

## Plant based remedies for the treatment of rheumatism among six tribal communities in Malappuram district, Kerala

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### Abstract

This paper provides information about the ethnomedicines practiced by the six tribal communities viz, Arnadan, Cholanaikkan, Kattumakkan, Kuruman, Muthuvan and Paniya tribes of Malappuram District, Kerala state for the treatment of Rheumatism. In this survey, 73 species distributed in 45 botanical families, used as antirheumatic herbal remedies, were collected and identified. Their Latin names, local names, local medicinal uses, the used parts of the plant and the preparations and the mode of administration are described. It is noted that out of 73 plant species used for treating rheumatism, the mode of administration was varied according to plant and tribe. The present communication highlights the indigenous knowledge of very primitive tribes like Cholanaikkans to tribes outside or nearer to forest Arnadans. It is evident from the present communication that these plants and the treatments are not only useful for tribal people but also for public, due to its safety, efficacy and low cost.

**Keywords:** Arnadan, Cholanaikkan, Kattumakkan, Kuruman, Muthuvan and Paniya

### 1. Introduction

In India most of the tribal societies have great affinity to nature and they have their own notions, beliefs and way of protecting plants and they harvest the natural resources in a moderate manner. Ethnobotanical inventory of an area contain raw data, abundant of ideas and applications of knowledge of certain people and it is an important area that deserves serious attention. This precious knowledge today becoming depleting or lost forever and ethnobotanist should complete the field survey and the recording of ethnic knowledge as early as possible and should understood how this knowledge could be beneficial in terms of economy for people. But unfortunately most of the tribal societies have not yet been explored and their knowledge still exists in the form of unwritten folklore and proper documentation is needed [6].

In India 550 tribal communities of 227 ethnic groups inhabit and traditionally 10,000 plant species are utilized for healthcare, food and other day to day requirements. About 80 % of the world's total populations comprising 4.4 billion people are depend on plants as their primary source of medicine [3]. Out of 35 tribal communities in Kerala, 6 of them are from Malappuram district and Paniyan is the most populous tribe with a population of 81,940, forming 22.5 percent of the total tribal population of the state [1].

Ethnobotanical wealth of our forests is on the way of extinction and several areas are yet to be discovered. No other work is being done in this area except the documentation of the ethnobotanical knowledge in the Malappuram district by Thomas *et al.* (2010; 2011; 2012; 2013) [18, 21, 20, 17, 19], Haridas *et al* (2015) [4] and Pius *et al* (2015) [10]. The present communication outlines ethnobotanical plant uses against rheumatism by the six tribal communities of Malappuram district for the first time.

### 2. Materials and methods

#### 2.1 Study area

The area under study is Malappuram district in Kerala situated at 10°-12° N latitude and 75°-77° E longitude. The tribals of Malappuram district are mainly found in the regions of Nilambur valley. The valley is divided into three forest ranges, viz., the Nilambur Range, Chungathara Range and Karulai Range. Geographically, the area is located approximately between 11°26'–11°09' N latitude and 75°48'–76°33' E longitude with altitudes ranging from 50 to 2500m AMSL. Soil is largely loamy on the Ghats, but at lower elevation it is lateritic. With an annual average rainfall of over 2500 mm, spread almost throughout the year, the climate is warm humid. The temperature ranges from 17° to 37 °C [16] (Fig.1).

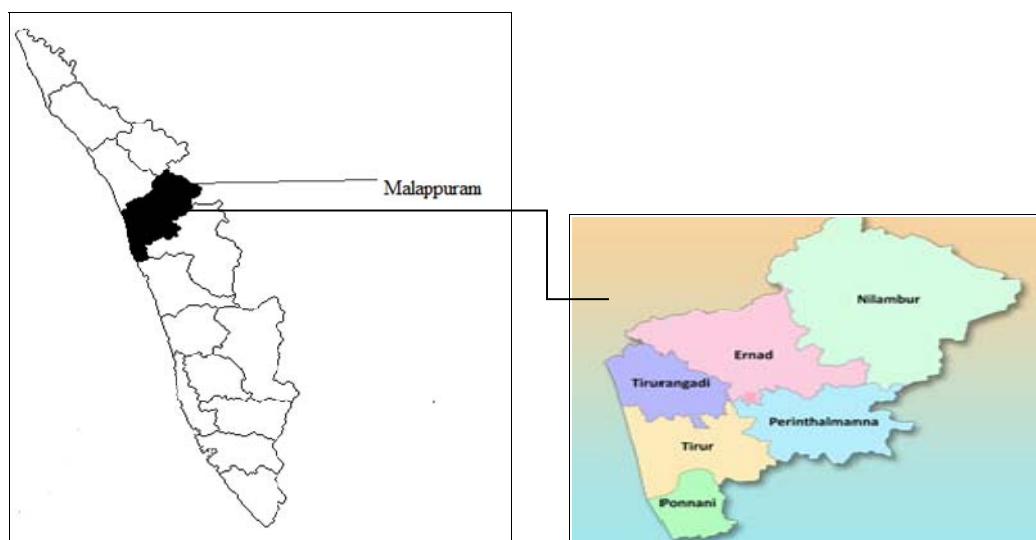


Fig 1: Map of Kerala state showing Malappuram district

## 2.2 Ethnobotanical data collection

Extensive field visits were conducted between 2010 and 2016 in the forest areas of Nilambur taluk of Malappuram district among six tribal communities viz, Arnadan, Cholanaikkan, Kattumakkan, Kuruman, Muthuvan and Paniya to collect information on plants used for the treatment of rheumatism and was done on the basis of a prescribed format [6]. Knowledgeable elders, religious leaders and other individuals (including male and female informants) are the main participants in our study. Older people (age >50 years) generally possessed a greater knowledge of plant species than younger generation. Botanical name, family, local name, part used, habit, mode of administration-orally, locally, quantity of dose, after food or before food, how many times a day, how many days and voucher number etc. of the plants were covered. Each plant use among male/ female informants in different tribal communities was included. Scientific recording of ethnobotanical data [6] was followed throughout the study. Plant species were identified with the help of relevant floristic literature [2, 5, 8, 16] and their uses were carefully recorded in the field data book. The herbarium specimens are preserved in the Centre for Medicinal Plants Research Herbarium.

## 3. Results and discussion

A total of 73 plants named by the respondents was collected, identified and documented for their therapeutic use against rheumatism by six tribal groups. These 73 species belongs to 45 families and the most represented families were Leguminosae (9 species), Lamiaceae (5 species), Apocynaceae, Zingiberaceae, Compositae, Euphorbiaceae and Solanaceae (3 species each). Other families were represented by 1 or 2 species (Table 1). According to their life forms the total plant species are classified as, 30% herbs, 26 % each of trees and shrubs and 18% of climbers (Fig.2). Differences were observed in the use of plant parts for each and every mode of treatment. Among the 20 different plant parts being used, whole plants were used in 13 preparations followed by seeds and roots for 10 treatments each. Use of other plant parts such as leaves, fruits, rhizome and other

parts varies from 1 to 6 applications (Fig.3).

From the present observation it is clear that all the six tribes have developed their own remedies against rheumatism. The use of plant species and the mode of administration vary from one tribe to the other, even though they inhabit more or less same region. However commonality in usage of three plants species (*Alpinia galanga*, *Nyctanthes arbor-tristis*, *Vitex negundo*) was observed among the tribes. The plant *Vitex negundo* is being used by both Cholanaikkans and Kattunaikkans; *Nyctanthes arbor-tristis* is used by Paniyans and Kurumans; *Alpinia galanga* by Muthuvans and Paniyans. Paniya tribes use 15 plant species against rheumatism followed by Cholanaikkans and Kattunaikkans with 14 species each. Muthuvans, Kurumans and Arnadans use 12, 11 and 10 species respectively. Gender-wise differences were observed in the information given by the tribes. Information on the use of 47 plant species for rheumatic complaints were given by both male and female informants, while the female informants alone describes the uses 15 species and male alone about 11 plant species.

Ethno-botanical studies in the Wayanadu District, Kerala documented information on 165 edible plants used by Kattunaikka, Paniya and Kuruma tribes and according to them Paniya tribes possesses knowledge regarding 136 taxa of wild edible plants, Kattunaikkas coming next with knowledge of 97 taxa and Kurumas are at the bottom of the knowledge-ladder with knowledge of 42 taxa of wild edible plants [9]. The data recorded during the present survey also indicates that Paniya community of Nilambur area is rich in their ethnobotanical knowledge.

Mulla Kuruma tribes of Wayanadu District of Kerala uses *Justicia gendarussa*, *Mangifera indica*, *Sida* sps and *Tamarindus indica* against rheumatism [14]. Report of the use of three plant species namely *Calotropis gigantea*, *Naravelia zeylanica*, *Sida* sps by tribals in Naduvil panchayat in Kannur district of Kerala for the treatment of rheumatism supports our documentation [22]. Eleven plant species (*Cassia fistula*, *Celastrus paniculatus*, *Costus speciosus*, *Cynodon dactylon*, *Gloriosa superba*, *Holoptelea integrifolia*, *Momordica charantia*, *Ricinus communis*, *Vitex negundo*, *Jatropha* sps, *Ipomoea* sps) used by the Bhoxa tribes of

Uttarakhand, India showed commonality with our documentation from the Nilambur tribes [7]. Documentation of ethnobotanical knowledge of medicinal plants in Taindol village, Uttar Pradesh showed commonality in the usage of five plant species (*Asparagus racemosus*, *Calotropis gigantea*, *Datura* sps, *Ricinus communis*, *Zingiber officinale*) for the treatment of rheumatism [12]. *Tinospora cordifolia*, *Zingiber officinale*, *Asparagus racemosus*, *Sida cordifolia*, *Ricinus communis*, *Boerhavia diffusa* are a few prominent drugs in classical Ayurvedic literature recorded for joint disorders. Plants like *Azadirachta indica*, *Cardiospermum halicacabum*, *Hemidesmus indicus*, were found to have multiple modes of administration for arthritis in ethnomedicine [11]. Report on plants used in the treatment

of joint diseases in Wayanad district of Kerala outline a total of 56 plant species of which 11 plant species supports our observations [13]. During the ethnobotanical survey of Mayurbhanj district, Odisha, India, 23 plant species belonging to 22 genera and 18 families are being used in the treatment of joint diseases (rheumatism, arthritis, gout and lumbago) by the tribal and non-tribal people of the district and of these 7 species are similar in our documentation [15]. Out of the 35 ethno medicinal plant species belonging to 32 families and 35 genera documented as herbal remedies used by the tribal people of Jhabua district, Madhya Pradesh for the treatment of joint diseases, 11 species are included in our study [23].

### 3.1 Tables and Figures

**Table 1:** Plant species in various taxonomic families used by six tribal communities for treatment of rheumatism

S. No.	Family, Botanical Name, Local Name, Part used, Habit	Mode of administration	Tribal community	Voucher number	Informer's Gender
<b>I</b>	<b>Acanthaceae</b>				
1	<i>Justicia gendarussa</i> Burm.f. Vathamkolli, Whole plant, Shrub	Whole plant paste mixed with <i>Azadirachta indica</i> leaf paste is applied externally twice daily for one week on affected regions.	Pa	07432	M/F
<b>II</b>	<b>Achariaceae</b>				
2	<i>Hydnocarpus pentandrus</i> (Buch-Ham.) Oken. Marotti, Seeds, Tree	Seed oil is applied externally, rubbed thoroughly in the affected area and after 10 minutes a cloth dipped in hot water is pressed over that. Continue the treatment for one week.	Pa	07435	F
<b>III</b>	<b>Anacardiaceae</b>				
3	<i>Mangifera indica</i> L. Mavu, Kernal and Inflorescence, Tree	Kernal paste is applied externally for one month twice daily and decoction made up of inflorescence is taken internally (5ml) once daily for one week.	Ch	08376	M/F
4	<i>Anacardium occidentale</i> L. Kasumavu, Seeds, Tree	External application of seed oil on the affected regions thrice daily for one week.	Mu	08261	M/F
<b>IV</b>	<b>Annonaceae</b>				
5	<i>Annona reticulata</i> L. Ramasitha, Bark and Root, Tree	Crushed bark and root tied in a white cloth is placed over a hot mud utensil and is applied slowly on the affected portion at minimum temperature twice daily for one week.	Mu	08373	F
<b>V</b>	<b>Apiaceae</b>				
6	<i>Centella asiatica</i> (L.) Urban in Mart. Kodangal, Leaves, Herb	Decoction made of leaves and jaggery (10ml) is allowed to drink on empty stomach daily for one month.	Pa	08026	F
<b>VI</b>	<b>Apocynaceae</b>				
7	<i>Calotropis gigantea</i> (L.) Dryand. Yerikku, Bark and leaf latex, Shrub	Leaf latex along with salt is applied once daily for one week on affected portion and also bark paste covered with leaf is tied over for one month.	Ku	08031	M/F
8	<i>Hemidesmus indicus</i> (L.) R. Br. ex Schult. Nannari, Roots, Climber	Crushed roots are heated with coconut oil allowed to cool and apply externally once a day for one month.	Ka	07420	F
9	<i>Wattakaka volubilis</i> (L.f.) Stapf Apocynaceae, Vattakakkakkoti, leaf, Climber	A paste made up of leaves is applied on affected portion and allowed to dry after that some salt is applied, continue the treatment for one month once daily.	Ch	07951	M/F
<b>VII</b>	<b>Araceae</b>				
10	<i>Amorphophallus paeoniifolius</i> (Dennst.) Nicolson Chena, Corn, Herb	The corn is cut in to small pieces; add 1-2 teaspoon turmeric powder and water, boiled in a mud pot, if needed salt is added. This dish is to be eaten early morning or evening once daily for two weeks. (Fresh preparation is needed)	Ch	08394	M
<b>VIII</b>	<b>Asparagaceae</b>				
11	<i>Asparagus racemosus</i> Willd. Sathavari, Tuber, Climber	The tuber decoction (5ml) along with coconut milk (5ml) is allowed to drunk on empty stomach once daily for two weeks in accordance with the recovery.	Pa	07410	F
<b>IX</b>	<b>Bignoniaceae</b>				
12	<i>Oroxylum indicum</i> (L.) Kurz Palakapayyani, Roots, Tree	Root decoction (2.5ml) is taken internally once daily for one week.	Ku	08021	M/F

<b>X</b>	<b>Cannaceae</b>				
13	<i>Canna indica</i> L. Thottavazha, Root, Herb	Drink 5ml decoction made up of root twice daily in the morning and evening on empty stomach for one week.	Ar	08374	M/F
<b>XI</b>	<b>Celastraceae</b>				
14	<i>Celastrus paniculatus</i> Willd. Cherupunna, Seeds, Climber	Dried seeds are roasted with coconut oil and then crushed in to a powder. The powder mixed with one teaspoon of honey is to be consumed once daily for one month.	Ka	08283	M/F
<b>XII</b>	<b>Colchicaceae</b>				
15	<i>Gloriosa superba</i> L. Menthonni, Rhizomes, Climber	Rhizome paste applied on affected portions and is covered with banana leaf once in a day for two weeks.	Ku	08025	M
<b>XIII</b>	<b>Combretaceae</b>				M/F
16	<i>Terminalia catappa</i> L. Badam, Seeds, Tree	Seed decoction (5 seeds) along with coconut milk is recommended to drink (10ml) twice daily for one or two months (Fresh preparation is needed)	Mu	08393	F
<b>XIV</b>	<b>Compositae</b>				
17	<i>Eclipta prostrata</i> (L.) L. Kanjunni, Whole plant, Herb	Whole plant (2-3 plants) is made in to a paste and mixed well with starch water 20ml) allowed to drink (10ml) twice daily for two weeks.	Ar	08000	M/F
18	<i>Elephantopus scaber</i> L. Aanachuvadi, Whole plant, Herb	Whole plant (1 plant) decoction along with cow's urine is taken (5ml) once daily on empty stomach for one week.	Pa	07403	M/F
19	<i>Ageratum conyzoides</i> (L.) L. Appa, Roots, Herb	Crushed roots are boiled with turmeric powder (1 spoon) and water allowed to cool. Use this water to wash the affected portion twice daily for two weeks.	Mu	08143	M/F
<b>XV</b>	<b>Convolvulaceae</b>				
20	<i>Ipomoea mauritiana</i> jacq. Palmuthukku, Tuber, Climber	Tubers cut in to pieces are crushed, tied in a cloth ( <i>kizhi</i> ) and heated on warm ash and then applied externally once daily for one month	Ku	08036	M/F
21	<i>Operculina turpethum</i> (L.) Silva Manso, Convolvulaceae, Thrikolpakonna, Roots, Climber	Crushed roots are applied on affected areas once daily for two weeks.	Mu	07952	M/F
<b>XVI</b>	<b>Costaceae</b>				
22	<i>Costus speciosus</i> (J.Koenig) Sm. Channakoova, Rhizome, Herb	The decoction made up of rhizome along with sugar candy (5ml) is taken internally once daily for one or two weeks. External application of rhizome paste on affected area twice daily for one month.	Ka	08281	M/F
<b>XVII</b>	<b>Cucurbitaceae</b>				
23	<i>Momordica charantia</i> L. Fruit and leaves, Climber	Ripened fruit pulp mixed with little salt is applied on affected portion twice daily for one week and also tender fruit decoction (10ml) is taken internally once daily early in the morning for two weeks.	Ar	07995	F
<b>XVIII</b>	<b>Cycadaceae</b>				
24	<i>Cycas circinalis</i> L. Eenthu, Fruit, Shrub	Sundried fruits are roasted with castor oil and crushed in to fine powder. Add this powder into a mildly heated mud pot with jaggery, mix thoroughly and heated. On the next day onwards one pinch of this <i>lehyam</i> is consumed once daily early in the morning for two months.	Ar	07965	M/F
<b>XIX</b>	<b>Euphorbiaceae</b>				
25	<i>Baliospermum montanum</i> (Willd.) Müll.Arg. Nagadanthi, Seed, Shrub	Sundried seeds are powdered, mixed with some hot water and 5ml is allowed to drink once daily on empty stomach for two weeks.	Ka	07419	F
26	<i>Jatropha multifida</i> L. Churakkalli, Latex, Roots, Shrub	A paste made up of root along with latex is applied on affected area and covered with <i>Jatropha</i> leaves once a day for one week.	Ch	08375	M/F
27	<i>Ricinus communis</i> L. Avanakku, Seeds, Shrub	Seed oil is used to massage the affected portion for 10 minutes then wash with hot water twice daily for three months.	Mu	07407	M
<b>XX</b>	<b>Lamiaceae</b>				
28	<i>Clerodendrum infortunatum</i> L. Peruvelam, Roots and flowers, Shrub	A paste made up of roots and flowers is applied along with coconut shell ash externally on affected portion once daily for one week.	Pa	08391	F
29	<i>Clerodendrum paniculatum</i> L. Krishnakireedam, Bark and flower, Shrub	A paste made up of bark and flowers mixed with salt water is applied on affected portion twice daily for one month.	Ch	08390	M
30	<i>Ocimum basilicum</i> L. Ramathulasi, Whole plant, Herb	Decoction made up of whole plant mixed well with jaggery and <i>Zingiber officinale</i> rhizome paste is taken internally (5ml) once daily for two weeks. External application leaf paste on affected area twice daily for one week.	Ch	08377	M/F

31	<i>Premna serratifolia</i> L., Munja, Whole plant, Shrub	Decoction made up of whole plant (2.5ml) is taken once daily on empty stomach for one week.	Ka	07404	M/F
32	<i>Vitex negundo</i> L. Karinochi, Leaves and roots, Shrub	Juice of leaves and roots are taken internally (2.5ml) and paste of leaves applied externally for one month once daily.	Ch, Ka	08160	M/F
<b>XXI</b>	<b>Lauraceae</b>				
33	<i>Cinnamomum zeylanicum</i> Blume Karuvappatta, Seeds, Tree	External application of mild heated seed oil on affected region twice daily for one month.	Mu	08077	M/F
<b>XXII</b>	<b>Leguminosae</b>				
34	<i>Abrus precatorius</i> L. Kunni, Leaves, Climber	Leaves soaked in hot water for 1-2 seconds are applied on affected portion twice daily for one week.	Ch	07987	F
35	<i>Adenanthera pavonina</i> L. Manchadai, Seeds, Tree	Roasted seeds tied in a cloth ( <i>Kizhi</i> ) are applied on affected portion at different minimum and low temperatures once daily for three months.	Ku	08379	M
36	<i>Albizia saman</i> (Jacq.) Merr. Mazhamaram, Bark, Tree	Crushed bark boiled with some salt water and 2.5ml of warm decoction is taken internally once daily for one month.	Ar	08372	M/F
37	<i>Butea monosperma</i> (Lam.) Taub. Chamatha, Bark, Tree	Bark paste is applied externally for one month twice a day.	Pa	08042	M
38	<i>Cassia fistula</i> L. Kanikonna, Tender Root and fruit, Tree	Fruit pulp decoction (5ml) is taken internally and tender root paste is applied externally once daily for one month. This treatment is applicable on early morning.	Pa	07433	M/F
39	<i>Desmodium gangeticum</i> (L.) DC. Orila, Roots, Herb	Decoction of dried roots (5ml) is taken internally on early morning daily for one month and also the root paste is applied over affected area twice a day for one month.	Ka	08111	M/F
40	<i>Pongamia pinnata</i> (L.) Pierre Ungu, Bark and leaves, Tree	A paste made up of bark along with leaves is applied externally on affected portion once daily for three days.	Ch	08129	M/F
41	<i>Pseudarthria viscida</i> (L.) Wight & Arn. Moovila, Roots, Shrub	Sun dried roots are tightly covered on the affected areas for two seconds then slightly loosen. Repeat it for one month twice daily.	Ku	07428	M/F
42	<i>Tamarindus indica</i> L. Puli, Fruit and leaves, Tree	Fruit pulp and jaggery are placed in an earthen pot tightly covered with a cloth and after three weeks 5ml of this decoction is taken internally daily for one month. The leaf paste is applied externally on the affected area for one month.	Ar	08255	
<b>XXIII</b>	<b>Loganiaceae</b>				
43	<i>Strychnos nux-vomica</i> L. Kanjiram, Bark, Tree	A paste made up of bark is applied externally on affected area and the mild heated leaves also placed above that and tied with a thin thread. Repeat the treatment until it recovers.	Ch	07408	M
<b>XXIV</b>	<b>Malvaceae</b>				
44	<i>Sida cordifolia</i> L. Kurunthotti, Root and leaves, Shrub	Root decoction (10ml) along with 1 teaspoon honey is taken internally twice daily for one month and a paste of leaves and root is applied externally for one month once daily.	Mu	07443	M/F
45	<i>Urena lobata</i> L. Oorakam, Roots, Shrub	Juice obtained from crushed root is applied externally once daily for one week.	Ka	08012	M/F
<b>XXV</b>	<b>Marantaceae</b>				
46	<i>Maranta arundinacea</i> L. Koovva, Rhizomes, Herb	Powdered dried rhizome is dissolved in water and 5ml is taken internally once daily on empty stomach for one week.	Ka	08278	M/F
<b>XXVI</b>	<b>Meliaceae</b>				
47	<i>Azadirachta indica</i> A. Juss. Aryaveppu, Bark, leaves and seeds, Tree	Water boiled with bark and leaves is used for bathing once daily for three weeks. The seed decoction (10ml) is taken internally along with 2 teaspoon each of turmeric powder and honey daily for three weeks.	Ka	08089	M/F
48	<i>Naregamia alata</i> Wight & Arn. Nilanarakam, Whole plant, Herb	Whole plant is made into a paste and applied externally on the affected area twice daily for one month	Ka	07964	
<b>XXVII</b>	<b>Menispermaceae</b>				
49	<i>Tinospora cordifolia</i> (Willd.) Miers Chitamruthu, Stem, Climber	External application of stem paste on affected areas once daily for two months.	Ku	08351	M/F
<b>XXVIII</b>	<b>Moraceae</b>				
50	<i>Artocarpus heterophyllus</i> Lam. Plavu, Fruits, Tree	Ten ml ripened fruit decoction is consumed on empty stomach and fruit paste along with salt crystals is applied externally and covered with a heated banana leaf. Repeat the treatment for one month once daily.	Ar	08380	F
<b>XXIX</b>	<b>Moringaceae</b>				
51	<i>Moringa oleifera</i> Lam. Muringa, Whole plant, Tree	Decoction made up of whole plant is taken internally (10ml) on empty stomach once daily for two months and flower paste is applied externally on affected area twice daily for	Ku	08389	M/F



		one month.			
<b>XXX</b>	<b>Musaceae</b>				
52	<i>Musa × paradisiaca</i> L. Vazha, Stem, Herb	Drink 10ml of the sap of inflorescence stalk ( <i>vazhaapindi</i> ) twice daily for one month.	Ch	08382	M/F
<b>XXXI</b>	<b>Myristicaceae</b>				
53	<i>Myristica fragrans</i> Houtt. Jathikka, Seeds, Tree	Seed oil applied externally twice daily for three months.	Mu	08055	M/F
<b>XXXII</b>	<b>Nyctaginaceae</b>				
54	<i>Boerhavia diffusa</i> L. Thazhuthama, Leaves, Herb	Decoction made up of leaves (5ml) is taken internally once daily for one month on empty stomach. A white cloth dipped in hot water is placed on affected portion and leaf paste is applied over it.	Ku	07405	M/F
<b>XXXIII</b>	<b>Oleaceae</b>				F
55	<i>Nyctanthes arbor-tristis</i> L. Pavizha mulla, Bark and flowers, Shrub	Bark paste is applied on affected area externally and 2.5ml of the flower decoction is taken internally once daily for one month	Pa, Ku	08392	F
<b>XXXIV</b>	<b>Orchidaceae</b>				
56	<i>Acampe praemorsa</i> (Roxb.) Blatt. & McCann Upputhali, Whole plant, Epiphytic herb	Whole plant extract with honey (to avoid bitter taste) is kept in a mud pot tightly covered with a cloth for one month. Consume 5ml of the preparation per day for one month.	Ka	08028	M/F
<b>XXXV</b>	<b>Piperaceae</b>				
57	<i>Piper nigrum</i> L. Kurumulaku, Fruits, Climber	Fruits are roasted with coconut oil and made in to fine powder. The powder is mixed with 5ml honey and taken on empty stomach once daily for one month.	Ka	08186	M/F
58	<i>Peperomia pellucida</i> (L.) Kunth Mashithandu, Whole plant, Herb	Decoction made out of whole plant (10ml) is taken internally once daily for one month.	Ch	08378	M
<b>XXXVI</b>	<b>Plumbaginaceae</b>				
59	<i>Plumbago indica</i> L. Chethikoduveli, Roots, Shrub	Crushed roots are boiled with some water and coconut milk and 10ml is taken internally once daily for one week.	Ar	08095	M/F
<b>XXXVII</b>	<b>Poaceae</b>				
60	<i>Cynodon dactylon</i> (L.) Pers. Karuka, Whole plant, Herb	Decoction made up of whole plant (10ml) is taken once daily early in the morning for six months.	Ch	08352	M/F
<b>XXXVIII</b>	<b>Ranunculaceae</b>				
61	<i>Naravelia zeylanica</i> (L.) DC. Soothravalli, Whole plant, Climber	Whole plant is made in to a paste and mixed with burnt coconut shell and applied overnight on affected areas only once a day.	Ka	07442	M/F
<b>XXXIX</b>	<b>Rutaceae</b>				
62	<i>Glycosmis pentaphylla</i> (Retz.) DC. Panal, Leaves, Shrub	Leaf decoction (5ml) is taken internally and leaf paste applied externally twice a day for one week.	Pa	07418	M/F
63	<i>Murraya koenigii</i> (L.) Spreng. Karivepu, Leaves and fruits, Shrub	Decoction made up of leaves, fruits along with 1 teaspoon each of salt and turmeric (10 ml) taken daily	Pa	07956	F
<b>XL</b>	<b>Sapindaceae</b>				
64	<i>Cardiospermum halicacabum</i> L. Uzhinja, Whole plant, Climber	Whole plant decoction (5ml) is taken internally and whole plant paste is applied externally once daily for two weeks.	Mu	08108	F
<b>XLI</b>	<b>Solanaceae</b>				
65	<i>Capsicum frutescens</i> L., Kantharimulaku, Fruits, Herb	The affected portion covered with a white cloth and the fruit paste is applied over that. Continue the treatment for one week once daily.	Pa	08381	M
66	<i>Datura stramonium</i> L. Solanaceae, Vella ummam, Fruit, Shrub	External application of fruit paste along with turmeric powder (1/2 teaspoon) once daily for one month.	Pa	07439	M
67	<i>Solanum torvum</i> Sw. Solanaceae, Anachunda, Roots and fruits, Shrub	Grind the roots and massage on affected areas and fruits roasted in coconut oil along with salt is taken internally (5ml) once daily for one week.	Ku	07445	M/F
<b>XLII</b>	<b>Talinaceae</b>				
68	<i>Talinum portulacifolium</i> (Forssk.) Asch. ex Schweinf. Badhalacheera, Whole plant, Herb	A freshly prepared curry made up of whole plant is taken on empty stomach once daily for three days.	Ch	08112	M/F
<b>XLIII</b>	<b>Ulmaceae</b>				
69	<i>Holoptelea integrifolia</i> Planch. Aavel, Bark, Tree	Internal consumption of bark decoction (2.5ml) and external application of bark paste twice daily for one month	Ar	07969	M/F
<b>XLIV</b>	<b>Xanthorrhoeaceae</b>				
70	<i>Aloe vera</i> (L.) Burm.f. Kattarvazha, Leaves, Herb	Leaf pulp is mixed thoroughly with one teaspoon coconut oil and heated to a minimum tolerable temperature and applied to the affected portion twice a day for one month.	Ar	08027	M/F
<b>XLV</b>	<b>Zingiberaceae</b>				

71	<i>Alpinia galanga</i> (L.) Willd. Peraratha, Rhizome, Herb	Rhizome paste along with <i>Cassia fistula</i> bark paste is applied externally and a cloth dipped in hot water is tied on the affected area for few minutes. Repeat the treatment once daily for three months.	Mu, Pa	07417	M/F
72	<i>Elettaria cardamomum</i> (L.) Maton Zingiberaceae, Elam, Seeds, Herb	Seed oil applied externally and crushed seed husk covered over that then tied with a leaf. Continue the treatment for one week once daily.	Mu	08069	M
73	<i>Zingiber officinale</i> Roscoe Zingiberaceae, Inchi, Rhizome, Herb	Rhizome decoction along with sugar is taken internally (5ml) once a day for one month.	Pa	08009	M/F

\* Ar-Arnadan, Ch-Cholanaikkan, Ka-Kattunaikkan, Ku-Kuruman, Mu-Muthuvan, Pa-Paniyan

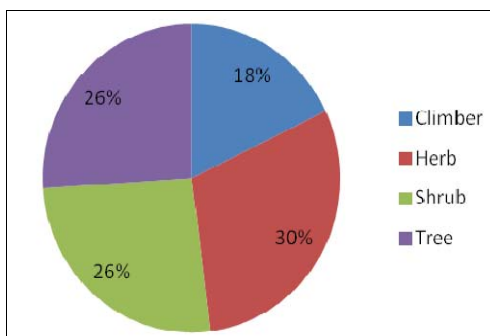


Fig 2: Percentage of growth forms (plant habit) of medicinal plants recorded in the study

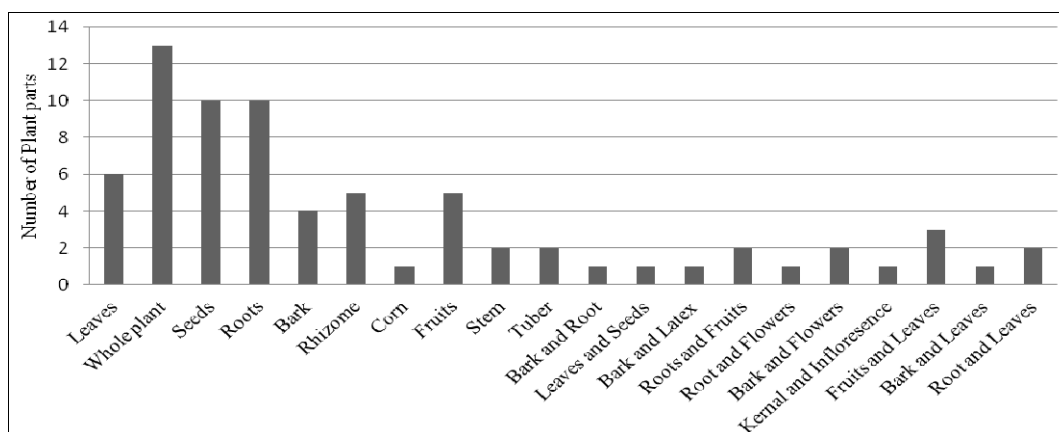


Fig 3 Use pattern of various plant parts for Rheumatism by six tribal communities



Fig 4: Herbarium specimens of selected species recorded for treating Rheumatism

1. *Anacardium occidentale*, 2. *Acampe praemorsa*, 3. *Ricinus communis*, 4. *Gloriosa superba*, 5. *Zingiber officinale*, 6. *Aloe vera*, 7. *Costus speciosus*, 8. *Oroxylum indicum* 9. *Abrus precatorius*, 10. *Celastrus paniculatus*, 11. *Vitex negundo* 12. *Justicia gendarussa*

#### 4. Conclusion

An ethnobotanic survey was carrying out among six tribals of Malappuram district for the treatment of rheumatism shows that the tribals possess a wealth of knowledge. The precious knowledge is transferred through generation to generation combining years of experiences, practices from their forefathers but all the information lacking a written script. The indigenous knowledge of these tribal traditional healers has been disappearing due to lack of followers for this valuable knowledge, as well as their migration to places outside of the forest. So the present work aims to document the unexplored knowledge about plants for a very common disease like rheumatism beneficial to public and novel drug development industries.

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