



Analysis of herbal poultices for knee pain relief in hospitals in the Office of the Permanent Secretary, Ministry of Public Health, Thailand

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ABSTRACT

This qualitative research aimed to collect and analyze herbal poultices used for relieving knee pain in hospitals in the Office of the Permanent Secretary of the Ministry of Public Health, Thailand. The study was conducted through interviews with Thai traditional medicine doctors at 33 hospitals, using purposive sampling from the prototype areas designated by the Department of Thai Traditional Medicine Development. The gathered information was then analyzed and compiled to provide insights into traditional Thai medicine and the science of herbs used in these recipes. The results revealed 39 medicinal formulas consisting of 61 species from 34 families, with *Zingiber montanum* being the most common (24 formulas, 61.54%). The plant part most commonly used was the leaf (22 species), and the predominant flavor was bitter (36.67%). Two groups of formulas were identified: hot formulas, with the main component being carminative, the secondary component being muscle relaxant, and assembled component being anti-inflammatory; and cold formulas, with the main component being anti-inflammatory, the secondary component being muscle relaxant, and assembled component being carminative. These findings highlight that the components of the herbal remedies used in most knee poultice formulas in hospitals are largely consistent with previous studies, which have demonstrated anti-inflammatory properties and pain relief effects. Further in-depth studies should be conducted to investigate their effectiveness in relieving knee pain.

Keywords: Formula, Herbal poultice, Knee pain, Hospital

Introduction

Currently, various drugs are used to treat knee pain and inflammation, including acetaminophen and non-steroidal anti-inflammatory drugs (NSAIDs). Narcotic pain relievers, including intra-knee administration, are also utilized. Additionally, the use of analgesics targeting specific pathways in osteoarthritis has been studied and is increasing. Examples of these drugs include glucosamine sulfate, chondroitin sulfate, and diacerein. Surgery is considered when medication is ineffective or unable to adequately treat the condition. This may be due to persistent pain, significant joint damage or deformity, or complications such as bone collapse. Several surgical treatments are available, each with specific indications. These include arthroscopic procedures to remove foreign bodies and improve joint condition, bone trimming and realignment to correct deformities, and joint replacement surgery.¹

The problem with modern medical treatments is that patients often experience side effects, such as ulcers in the gastrointestinal tract from taking anti-inflammatory drugs, gastrointestinal bleeding, addiction to antidepressants, and overuse of medications.² In response to this issue, the concept of integrative medicine has been introduced to provide patient care, aiming to minimize the introduction of chemicals into the body while upholding the principles of holistic care.³

Thai traditional medicine has also begun to address issues for patients with osteoarthritis, focusing on pain reduction and empowering patients to take part in their own care. This approach helps alleviate the burden on caregivers and reduce costs associated with medication and surgery. Various traditional Thai medical methods are available for managing osteoarthritis, including massage, compresses, and poultices.⁴ Many studies confirm the effectiveness of knee wraps. A study on the efficacy of knee poultices for pain relief in patients with osteoarthritis, using a 15-minute herbal poultice in 36 patients, found that knee pain levels, stiffness, and walking time were significantly reduced compared to before the trial. Additionally, knee joint operability showed a statistically significant improvement at 0.001.⁵ The effectiveness of herbal poultices for osteoarthritis pain was also examined in a study involving 37 patients. The results showed that a 20-minute herbal poultice significantly reduced osteoarthritis pain in elderly patients, with statistical significance at 0.001.⁶ Based on this information, the researcher recognized the importance of studying herbal knee poultices used in hospitals in the Ministry of Public Health as a basis for further investigation. This qualitative research aimed to collect and analyze data on herbal poultices for knee pain relief in hospitals in the Office of the Permanent Secretary of the Ministry of Public Health, Thailand. The research contributes to the growing body of knowledge on traditional medicine by providing insights into the practical applications of herbal poultices within Thailand's healthcare system. The novelty of this study lies in its qualitative approach to understanding the integration of traditional therapies in hospital settings, addressing gaps in existing literature.

Materials and Methods

Research design

This qualitative research aimed to collect and analyze herbal poultices for knee pain relief in hospitals in the Office of the Permanent Secretary

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of the Ministry of Public Health. This protocol was approved by the institutional review boards of Kanchanabhisek Institute of Medical and Public Health Technology, Faculty of Public Health and Allied Health Sciences Praboromarajchanok Institute. The license number is KMPHT-65010011.

Population and Sample group

The sample consisted of 33 Thai traditional medicine doctors affiliated with hospitals in the Office of the Permanent Secretary of the Ministry of Public Health, Thailand. They were selected through purposive sampling from prototype areas of the Department of Thai Traditional and Alternative Medicine and agreed to provide information during the interview.

Research Instrument

This survey involves interviews and consists of the following questions:

1. Pharmacopoeial formulations; 2. the method of substance extraction, including the extraction process and extract obtained; and 3. the method of utilization

Validity

Content validity was assessed by 3 experts:

1. Assistant Professor Dr. Benjawan Poonthananiwatkul, Pharmacist, affiliated with the Kanchanabhisek Institute of Medical and Public Health Technology
2. Assistant Professor Dr. Kittiporn Nawsuan, Public Health Specialist, affiliated with the Boromarajonani College of Nursing, Songkhla.
3. Miss Patama Chantarapon, Traditional Thai Medicine Practitioner, affiliated with the Songkhla Provincial Public Health Office.

The results were analyzed, and an index of Item-Objective Congruence (IOC) value of 0.69 was obtained.

Research methods and Data Collection

The study defined and coordinated secondary facilities for knee joint treatment using herbal poultices and conducted interviews on Thai Traditional Medicine recipes, focusing on extraction methods and applications. The study also verified the accuracy and completeness of the collected data. It identified and documented the scientific names, family names, and flavours of the herbal medicines.

Data Analysis

1. Analyzed the components of the formulation, including the medicinal plant family, parts of plants used, taste of herbal medicine, and frequency of herbs used in recipes.⁷
2. Classified the formulations into hot and cold groups based on their pharmacological actions.⁸
3. Categorized drug groups according to traditional pharmaceutical principles by identifying primary drugs, secondary drugs, and accompanying drugs.⁹

Results and Discussion

Ingredients in the Pharmacopoeia

According to a survey of 33 hospitals, 39 formulations were provided to patients, comprising 83 types of herbal knee poultice formulations. These formulations were classified into three categories: herbs, starches, and liquids used in mixing/extraction. Among these, 68 types of herbs were identified, consisting of 61 plant species (73.50%), 1 animal material (1.20%), 6 mineral elements (7.23%), and 5 types of flour, namely rice flour, betel nut flour, wheat flour, and brown rice powder (6.02%). Additionally, there were 11 types of liquids, including alcohol, liquor, red lime, Plai oil, ginger oil, sesame oil, chili oil, coconut oil, and Vaseline (13.25%). The poultice is effective when the medication is in contact with the skin for a period of time, so a binding agent is used to make the medication adhere to the skin more effectively. This aligns with a study by Aumpol Bunpean, who developed a knee poultice slime for patients with knee pain at Ratchaphiphat Hospital, Bang Khae District, Bangkok. The formulation includes a slime, infused with oil to extract the essence, and a mixture

of clear water glue and rice flour to form the slime for better adherence to the skin.¹⁰

Family of medicinal plants

From the 61 medicinal plants, a total of 34 families were identified. The top three most common families are Zingiberaceae, with 9 species (15.00%), followed by Euphorbiaceae and Acanthaceae, each with 6 species (8.33%), indicating that Zingiberaceae is a readily available plant in Thailand, mostly used as spices or herbs, thus promoting widespread adoption. This finding is consistent with the study conducted by Korkanok.¹¹ A survey of medicinal plants used by the Karen people at Huay Nak Village and Nong Ta Dang Dog House, Tanao Si Subdistrict, Suan Phueng District, Ratchaburi Province, revealed that the most frequently used herb belongs to the Zingiberaceae family.

Parts of medicinal plants used

The various parts of the 61 medicinal plants were utilized in different ways, with 9 components being identified. The most commonly used were leaf parts, found in 22 species (36.07%), followed by rhizome tubers in 12 species (19.67%) and the whole plant in 10 species (16.39%). Leaves typically absorb water and minerals from the soil, transferring them to various parts of the plant, while roots serve as a reservoir of nutrients. This finding is consistent with research by Suntree Chintham et al., who studied the diversity of medicinal plants and local wisdom through community participation in the Ban Dong Bang area of Dongchileik Muang District, Prachinburi Province. Their research revealed that the most common medicinal uses from herbs were derived from leaves and shoots.¹² In line with Oratai Neamsuvan's research, Patcharawalai et al. surveyed medicinal plants used for nourishment from the Ban Thung Sung Community Forest, Ao Luek District, Krabi Province, and found that the most commonly used part is the underground portion.¹³ When considering the botanical families of medicinal plants, the Zingiberaceae family was the most prevalent. Hendrikus Julung's study on this family indicated that rhizomes were the most commonly used plant part, particularly among ginger species.¹⁴

Flavor of herbal medicine

When classified according to the 10 medicinal flavors, the three most common flavors are bitter, found in 22 species (36.07%), followed by spicy, present in 19 species (31.15%), and tasteless, identified in 9 species (14.75%). It is explained that the bitter taste in traditional Thai medicine stimulates more phlegm and reduces the functioning of the pitta system, thereby reducing inflammation from knee pain. The hot taste helps to effectively calm the wind, making it ideal for stimulating blood circulation around the knee joint. This finding is consistent with the research of Thanatchaporn Nutmakul, who conducted a study on the taste of drugs affecting the classification of medicines. The classification analysis revealed that in the corrective drug group, the highest proportion of drugs had a bitter taste, followed by tasteless and spicy drugs. Regarding challenging recipes, the group of fragrant medicines and carminative drugs has the largest proportion of spicy medicines, followed by bitter ones.¹⁵

Frequency of use of herbs in recipes

Among the 39 pharmacopoeial formulations, Plai was the most frequently used ingredient, appearing in 24 recipes (61.54%), followed by ginger and Climbing Lily, each found in 14 recipes (38.89%). Borneol was also commonly used, appearing in 10 recipes (25.64%), while duck eggs were used in only one recipe (2.56%). Regarding the starches, rice flour was the most frequently used, included in 12 recipes (30.77%), followed by betel nut flour, which was found in 9 recipes (25.08%). For the liquids used in mixing or extraction, alcohol was the most prevalent, included in 20 recipes (51.28%), followed by lime water in 14 recipes (35.90%) and Plai oil in 10 recipes (25.64%). Plai is known to contain (E)-4-(3,4-dimethoxyphenyl) but-3-en-1-ol, which exhibits anti-inflammatory effects.¹⁶ Ginger contains Zingerone, which has anti-inflammatory effects and helps prevent cartilage breakdown.¹⁷ and Climbing Lily

Table 1 : Family names, scientific names/name, parts used, medicinal flavors and number of recipes used in herbal knee poultice formulation ingredients

	family names	scientific name/name	parts used	medicinal flavors	number of recipes
1	Acanthaceae	<i>Acanthus ebracteatus Vahl</i>	leaf	salty	1
2	Acanthaceae	<i>Andrographis paniculata (Burm.f.) Nees</i>	leaf	bitter	5
3	Acanthaceae	<i>Clinacanthus nutans (burm.f.) Lindau</i>	leaf	Inspid	2
4	Acanthaceae	<i>Barleria lupuina Lindl.</i>	leaf	Inspid	1
5	Acanthaceae	<i>Gendarussa vulgaris Nees.</i>	leaf	Inspid	2
6	Acanthaceae	<i>Justicia gendarussa Linn</i>	leaf	Inspid	1
7	Acoraceae	<i>Acorus calamus L.</i>	tuber-rhizome	acrimonious	1
8	Amaryllidaceae	<i>Crinum asiaticum L.</i>	leaf	drunken herbs	6
9	Apocynaceae-Periplocoideae	<i>Cryptolepis dubia (burm.f.) M.R.Almeida</i>	vine	bitter	1
10	Asphodelaceae (Liliaceae)	<i>Aloe vera (L.) Burm.f.</i>	sap	bitter	1
11	Asteraceae	<i>Blumea balsamifera (L.) DC.</i>	leaf	Cool scent	1
12	Asteraceae	<i>Elephantopus scaber L.</i>	Whole tree	Inspid	1
13	Boraginaceae	<i>Heliotropium indicum L.</i>	Whole tree	Inspid	1
14	Capparaceae	<i>Capparis micracantha DC.</i>	root	bitter	3
15	Cleomaceae	<i>Cleome viscosa L.</i>	leaf	hot	6
16	Colchicaceae (Liliaceae)	<i>Gloriosa superba L.</i>	tuber-rhizome	acrimonious	14
17	Costaceae	<i>Costus speciosus (Koen.) Sm.</i>	tuber-rhizome	Inspid	2
18	Cucurbitaceae	<i>Coccinia grandis (L.) Voigt</i>	leaf	Inspid	1
19		<i>Gymnopetalum scabrum (Low.) W.J. de Wilde & Duyfges</i>	vine	bitter	1
20	Euphorbiaceae	<i>Bridelia ovata Decne.</i>	leaf	bitter	1
21	Euphorbiaceae	<i>Putranjiva roxburghii Wall.</i>	leaf	bitter	1
22	Euphorbiaceae	<i>Euphorbia hirta L.</i>	Whole tree	bitter	1
23	Euphorbiaceae	<i>Phyllanthus amarus Schumach & Thonn.</i>	Trunk and root	bitter	1
24	Euphorbiaceae	<i>Phyllanthus urinaria L.</i>	Whole tree	bitter	1
25	Labiatae	<i>Clerodendrum petasites (Lour.) S. Moore</i>	root	bitter	3
26	Leguminosae-Caesalpinioideae	<i>Acacia concinna (Willd.) DC.</i>	leaf	sour	4
27	Leguminosae-Caesalpinioideae	<i>Senna siamea (Lam.) H.S. Irwin & Barneby</i>	leaf	bitter	1
28	Leguminosae-Caesalpinioideae	<i>Tamarindus indica L.</i>	leaf	sour	3
29	Leguminosae-Papilionoideae	<i>Sophora tomentosa L.</i>	Fruit	bitter	1
30	Malvaceae	<i>Sida acuta Burm.f.</i>	Whole tree	Cool scent	1
31	Meliaceae	<i>Azadirachta indica A. Juss. var. siamensis Valeton</i>	leaf	bitter	1
32	Menispermaceae	<i>Tiliacora triandra (Colebr.) Diels</i>	leaf	bitter	4
33	Menispermaceae	<i>Tinospora crispa (L.) Miers ex Hook.f. & Thomson</i>	vine	bitter	2
34	Moringaceae	<i>Moringa oleifera Lam.</i>	leaf	bitter	1
35	Moraceae	<i>Ficus racemose L.</i>	root	bitter	3
36	Myrtaceae	<i>Syzygium aromaticum (L.) Merr. & L.M.Perry</i>	blossom	acrimonious	1
37	Meliaceae	<i>Azadirachta indica A. Juss. var. siamensis Valeton</i>	leaf	bitter	1
38	Pandanaceae	<i>Pandanus amaryllifolius Roxb.</i>	leaf	Cool scent	1
39	Papilionaceae	<i>Derris scandens (Roxb.) Benth.</i>	vine	drunken herbs	1
40	Piperaceae	<i>Piper retrofractum Vahl</i>	blossom	acrimonious	6
41	Piperaceae	<i>Piper nigrum L.</i>	Fruit	acrimonious	4
42	Piperaceae	<i>Piper betle L.</i>	leaf	acrimonious	2
43	Plumbaginaceae	<i>Plumbago indica L.</i>	root	acrimonious	3
44	Poaceae	<i>Cymbopogon citratus (DC.) Stapf.</i>	leaf, stem	acrimonious	2
45	Poaceae	<i>Cynodon dactylon (L.) Pers.</i>	Whole tree	bitter	1
46	Polygonaceae	<i>Muchlenbeckia platyclada Meissn</i>	Whole tree	drunken herbs	1
47	Rubiaceae	<i>Gardenia jasminoides Ellis</i>	Fruit	Sweet	2
48	Rutaceae	<i>Citrus x aurantiifolia (Christm.) Swingle</i>	leaf	sour	1
49	Rutaceae	<i>Citrus hystrix DC.</i>	Skin of fruit	acrimonious	7
50	Simaroubaceae	<i>Harrisonia perforate (Blanco) Merr.</i>	root	bitter	3

Table 1 : Family names, scientific names/name, parts used, medicinal flavors and number of recipes used in herbal knee poultice formulation ingredients (Cont.)

	family names	scientific name/name	parts used	medicinal flavors	number of recipes
51	Solanaceae	<i>Solanum nigrum L.</i>	Whole tree	bitter	1
52	Umbelliferae	<i>Centella asiatica (L.) Urb.</i>	Whole tree	bitter	4
53	Vitaceae	<i>Ampelocissus martini Planch.</i>	Whole tree	sour	1
54	Zingiberaceae	<i>Alpinia galanga (L.) Willd.</i>	tuber-rhizome	acrimonious	6
55	Zingiberaceae	<i>Curcuma aromatica Salisb.</i>	tuber-rhizome	acrimonious	3
56	Zingiberaceae	<i>Curcuma longa L.</i>	tuber-rhizome	acrimonious	8
57	Zingiberaceae	<i>Curcuma sp.</i>	tuber-rhizome	acrimonious	2
58	Zingiberaceae	<i>Curcuma sp.</i>	tuber-rhizome	acrimonious	4
59	Zingiberaceae	<i>Zingiber montanum (J.Konig) Link ex A. Dietr</i>	tuber-rhizome	acrimonious	24
60	Zingiberaceae	<i>Zingiber officinale Roscoe</i>	tuber-rhizome	acrimonious	14
61	Zingiberaceae	<i>Zingiber ottensii Valetton</i>	tuber-rhizome	acrimonious	1
62	Zingiberaceae	<i>Zingiber zerumbet (L.) Sm.</i>	tuber-rhizome	acrimonious	3
63	-	Marly limestone	-	-	13
64	-	Borneol camphor	-	-	10
65	-	Camphor	-	-	17
66	-	Menthol	-	-	6
67	-	Sea salt, Rock salt	-	-	1
68	-	Clay soil	-	-	1
69	-	Anas platyrhynchos	Egg	-	1
70	-	Rice flour	-	-	12
71	-	Glutinous rice flour	-	-	9
72	-	Wheat flour	-	-	1
73	-	Polished rice powder	-	-	1
74	-	Alcohol 70%	-	-	20
75	-	water	-	-	2
76	-	Clear lime solution	-	-	14
77	-	Plai oil	-	-	10
78	-	Ginger oil	-	-	5
79	-	Pepper oil	-	-	5
80	-	Sesame oil	-	-	1
81	-	Coconut oil	-	-	1
82	-	Petrolatum	-	-	1

contains the substance Colchicine, which also has an anti-inflammatory effect.¹⁸ These findings align with traditional Thai medicine, where Plai is used in as many as 267 formulations.¹⁹

1. From a collection of 39 pharmacopoeia formulations, there are 61 types of medicinal plants. These plants can be used to identify a total of 34 families (Table 1).

2. Classification of herbal medicines

Considering the composition of herbs in each recipe, it has been found that the pharmacopoeia can be divided into 2 main groups: 31 hot formulations and 8 cold formulations. This classification takes into account the main drug, secondary drug, and accompanying drug according to Thai traditional pharmaceutical principles.

The application of hot knee poultices may involve the use of herbs that are considered to be hot and possessing carminative properties, which aid in the movement of wind in the knee joint (e.g., *Zingiber montanum* (J.Konig) Link ex A. Dietr, Camphor, *Zingiber officinale* Roscoe,

Gloriosa superba L., *Curcuma longa* L., Borneol camphor, *Piper retrofractum* Vahl, *Alpinia galanga* (L.) Willd., Menthol, etc.) and medicines that help reduce muscle stiffness (e.g., *Citrus hystrix* DC., *Citrus x aurantiifolia* (Christm.) Swingle, *Acacia concinna* (Willd.) DC., *Tamarindus indica* L., *Cryptolepis dubia* (burm.f.) M.R.Almeida, *Derris scandens* (Roxb.) Benth., etc.) The accompanying drugs, known for their bitter and cold taste, possess properties that can reduce inflammation, such as *Cleome viscosa* L., *Crinum asiaticum* L., *Andrographis paniculata* (Burm.f.) Nees, *Tinospora crispa* (L.) Miers ex Hook.f. & Thomson, *Centella asiatica* (L.) Urb., *Tiliacora triandra* (Colebr.) Diels, *Cynodon dactylon* (L.) Pers. and *Clinacanthus nutans* (burm.f.) Lindauy, etc. These herbs are typically extracted using alcohol or other reagents and then mixed with substances to adhere to rice flour. Consideration should be given to choosing ingredients that are locally available or easily accessible (Table 2).

Table 2 Classification of medicines in hot medicine formulas

Category	Properties	Herbal (number of recipes)
Direct medicine	Carminative	<i>Zingiber montanum</i> (J.Konig) Link ex A. Dietr (22), <i>Camphor</i> (17), <i>Zingiber officinale</i> Roscoe (14), <i>Gloriosa superba</i> L. (14), <i>Borneol camphor</i> (8), <i>Curcuma longa</i> L. (7), <i>Piper retrofractum</i> Vahl (6), <i>Alpinia galanga</i> (6), <i>Menthol</i> (6), <i>Piper nigrum</i> L. (4), <i>Curcuma sp.</i> (3), <i>Curcuma aromatica</i> (3), <i>Plumbago indica</i> L. (3), <i>Zingiber zerumbet</i> (L.) Sm. (3), <i>Curcuma sp.</i> (2), <i>Cymbopogon citratus</i> (DC.) Stapf. (2), <i>Piper betle</i> L. (1), <i>Acorus calamus</i> L. (1), <i>Syzygium aromaticum</i> (L.) Merr. & L.M.Perry (1), <i>Zingiber ottensii</i> Valeton (1), <i>Gendarussa vulgaris</i> Nees. (1)
Medicine helps	reduce muscle stiffness	<i>Citrus hystrix</i> DC. (6), <i>Acacia concinna</i> (Willd.) DC. (3), <i>Tamarindus indica</i> L. (2), <i>Citrus x aurantiifolia</i> (Christm.) Swingle (1), <i>Cryptolepis dubia</i> (burm.f.) M.R.Almeida (1), <i>Derris scandens</i> (Roxb.) Benth. (1), <i>Acanthus ebracteatus</i> Vahl (1), <i>Elephantopus scaber</i> L. (1), <i>Sida acuta</i> Burm.f. (1), <i>Salt</i> (1)
Compound medicine	anti-inflammation	<i>Cleome viscosa</i> L. (5), <i>Crinum asiaticum</i> L. (5), <i>Andrographis paniculata</i> (Burm.f.) Nees (2), <i>Tinospora crispa</i> (L.) Miers ex Hook.f. & Thomson (2), <i>Centella asiatica</i> (L.) Urb. (2), <i>Tiliacora triandra</i> (Colebr.) Diels (2), <i>Cynodon dactylon</i> (L.) Pers. (1), <i>Barleria lupulina</i> Lindl. (1), <i>Clinacanthus nutans</i> (burm.f.) Lindau (1), <i>Heliotropium indicum</i> L. (1), <i>Costus speciosus</i> (Koen.) Sm. (1), <i>Bridelia ovata</i> Decne. (1), <i>Putranjiva roxburghii</i> Wall. (1), <i>Sophora tomentosa</i> L. (1), <i>Aloe vera</i> (L.) Burm.f. (1), <i>Pandanus amaryllifolius</i> Roxb. (1), <i>Azadirachta indica</i> A. Juss. var. <i>siamensis</i> Valeton (1), <i>Gardenia jasminoides</i> Ellis (1), <i>Senna siamea</i> (Lam.) H.S. Irwin & Barneby (1), <i>Anas platyrhynchos</i> (egg) (1)
Substances used for extraction		Alcohol 70% (14), Clear lime solution (13), Plai oil (10), Ginger oil (6), Sesame oil (5), Pepper oil (1), Coconut oil (1), water (1)
Adhesion aids		Rice flour (12), Glutinous rice flour (9), Marly limestone (8), Petrolatum (1), Clay soil (1)

Table 3 Classification of medicines in cold medicine formulas

Category	Properties	Herbal (number of recipes)
Direct medicine	anti-inflammation	<i>Tiliacora triandra</i> (Colebr.) Diels (4), <i>Harrisonia perforate</i> (Blanco) Merr. (3), <i>Clerodendrum petasites</i> (Lour.) S. Moore (3), <i>Ficus racemose</i> L. (3), <i>Capparis micracantha</i> DC. (3), <i>Andrographis paniculata</i> (Burm.f.) Nees (3), <i>Centella asiatica</i> (L.) Urb. (2), <i>Crinum asiaticum</i> L. (1), <i>Clinacanthus nutans</i> (burm.f.) Lindau (1), <i>Costus speciosus</i> (Koen.) Sm. (1), <i>Gymnopetalum scabrum</i> (Lour.) W.J. de Wilde & Duyfges (1), <i>Solanum nigrum</i> L. (1), <i>Coccinia grandis</i> (L.) Voigt (1), <i>Gardenia jasminoides</i> Ellis (1), <i>Cleome viscosa</i> L. (1), <i>Phyllanthus amarus</i> Schumach & Thonn. (1), <i>Muchlenbeckia platyclada</i> Meissn (1), <i>Euphorbia hirta</i> L. (1), <i>Phyllanthus urinaria</i> L. (1),
Medicine helps	reduce muscle stiffness	<i>Citrus hystrix</i> DC. (1), <i>Tamarindus indica</i> L. (1), <i>Acacia concinna</i> (Willd.) DC. (1)
Compound medicine	Carminative	<i>Zingiber montanum</i> (J.Konig) Link ex A. Dietr (2), <i>Borneol camphor</i> (2), <i>Curcuma sp.</i> (1), <i>Piper betle</i> L. (1), <i>Justicia gendarussa</i> Linn (1), <i>Gendarussa vulgaris</i> Nees. (1), <i>Curcuma longa</i> L. (1), <i>Blumea balsamifera</i> (L.) DC. (1), <i>Moringa oleifera</i> Lam. (1)
Substances used for extraction		Alcohol 70% (6), Water (1), Clear lime solution (1),
Adhesion aids		Marly limestone (5), Rice flour (1), Polished rice powder (1), Wheat flour (1)

These herbs are typically extracted using alcohol. To prepare the poultice, these extracts are mixed with substances like marly limestone, rice flour, polished rice powder, or wheat flour which aid adhesion (Table 3).

Knee poultices with very hot taste are not suitable for patients with knee pain who have inflammatory conditions. However, for patients with chronic knee pain, a hot-tasting knee poultice is needed to stimulate blood circulation in the knee joint. This aligns with the principles of Thai traditional medicine, which distinguish knee pain diseases as knee pain syndrome, characterized by severe pain, swelling, redness, and heat in the knee, and dry knee syndrome, characterized by knee pain, slight swelling, a little redness, and rustling knees.²⁰ This finding supports the study by Papada Nadee, Achida Jaruchotikamol, and Benjamart Cushnie, which reported that *Tiliacora triandra* (Colebr.) Diels contains a high concentration of phenolic compounds with strong antioxidant properties, effectively alleviating inflammatory processes.²¹

Conclusions

The study identified 61 plant species used in 39 formulations, with Zingiberaceae being the most common. Hot and cold knee poultices effectively treat pain by stimulating circulation or reducing inflammation. Alcohol was the primary extraction medium, improving adhesion and efficacy.

Conflict-of-Interest Disclosure

The authors declare no conflict of interest.

Authors' Declaration

The authors hereby declare that the work presented in this article is original and that any liability for claims relating to the content of this article will be borne by them.

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