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A note on the role of siddha system of medicine in the treatment of arthritis

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Abstract

Siddha, the traditional system of medicine is widely being practiced in the Tamil Nadu and the concept pertaining to drug ingredients are from Plant (Mooligai/Thavaram), Mineral (Thathu), Metals and Animal (Jeevam) origin. Arthritis is categorized as Vali or Vadha noikal in the ancient literature of Siddha. A number of single drugs and compound formulations are documented for the treatment of different kinds of Vali noikal. In the last decade, numbers of clinical studies are increased and evidenced the efficacy of Siddha System of medicine in the treatment of Arthritis. In this connection, the present article documented with 30 medicinal plants used as single drugs / ingredient of poly-herbal formulations and the reverse pharmacological studies based of Siddha formulations used for Vali-noikal (Arthritis) also discussed.

Keywords: Arthritis; siddha; herbal drugs; vadha noikal

Introduction

Arthritis, an auto-immune disorder has been treated by several medicinal practices includes modern medicine, traditional medicinal systems such as Ayurveda, Siddha, Homeopathy etc. Recent report of Arthritis Foundation recorded more than 100 types of arthritis globally such as Osteo-arthritis- OA, Rheumatoid Arthritis -RA, Juvenile Arthritis JA-etc). Numbers of review articles have been published based on the medicinal plants used in the treatment of Arthritis evidenced the need of documentation on anti-arthritic activity of plants. Medico ethno botanical studies and folk-lore medicinal system from India and other parts of the World have also been supported the application of many plants in the treatment of Arthritis (Rathore *et al.*, 2007; Kumar *et al.*, 2013; Patel *et al.*, 2013; Chen *et al.*, 2016; Baky *et al.*, 2016; Saritha *et al.*, 2016; Wambugu *et al.*, 2011). In this connection, Choudhary *et al.* (2015) reviewed more than 350 articles which deals the medicinal plants with potential anti-arthritic activity and reported that 65% of them carried out in India, especially in the traditional medicinal systems such as Ayurveda, Unani and Siddha which emphasis the need of more research in this area.

Siddha, an ancient medicinal practice followed on the basis of literature written by Siddharkal-Siddhas-Saints, (18 Siddhas). All the literatures are written in the Classical language Tamil (South Indian language) and followed by the inhabitants of the Indian states, Tamil Nadu and Kerala in some extends the adjacent countries like Sri Lanka. However, in Siddha System there are 80 types of arthritis have been reported in name of vali /vadha noikal.

Aging, inflammations, wounds, over strain, improper physiological activities are the leading causes for the arthritis. Some types of vali noikal are hereditary in nature. In the present scenario, number of pharmacological studies is carried out to check the therapeutically uses of the medicinal plants used for arthritis. In Siddha, arthritis patients are treated by given siddha medicine either in the form of internal (Chooranam -Powder; Nei – Gritham. Mathirai – Tablets; Kudineer- Decoction; Manapaagu -Syrup etc) or external dosages (Thailam- Thaila; Pattru –Poultice; Poochu - Liquid application; Ottradam – Fomentation etc). Siddha drugs used in the treatment of Arthritis have been reviewed in last two decades (Wilson, *et al.*, 2007; Sushilkumar and Neelavathy, 2016; Debnath, 2013 ; Nagarathana *et al.*, 2013; Thillaivanan *et al.*, 2013; Kantham *et al.*, 2016; Rajalakshmi *et al.*, 2016) . In the present review article, the authors adding information on siddha drugs (Herbs/minerals) are used as single drug and as poly-herbal formulation in the clinical studies against different types of arthritis were documented and discussed.

Materials and Methods

A documentation of the medicinal plants based siddha drugs is done using the literature survey. The botanical name, Tamil name, part used and dosage form of the drugs used (as single drug and part of the poly herbal formulations) are tabulated. The anti-arthritic activities of the drugs are discussed. Pharmacological and clinical studies on different types of arthritis with the treatment of Siddha system was collected by the literature survey through online database (Pub Med, Science direct, Google etc.) and ancient literatures.

Results and Discussion

Among the listed drugs, most of the drugs prepared from single drugs are given internally. The poly-herbal included herbal (Mooligai) and mineral (Thathu) based drugs are given mostly for external therapy (Eg. Thailam, Poochu, Patru etc). The single drugs indicate a plant or a part of plant is given as a drug in any dosage form (Powder, Infusion, extract, decoction, oil, rejuvenator, etc.). The list of 25 plants and their parts used as single drug in the treatment of Arthritis is given below (Table 1.) Fig. 1 and 2.



Fig 1: Medicinal plants used in the treatment of Arthritis

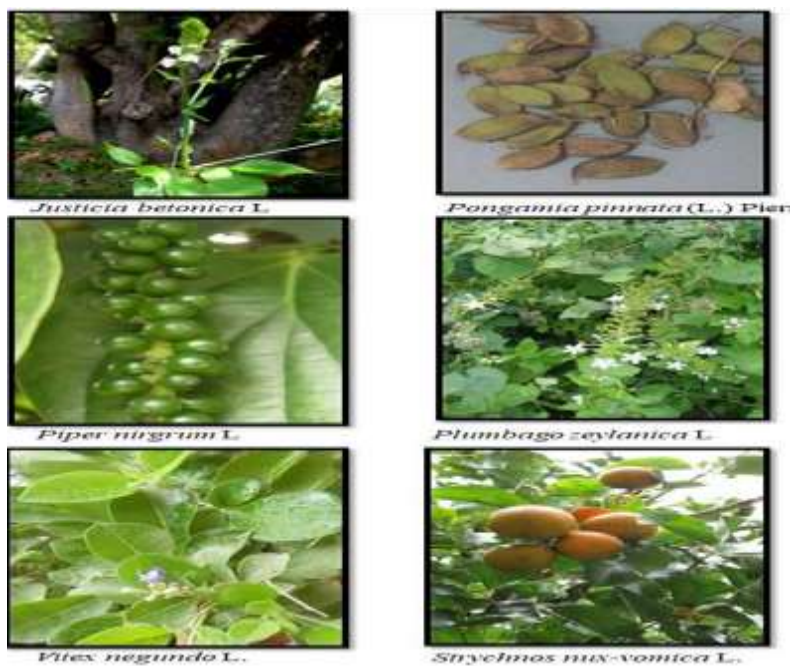


Fig. 2. Medicinal plants used in the treatment of Arthritis

Table 1: Selected medicinal plants used as single drug in Siddha system of medicine (Mudhaliar and Uthmarayan, 2006; Murugesha Muthaliar, 2013; Venkatrajan, 2005)

Name	Botanical Name/Family	Part Used	Dosage Form
1.	<i>Abrus precatorius</i> L./ Fabaceae	Seed	Powder
2.	<i>Aconitum heterophyllum</i> Wall. ex Royle/ Ranunculaceae	Root	Powder
3.	<i>Anacyclus pyrethrum</i> (L.) Lag./ Asteraceae	Root	Infusion
4.	<i>Aristolochia bracteolata</i> Lam./ Aristolochiaceae	Whole plant	Extract
5.	<i>Boerhavia diffusa</i> L./ Nyctaginaceae	Root/Leaf	Decoction
6.	<i>Calamus rotang</i> L./ Arecaceae	Rhizome	Decoction or Powder
7.	<i>Calotropis gigantea</i> (L.) R.Br./ Asclepiadaceae	Root bark	Rejuvenator
8.	<i>Canarium strictum</i> Roxb./ Burseraceae	Resin	Ointment
9.	<i>Cannabis sativa</i> L./ Cannabinaceae	Wh.Pl.	Oil, Powder
10.	<i>Cissampelos pareira</i> L./ Menispermaceae	Root	Decoction
11.	<i>Celastrus paniculatus</i> Willd./ Celastraceae	Seed	Decoction
12.	<i>Clerodendrum inerme</i> (L.) O.Ktze./ Verbenaceae	Root	Liniment
13.	<i>Datura metel</i> L./ Solanaceae	Wh.Pl.	Paste
14.	<i>Delonix elata</i> (L.) Gamble/ Caesalpiniaceae	LF.	Extract
15.	<i>Justicia betonica</i> L./ Acanthaceae	Leaf	Fomentation
16.	<i>Madhuca longifolia</i> (Koen.) Macbr./ Sapotaceae	Bark	Decoction
17.	<i>Moringa pterygosperma</i> Gaertn./ Moringaceae	Root	Decoction
18.	<i>Myristica fragrans</i> Houtt./ Myristicaceae	Seed	Oil
19.	<i>Picrorhiza kurroa</i> Royle ex Benth. / Plantaginaceae	Root	Decoction
20.	<i>Piper nigrum</i> L./ Piperaceae	Lf.Sd.	Fomentation/Oil
21.	<i>Pongamia pinnata</i> (L.) Pierre/ Papilionaceae	Seed	Oil
22.	<i>Strychnos nux-vomica</i> L./ Loganiaceae	Seed	Powder
23.	<i>Vigna mungo</i> (L.) Hepper/ Papilionaceae	Seed	Oil
24.	<i>Vitex negundo</i> L. / Verbenaceae	Leaf	Poultice
25.	<i>Zingiber officinale</i> Rosc./ Zingiberaceae	Rhizome	Infusion

However, the poly herbal formulations which have been studied extensively against rheumatoid arthritis and Osteoarthritis (Madhavan and Manickavasagam, 2012; Rajalakshmi et al., 2016). Some of the Siddha drugs used in external dosage in the treatment of Keel vaayu, Aama

vaatham (Merugulli thailam), Thimir vaatha (Milagai thailam), pakka vatham (Vaathakeseri thailam) have shown significant result in anti-arthritic activities (Ajmal et al., 2017; Janani et al., 2017). Details of selected medicinal plants in the formulations are listed in Table 2

Table 2: Medicinal plants used in single / Poly-herbal formulations to cure the arthritis -Vali Noikal (Venkatrajan, 2005; SFI, 2011; Mohammed Iqbal, 2016)

Name	Botanical Name/Tamil Name	Plants used Siddha Formulations
1.	<i>Aconitum heterophyllum</i> Wall. ex Royle/ Adividayam	Adividaya mathirai, Kapada illagam
2.	<i>Alocasia indica</i> (Roxb.) Schott / Anaisembu	Merugulli Thailam
3.	<i>Anacyclus pyrethrum</i> (L.) Lag. / Akkirakaram	Kumari Thailam, Mahavilvathi illagam.
4.	<i>Aristolochia bracteolata</i> Lam./ Aadutheendapalai	Peruvayiru Thailam, Valampurikai Thailam
5.	<i>Boerhavia diffusa</i> L./ Mukkirattai	Mookirattai Karpam Mookirattai Chooranam
6.	<i>Calamus rotang</i> L./ Pirappan kilangu	Pirappan Kilangu kudineer
7.	<i>Calotropis gigantea</i> (L.) R.Br/ Erukku	Milagu thailam, Navapaadana sudar thailam, Arka sheeradhi Thailam
8.	<i>Canarium strictum</i> Roxb./ Karumkungiliam	Soubhagyasundi illagam Mahavilvathi illagam
9.	<i>Cannabis sativa</i> L./ Kanja, Aanda mooli, Moothandam/	Naracimma illagam Kapada illagam
10.	<i>Celastrus paniculatus</i> Willd./ Vaaluluvaiarisi	Mahavilvathi Thailam
11.	<i>Centella asiatica</i> (L.) Urban/ Vallarai	Vallarai Nei, Veeli ennai, Vipruthi ennai, Megasanjeevi Kudineer
12.	<i>Cissampelos pareira</i> L./ Ponmusuttai	Vallampuri Kai Thailam Ilangavaadhi Chooranam
13.	<i>Clerodendrum inerme</i> (L.) O.Ktze./ Sangankuppi	Sangankuppi ennai, Vippuruthi ennai
14.	<i>Cyperus rotundus</i> L./ Koraikkilangu	Musthathi thailam
15.	<i>Datura metel</i> L./ Karuomathai	Thurusu Parpam
16.	<i>Justicia adhatoda</i> L./ Adathodai	Aadathoda Manapaagu
17.	<i>Madhuca longifolia</i> (Koen.) Macbr./ Illuppai	Chadiragandhi illagam Mahavilvathi illagam
18.	<i>Moringa pterygosperma</i> Gaertn./ Murungai	Sindhu valladhi melugu, Soubhagya sundi illagam
19.	<i>Myristica fragrans</i> Houtt. / Jathikkai	Kumari illagam, Neer kovai mathirai
20.	<i>Nardostachys jatamansi</i> (D.Don) DC./ Boothakesini/Jatamansi	Kaaya illagam, Mahavilvathi thailam, Milagu Thailam
21.	<i>Pergularia daemia</i> (Forssk.) Chiov./ Veliparuthi/	Sengathari ennai

	Oothamani	
22.	<i>Piper nirgrum</i> L./ Milagu	Kalikka mathirai, Kumari Thailam, Parankicahkkai chooranam, Milagu thailam
23.	<i>Plumbago zeylanica</i> L./ Chitramoolam	Parangichakkai Chooranam, Nayuruvi Nei, Megathennai
24.	<i>Pongamia pinnata</i> (L.) Pierre/Pungu	Nayuruvi Nei, Kan thelivu marunthu
25.	<i>Smilax china</i> / Parangi chakkai	Parangi chakkai Kudineer
26.	<i>Strychnos nux-vomica</i> L./Yetti	Sirangu kalimbu
27.	<i>Terminalia chebula</i> Retz. /Kadukkai	Milagu Thailam, Kadukkai illagam,
28.	<i>Vigna mungo</i> (L.) Hepper/ Ulundhu	Chandana illagam, Ulundu thailam, Soubhagya Sundi illagam
29.	<i>Vitex negundo</i> L. / Karunochi	Nochi thailam
30.	<i>Zingiber officinale</i> Rosc./ Inji	Inji chooranam, Milagu thailam

Most of the plants listed above are being the ingredients of Thailams such as Milagu Thailam, Mahavilavathi illagam etc., which are highly effective on different kind of Arthritis. However, in the last few decades, the pharmacological activities of medicinal plants are carried out globally towards anti-arthritic; anti-inflammatory activities. For example, the anti-arthritic activity of Adividayam root powder (*Aconitum heterophyllum*) which contains the active compounds Vakognavine and Palmatisine are mixed with honey is orally given three times per day to cure arthritis (Nagarajan *et al.*, 2015). The leaf of the Mookirattai (*Boerhavia diffusa*) is used as food as well as medicine in ages; leaf and roots are medicinally used for arthritis, jaundice (Dapurkar *et al.*, 2013). Dhashalini *et al.* (2017) has recommended that dosage of decoction or powder Pirapan Kilangu rhizome (*Calamus rotang*) used in the treatment of Osteoarthritis and mentioned that the internal administrative of rhizome powder shows effective anti-arthritic activity without any severe side effect (Dhashalini *et al.*, 2017). The root bark of Vellerukku (*Calotropis gigantea*) is diaphoretic; cures asthma and syphilis. Root boiled with 500 ml of milk to get a gel like substance and taken daily till cure also roots have been used in leprosy, eczema, syphilis, elephantiasis, ulceration and cough (Singh *et al.*, 2014) by the inhabitant of different part of Tamil Nadu. *Cannabis sativus* (Ganjah) which is an aromatic herb with important active compounds such as Eugenol, Cannabidiolic acids; seed oil is massaged over the painful part (Nallathambi *et al.*, 2017). Ethanolic extract of *Madhuca longifolia* showing significant immune-stimulatory activity (Baky *et al.*, 2016; Purohit *et al.*, 2012). Anti-arthritic and anti-inflammatory activity *Moringa oliefera* powder and it has been reported the significant anti-arthritic activity of ethanolic and aqueous leaf extracts of MO at a dose of 500 mg/kg body (Pandey *et al.*, 2012; Fatima and Fatima, 2016; Mehra *et al.*, 2017). Same kinds of pharmacological studies in nochi - *Vitex negundo* (Petchi *et al.*, 2011; Pavithra *et al.*, 2015; Gangwar, 2015; Kamble *et al.*, 2017; Ramesh *et al.*, 2011; Sultan *et al.*, 2017; Nair *et al.*, 2016; Patel *et al.*, 2015) and in *Strychnos nux-vomica* –Etti (Doss *et al.*, 2016) and other listed plants frequently published with proof of anti-arthritic, anti-inflammatory activities in the absence of lethal effects (Chandra, 2001; Arote and Yeole, 2010; Ahmad *et al.*, 2012).

However, recently many case -studies were attempted against RA and OA using the single drug like Pirapankilangu Chooranam - *Calamus rotang* rhizome powder (Dharshalini *et al.*, 2017) and Chitarathai Chooranam - *Alpinia officinarum* powder (Bhanumathi, 2012) against RA; Poly herbal formulations like Ashwathi Chooranam (Raheema *et al.*, 2014); Herbo-mineral formulations like Karpooora Chindhamani Mathirai (KCM) against anti-inflammatory activities (Meena and Ramasamy, 2012); and Compound formulation like KCM + Mannennai Kalavai Thailam against

Uthiravatha suronitham (Meena and Ramaswamy, 2015) also by applying only mineral based drug like Kodashuri veeravaipu against Keelvayu (Rao *et al.*, 2014), Chandamarutha Chenduram against RA (Madhavan and Manickavasakam, 2012); Gowri chintamani chendooram towards OA (Velpandian *et al.*, 2013) and Appalakaram (Impure Sodium Carbonate) against chronic- anti-inflammatory effects (Karu and Kumari, 2012). Apart from these Phyto-minerals based formulations which have been used as internal and external dosages. Siddha medicinal system renowned for its own external therapies, the ex-ordinary arts like Varma and Thokkanam. Varma, is an ancient art that have been successfully applied in distinguished ailments. A few single case studies have been reported using Varma in the treatment of Arthritis such as Uthiravatha Suronitham (Rheumatoid Arthritis) and anti-inflammatory activities (Meena and Ramaswamy, 2016; Sivaranjani, 2016; Meena *et al.*, 2017).

Conclusion

WHO has reported that 0.3-1% of World population especially Female population is facing problem of RA. To solve this un-tolerable pain-full chronic disease, a number of research works have been ongoing globally. Since, WHO supported the traditional medicinal system which consist of herbal formulation without side effects, the World Pharmaceutical companies and researchers who are well-found of scientific knowledge and technology has started to do the reverse pharmacological studies of the formulations mentioned in the Traditional system of medicine.

As we discussed, Siddha consists of many formulations such as Single drug, Poly herbal, Herbo- mineral, Mineral, Compound formulation and external therapies to treat the arthritis which have been followed by the ancient literature such as *Siddha Vaidya Thirattu*, *Yugi Vaidhya Chindhamani*, *Agathiar Vaithiya Kaaviyam* etc. The upcoming pharmacological studies on Siddha formulations reported the significant anti-arthritic activities with lesser or absence of side effects, which strengthens the positive role of Siddha therapies in Arthritis. Still there is a need to do more scientific studies will be equipped that, enable to the human kind to approach this valuable traditional medicine system.

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References

- Ahmad N, Fazal H, Abbasi BH, Farooq S, Ali M, Khan MA. Biological role of *Piper nigrum* L. (Black pepper): A review. *Asian Pacific Journal of Tropical Biomedicine* 2012; 1945-1953.
- Ajmal SM, Naga Lakshmi M, Nandhini M, Meenadharshini G, Kowshika shree PJ, Keerthiga T. *et al.* Standard Operative Procedure on external therapies in Siddha system of medicine. *International Journal of Research in Medical Sciences* 2017; 3(7):112-127.
- Arote SR, Yeole PG. *Pongamia pinnata* L. A comprehensive review. *International Journal of PharmTech Research* 2010; 2(4):2283-2290.
- Baky MH, Kamal AM, Elgindi MR, Haggag EG. A review on phenolic compounds from family Solanaceae. *Journal of Pharmacognosy and Phytochemistry* 2016; 5(2):280-287.
- Bhanumathi VA. Study of Chitrarathai Chooranam (*Alpinia officinarum* Hance) in Valiazhal Keelvayu (Rheumatoid Arthritis): A Randomized Clinical Trial. *International Journal of Pharmacy and Pharmaceutical Sciences*. 2012; 4(2):1-2.
- Chandra D. Analgesic effect of aqueous and alcoholic extracts of *Madhuca longifolia* (Koeing) J.F.Macbr. *Indian Journal of Pharmacology*. 2001; 33:108-111.
- Chen P, Zheng F, Zhang Y, Gao F, Chen Y, Shi G. Ethnobotanical Study of Medicinal Plants on Arthritis Used by Chaoshan in Guangdong, China. *Medicinal Chemistry (Los Angeles)*. 2016; 6:715-723.
- Choudhary M, Kumar V, Malhotra H, Singh S. Medicinal plants with potential anti-arthritic activity, *Journal of Intercultural Ethnopharmacology* 2015; 4(2):147-179.
- Dapurkar VK, Sahu GK, Sharma H, Meshram S, Rai, G. Anti-arthritic activity of Roots Extract of *Boerhaavia diffusa* in Adjuvant induced Arthritis Rats. *Scholars Academic Journal of Pharmacy*. 2013; 2(2): 107-109.
- Debnath T, Kim DH, Lim BO. Natural products as a source of anti-inflammatory agents associated with inflammatory bowel disease. *Molecules*. 2013; 18:7253-7270.
- Dhshalini T, Paheerathan V, Kumar RP. Clinical trial of the effectiveness *Calamus rotang* on the management of azhal keelvayu (Osteoarthritis of Knee). *International Journal of Current Medical and Pharmaceutical Research*. 2017; 3(6):1822-1832.
- Doss DVA, Maddisetty PNP, Sukumar MS. Biological active compounds with various medicinal values of *Strychnos nux-vomica*-A pharmacological summary. *Journal of Global Trends in Pharmaceutical Sciences* 2016; 7(1):3044-3047.
- Fatima F, SJ Fatima. Pharmacological Screening for Anti-Arthritic Activity of *Moringa Oleifera*. *Asian Journal of Pharmaceutical and Clinical Research*. 2016; 9(3):106-111.
- Gangwar AK, Ghosh AK, Saxena V. Anti-inflammatory activity of ethanolic extract of *Vitex negundo* Linn roots. *International Journal of Herbal Medicine*. 2015; 2(6):01-02.
- Janani L, Christian GJ, Guru Manikandan A. Review on external medicines in Siddha system of medicine. *International Journal of Research in Pharmaceutical and Nano Sciences*. 2017; 6(1):16-25.
- Kamble AA, Khan ND, Khan ZH, Mular SM, Sohail S. *In vitro* anti-arthritic activity of *Vitex negundo* and *Punica granatum*. *Research Journal of Pharmaceutical Sciences*, 2017; 6(2):5-7.
- Kantham LT, Ganapathy G, Geetha A, Bhanumathi V. A Review of Rheumatoid Arthritis and Medicines in Siddha System. *World Journal of Pharmaceutical and Medical Research*. 2016; 2(6):211-214.
- Karu K, Kumari VMH. Acute and Chronic Anti Inflammatory Study of a Mineral Drug-Appalakaram (Impure Sodium Carbonate). *International Journal of Pharmacy and Pharmaceutical Sciences* 2012; 4(2):8-9.
- Kumar S, Bajwa BS, Kuldeep S, Kalia AN. Anti-inflammatory activity of Herbal plants: a review. *International Journal of Advances in Pharmacy, Biology and Chemistry* 2013; 2(2):272-281.
- Meena R, Ramaswamy RS. Preclinical, Pharmacological and Toxicological Studies of Karpooora Chindhamani Mathirai (KCM) For Analgesic, Anti Inflammatory, Antipyretic Effects in Rats. *International Journal of Ayurvedic Medicine* 2012; 3(1):11-15.
- Meena R, Ramaswamy RS. Treatment of Uthiravatha Suronitham (Rheumatoid Arthritis) with a Siddha Compound Formulation - A Case Study. *Journal of Pharmacy* 2015; 5(9):50-52.
- Meena R, Ramaswamy RS. Management of Uthiravatha Suronitham (Rheumatoid Arthritis) By Varmam Therapy- A Case Report. *Research Journal of Pharmaceutical, Biological and Chemical Sciences*. 2016; 7(5):2679-2682.
- Meena R, Natarajan S, Anbarasi C, Muralidass SD. Effect of Varmam Therapy in Santhu Vatham (Osteo Arthritis-Knee Joint) - A Single Case Study. *International Journal of Pharmacy and Pharmaceutical Sciences*. 2017; 9(9):284-287.
- Mehra M, Jakhar N, Joshi S, Meghwal M. Phytotherapeutic functionality of *Moringa oleifera* Lam. for health. *International Journal of Cell Science and Molecular Biology*, 2017; 3(3):1-4.
- Mohammed Iqbal. Pharmacy and Pharmaceutics of Siddha Medicine. National Institute of Siddha Chennai, 2016.
- Mudhaliar KKN, Uthamarayan KS. Siddha Vaidhya thirattu, Indian Medicine and Homeopathy Department, Chennai, 2006.
- Murugesu Mudhaliyar KS. Gunapadam-mooligai vaguppu, 9th Edition, Directorate of Indian Medicine and Homeopathy, 2013.
- Nagarajan M, Kuruvilla GR, Kumar KS, Venkatasubramanian P. A review of pharmacology of Ativisha, Musta and their substitutes. *Journal of Ayurveda and Integrative Medicine*, 2015; 6(2):122-133
- Nagarathana PKM, Reena K, Reddy S, Wesley J. Review on immunomodulation and immunomodulatory activity of some herbal plants. *International Journal of Pharmaceutical Sciences Review and Research* 2013; 22(1):223-230.
- Nair AJ, Soman P, George A, Surendran SA. Formulation of *Myristica fragrans* (Nutmeg) topical gel and it's *in vitro* evaluation for anti-inflammatory activity. *International Journal of Pharmacy and Technology* 2016; 8(1):11065-11076.
- Nallathambi R, Mazuz M, Lon A, Selvaraj G, Weininger S, Fridlender M, *et al.* Anti-inflammatory activity in colon models is derived from D9-Tetrahydrocannabinolic Acid That Interacts with Additional Compounds in *Cannabis* Extracts. *Cannabis and Cannabinoid Research* 2017; 2:167-182.

32. Pandey A, Pandey RD, Tripathi P, Gupta PP, Haider J, Bhatt S *et al.* *Moringa oleifera* Lam. (Sahijan) – A plant with a Plethora of diverse therapeutic benefits: An updated retrospection. *Medicinal and Aromatic Plants* 2012; 1:101.
33. Patel D, Kaur G, Sawant MG, Deshmukh P. Herbal Medicine-A Natural cure to arthritis. *Indian Journal of Natural Product and Resources* 2013; 4(1):27-35.
34. Patel DV, Sawant MG, Kaur G. Evaluation of anti-osteoarthritic activity of *Vigna mungo* in papain induced osteoarthritis model. *Indian Journal of Pharmacology* 2015; 47(1):59-64.
35. Pavithra TK, Smitha KP, Kulashekar KS, Ashok Kumar BS. Evaluation of *in-vitro* Anti-Arthritic Activity of *Vitex negundo* against the Denaturation of Protein. *International Journal of Current Microbiology and Applied Sciences*. 2015; 4(9):87-90.
36. Petchi RR, Vijaya C, Parasuraman S, Natchiappan A, Devika GS. Anti-arthritis effect of ethanolic extract of leaves of *Vitex negundo* Linn. (Verbenaceae) in male albino Wistar rats. *International Journal of Research in Pharmaceutical Sciences*. 2011; 2(2):213-218.
37. Purohit R, Singh SK, Shaban A, Nautiyal R, Purohit MC, Verma SK. Immuno modulatory activity of *Madhuca longifolia*. *Der Pharmacia Sinica*. 2012; 3:153-155.
38. Madhavan R, Manickavasakam K. The Influence of the Siddha Formulation Chandamarutha Chenduram on Serum Rheumatoid Factor in Uthiravatha Suronitham (Rheumatoid Arthritis). *International Journal of Pharmacy and Pharmaceutical Sciences* 2012; 4(2):154-156.
39. Raheema SA, Aswini C, Sathya M, Merish S, Thomas M. Walter. In-Vitro Anti-Inflammatory Screening of a Poly Herbal Siddha Medicine, “Ashwathi Chooranam”. *International Journal of Pharmaceutical Sciences and Research*. 2014; 5(10):4395-4399.
40. Rajalakshmi P, Vadivel V, Abirami K, Brindha P. Evaluation of Antioxidant and Anti-inflammatory Potentials of Selected Siddha Herbal Drugs-An *In vitro* Study. *International Journal of Pharmacognosy and Phytochemical Research*. 2016; 8(3):519-523.
41. Ramesh PR, Vijaya C, Parasuraman S, Natchiappan A, Devika GS. Anti-arthritis effect of ethanolic extract of leaves of *Vitex negundo* Linn. (Verbenaceae) in male albino Wistar rats. *International Journal of Research in Pharmaceutical Sciences*. 2011; 2(2):213-218.
42. Rao MRK, Ganesan A, Ganesan RS, Manoharan SK, Jha NK. The clinical efficacy of ‘Kodasuri veeravaippu’ (a siddha formulation) in patients affected by the disease “Keelvayu” (Arthritis). *Der Pharmacia Lettre*. 2014; 6(1):71-77.
43. Rathore B, Mahdi AA, Paul BN, Saxena PN, Das SK. *Indian Herbal Medicines: Possible potent Therapeutic agents for Rheumatoid Arthritis*. *Journal Clinical Biochemistry Nutrition*. 2007; 41:12-17.
44. Saritha K, Vijayan PE, Ramesh D. Phyto chemical screening of Medicinal Plants Used by the Tribes of Bhadrachalam Forest Area. *International Journal of Modern Chemistry and Applied Science*. 2016; 3(2):389-391.
45. SFI - The Siddha Formulary of India, Part II, 2011, Ministry of AYUSH. New Delhi.
46. Singh S, Singh S, Mishra RM, Shrivastava MP. Preliminary phytochemical screening of *Calotropis gigantea* leaf. *International Journal of Scientific and Research Publication*. 2014; 4(2): 1-2.
47. Sivaranjani K. Varma therapy for musculoskeletal disorders. *European Journal of Pharmaceutical and Medical Research* 2016; 3(10): 131-35.
48. Sultan P, Rasool S, Hassan QP. *Picrorhiza kurroa* Royle ex Benth. A plant of diverse pharmacological potential. *Annals of Phytomedicine* 2017; 6(1):63-67.
49. Sushilkumar PN, Neelavathy R. Herbs used in the Treatment of Arthritis-A Review *World Journal of Pharmaceutical and Medical Research* 2016; 2(4):47-56.
50. Thillaivanan S, Samra K, Parthiban P. A Review on Anti-Arthritic Herbs in Siddha Medicine. *International Journal of Pharmaceutical Research*. 2013; 5(4):13-20.
51. Velpandian V, Pitchiah Kumar M, Anbu N, Musthafa Kanakavalli K. Clinical Evaluation of Siddha Drug Gowri Chinthamani Chendooram in the Management of Osteoarthritis. *International Journal of Pharmaceutical Science Invention* 2013; 2(1):26-32.
52. Venkatrajan P. Agathiyar 2000 Part I, II, Thanjavur Saraswathi Mahal Library. 2005, 217-18.
53. Wambugu SN, Mathiu PM, Gakuya DW, Kanui TI, Kabasa JD, Kiama SG. Medicinal plants used in the management of chronic joint pains in Machakos and Makueni counties, Kenya. *Journal of Ethnopharmacology* 2011; 137:945-955.
54. Wilson E, Rajamanickam GV, Vyas N, Agarwal A, Dubey GP. Herbs used in Siddha medicine for arthritis - a review. *Indian Journal of Traditional Knowledge*. 2007; 6(4):678-686.