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Medicinal botanicals in the osteoarthritis treatment and management in traditional Vietnamese medicine

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Abstract
Osteoarthritis, a major public health problem, is increasing in prevalence worldwide. This research attempted to encompass valuable knowledge on using main herbs in treatment of osteoarthritis in Traditional Vietnamese Medicine. As a result, we reported 42 species which can be used as alternative therapies and among of them, 32 species used via oral administration and 10 species via external use. Summaries of their pharmacological properties are discussed. As future perspectives, the authors of this work encourage new studies on efficacy and practical application of herbs in treatment of osteoarthritis being future trends and hope that these results may shed light on insight science information of anti- osteoarthritis herbal resources for who are interested in the related field of the anti-osteoarthritis drug development from herbal medicines.

Keywords: herbal medicine, osteoarthritis, treatment, rheumatism

1. Introduction
Osteoarthritis (OA) is identified as a disorder of synovial joints featured by the degeneration of articular cartilage, new bone formation at the joint margins, variable degrees of mild synovitis and, in chronic cases, narrowing of the joint space and changes in the subchondral bone [1]. The OA has become a well-known clinical morbidity which affects life quality and health care activities, especially in elderly patients [2]. Applying Western medicine in management of the OA had been considered to be effective therapy, but it was associated with serious complications, such as bleeding and perforating gastric ulcers induced by using non-steroidal anti-inflammatory drugs and increased risk of cardiovascular disease such as myocardial infarction attributed to using Cyclooxygenase-2 (COX-2) inhibitors [3-5]. So, the use of complementary and alternative therapies for the treatment of osteoarthritis is recommended. This study aims to introduce and display knowledge on natural herbal medicines used commonly in the control and management of osteoarthritis in Traditional Vietnamese Medicine.

2. Materials and Methodology
The study was conducted in provinces located in Northern Vietnam. The interviews were carried out from October 2017 to September 2018. A total of 480 people were interviewed belonging to high-density ethnic minorities areas: Tay-Nung people in the Cao Bang; Tai people in the Tuyen Quang; H'Mong people in the Yen Bai; Muong people in Hoa Binh; Trai-San Diu people in Thai Nguyen; San Chay people in Bac Kan. The information was gathered through unstructured interviews and semi-structured with questionnaires regarding the local knowledge on utilization of botanicals in the treatment of osteoarthritis. At first, open interviews were performed, in which people were interviewed through informal conversation in order to get a list medicinal species and natural remedies used in the past. Then, semi-structured interviews were performed to get specific quantitative and qualitative information. A written questionnaire was used to record individual information concerning name, age, gender, address, level of education along with place and date of interview.
The parameters, medicinal properties, including the vernacular name, the consumed plant parts, the frequency of use, the attributed medicinal properties, the treatment efficacy and the methods of preparation were mentioned by the informants, which used to determine the plant importance in the local. The collected plants were determined using "An Illustrated Flora of Vietnam" [6]. Scientific names of the plant species were determined according to the Plant List (The Plant List, 2013) (http://www.theplantlist.org). Vernacular plant were confirmed and compared with the previously published data from Vietnam. The data were processed by basic mathematic method in micro-soft excel.

3. Results and discussions
3.1 General data on medicinal species
A total of 38 herbal medicinal species belonging to 29 families gibing efficacy for the treatment of osteoarthritis were recorded from our survey and described in Table 1, arrange in an alphabetic order for families. Among of them, 32 species are used via oral administration and 10 species via external use. The most frequently used families are Araliaceae (3 species) and Moraceae (4 species). The remaining families are represented by 1 or 2 species.

3.2 Plants parts used and route of administration

Whole plant represents the most used plant part (27.9 %), followed by roots (23.2%), stems (18.6 %), Rhizome (16.3 %), fruits and seeds (4.7 %), leaves and oil (2.3%), respectively (Fig. 1). The use of whole plant, root and stems for medicinal purposes is preferred which affects the survival of the plant. Suitable using methods are necessary because root and stems are not sustainable for development of traditional medicine [7]. Decoction was the most frequently quoted mode of preparation.

Table 1: Checklist of herbs for the management of diabetes osteoarthritis in traditional Vietnamese medicine

No	Family name	Latin name	Vietnamese name	Used parts
		I. Oral administration		
1	Amaranthaceae	*Achyranthes aspera*	Cỏ xước	Whole plant
2	Amaranthaceae	*Achyranthes bidentata*	Ngưu tất	Root
3	Apiaceae	*Angelica acutiloba*	Đương quy	Root
4	Araliaceae	*Polyscias fruticosa*	Đinh lăng	Whole plant
5	Araliaceae	*Aralia armata* Seem	Đơn châu chấu	Root
6	Araliaceae	*Eleutherococcus trifoliatus* L.	Ngũ gia bì gai	Whole plant
7	Araliaceae	*Schefflera heptaphylla* L.	Ngũ gia bì chân chim	Whole plant
8	Araceae	*Lasia spinosa* L.	Sơn thục gai	Rhizome
9	Araceae	*Homalomena occulta*	Thiên niên kiện	Rhizome
10	Asparagaceae	*Ophiopogon reptans* Hook.f.	Cao cẳng	Root, stem
11	Asteraceae	*Sigesbeckia orientalis*	Hy thiêm	Whole plant
12	Boraginaceae	*Heliotropium indicum* L.	Vòi voi	Whole plant
13	Dicksoniaceae	*Cibotium barometz*	Cẩu tích	Rhizome
14	Dioscoreaceae	*Dioscorea tokoro*	Tỳ giải Việt Nam	Root
15	Fabaceae	*Mimosa pudica* L.	Xấu hổ, trinh nữ	Whole plant
16	Fabaceae	*Milletia reticulate* Benth	Kê huyết đằng	Stem
17	Lamiaceae	*Clerodendrum cyrtophyllum*	Đại thanh, bọ mẩy	Root
18	Lauraceae	*Cinnamomum*	Quế	Stem
19	Menispermaceae	*Tinospora sinensis*	Dây đau xương	Stem
20	Moraceae	*Morus alba* L.	Dâu tằm	Stem
21	Moraceae	*Ficus pumila* L.	Trâu cổ	Fruit
22	Moraceae	*Artocarpus tonkinensis*	Chay	Root
23	Piperaceae	*Piper sarmentosum*	Lá lốt	Whole plant
24	Polypodiaceae	*Drynaria fortunei*	Cốt toái bổ	Rhizome
25	Polygonaceae	*Fallopia multiflora*	Hà thủ ô đỏ	Root
26	Polygonaceae	*Reynoutria japonica*	Cốt khí củ	Root
27	Rhamnaceae	*Berchemia lineata* L.	Rung rúc	Whole plant
28	Rubiaceae	*Morinda umbellate L.*	Mặt quỷ	Whole plant
29	Schisandraceae	*Kadsura coccinea*	Na rừng	Stem
30	Smilacaceae	*Smilax glabra*	Khúc khắc	Rhizome
31	Solanaceae	*Solanum procumbens*	Cà gai leo	Whole plant
32	Vitidaceae	*Leea rubra* Blume	Gối hạc	Whole plant
		II. External use		
33	Asparagaceae	*Dracaena cochinchinensis*	Huyết giác	Stem
34	Cucurbitaceae	*Momordica cochinchinensis*	Hạt gấc	Seed
35	Euphorbiaceae	*Euphorbia antiquorum* L.	Xương rồng ba cạnh	Stem
36	Lauraceae	*Cinnamomum camphora* L.	Long não	Oil
37	Llliciaceae	*Lllicium verum*	Đại hồi	Fruit
38	Loganiaceae	*Strychnos nux-vomica* L.	Mã tiền	Seed
39	Zingiberaceae	*Kaempferia galangal* L.	Địa liền	Rhizome
40	Zingiberaceae	*Zingiber officinale*	Gừng	Rhizome
41	Rutaceae	*Micromelum falcatum*	Kim sương	Root
42	Vitidaceae	*Cissus modeccoides*	Cây chìa vôi	Leaves

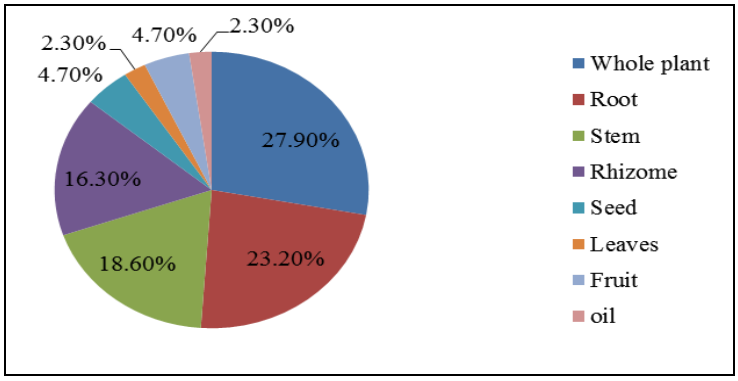

Fig 1: Plant parts used for their medicinal properties (Percentage)

3.3 Herbal medicines mostly used in good control and management of osteoarthritis

Also according to survey results, we recorded that among possible anti-osteoarthritis herbs, there are seven herbs (*Tinospora sinensis*, *Homalomena occulta*, *Achyranthes aspera*, *Piper sarmentosum*, *Smilax glabra*, *Cibotium barometz*, *Drynaria fortunei*), which are consumed commonly in Vietnam traditional medicine (Fig.2).

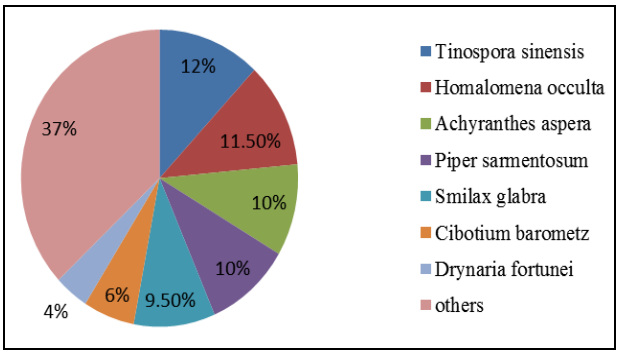

Fig 2: Percentage of herbal medicine consumed for management of osteoarthritis

Cibotium barometz is known and used mostly wide to treat osteoarthritis in Vietnam folk medicine and is found in mountainous and forest regions. According to the theory of Traditional Vietnamese Medicine, this herb can strengthen bones and muscles, and its rhizomes are widely used in the treatment of lumbago, limbache, rheumatism, and sciatia. Many studies reported that *Cibotium barometz* exhibits anti-osteoarthritis effect. Concomitant oral administration of *barometz* extract in bone loss rat model induced by ovariectomy exhibited significantly preventive efficacy [8]. Administration of C. *barometz* extract significantly increased bone mineral content and bone mineral density, and prevented damage of the trabecular bone in ovariectomized rats [9].

Drynaria fortunei is widely consumed in Traditional Vietnam Medicine to treat Lumbago, neck shoulder pain, coxalgia and rheumatism. It was used to treat osteoporosis and bone metabolic disorders [10]. Small polar fraction of *D. fortune* exhibited preventive efficacy of bone loss in ovarietomized rats [11]. Administration of *D. fortunei* enhanced the bone strength, and increased bone mineral content and trabecular bone amounts in ovariectomized rats [12].

Smilax glabra is considered well herb in the treatment of rheumatoid arthritis in indigenous medicine. Administration of *S. glabra* extract exhibited significant prevention of rheumatoid arthritis and anti-inflammatory effect in carrageenan-induced paw edema model [13]. The studies on anti-rheumatoid arthritis effect of other herbs are not found.

3.4 Combination of medicinal plants

When herbs were used together, strong synergistic effect was stated by osteoarthritis patients. Combining formula of herbs depends on type of osteoarthritis. Some plant combinations showed in Table 2. Maceration are allowed to steep in alcohol over a period of time, usually 6 weeks under the room temperature, but some could be used after two weeks under sun condition or incubated in high temperature room. Herb materials can be crushed or without. Liquid drug will be extracted and spray on skin in which there is osteoarthritis zone two to three times per day. Combining both oral administration and external use increases efficacy and shortens the duration of treatment.

Table 2: List of plant combinations used

Scientific name (parts used)	Preparation method	Medicinal use
Fallopia multiflora + *Morus alba* L. + *Achyranthes aspera* + *Tinospora sinensis*+ *Drynaria fortune*	Decoction/oral	Lumbago, neck shoulder pain
Cibotium barometz + *Mimosa pudica* L.+ *Berchemia lineata* L.+ *Milletia reticulate Benth*	Decoction/oral	Osteoarthritis of knee
Tinospora sinensis + *Piper sarmentosum*+ *Smilax glabra*+ *Achyranthes aspera*+ *Homalomena occulta* + *Cinnamomum*+ *Ophiopogon reptans Hook.f.*	Decoction/oral	Limbache, limb numbness
Achyranthes aspera+ *Heliotropium indicum* L.+ *Cibotium barometz*+ *Drynaria fortune*+ *Leea rubra blume*+ *Fallopia multiflora*+ *Drynaria fortune*	Decoction/oral	Coxalgia, rheumatism
Tinospora sinensis + *Homalomena occulta* + *Achyranthes aspera* + *Piper sarmentosum, Smilax glabra* + *Cibotium barometz* + *Mimosa pudica* L.	Decoction/oral	Sciatia
Momordica cochinensishinc + *Kaempferia galangal* L.	alcohol maceration/apply to skin	Lumbago, neck shoulder pain, Osteoarthritis, Coxalgia, rheumatism

4. Future research

Thorough scientific researches on compositional analysis, pharmacological activity and pharmacokinetic related to the osteoarthritis are necessary for almost species. There is a need of more studies carried out at large scale in *vivo* substantiation on human to certify and qualify treatment potential of herbal combinations. It could be anticipated that introduced herbs in this study may alter completely western medicine in the treatment of osteoarthritis. The authors believe that it is future promise.

5. Conclusion

In Traditional Vietnamese Medicine, though 42 species are used to treat osteoarthritis, 7 species are used mostly. The practical knowledge in this study plays an important role in solving osteoarthritis problems in community health care strategy. The data will provide firm evidence for further clinical application and basis for phytochemical and

pharmaceutical studies.

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