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Ethnobotanical Study of Medicinal Plants on Arthritis Used by Chaoshan in Guangdong, China

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Abstract

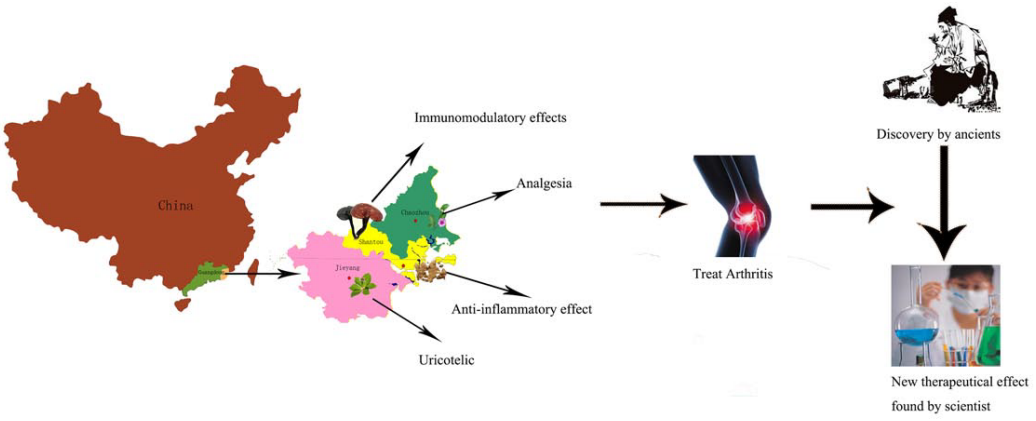
Ethnopharmacological relevance: An ethnobotanical survey was conducted to collect information of medicinal plants on Arthritis relating to anti-inflammatory and Analgesia effect by Chaoshan-Shantou People living in Guangdong.

Aim of the study: This investigation was to document valuable knowledge represented as Chaoshan herbal medicine.

Materials and methods: Information was obtained from interviews and by reviewing studies of Chaoshan and Cantonese reported in the literature.

Results: Our data covered 86 species belonging to 82 genera in 52 families. In the search of the PubMed database, there are 28 herbs that have been studied, which have the most anti-inflammatory effects of the herb, followed by analgesia.

Conclusions: Due to the rapid disappearance of urbanization and industrialization of traditional culture and natural resources, indicating that the recorded information may be lost forever. Therefore, there is an urgent need to record the value of Chaoshan medicinal knowledge and encourage the transfer to the next generation.



Keywords: Chaoshan herbal medicine; Arthritis; Anti-inflammation; Analgesia

Introduction

The chronic and acute inflammation can lead to serious organs and tissues damage. Arthritis refers to occur in the human body joint and surrounding tissue inflammatory diseases, points to dozens. There are more than 100 million Chinese patients with arthritis and increasing in number. Its clinical manifestations are red, swollen, hot, painful, functional disability and joint deformities, which lead to joint disability, affecting the quality of life of patients. The etiology of arthritis is complex, mainly related to inflammation, autoimmune reaction, infection, metabolic disorders, trauma, degenerative diseases and so on. According to the pathogenesis and clinical manifestations, arthritis can be divided into rheumatoid arthritis, rheumatoid arthritis, osteoarthritis, gout arthritis and ankylosing spondylitis, etc.

Non-steroidal anti-inflammatory drugs (non-steroidal anti-inflammatory drugs) are the most commonly used drugs for the treatment of pain caused by inflammatory and degenerative diseases, including reactive arthritis [1-4]. The main mechanism is considered to be the two isoforms of epoxy synthase blockade, namely COX-1 and

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COX-2 expression, resulting in a decrease of prostaglandin synthesis. In fact, the therapeutic effect of non-steroidal anti-inflammatory drugs is due to its inhibition of the COX-2 isoform, in inflamed tissue inducing capacity, and some of the most common side effects of their is, generally with homeostasis and inhibition of COX-1 isoform.

Similarly, tumour necrosis factor alpha (TNF-alpha) in the pathogenesis of rheumatoid arthritis (RA) plays a core role, because it is in arthritis inflammatory and destructive processes vertices. Using anti TNF alpha blocking clinical trials showed, TNF regulation of inflammatory cytokine and chemokines, adhesion molecule expression, resulting in joint leukocyte migration, matrix metalloproteinases (MMPs), and joint destruction, and vascular endothelial growth factor (VEGF) and angiogenesis [5-9]. TNF-alpha gene expression in complex control, and p38 mitogen activated protein kinase pathway controlling translation possible actions on the 3-untranslatedregion [10], and with the 5-untranslated/promoter region contains multiple transcription factor binding sites, including nuclear factor B (NF-κB) and activator protein-1 and nuclear factor of interleukin IL - 6 (IL-6) gene, and activation of T cells [11-13]. NF-κB has recently attracted particular attention because of its ability to regulate macrophage

TNFα production induced in response to lipopolysaccharide (LPS), ultraviolet light, phorbol myristate acetate, or contact with cytokine-activated T cells [14,15].

Chaoshan area is located in the eastern part of Guangdong Province. Complex geographical factors as well as mountains, sea, plain both superior natural conditions, making medicinal plant resources in the eastern region is very rich. Most of them are used based as anti-inflammatory and analgesia herbs. There is an urgent need to record the value of Chaoshan medicinal on anti-inflammation and analgesia and encourage the transfer to the next generation (TOC Graphic).

Materials and Methods

Study area

Chaoshan area is located in the eastern part of Guangdong Province, is located approximately east longitude 114'53 ~ 117'16', north latitude 22'31'~ 24'15', The Tropic of cancer through this place. The central region including Shantou, Chaozhou, Jieyang, Shanwei City, a total area of 157720 square kilometers. At the junction of the northeast and Fujian Province, the northwest bordering near Xinghai area, southeast region near the South China Sea. The northeast, northwest mountains, a natural barrier between regions, the main peak of Lantau Peak Phoenix bird bun 1498 meters above sea level, the highest peak in the territory, while the southeast coast is flat, rivers of Chaoshan Plain, west coast is a multistage platform. The climate in this region is a subtropical climate throughout the year, affected by the monsoon, but the coastal and inland areas are slightly different, plenty of sunshine, the annual average temperature is 21 to 22 degrees Celsius, rainfall, the average annual rainfall is 1300 to 2200 mm, relative humidity above 80% soil. Complex and varied types of soil, lateritic red soil, followed by yellow soil, red soil, alluvial, paddy soil, saline soil. Complex geographical factors as well as mountains, sea, plain both superior natural conditions, making plant resources in the eastern region is very rich. According to preliminary statistics there are medicinal plants 228 families, 903 genera, 1599, 73 variants [16].

Ethnobotanical survey

For this study, ethnopharmarcologists, pharmacognosists and botanists, translators with medicinal background from the Shantou University Medical college and local people with medicinal background. Information was obtained from interviews and by reviewing studies of Chaoshan and Cantonese reported in the PubMed.

Results

Ethnobotanical survey

Through the investigation, we have found a total of 86 herbs, including 52 families and 82 genera (Table 1). Details of relative number of species per family as medicinal herbs in Chaoshan area are showed in Figure 1. Among Leguminosae accounted for 11, Compositae accounted for 5 and so on. The folk prescription aggregated into the editor, and the Chinese herbal medicine compilation and Chinese Pharmacopoeia contrast found *Wikstroemia indica* (Linn.) C. A. Mey, *Ampelopsis brevipedunculata* (Maxim.) *Trautv., Bombax malabarica* L. and other herbs to the methods used in the treatment of arthritis in both of the books were no record or record dosage and extraction methods are different. Of the 86 plants recorded, for most (37 species)

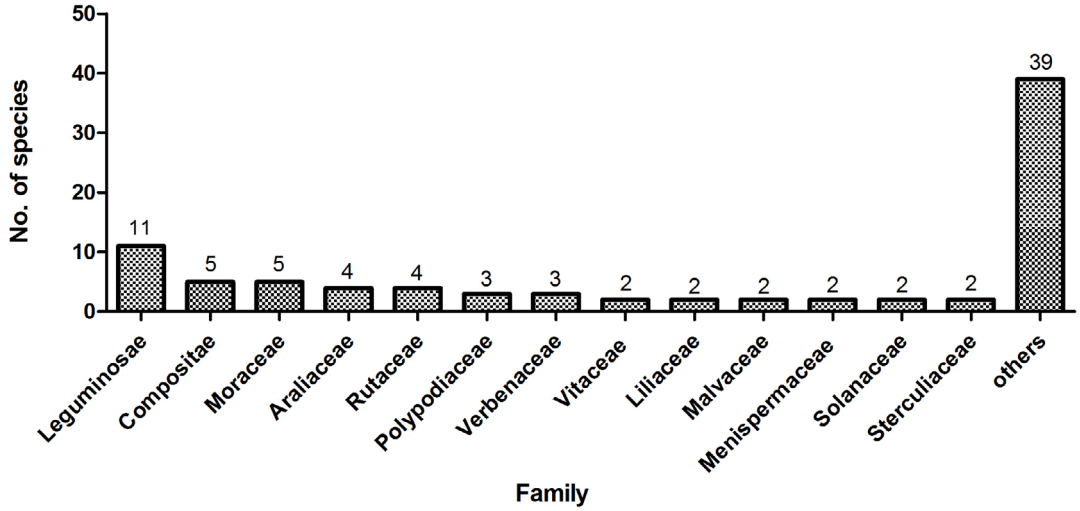

Figure 1: Relative number of species per family used as medicinal herbs by the ChaoShan area.

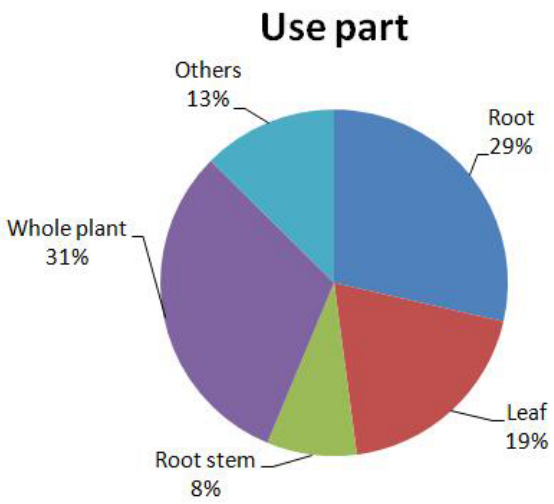

Figure 2: Form in which Chao Shan medicinal herbs are used.

the entire plant is used as medicine. Of the remaining species, for 34 only their roots are used, and for 23 only their leaves are used. Figure 2 displays the result of analysis of medicinal plant parts used to treat ailment.

The pharmacological effects of herbal medicine reported in the PubMed

Through in PubMed database search we investigate to the herbs in the treatment of arthritis of the research, we found 28 kinds of Chinese herbal medicine has done related pharmacological research. Among them, there are anti-inflammatory effects of 28 species, analgesia or ease the pain of a total of eight kinds of, and antibacterial, immune regulation and anti-hyperuricemia.

Anti-inflammatory effect

Narendhirakannan found that gynandra L. 150 mg kg / Cleome leaves methanol extract has significant anti-inflammatory activity in adjuvant arthritis rats [17-19] (Table 2). Yang caught sight of the ethanol and ethyl acetate extracts from *Radix Toddaliae* Asiaticae significantly reduced claws and joint swelling and spleen index is reduced, and reducing cytokines such as TNF-alpha, the concentration of IL-1, IL-6, and cytokines such as IL-10 was significantly higher than that of control group [61]. Matsui compounds of lansamide I, lansiumamide B, and SB-204900 from *Clausena lansium* (Lour.) Skeels (Rutaceae) markedly decreased histamine release. In addition, lansiumamide B- and SB-204900-treated cells also reduced the protein and/or mRNA levels of TNF-α. The phosphorylation of p38 MAPK was markedly suppressed by SB-204900 [32]. Rodanant was found to be highly effective in the use of paniculata Murraya compounds (L.) Jack to stimulate monocyte inflammation on lipopolysaccharide [37]. The extract of Celastrus - (-) -Epiafzelechin has inhibitory effect on cyclooxygenase, and exhibited about 3-fold weaker inhibitory potency on the enzyme activity than indomethacin as a positive control. Furthermore, (-) –Epiafzelechin shows significant anti-inflammatory activity on carrageenin-induced mouse paw edema when the compound (100 mg/kg) was orally administrated at 1 h before carrageenin treatment [43]. Meng has adiscover on *Saururus chinensis* (Lour.) Baill., the subfraction 4 (SCF4) from the n-hexane layer of the ethanol extract of the aerial parts of S. chinensis significantly inhibited the production of nitrite and the expression of pro-inflammatory mediators via heme oxygenase-1 upregulation [52].

While Sauchinone, isolated from the roots of *Saururus chinensis* (LOUR.) BAILL., exhibited the vascular protective effects in human umbilical vein endothelial cells induced heme oxygenase (HO)-1 expression [51]. And Kim, Cho's study showed that *S. chinensis* methanol extract has antioxidative and anti-inflammatory activities by enhancing antioxidative defense systems and suppressing NO production via the down-regulation of iNOS expression and NFkappaB activity [49,50]. Pereira reported Intraperitoneal injection of methanol extract of *Bidens pilosa* (PLN) can significantly reduce the size of the popliteal lymph node inflammation caused by zymosan [62]. Chih was found by contrast experiment that extracts (500 mg/kg) of *B. pilosa* L. var. minor and *B. pilosa* L. is more significantly decreased the paw edema induced by complete Freund's adjuvant than *B. chilensis* DC [63]. Lu's study results showed that a compound extracted from the rhizome of *Smilax glabra*, at non-cytotoxicity concentrations, significantly suppressed the production of nitric oxide (NO) and tumor necrosis factor-α (TNF-α), as well as the mRNA expression of inducible nitric oxide synthase (iNOS) and TNF-α in LPS-induced RAW 264.7 cells, but did not affect interleukin-6 (IL-6) release or its mRNA expression. It seems related to its up-regulation of the phosphorylation of p65, extracellular signal-regulated kinases 1/2 (ERK1/2) and c-Jun N-terminal kinase (JNK) [55]. Patel found the ethyl acetate (EtOAc) extract of *Cassia occidentalis* L. (roots) (IC_{50}=21.3 to 43.1 micro g/mL) and *Mimosa pudica* (whole plant) (IC_{50}=31.7 to 47.2 micro g/mL) and the dichloromethane (DCM) extract of *Leucas cephalotes* (whole plant) (IC_{50}=46.8 to 49.3 micro g/mL) exhibited significant anti-inflammatory activity by *in vitro* inhibition of the production of TNF-alpha, IL-1beta and NO in LPS stimulated RAW 264.7 cells. Furthermore, the five compounds isolated from the ethyl acetate extract of *Cassia occidentalis* roots were found to suppress LPS-induced IL-1beta, TNF-alpha and NO production in a concentration-dependent manner in these cells at IC_{50} values ranging from 22.5 to 97.4 micro M. Emodin and chrysophanol were also found active in inhibiting pro-inflammatory cytokines *in vivo* [56]. Saleem found both aqueous and alcoholic extracts of the leaves *Gendarussa vulgaris* (*G. vulgaris*) Nees. showed significant anti-inflammatory property *in vivo* method that was estimated by human red blood cell membrane stabilisation (HRBC) method and *in vivo* method was estimated on the carrageenan induced paw oedema. And alcoholic extract at a concentration of 300 mg/mL showed potent activity on comparing with the standard drug diclofenac sodium [57].

Chen's results showed that the ethanol extract of *S. octophylla* has significant dose-dependent anti-inflammatory and antinociceptive activities. And its five different polar fractions especially the $CHCl_3$ fraction significantly inhibited the abdominal writhing induced by acetic acid and ear edema induced by xylene, also increased pain threshold in hot plate test in 120 min and reduced ticking times in formalin test. The ethanol extract of *S. octophylla* and the $CHCl_3$ fraction demonstrated an anti-RA effect in a dose-dependent manner. The levels of TNF-α, IL-1β and IL-6 in ethanol extract (600 mg/kg) and $CHCl_3$ fraction (300 mg/kg) groups were significantly lower than those of the model group [58]. Yang had isolated Nine new with anolides from the leaves of *Datura metel* L. All isolates were evaluated for *in vitro* anti-inflammatory potential using LPS-stimulated RAW 264.7 murine macrophages. Among them, compounds daturafolisides A, daturafolisides B, baimantuoluoside B, 12-deoxywithastramonolide exhibited significant inhibition of nitrite production. Compounds daturafolisides C, daturafolisides D, daturafolisides F, and daturataurin

NO.	Latin name	Family	Local name	Part use	From of administration	Medicinal use
1	Alangium chinense(Lour.) Rehd	Alangiaceae	Ba jiao feng	Root, Leaf, Flower	Vinum, Soup	RA, traumatic injury
2	Murraya paniculata(L.) Jack	Rutaceae	Jiu li xiang	Root, Leaf	Vinum, Soup	Traumatic injury, RA, localized anesthesia
3	Wikstroemia indica (Linn.) C. A. Mey	Thymelaeaceae	Liao ge wang	Root, Leaf	Soup, Compress	RA, Traumatic injury, Injury blooding
4	Kyllinga brevifolia Rottb	Cyperaceae	San jia cao	Whole plant	Vinum, Decoction	RA, Traumatic injury
5	Smilax glabra Roxb	Liliaceae	Tu fu ling	Root,Stem	Soup	RA
6	Ampelopsis brevipedunculata(Maxim.)Trautv.	Vitaceae	Da hao shan pu tao	Root, Stem, Leaf	Decoction	RA, Traumatic injury
7	Waltheria americama L.	Sterculiaceae	He ta cao	Root,Whole plant	Decoction	Relieve pain and inflammation
8	Toddalia asiatica (L.) Lam.	Rutaceae	Fei long zhang xue	Root, Leaf	Vinum, Decoction	RA, Traumatic injury
9	Ipomoea pescaprae (L.) Sweet.	Convolvulaceae	Ma an teng	Whole plant	Vinum, Decoction, Soup	Rheumatic pain, Knee joint pain
10	Bombax malabarica L.	Bombacaceae	Mu mian	Root, Stem, Bark	Decoction, Vinum	Traumatic injury
11	Ficus simplicissima Lour.	Moraceae	Wu zhi mao tao	Root, Stem	Decoction	RA, Traumatic injury
12	Impatiens balsamina L.	Balsaminaceae	Feng xian hua	Flower	Decoction drink by liquor	RA
13	Gendarussa vulgaris Nees.	Acanthaceae	Wu gu huang teng	Whole plant	Decoction	Fracture, Sprain and contusion, RA
14	Ficus pandurata Hance.	Moraceae	Niu nai shu	Root, Leaf	Decoction drink by liquor	Traumatic injury
15	Adenosma glutinosum(L.) Druce	Scrophulariaceae	Mao she	Whole plant	Decoction, compress	RA, Traumatic injury
16	Callicarpa loureiri Hook. etArn	Verbenaceae	Chang ye zi zhu cao	Root, Stem	Decoction	RA, Traumatic injury
17	Saurures chinensis (Lour.) Baill	Saururaceae	Shui lao	Root, Stem	Decoction	Diuretic swelling
18	Lysimachia fortunei Maxim.	Primulaceae	Shui pu yin	Whole plant	Decoction	RA, Traumatic injury
19	Pholidota chinensis Lindl	Orchidaceae	Shi xian tao	Bulb	Soup	RA
20	Humata tyermanni S.Moore.	Davalliaceae	Shi qiu yin	Rhizome	Decoction	RA, Urticaria
21	Lycoris radiate(L Herit) Herb	Amaryllidaceae	Shi suan	Bulb	Compress	RA,
22	Phymatopsis hastata (thunb.) Kitag	Polypodiaceae	Long she hao	Whole plant	Vinum	Osteomyelitis
23	Clerodendron japonicum (Thunb) Sweet.	Verbenaceae	Long chuang hua	Root, Leaf	Hot compress	RA, Lumbar muscle strain, Traumatic injury
24	Selaginella uncinata (Desv.) Spring	Selaginellaceae	Long ling cao	Whole plant	Vinum	RA, Traumatic injury
25	Bidens pilosa L.	Compositae	Si fang ku gu jing	Whole plant	Soup	Antiinflammatory, Antidiarrheal
26	Chloranthus henryi Hemsl	Chloranthaceae	Si kuai wa	Root,Whole plant	Decoction	RA, Traumatic injury
27	Siegesbeckia glabrescens Makino.	Compositae	Mu jing cao	Whole plant	Decoction	RA, Limbs anesthesia
28	Cleome gynandra L.	Capparidaceae	Bai hua chou cao	Seed or Whole plant	Compress	RA
29	Acanthopanax trifoliatus (L.)Merr	Araliaceae	Bai le	Root, Leaf	Decoction	RA
30	Pterospermum heterophyllum Hance.	Sterculiaceae	Ban feng he	Root stem	Decoction, Vinum	RA Lumbar muscle strain traumatic injury, Sprain and contusion
31	Eupatorium chinense L.	Compositae	Duo xu gong	Root, Leaf	Decoction, add salt	RA, Bronchitis
32	Millettia dielisana Harms ex Diels.	Leguminosae	Xue feng gen	Root rattan	Decoction and vinum	RA, Traumatic injury , Limbs anesthesia
33	Inula cappa DC.	Compositae	Chong tian bai	Root,Whole plant	Soup	Rheumatism edema, Traumatic injury
34	Artocarpus hypargyraea Hance	Moraceae	Hong she geng	Root	Decoction or soak in Liquor	RA
35	Ardisiae gigantifoliae Stapf.	Myrsinaceae	Zou ma tai	Root,Leaf,Whole plant	Decoction	RA, Traumatic injury
36	Cunninghamia lanceolata (Lamb.) Hook	Taxodiaceae	Sang	Root, Bark, Fruit, Wood	Decoction	RA, Traumatic injury ,
37	Xanthium Sibiricum Patr. Ex Widd.	Compositae	Can ger zi	Fruit, Whole plant	Decoction	RA
38	Moghania philippinensis (Merr. et Rolfe) Li	Leguminosae	Ding di gen	Root, Leaf	Decoction	Lumbar muscle strain, Traumatic injury
39	Ganoderma lucidum(Leyss. ex Fr.) Karst.	Polyporaceae	Ling zhi	Sporocarp	Tincture	RA, Bronchitis
40	Rhynchosioa volubilis Lour.	Leguminosae	Ji zai mu zhougen	Whole plant	Soup	RA, Llumbar muscle strain
41	Paederia scandens (Lour.) Merr.	Rubiaceae	Ji shi teng	Whole plant	Vinum	RA

42	Abrus cantoniensis Hance.	Leguminosae	Ji gu cao	Whole plant(execpt seed)	Decoction	RA
43	Achyranthes aspera L.	Amarantaceae	Ji cuo bi	Root or Whole plant	Decoction and drink by Liquor	RA
44	Liquidambar formosana Hance	Hamamelidaceae	Feng shu	Root, Leaf, Fruit-resin	Decoction	RA
45	Aralia chinensis L.	Araliaceae	Ci jiang mu	Root,Stem	Soup	RA, Traumatic injury
46	Zanthoxylum avicennae (Lam.)DC	Rutaceae	Ci cang gen	Root,Leaf	Decoction, soak in liquor	RA, Traumatic injury
47	Desmodium caudatum (Thunb.)DC.	Leguminosae	Mo cao	Root or Whole plant	Vinum	RA
48	Glechoma longituba(Nakai) Kupr.	Labiatae	Ruan zhi jie gu xiao	Whole plant	Drink by liquor	RA, Fracture
49	Rubus parvifolius L.	Rosaceae	Hu mu gen	Root	Alcohol extraction	Antiinflammatory, Analgesic, Insecticide
50	Podocarpus macrophyllus (Thunb.) D. Don	Podocarpaceae	Luo han song	Root,Leaf	Fire with liquor Compress	RA, Traumatic injury, Fracture
51	Salix babylonica L.	Salicaceae	Cui liu	Branch Root Bark, Fibril	Decoction	RA
52	Uraria crinite Desv.	Leguminosae	Hu li wei	Whole plant	Fumigant	Bronchitis, RA, Traumatic injury
53	Urena procumbens L.	Malvaceae	Gou jiao ji	Whole plant	Soup	RA, Traumatic injury
54	Solanum indicum L.	Solanaceae	Ci qie	Root or Whole plant	Soup	RA, Traumatic injury
55	Celastrus orbiculatus Thunb.	Celastraceae	Nan she teng	Root, Rattan	Vinum	RA, Traumatic injury
56	Oxalis corniculata L.	Oxalidaceae	Xian suan cao	Whole plant	Vinum	Traumatic injury, RA
57	Drynaria fortune (kunze)J.Smith	Polypodiaceae	Gu sui bu	Rhizome	Vinum, Decoction	Traumatic injury, Fracture, RA
58	Cymbopogon citrates (DC.)Stapf.	Gramineae	Xiang mao	Whole plant	Compress	Pain from rheumatism
59	Datura metel L.	Solanaceae	Yang jin hua	Flower, Leaf, Seed	Vinum, Soup	Chronic bronchitis, RA
60	Schefflera octophylla (Lour.) Harms	Araliaceae	Ya jiao mu	Bark,Leaf,Root	Vinum	RA, Sciatica, Traumatic injury
61	Millettia speciosa champ.	Leguminosae	Dao diao jin zhong	Root	Decoction	RA, Lumbar muscle strain, Chronic bronchitis, Traumatic injury
62	Clerodendrum fragrans Vent.	Verbenaceae	Chou mo li	Leaf, Root	Soup, Decoction	RA, Sprain and Contusion
63	Cissus modecoides Planch var. subintegra Gagnep.	Vitaceae	Feng teng tou	Root	Decoction, Compress	RA, Lumbar muscle strain
64	Morus alba L.	Moraceae	Sang bai pi	Branch	Decoction	Rheumatism edema, Joint pain
65	Clausena lansium (Lour.) Skeels.	Rutaceae	Huang shu pi	Root	Decoction	Root treat rheumatic arthritis,
66	Gymnema sylvestre(Retz.) schult.	Asclepiadaceae	Gua xue zai teng	Stem, Leaf, Root	Compress	RA, Traumatic injury
67	Desmodium pulchellum(L.) Benth	Leguminosae	Pai qian cao	Whole plant	Soup	RA
68	Hedera nepalensis K,Koch var.. sinensis (Tobl.) Rehd	Araliaceae	Chang chun teng	stem, Whole plant	Fumigant and washing	RA, Sciatica, Osteomyelitis, Traumatic injury
69	Pratia nummularia A. Brown. et Aschers.	Campanulaceae	Tong cui yu dai cao	Whole plant	Decoction	RA, Traumatic injury
70	Ranunculus sceleratus L.	Ranunculaceae	Jia qin cai	Whole plant	Decoction	RA
71	Desmos chinensis Lour.	Annonaceae	Jia yin zhua	Root, Whole plant	Decoction	RA, Traumatic injury
72	Stephania longa Lour.	Menispermaceae	Li bi teng	Whole plant	Decoction	RA, Sciatica
73	Cassia occidentalis L.	Leguminosae	Wang jiang nan	Whole plant	Decoction	RA, Traumatic injury
74	Lycopodium cernuum L.	Lycopodiaceae	Lu jiao mao	Whole plant	Decoction	RA, Traumatic injury
75	Desmodium triquetrum(L.)DC.	Leguminosae	Hu lu cha	Whole plant	Decoction	Waist pain
76	Melastoma candidum D.Don.	Melastomataceae	Yin zhi pu bi	Root, Leaf	Decoction	Migraine, RA, Traumatic injury
77	Caesalpinia minax Hance	Leguminosae	La ba ci	Root, Stem, Leaf	Decoction	RA, Traumatic injury fracture
78	Cocculus sarmenntosus (Lour.) Diels	Menispermaceae	Yi dou jin	Root	Decoction	RA, Sciatica
79	Pistia stratiotes L.	Araceae	Fan pin	Leaf	Decoction	Rheumatism Edema, RA
80	Mirabilis jalapa L.	Nyctaginaceae	Gu shou hua gen	Root, Leaf	Decoction	Acute arthritis
81	Basella rubra L.	Basellaceae	Pu ten gcai	Whole plant	Soup	RA, Fracture ,Traumatic injury
82	Berchemia lineata DC.	Rhamnaceae	Shu ru gen	Root	Soup	Traumatic injury, RA
83	Smilax china L.	Liliaceae	Hao ke ci	Rhizome	Vinum, Decoction	RA, Traumatic injury, Cancer
84	Ficus microcarpa L.f.	Moraceae	Rong shu	Root, Aerial root	Soup, Sirup	RA, Bronchitis
85	Malvastrum coromandelianum (L.) Garcke	Malvaceae	Sai kui	Whole plant	Soup	RA, Traumatic injury
86	Cinnamomum parthenoxylon (Jack) Nees.	Lauraceae	Zhang shu	Root, Stem, Leaf, Bark	Decoction	Traumatic injury, RA

Note: RA: Rheumatic Arthritis, Traumatic injury

Table 1: Medicinal plants used by Chaoshan.

Latin	Pharmacological Action	Reference
Cleome gynandra L.	Anti-inflammatory	[17-19]
Pterospermum heterophyllum Hance.	Anti-inflammatory	[20]
Eupatorium chinense L.	Anti-inflammatory	[21]
Toddalia asiatica (L.) Lam.	Anti-inflammatory, Analgesia, Antibacterial	[22,23]
Impatiens balsamina L.	Antibacterial, Analgesia	[24]
Mirabilis jalapa L.	Antibacterial	[25,26]
Waltheria americama L.	Analgesia	[27]
Smilax china L.	Anti-inflammatory, Uricotelic, Analgesia	[28-30]
Clausena lansium (Lour.) Skeels.	Anti-inflammatory, Analgesia	[31-33]
Achyranthes aspera L.	Immunomodulatory effects	[34]
Abrus cantoniensis Hance.	Immunomodulatory effects	[35]
Ranunculus sceleratus L.	Anti-inflammatory	[36]
Murraya paniculata(L.) Jack	Antibacterial, Anti-inflammatory	[37]
Caesalpinia minax Hance	Anti-inflammatory	[38,39]
Ganoderma lucidum (Leyss. ex Fr.) Karst.	Immunomodulatory effects	[40]
Ipomoea pescaprae (L.) Sweet.	Analgesic	[41]
Desmodium caudatum (Thunb.)DC.	Anti-inflammatory, Analgesia	[42]
Celastrus orbiculatus Thunb.	Anti-inflammatory	[43]
Ficus pandurata Hance.	Analgesia	[44]
Basella rubra L.	Immunomodulatory effects	[45]
Morus alba L.	Antibacterial, Immunomodulatory effects, Uricotelic	[46-48]
Saururus chinensis (Lour.) Baill	Anti-inflammatory	[49-52]
Bidens pilosa L.	Anti-inflammatory, Antibacterial	[53,54]
Smilax glabra Roxb	Anti-inflammatory	[55]
Cassia occidentalis L.	Anti-inflammatory	[56]
Gendarussa vulgaris Nees.	Anti-inflammatory	[57]
Schefflera octophylla (Lour.) Harms	Analgesia, Anti-inflammatory	[58]
Datura metel L.	Anti-inflammatory, Antifungal	[59,60]

Table 2: The pharmacological effects of herbal medicine.

B presented moderate inhibitory activities with values of IC_{50} at 59.0, 52.8, 71.2, and 53.1 μM, while the rest compounds displayed weak suppressive effect. In addition, they found Compounds dmetelins A, dmetelins D, 7α,27-dihydroxy-1-oxo-witha-2,5,24-trienolide isolated from the leaves of *Datura metel* L. (Solanaceae) also showed significant inhibitory activities on lipopolysaccharide (LPS)-induced nitric oxide (NO) production in RAW264.7 cells, and compounds dmetelins B and dmetelins C showed moderate inhibitory activities with IC_{50} values of 17.8, 11.6, 14.9, 33.3 and 28.6 μM, respectively.

Analgesia

Kariuki HN's experiment in 2013 showed, in the early phase of the formalin test, the 100 mg/kg dose showed no significant antinociceptive activity while the 200 mg/kg showed significant ($p<0.01$) antinociceptive activity. The 100 mg/kg dose showed highly significant antinociceptive activity ($p<0.001$) in the late phase of the formalin test while the 200 mg/kg dose showed no significant antinociceptive activity. A reduction in carragenin induced acute inflammation paw oedema was significant ($p<0.01$) following administration of 100 mg/kg dose but not with the 200 mg/kg dose. The study therefore lends support to the anecdotal evidence for use of *T. asiatica* in the management of painful and inflammatory conditions [23]. Oku H's results showed 1,4-naphthoquinone sodium salts, sodium 3-hydroxide-2[[sodium3-hydroxide-1,4-dioxo(2-naphthyl)]ethyl]naphthalene-1,4-dione (impatienolate) and sodium 2-hydroxide-3-(2-hydroxyethyl) naphthalene-1,4-dione (balsaminolate) isolated from the corolla of Impatiens balsamina L exhibited Significant selective cyclooxygenase-2 (COX-2) inhibitory activities [24]. Muthuraman A 's study showed that rats administered the hydroalcoholic extract of *Acorus calamus* could increase the levels of superoxide anion, total calcium and myeloperoxidase activity significantly in chronic constriction injury of sciatic nerve induced thermal, radiant, mechanical hyperalgesia and thermal, chemical, tactile allodynia. Moreover, HAE-AC attenuated chronic constriction injury induced by development of painful behavioural, biochemical and histological changes in a dose dependent manner similar to that of pregabalin serving as positive control [64]. Khunakornvichaya A found oral administration of M. alba stem extract (56 and 560 mg/kg) significantly attenuated joint pain as indicated by a significant ($p<0.05$) increase in the values of percent weight borne on the operated hind limb for the OA-induced groups that received M. alba stem extract at 56 and 560 mg/kg when compared to those of the vehicle-treated OA-induced group. Moreover, a significant improvement in the Mankin score was also observed in rats treated with 560 mg/kg M. alba stem extract, which was in agreement with its pain-relieving effect. The results showed that *M. alba* stem extract exhibited an anti-nociceptive effect as well as cartilage protection in the ACLT-induced rat model of OA47. Ma KJ found oral administration of *Desmodium caudatum* (Thunb.) DC significantly and dose-dependently inhibited the writhing responses in mice, increased reaction time in mice in the hot-plate test. Furthermore, no death was observed when mice were orally administered DCE up to 40 g/kg [42]. Khedr AI did a molecule docking with compounds 3b-acetoxy-11amethoxy-olean-12-ene, ficupanduratin A, stigmastane-3,6-dione isolated from *Ficus pandurata* that exhibited good affinity towards the CB2 receptor, with displacement values of 69.7, 62.5 and 86.5%, respectively [44]. Chen's results showed that the ethanol extract of *Schefflera octophylla* has significant dose-dependent antinociceptive activities. And its five different polar fractions especially the $CHCl_3$ fraction significantly inhibited the abdominal writhing induced by acetic acid and ear edema induced by xylene, also increased pain threshold in hot plate test in 120

min and reduced ticking times in formalin test [58]. The antinociceptive effects of the methanolic extract and two fractions obtained from aerial parts of *Ipomoea pescaprae* (L.) Sweet. exhibited considerable antinociceptive activity against two classical models of pain in mice. Methanolic extract presented a calculated ID_{50} value of 33.8 mg/kg, i.p. against writhing test and also inhibited both phases of pain (neurogenic and inflammatory) of the formalin test with ID_{50} of 37.7 and 12.5 mg/kg, i.p. for the first and second phase, respectively [41].

Uricotelic

Chen studies showed that ethyl acetate fraction from *Smilax china* L. showed a significant anti-hyperuricemic activity in hyperuricemic mice compared with petroleum ether, chloroform, n-butanol and residual ethanol fraction fractions. Caffeic acid, resveratrol, rutin and oxyresveratrol isolated from EAF showed different inhibitory activities on xanthine oxidase *in vitro*, with the IC_{50} values of 42.60, 37.53, 42.20 and 40.69 μM, respectively, and exhibited competitive or mixed inhibitory actions [28]. Different dosages of astilbin which isolated from the rhizome of *Smilax china* L. (1.25, 2.5, and 5.0 mg/kg) were administered to 10% fructose-induced hyperuricemic rats. In Chen studies, the results demonstrated that astilbin significantly decreased the serum uric acid (Sur) level by increasing the urinary uric acid (Uur) level and fractional excretion of urate (FEUA) but not inhibiting the xanthine oxidase (XOD) activity [65]. The effective substance of *Morus alba* L. could promote the excretion of uric acid through different mechanisms in rats and mice, reduce the concentration of uric acid in the body [66,67].

Immunomodulatory effects

Narayan found that PCA feed urethane primed lung tissues showed down regulated expression of pro-inflammatory cytokines IL-1β, IL-6 and TNF-α along with TFs, NF-κB and Stat3 while the expression of pro-apoptotic proteins Bax and p53 were enhanced in PCA feed urethane primed lung tissues [34]. In Rubel R's test *G. lucidum* was able to increase interferon-gamma (IFN-gamma) concentration but reduced CD3(+) and CD8(+) spleen lymphocytes. *in vivo*. *Ex-vivo*, IFN-gamma; and interleukin-10 levels were increased and the tumor necrosis factor-alpha (TNF-alpha) level was reduced by peritoneal macrophages from mice fed with *G. lucidum* [40]. An extract from *Basella rubra* (*B. rubra*) L polysaccharide in -BRP-4, can generate NO at a concentration of 10 to 100 g/mL. The phagocytic activity of macrophage was enhanced in BRP-4 treated RAW264.7 cells. BRP-4 combined with concanavalin A (Con A) provided obvious promotion and strengthening of the proliferation of the splenocytes [45]. *M. alba* L. fruit extract could stimulated the production of cytokines, nitric oxide (NO) and tumour necrosis factor-α (TNF-α) and tumoricidal properties of macrophages. MFE activated macrophages through the mitogen-activated protein kinase (MAP Kinase) and nuclear factor-κB (NF-κB) signaling pathways downstream from toll-like receptor (TLR) 4. MFE was shown to exhibit cytotoxicity of CT26 cells via the activated macrophages, even though MFE did not directly affect CT26 cells. In a xenograft mouse model, MFE significantly enhanced anti-cancer activity combined with 5-fluorouracil and markedly promoted splenocyte proliferation, natural killer (NK) cell activity, cytotoxic T lymphocyte (CTL) activity and IFN-γ production. Immunoglobulin G (IgG) antibody levels were significantly increased [46].

Discussion and Conclusion

The present investigation revealed that Chaoshan in Guangdong are using 86 plant species belonging to 82 genera in 52 families for arthritis. Most species are collected locally. In previous Chaoshan Chinese herbal medicine culture inheritance is survive on "father son" mode of inheritance. However, with the advance of the process of urbanization in the Chaoshan area, many of the older generation Chaoshan herbalist facing no successor predicament, because a new generation of Chaoshan young people unwilling to engage in grass pharmacists job. Also, the fast disappearance of traditional culture and natural resources due to urbanization and industrialization suggests that unrecorded information may be lost forever. Thus, We urgently need document systematically the medical knowledge of Chaoshan.

In relation to plant use,72 species of the plants recorded in this study were found to be used for treating rheumatic arthritis, part of them used for analgesia, anti-inflammatory. Through the analysis of the results of a search of PubMed database we obtain, reported in the literature of Chinese herbal medicine, more than half have anti-inflammatory effect and analgesic effect of the herbs in the quantity ranks the second. And the clinical treatment of arthritis the method is by non-steroidal anti-inflammatory drugs to relieve inflammation and pain of patients.

In search of the 86 Chaoshan herbs, there are 28 herbs pharmacological studies on treatment of arthritis, indicating that there are still many Chaoshan herbal undetected and research. Chaoshan area is located along the coast, because of climate and diet, the natives are more likely to suffer from arthritis, rheumatoid arthritis. In the struggle to perennial and arthritis, this kind of disease, the Chaoshan area of the ancestors left a number of therapeutic arthritis remedies and herbal knowledge. Through to these knowledges were classified and unified will of Chaoshan area of herbal medicine culture inheritance and development of therapeutic arthritis drugs have very good help.

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