

Antidiabetic activity and Hypolipidemic - Aqueous extract of the fruit of *Terminalia chebula* Retz. has been evaluated for its antidiabetic activity in streptozotocin (STZ) induced mild diabetic rats and compared with a known drug tolbutamide. The oral effective dose (ED) of the extract produced a fall of 55.6% ($p<0.01$) in the oral glucose tolerance test. It also showed a marked improvement in controlling the elevated blood lipids as well as decreased serum insulin levels in contrast to the untreated diabetic animals. The findings suggest further investigations for the possible use of the aqueous extract of fruits of *T. chebula* for the treatment of hyperglycemia and associated hyperlipidemia. [35]

Nephro-protective effect: The dose of *Terminalia chebula* seed methanolic extract (TCSME) 50 mg/kg, 100 mg/kg, 200 mg/kg and 400 mg/kg per day was given daily to diabetic rats for 13 weeks. The present study reveals that the seeds of *Terminalia chebula* showing protective role for diabetic nephropathy and improved the oxidative enzymatic condition by minimizing the oxidative stress. Thus, it might be concluded that the seeds of *Terminalia chebula* used as antidiabetic agents reduce the risk of oxidative stress and ameliorate kidney damage. [36]

Anti-secretory or anti ulcer-activity - The fruits of *Terminalia chebula* Retz extract were administered orally at doses of 250, 500 mg/kg and produced significant inhibition of gastric lesions caused by gastric ulcers induced by pylorus ligation & ethanol, which may be due to its anti-secretory activity. [37]

Anti-amoebic effect – In experimental caecal amoebiasis in rats with a curative rate of 89 percent at 500 mg/kg body weight due to varying degrees of inhibition of the action of enzymes such as DNAase, RNAase, aldolase, alkaline phosphatase, acid phosphatase, alpha amylase and protease in

axenically cultured amoebae, the crude drug *T. chebula* formulation was investigated. [38]

Immuno-modulatory activity - In another study, *T. chebula* was evaluated in golden hamsters and immunomodulation studies in experimental amoebic liver abscesses. At 800 mg/kg body weight in hepatic amoebiasis, the formulation had a maximum cure rate of 73 percent. Humor immunity was improved in immunomodulation studies where T-cell counts remained unchanged in animals, but cell-mediated immune response was stimulated. [39]

Anti-oxidant activity - In a study, anti-lipid peroxidation, antisuperoxide radical formation and free radical scavenging activities at different magnitudes of potency were shown in 6 extracts and 4 pure *T. chebula* compounds. [39] The antioxidant enzymes were protected by the aqueous extract of *T. chebula* from reactive oxygen species (ROS) produced by gamma radiation in microsomes and mitochondria of the rat liver. The level of lipid peroxidase in albino rats was reduced by the ethanolic extract of *T. chebula* fruits. [40]

Cytoprotective effect - Cytotoxicity-mediated gallic acid and chebulagic acid, isolated from *T. chebula* fruit extract, blocked cytotoxic T lymphocyte (CTL). Granule exocytosis was also blocked by the above phytochemicals at equivalent concentrations in response to anti-CD3 stimulation. [41]

Anti-ageing activity – *T. chebula* gall extracts have been tested for antioxidant and tyrosinase inhibition activity as well as for proliferative and MMP-2 inhibition activity on early ageing human skin fibroblasts for in vitro anti-aging assessment purposes. In normal human fibroblast proliferation, the cold water extract of *T. chebula* gall showed the highest stimulation index (SI). The extract also showed a 1.37 times more potent MMP-2 inhibition on fibroblasts than ascorbic acid. The study confirmed the conventional use of *T. chebula* gall for longevity in many Thai medicinal plant recipes. [42]

Hepatoprotective Activity: *T. chebula* ethanol extract was found to prevent hepato-toxicity caused by rifampicin, isoniazid and pyrazinamide (combination) administration in the sub chronic model (12 weeks). [43, 44].

Wound Healing Activity: The extract of Terminalia chebula with the concentration of 200 mg/kg and 400 mg/kg body weight was induced through intraperitoneal in diabetic and non-diabetic mice. The results showed that seeds of *Terminalia chebula* were a potent source of antioxidative phenolic compounds that counteract with reactive oxygen species responsible for delayed wound healing. [45]

DISCUSSION

The ingredients of *Bhallatakadi Churna* having dominance of *Kashaya (astrignent), Tikta* (bitter) and *Katu* (pungent) *rasa*; *Laghu* (light), *Sukshma* (fineness quality), *Snigdha* (unctuousness) and *Vyavayi Guna* (spreading); *Ushna Virya* (hot potency) and *Madhura Vipaka* (sweet); having predominantly *Kapha-Vatashamaka* effect. The pharmacological action of all three drugs of *Bhallatakadi Churna* reveals that these drugs impart *Deepana* (appetizer), *Rasayana* (rejuvenator), *Anulomana* (carminatives), *Pachana* (digestives), *Ama-doshahara*, *Medhya Prabhva* (nootropic drugs) & *Shothahara* (anti-inflammatory) effect. So, this formulation used in *Amavata* (Rheumatoid Arthritis) not only pacify and correct the *Ama* & *Vatadosha*, but it also hit on the root cause of disease [46] i.e. *Mandagni*; because these drugs are *Agni* promoter and digestive in nature. Its *Ama-doshahara*, *Anulomana* (carminatives) and *Rasayana* (rejuvenator) effects reduces the intensity of pain and maintain the nutritional status. Due to *Rasayana* (rejuvenator) effects it maintains the *dhatushamya* (balance *doshas*) and imparts significant nutrition to the respective depleted *dhatus*. The *Bhallataka* (*Semicarpus anacardium)* itself correct the deranged immune strength through its anti-oxidant, anti-inflammatory etc properties side by side it also corrects the deranged functioning

of *Ojas*, which is clearly visualized in *Amavata* (Rheumatoid Arthritis) patients. Due to *Ushana virya* (hot) and *tikshana* (sharp) property, the selected formulation open and cleans the micro-channels and counteracts with the inflammatory biomarkers.

CONCLUSION

Rheumatoid Arthritis is a chronic inflammatory systemic disorder triggered by auto-immunity to self-antigens. The critical evaluation of pharmacological actions as per studies published in various Journals and conducted throughout the world; reveals that these drugs have potency of anti-oxidant effects against the free-radicals present in the body, which is quite enough to modify the disease diathesis from its root cause auto-antigen (most correlative with *Ama*). Besides this, also have capacity to break the mechanism of inflammatory process, anti-nociceptive effect which able to pacify the chief complaint of the patients of RA. Immune-modulatory effects of drug (*Haritaki*) are far better to use in place of corticosteroids or immune-suppressive drugs explained in conventional system of medicine. Besides, the pharmacological action of given drugs also imparts anti-arthritic effects, anti-toxin effects & cyto-protective. All these effects are expected to produce in synergic manner when given in compound formulation with appropriate dose & dosing format.

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