Analysis of traditional knowledge of medicinal plants from residents in Gayasan National Park (Korea)

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Abstract

Background: The purpose of this study is to investigate and analyze the traditional knowledge of medicinal plants used by residents in Gayasan National Park in order to obtain basic data regarding the sustainable conservation of its natural plant ecosystem.

Methods: Data was collected using participatory observations and in-depth interviews, as the informants also become investigators themselves through attending informal meetings, open and group discussions, and overt observations with semi-structured questionnaires. Quantitative analyses were accomplished through the informant consensus factor (ICF), fidelity level, and inter-network analysis (INA).

Results: In total, 200 species of vascular plants belonging to 168 genera and 87 families were utilized traditionally in 1,682 ethnomedical practices. The representative families were Rosaceae (6.5%) followed by Asteraceae (5.5%), Poaceae (4.5%), and Fabaceae (4.0%). On the whole, 27 kinds of plant-parts were used and prepared in 51 various ways by the residents for medicinal purposes. The ICF values in the ailment categories were muscular-skeletal disorders (0.98), pains (0.97), respiratory system disorders (0.97), liver complaints (0.97), and cuts and wounds (0.96). In terms of fidelity levels, 57 plant species showed fidelity levels of 100%. Regarding the inter-network analysis (INA) between ailments and medicinal plants within all communities of this study, the position of ailments is distributed into four main groups.

Conclusion: The results of the inter-network analysis will provide a suitable plan for sustainable preservation of the national park through a continued study of the data. Particular species of medicinal plants need to be protected for a balanced plant ecosystem within the park. Consequently, through further studies using these results, proper steps need to be established for preparing a wise alternative to create a sustainable natural plant ecosystem for Gayasan National Park and other national parks.

Keywords: Traditional knowledge, Informant consensus factor, Fidelity level, Inter-network analysis, Gayasan National Park

Introduction

National Parks in the world grow various useful bio-resources owing to its well-preserved natural plant ecosystem. For residents living within a national park, these resources become materials for medicine, food, clothing, and other purposes. The relationship between the natural conservation of a national park and the life of its residents is interconnected [1].

Also, the traditional knowledge regarding the bio-resources of residents living in a national park affects the natural conservation of an ecosystem [2]. Among all knowledge, the traditional knowledge of food and medicinal plants causes negative effects to plant ecosystems because of its applicability. Particularly, the additional value of medicinal plants is a major concern for species possessing high efficacy and utility as they are potentially overused and supplies become rapidly depleted [3]. These
trends are stronger in developing countries with poor health care systems than in developed countries [4].

From this point, the analysis and investigation of traditional knowledge for medicinal plants used by residents in a national park will be applied for a sustainable conservation plan for a natural plant ecosystem.

Research in this field has been widely accomplished in several countries around the world, including Europe [5,6], Africa [7,8], Asia [9,10], North America [11], and South America [12]. The results of this research have been utilized as basic data to formulate a sustainable conservation plan for natural plant ecosystems within a national park.

In Korea, the research of the same pattern has been only conducted from residents living in Hallasan National Park [13].

The natural plant ecosystem of Gayasan National Park, located in the southeast region of Korea has been well preserved. Residents have maintained a traditional culture for over 30 years. These residents have utilized various ethnomedicine for treating numerous ailments. Therefore, a balance between medicinal plants and their utilization plays a very important role to sustain the natural conservation of a national park.

This study aims to investigate and analyze the traditional knowledge of medicinal plants used by residents in Gayasan National Park in order to obtain basic data regarding the sustainable conservation of its natural plant ecosystem.

Research area and methods
Climate and geography of Gayasan National Park
The study area is located in the center of the southern region of Korea and lies between 35° 45′ N to 35° 51′ N latitude and 128° 02′ 30″ E to 128° 09′ 30″ E longitude (Figure 1). The study area measures 77.256 km² in areas including two provinces, one city, and four counties in its administrative district [14]. The annual average temperature is 13°C and the annual average precipitation is approximately 1,275.6 mm [15].

Investigative method
Proper data was collected using participatory observations and in-depth interviews, as the informants also become investigators themselves through attending informal meetings, open and group discussions, and overt observations with semi-structured questionnaires [16,17].

The content of the semi-structured questionnaires was composed of diverse information about medicinal plants, including local names, plant-parts used, ailments, methods of preparation, manufacturing and administration, dosage, and the usable duration regarding each curable formula [17-19].

All plant specimens were collected during their flowering or fruiting seasons and were organized utilizing the normal specimen manufacturing method [18,20]. The voucher specimens were deposited for preservation in the herbarium of Jeonju University. The precise identification of plants mentioned by the informants was performed in accordance with Lee [21] and Lee [22]. Scientific names of plants were confirmed by the National Knowledge and Information System for Biological Species [23] of Korea.

Quantitative analysis
Informant consensus factor (ICF)
The ICF was used to analyze the agreement degree of the informants’ knowledge about each category of ailments [24,25]. The ICF was calculated using the following formula:

$$ICF = \frac{(nur-nt)}{(nur-1)}$$

where $nur$ stands for the number of use reports of informants for a particular illness category, and $nt$ is the number of species used by all informants for a particular illness.

Figure 1 Investigation sites.
Fidelity level (FL)

The FL was employed to determine the most important plant species used for treating certain diseases by the local herbal practitioners and elderly people living in the study area [17,20,26]. The FL was calculated using the following formula:

\[
\text{FL(\%)} = \frac{N_p}{C} \times 100 / N,
\]

where \(N_p\) is the number of informants that mentioned the specific plant species used to treat certain ailments, and \(N\) is the total number of the informants who utilized the plants as medicine for treating any given ailment.

Inter-network analysis (INA)

The INA considers the results of the interrelationship among each individual of a community instead of focusing on the independent characteristics of an individual within the community. The INA has been applied within communities for various ethnographical problems, including ethnogenesis [27] and obesity [28-30].

However, the INA has yet to be applied to traditional medicinal knowledge, although it has been included in relation to its ethnographical properties.

Therefore, this research has newly applied this method in order to attain more network information between categories of ailments and medicinal plants within communities in Korea. The results of the INA were analyzed using UCINET (Ver. 6.460) and NetDraw (Ver. 2.125) software [31,32].

Results and discussion

Demographic characteristics of the informants

Field investigations were conducted from May 2012 to October 2012. All 208 key informants (28 men and 180 women) were randomly selected at 54 sites, which included community halls, the senior welfare centers, and the traditional markets. The average age of the informants was 77 years of age, with a range in age from 52 to 93, with residents living more than 30 years in the study area (Table 1).

Ethnomedicinal knowledge

In total, 200 species of vascular plants belonging to 168 genera and 87 families were utilized traditionally in 1,682 ethnomedicinal practices.

The species numbers from the Gayasan National Park were similar to those of other communities from previous research, including the communities of the western region of Jeolla North Province (183 species), the southern mountainous region (217 species) of Korea, and Hallasan National Park [13,16,19]. These results conclude that people living in the communities in and around Gayasan National Park possess similar application abilities for ethnomedicinal knowledge with other communities in Korea. Also, the number of species recorded in Gayasan National Park occupied 36.9% of the flora (542 species) in the study area [15]. This high percentage means that all medicinal plants collected by residents may negatively affect the conservation of a natural plant ecosystem.

Regarding the number of species in their families and the percentage of the number of times mentioned from our current investigations, 13 species of Rosaceae occupied 6.5% of the total species mentioned, followed by 12 species of Asteraceae, 11 species of Poaceae, and 9 species of Fabaceae, which occupied 5.5%, 4.5% and 4.0% of the whole, respectively. Generally, these four families contain many more medicinal species than any other family. This data is similar to results obtained within national parks of other countries, including Pollino National Park in Italy [5], Kibale National Park in Uganda [8], Ben En National Park in Vietnam [9], Cumbres de Monterrey National Park in Mexico [11], and Isiboro-Secure National Park in Bolivia [12].

Our overall analysis reveals that 27 plant-parts were selected as medicinal materials. Stems were the most frequently used plant-parts, constituting 25.7% of the whole followed by roots (22.7%), fruits (12.9%), whole parts (7.3%), seeds (5.3%), and other sections of the plant. These results were similar to data obtained in Korea for the western region of Jeolla North Province [19], the southern mountainous regions [16], and Hallasan National Park [13].

The results revealed 51 modes of preparation for the medicinal materials. The percentages for the main modes of preparation were as follows: infusions (32.1%),
sweet drinks made from fermented rice (20.1%), brew-ings (9.3%), macerations (7.1%), and juices (6.8%). Oral administration accounted for 84.8% of all applications, while topical application totaled 15.2%.

Among the medicinal plants mentioned more than 50 times, with certain species used to treat numerous ailments, *Hordeum vulgare* var. *hexastichon* (L.) Asch. was used to treat 36 ailments, followed by *Artemisia princeps* Pamp. in treating 24 ailments, and *Zanthoxylum schinifolium* Siebold. & Zucc. for treating 11 ailments. One area of major concern is the over application of the *Artemisia princeps* Pamp. and *Zanthoxylum schinifolium* Siebold. & Zucc. which can easily lead to its extinction within the plant ecosystem.

**Ethno-veterinary knowledge**
The medicinal plants for ethno-veterinary treatments were recorded as 15 families, 22 genera, and 23 species that displayed 38 ethnomedicinal practices (Table 2). Among the veterinary medicinal plants, the whole part of *Artemisia princeps* Pamp., *Papaver somniferum* L., *Picrasma quassioides* (D.Don) Benn., *Sanguisorba officinalis* L., and *Poria cocos* Wolf were used most often to treat bovine diarrhea. Particularly, *Ipomoea batatas* (L.) Lam., *Ricinus communis* L., and *Zanthoxylum schinifolium* Siebold. & Zucc. were ingested for particular pig ailments, while *Lageneria leucantha* Rushy was generally used for treating a bovine disease caused by a loss of appetite.

At present, these veterinary species do not affect the natural plant ecosystem of a national park anymore, as residents use a modern system of veterinary medicine to treat the diseases of domestic animals.

**Quantitative analysis**

**ICF**
The ICF ranges from 0 to 1, where increasing values of this factor indicate a higher rate of informant consensus among the illness category.

The category with the highest degree of consensus from the informants was muscular-skeletal disorders (0.98). The ranking followed with remarks from informants related to concerns of pain (0.97), respiratory system disorders (0.97), liver complaints (0.97), and cuts and wounds (0.96). The lowest degree of consensus was birth-related disorders (Table 3). These results expose the fact that the residents living in a national park work in dry-field farming and laboriously gather products from the forests as they live in the mountainous region.

Medicinal plants for treating disease with a higher degree of consensus can easily be harvested for treating medical ailments. As a result, the natural plant ecosystem of a national park may be partly destroyed in the near future. Therefore, through further study, proper steps to determine a wise alternative to protect them need to be considered.

**FL**
The FL is useful for identifying the key informants’ most preferred species in use for treating certain ailments. The FL values in this study varied from 1.0% to 100%. Generally, the FL of 100% for a specific plant indicates that all of the use-reports mentioned the same plant for specific treatment [33].

This study classified 57 species of plants with a FL of 100%, even without considering plants that were mentioned only once for better accuracy (Table 3). This information reveals that the informants had a tendency to rely on one specific plant species for treating one specific ailment than for several different ailments. These species possess a much higher potential for being gathered in Gayasan National Park.

Special attention for species conservation within the national park was given to important species (N, Np) with a FL above 100%, regarding the viewpoint of the number of times mentioned and the consensus level for the specific ailment, like *Solanium nigrum* L. (68, 68) in being used for burns, *Fallopia japonica* (Houtt.) Ronse-Decr. for pollakiuria (60, 60), *Colocassia esculenta* (L.) Schott (15, 15) for sterility, *Euonymus sachalinensis* (F. Schmidt) Maxim. (13, 13) for hemorrhoids, and *Staphylea bumalda* DC. (13, 13) for facial nerve paralysis (Table 2).

**INA between categories of ailments and medicinal plants**
INA has originally analyzed social phenomenon and its trends through the network of components [34]. Our research has attempted to analyze the interrelationship between ailments and medicinal plants recorded within these communities.

In relation to the network of ailments and medicinal plants, the position of the ailments is distributed into four main groups, where each circle represents four different groups of ailments (Figure 2). Accordingly, the first group is positioned in the upper section of Figure 2 and consists of poisonings, respiratory system disorders, others, inflammation and so on.

The second group is located in the bottom left section and consists of nervous system disorders, gastrointestinal disorders, cuts and wounds, and pains. This group of disorders will require a deeper analysis in order to determine the overlapping use of medicinal species for these ailments.

The third group is positioned on the left side and consists of birth-related disorders and genitourinary system disorders. These results depict that the same medicinal
| Family       | Scientific name                  | Voucher | Abbreviation | Korean name | Used part | Ailments                  | Preparation | Application | FL  |
|--------------|----------------------------------|---------|--------------|-------------|-----------|---------------------------|-------------|-------------|-----|
| Aceraceae    | Acer pseudoplatanus subsp. mono (Maxim.) Ohashi | KHS340  | S1           | Gorosoenamu | Sap       | Hypofunction              | Sap         | Oral        | 100.00 |
| Actinidiaceae| Actinidia arguta (Siebold & Zucc.) Planch. ex Miq. | KHS341  | S5           | Darae       | Stem      | Abdominal pain           | Infusion    | Oral        | 100.00 |
| Amaranthaceae| Achyranthes japonica (Miq.) Nakai | KHS342  | S2           | Soemureup   | Root      | Arm pain                  | A sweet drink made from fermented rice, brewing, infusion | Oral        | 16.71 |
|              |                                  |         |              |             |           | Arthritis                 | Oral        | 1.62        |
|              |                                  |         |              |             |           | Bone diseases             | A sweet drink made from fermented rice, brewing, infusion | Oral        | 32.61 |
|              |                                  |         |              |             |           | Common cold               | A sweet drink made from fermented rice, infusion | Oral        | 2.43  |
|              |                                  |         |              |             |           | Convulsion                | A sweet drink made from fermented rice, brewing, infusion | Oral        | 3.23  |
|              |                                  |         |              |             |           | Knee pain                 | A sweet drink made from fermented rice | Oral        | 2.16  |
|              |                                  |         |              |             |           | Leg pain                  | A sweet drink made from fermented rice, brewing, decoction, infusion | Oral        | 31.54 |
|              |                                  |         |              |             |           | Lumbago                   | A sweet drink made from fermented rice, infusion | Oral        | 9.16   |
|              |                                  |         |              |             |           | Pollakiuria               | Infusion     | Oral        | 0.54  |
| Celosia cristata L. | KHS343  | S41      | Maendeurami  | Whole part  | Carpal tunnel syndrome | Infusion     | Oral        | 50.00 |
|              |                                  |         |              |             |           | Tarsal tunnel syndrome    | Infusion     | Oral        | 50.00 |
| Anacardiaceae| Rhus javanica L.                  | KHS344  | S155         | Bulknamu    | Worm cyst  | Coated tongue             | Infusion     | Topical     | 15.12 |
|              |                                  |         |              |             |           | Stomatitis                | Dried, infusion, maceration, powder, raw, steamed | Oral, topical | 84.88 |
|              |                                  |         |              |             |           | Gastroenteric disorder    | Simmer       | Oral        | 19.87 |
|              |                                  |         |              |             |           | Lacquer                   | Abdominal cold hypersensitivity | Oral        | 58.97 |
|              |                                  |         |              |             |           | Facial nerve paralysis    | Raw          | Topical     | 0.64  |
|              |                                  |         |              |             |           | Abdominal cold hypersensitivity | Infusion, simmer, soup | Oral        | 58.97 |
|              |                                  |         |              |             |           | Diarrhea                  | Burn, powder  | Oral        | 1.28  |
| Table 2 Plant species for medicinal purposes in community of Gayasan National Park in Korea (Continued) |
|---------------------------------------------------------------------------------------------------|
| Gastroenteric disorder | Infusion, simmer | Oral | 19.87 |
| Hangover | Infusion, simmer | Oral | 10.90 |
| Indigestion | Infusion | Oral | 3.85 |
| Lack of energy | Infusion | Oral | 1.92 |
| Woman diseases | Infusion | Oral | 2.56 |
| Young leaf Gastroenteric disorder | Raw | Oral | 19.87 |
| Apiaceae | Angelica acutiloba (Siebold & Zucc.) Kitag. | KHS346 | S14 | Waedanggwi | Root | Poor circulation | Infusion | Oral | 53.33 |
| Apiaceae | Angelica dahurica (Fisch. ex Hoffm.) Benth. & Hook. f. ex Franch. & Sav. | KHS347 | S15 | Guritdae | Root | Lack of energy | Decoction, infusion | Oral, topical | 100.00 |
| Apiaceae | Angelica gigas Nakai | KHS348 | S16 | Chamdanggwi | Root | Lack of energy | Decoction, infusion | Oral, topical | 100.00 |
| Apiaceae | Bupleurum falcatum L. | KHS349 | S32 | Siho | Root | Alopecia | A sweet drink made from fermented rice | Oral | 100.00 |
| Apiaceae | Cnidium officinale Makino | KHS350 | S48 | Cheongung | Root | Bone diseases | A sweet drink made from fermented rice | Oral | 23.53 |
| Apiaceae | Ledebouriella seseloides (Hoffm.) H.Wolff | KHS351 | S99 | Bangpung | Root | Hypofunction | Decoction | Oral | 100.00 |
| Araceae | Oenanthe javanica (Blume) DC. | KHS352 | S111 | Minari | Stem | Cancer | Juice | Oral | 25.00 |
| Araceae | Ostericum praeteritum Kitag. | KHS353 | S115 | Gughwal | Root | Hyperthermia | Infusion | Oral | 60.00 |
| Araceae | Arisaema amurense f. serratum (Nakai) Kitag. | KHS354 | S19 | Cheonnamseong | Corm | Chronic myofascial pain | Chopped noodles, clear soup with flour dumplings | Oral | 55.56 |

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| Table 2 Plant species for medicinal purposes in community of Gayasan National Park in Korea (Continued) |
|---------------------------------------------------------------|
| **Species** | **KHS** | **Type** | **Use** | **Dosage** |
| Colocasia esculenta (L.) Schott | S52 | Toran | Flower | Sterility | Infusion | Oral | 100.00 |
| Araliaceae | S17 | Dokhwal | Root | Abdominal pain | Infusion | Oral | 5.56 |
| Araloe cordata var. continentalis (Kitag.) Y.C. Chu | S17 | Dokhwal | Root | Abdominal pain | Infusion | Oral | 5.56 |
| Araloe elata (Miq.) Seem. | S18 | Dureupnamu | Root | Edema | Infusion | Oral | 100.00 |
| Eleutherococcus senticosus (Rupr. & Maxim.) Maxim. | S66 | Gasiogalpi | Stem | Bone diseases | Decoction | Oral | 100.00 |
| Eleutherococcus sessiliflorus (Rupr. & Maxim.) S.Y.Hu | S67 | Ogalpinamu | Fruit | Bone diseases | Extraction | Oral | 47.38 |
| Arm pain | A sweet drink made from fermented rice, brewing, infusion | Oral | 11.53 |
| Arthritis | A sweet drink made from fermented rice | Oral | 1.05 |
| Bone diseases | A sweet drink made from fermented rice, brewing, infusion | Oral | 47.38 |
| Glycosuria | Infusion | Oral | 1.05 |
| Growing pain | A sweet drink made from fermented rice, brewing | Oral | 2.94 |
| Hyperthermia | Brewing | Oral | 0.21 |
| Leg pain | A sweet drink made from fermented rice, brewing, infusion | Oral | 22.01 |
| Liver diseases | Infusion | Oral | 1.89 |
| Lumbago | A sweet drink made from fermented rice, infusion | Oral | 9.64 |
| Plant Family | Species | Code | Case | Uses | Route | Quantity |
|------------|---------|------|------|------|-------|----------|
| | | | Neuralgia | Infusion | Oral | 0.42 |
| | | | Paralysis | Infusion | Oral | 1.26 |
| | | | Shoulder pain | A sweet drink made from fermented rice | Oral | 0.42 |
| | | | Sinews and joint pain | A sweet drink made from fermented rice | Oral | 0.21 |
| | Kalopanax septemlobus (Thunb.) Koidz. | KHS360 | Eumnamu | Arm pain | A sweet drink made from fermented rice | Oral | 9.76 |
| | | | Bone diseases | Brewing, infusion | Oral | 55.10 |
| | | | Leg pain | A sweet drink made from fermented rice | Oral | 17.57 |
| | | | Stern | Abdominal cold hypersensitivity | Infusion, simmer | Oral | 0.65 |
| | | | Arm pain | A sweet drink made from fermented rice, brewing, infusion, simmer | Oral | 9.76 |
| | | | Bone diseases | A sweet drink made from fermented rice, brewing, infusion, simmer | Oral | 55.10 |
| | | | Gastroenteric disorder | A sweet drink made from fermented rice, brewing | Oral | 3.04 |
| | | | Hyperthermia | Brewing | Oral | 0.22 |
| | | | Indigestion | Infusion | Oral | 0.22 |
| | | | Lack of energy | Infusion | Oral | 0.87 |
| | | | Leg pain | A sweet drink made from fermented rice, brewing, infusion, simmer | Oral | 17.57 |
| | | | Liver diseases | Infusion | Oral | 0.87 |
| | | | Lumbago | A sweet drink made from fermented rice, infusion | Oral | 9.11 |
| | | | Neuralgia | Infusion | Oral | 0.43 |
| | | | Paralysis | Brewing, infusion | Oral | 2.17 |
| | Asarum sieboldii Miq. | KHS361 | S24 Jokdoripul | Root | Dentral pain | Chew, dried | Topical | 22.22 |
| | | | | Pain | A sweet drink made from fermented rice, infusion | Oral | 77.78 |
| | Athyrium yokoscense (Franch. & Sav.) H.Christ | KHS362 | S26 Baenggosari | Stern | Abrasion | Maceration, rubbing | Topical | 13.41 |
| | | | Common cold | Infusion | Oral | 6.10 |
| | | | Hemorrhaging | Maceration, rubbing | Topical | 62.20 |
| | | | Snakebite | Maceration, raw | Topical | 15.85 |
| | | | Wound | Maceration | Topical | 2.44 |
| Asteraceae | Artemisia capillaris Thunb. KHS363 | S21 | Sacheolssuk | Aerial part | Abdominal cold hypersentivity | Infusion | Oral | 2.18 |
|-----------|----------------------------------|-----|------------|-------------|-------------------------------|---------|-----|------|
|           | Boils                            | Decoction | Oral | 0.87 |
|           | Cattle disease                   | Burn, dried, fumigation | Topical | 0.87 |
|           | Glycosuria                       | Infusion | Oral | 1.75 |
|           | Jaundice                         | A sweet drink made from fermented rice, grain syrup, infusion, pill, simmer | Oral | 67.25 |
|           | Liver diseases                   | A sweet drink made from fermented rice, decoction, grain syrup, infusion, juice, simmer | Oral | 20.96 |
|           | Leaf                             | Indigestion | Decoction | Oral | 0.87 |
|           | Jaundice                         | A sweet drink made from fermented rice, decoction, dried, infusion | Oral | 67.25 |
|           | Liver diseases                   | Infusion | Oral | 20.96 |
|           | Pollakiuria                      | Infusion | Oral | 1.75 |
|           | Stem                             | Indigestion | Decoction | Oral | 0.87 |
|           | Jaundice                         | Decoction | Oral | 67.25 |
|           | Whole part                       | Gastroenteric disorder | A sweet drink made from fermented rice, infusion, pill | Oral | 3.49 |
|           | Jaundice                         | A sweet drink made from fermented rice, infusion | Oral | 67.25 |
|           | Liver diseases                   | Infusion | Oral | 20.96 |
|           | Pollakiuria                      | Infusion | Oral | 1.75 |
|           | Stern                            | Indigestion | Decoction | Oral | 0.87 |
|           | Jaundice                         | Decoction | Oral | 67.25 |
|           | Artemisia montana (Nakai) Pamp. KHS364 | S22 | Sanssuk | Leaf | Leg pain | Rubbing | Topical | 50.00 |
|           | Jaundice                         | A sweet drink made from fermented rice, pill | Oral | 1.26 |
|           | Liver diseases                   | A sweet drink made from fermented rice, pill | Oral | 20.96 |
|           | Artemisia princeps Pamp. KHS365 | S23 | Ssuk | Aerial part | Abdominal pain | Juice | Oral | 16.35 |
|           | Bone diseases                    | A sweet drink made from fermented rice | Oral | 1.26 |
|           | Cattle disease                   | Burn, dried, fumigation | Topical | 1.26 |
|           | Diarrhea                         | Infusion, juice | Oral | 6.29 |
|           | Dysentery                        | Infusion, juice | Oral | 2.52 |
|           | Head laceration                  | Raw | Topical | 1.26 |
|           | Hemorrhage                       | Maceration, rubbing | Topical | 38.36 |
|           | Hookworm                         | Raw | Oral | 0.63 |
|           | Irregular menstruation           | Decoction, infusion, pill | Oral | 0.63 |
|           | Leaf                             | Abdominal pain | Juice, maceration | Oral | 16.35 |
Table 2 Plant species for medicinal purposes in community of Gayasan National Park in Korea (Continued)

| Condition                              | Plant Species                  | Formulation                  | Route | Dosage |
|----------------------------------------|--------------------------------|-------------------------------|-------|--------|
| Anorexia                               | Juice                          | Oral                          | 2.83  |        |
| Arthritis                              | Dried, powder                  | Topical                       | 1.26  |        |
| Burn                                   | Maceration                     | Topical                       | 0.31  |        |
| Diarrhea                               | Juice, raw                     | Oral                          | 6.29  |        |
| Epistaxis                              | Maceration, rubbing            | Topical                       | 4.09  |        |
| Gastroenteric disorder                 | Powder                         | Topical                       | 5.66  |        |
| Hemorrhaging                           | Maceration, powder, rubbing    | Topical                       | 38.36 |        |
| Hoove                                  | Raw                            | Oral                          | 2.20  |        |
| Indigestion                            | Juice, raw                     | Oral                          | 2.52  |        |
| Jaundice                               | Rubbing                        | Topical                       | 1.57  |        |
| Pus                                    | Powder                         | Topical                       | 1.26  |        |
| Overheating                            | Juice                          | Oral                          | 0.94  |        |
| Wound                                  | Rubbing                        | Topical                       | 6.60  |        |
| Root Woman diseases                    | Infusion                       | Oral                          | 2.20  |        |
| Whole part                             | Abdominal pain                 | Juice                         | 16.35 |        |
| Anorexia                               | Juice                          | Oral                          | 2.83  |        |
| Diarrhea                               | Juice                          | Oral                          | 6.29  |        |
| Dysentery                              | Juice                          | Oral                          | 2.52  |        |
| Gastroenteric disorder                 | Infusion, juice                | Oral                          | 5.66  |        |
| Hemorrhage                             | Maceration, rubbing            | Topical                       | 38.36 |        |
| Indigestion                            | Juice                          | Oral                          | 2.52  |        |
| Atractylodes ovata (Thunb.) DC.        | KHS366, S28, Sapju Root        | Decoction                     | Oral  | 1.09   |
| Bone diseases                          | Decoction                      | Oral                          | 1.09  |        |
| Gastroenteric disorder                 | A sweet drink made from fermented rice, decoction, dried, infusion maceration, pill, powder, raw, steep in rice water | Oral  | 52.17 |        |
| Indigestion                            | Dried, maceration, powder, raw, steep in rice water | Oral  | 6.52  |        |
| Lack of energy                         | A sweet drink made from fermented rice, boiling, decoction, dried, infusion, pill, powder, steep in rice water | Oral  | 38.04 |        |
| Leg pain                               | Decoction                      | Oral                          | 1.09  |        |

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| Plant Species | GIN | Use | Condition | Preparation | Route |正式量 |
|---------------|-----|-----|-----------|-------------|-------|--------|
| *Carthamus tinctorius* L. | KH5367 | S37 | Itggot | Seed | Bone diseases | A sweet drink made from fermented rice | Oral | 33.33 |
|               |       |     |          | Fracture | Boiling | Oral | 33.33 |
|               |       |     |          | Lumbago | A sweet drink made from fermented rice | Oral | 33.33 |
| *Cirsium japonicum var. maackii* (Maxim.) Matsum. | KH5368 | S45 | Eonggeongkwi | Root | Abdominal cold hypersensitivity | Juice | Oral | 1.80 |
|               |       |     |          | Abdominal pain | Juice | Oral | 0.90 |
|               |       |     |          | Anhidrosis | Infusion, juice | Oral | 4.50 |
|               |       |     |          | Bone diseases | Juice | Oral | 0.90 |
|               |       |     |          | Epistaxis | Juice | Oral | 0.90 |
|               |       |     |          | Gastroenteric disorder | Juice | Oral | 0.90 |
|               |       |     |          | Hangover | Juice | Oral | 3.15 |
|               |       |     |          | Hookworm | Juice | Oral | 2.70 |
|               |       |     |          | Lack of energy | Juice | Oral | 3.60 |
|               |       |     |          | Lumbago | Infusion, juice | Oral | 4.50 |
|               |       |     |          | Sexual enhancement | Infusion, juice | Oral | 75.23 |
|               |       |     |          | Sterility | Infusion | Oral | 0.90 |
| *Helianthus tuberosus* L. | KH5369 | S86 | Ddungddanji | Tuber | Glycosuria | Maceration, tea | Oral | 100.00 |
| *Lactuca sativa* L. | KH5370 | S97 | Sangchu | Seed | Oligogalactia | Infusion | Oral | 100.00 |
| *Petasites japonicus* (Siebold & Zucc.) Maxim. | KH5371 | S123 | Meowi | Leaf | Gastroenteric disorder | Infusion, wrapped in leaves | Oral | 27.59 |
|               |       |     |          | Lacquer poisoning | Maceration | Topical | 37.93 |
|               |       |     |          | Paralysis | Maceration | Oral | 10.34 |
|               |       |     |          | Root | Convulsion | Maceration | Oral | 6.90 |
|               |       |     |          | Leg pain | Brewing | Oral | 17.24 |
|               |       |     |          | Stem | Gastroenteric disorder | Seasoned cooked vegetables | Oral | 27.59 |
| *Sigesbeckia glabrescens* (Makino) Makino | KH5372 | S175 | Jindeukchal | Aerial part | Pruritus | A sweet drink made from fermented rice, brewing, infusion, pill, simmer | Oral, topical | 79.89 |
|               |       |     |          | Flower | Hypertension | Grain syrup, infusion | Oral | 3.45 |
|               |       |     |          | Postpartum myofascial pain syndrome | A sweet drink made from fermented rice, infusion | Oral | 11.49 |
Table 2 Plant species for medicinal purposes in community of Gayasan National Park in Korea (Continued)

| Plant Species | Part | Condition | Preparation | Route |
|---------------|------|-----------|-------------|-------|
| *Taraxacum platycarpum* | Leaf | Pruritus | Dried, infusion | Oral 79.89 |
| | Root | Cancer | Infusion | Oral 8.24 |
| | Whole part | Cancer | Infusion | Oral 8.24 |
| | | Liver diseases | A sweet drink made from fermented rice, dried, extraction, infusion, juice | Oral 91.76 |
| *Xanthium strumarium* | Aerial part | Boils | Infusion | Topical 22.22 |
| | Fruit | Pruritus | Infusion | Oral 40.74 |
| | Stem | Boils | Infusion | Topical 22.22 |
| | Whole part | Boils | Infusion | Topical 22.22 |
| | | Gastroenteric disorder | A sweet drink made from fermented rice | Oral 11.11 |
| | | Leg pain | A sweet drink made from fermented rice | Oral 11.11 |
| | | Pruritus | A sweet drink made from fermented rice, brewing, infusion | Oral, topical 40.74 |
| *Impatiens balsamina* | Whole part | Indigestion | Infusion | Oral, topical 14.81 |
| *Epimedium koreanum* | Aerial part | Sexual enhancement | A sweet drink made from fermented rice, infusion | Oral 57.14 |
| | Stem | Tea | Oral 42.86 |
| *Betula costata* | Sap | Hypofunction | Sap | Oral 35.71 |
| | Indigestion | | | Oral 7.14 |
| | Stem | Arm pain | A sweet drink made from fermented rice | Oral 28.57 |
| | Leg pain | A sweet drink made from fermented rice | Oral 28.57 |
| *Catalpa ovata* | Stem | Bone diseases | A sweet drink made from fermented rice | Oral 30.77 |

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| Family       | Genus                  | Species                      | Common Name | Part | Use                                      | Preparation                      | Dosage  | Type          |
|--------------|------------------------|-------------------------------|-------------|------|------------------------------------------|----------------------------------|---------|---------------|
| Boraginaceae | Lithospermum           | erythrorhizon Siebold & Zucc. | Jichi       | Root | Bruising, Infusion, poultice             | Oral, topical                    | 10.00   |               |
|              |                        |                               |             |      | Convulsion, Decoction, infusion, oil, panbroiled, poultice, roast | Oral, topical                    | 83.33   |               |
|              |                        |                               |             |      | Indigestion                              | Panbroiled                       | 6.67    | Oral          |
| Brassicaceae | Brassica rapa var. glabra | Regel                        | Baechu      | Leaf | Burn, Kimchi, raw                        | Topical                          | 100.00  |               |
|              | Capsella bursapastoris (L.) | L.W.Medicus                 | Naengi      | Whole part | Liver diseases Juice, seasoned cooked vegetables, soup | Oral | 100.00 |
|              | Raphanus sativus L.    |                               | Mu          | Leaf | Lumbago, Steamed                         | Topical                          | 4.31    |               |
| Campanulaceae| Adenophora niphylla var. japonica (Regel) H. Hara |                               | Jandae      | Root | Sterility                                | Infusion                         | 2.62    |               |
|              |                        |                               |             |      | Common cold                              | Decoction, extraction, fermentation, infusion, raw, roast | Oral | 56.90 |
|              |                        |                               |             |      | Woman diseases                           | A sweet drink made from fermented rice, raw, simmer | Oral | 80.00 |
|              | Codonopsis lanceolata (Siebold & Zucc.) Trautv. |                               | Deodeok     | Root | Abdominal cold hyperesentivity          | Maceration, raw                  | 17.39   |               |
|              |                        |                               |             |      | Bronchitis                               | Maceration, raw                  | 19.57   |               |
|              |                        |                               |             |      | Cough                                    | Steamed                          | 10.87   |               |
|              |                        |                               |             |      | Orkiopathy                               | Brewing, maceration, raw         | 26.09   |               |
|              |                        |                               |             |      | Sexual enhancement                       | Brewing, infusion                 | 26.09   |               |
|              | Codonopsis ussuriensis (Rupr. & Maxim.) Hemsl. |                               | Sogyeongbulal | Root | Sexual enhancement                       | Infusion                         | 100.00  |               |
|              |                        |                               |             |      | Bronchitis                               | Infusion                         | 2.62    |               |
|              | Platycodon grandiflorum (Jacq.) ADC. |                               | Doraji      | Flower | Sterility                                | Infusion                         | 1.12    |               |
|              |                        |                               |             |      | Abdominal pain                           | Infusion                         | 1.12    |               |
|              |                        |                               |             |      | Anorexia                                 | Infusion                         | 1.12    |               |
|              |                        |                               |             |      | Asthma                                   | Brewing                          | 11.99   |               |
|              |                        |                               |             |      | Bronchitis                               | Extraction, infusion, juice, powder | Oral | 7.12 |
|              |                        |                               |             |      | Common cold                               | Brewing, decoction, dried, infusion, maceration, mixed in honey, pill, powder | Oral | 21.72 |
| Family            | Genus             | Species            | Code  | No.  | Part       | Diseases                                      | Oral  |
|------------------|-------------------|--------------------|-------|------|------------|-----------------------------------------------|-------|
| Cannabaceae      | Cannabis sativa L.| KHS387             | S33   | Sam  | Leaf       | Paralysis                                     | 50.56 |
|                  |                   |                    |       |      |            |                                               |       |
|                  | Humulus japonicus | KHS388             | S90   |      | Aerial part| Athlete’s foot                                | 1.50  |
|                  | Siebold & Zucc.   |                    |       |      |            |                                               |       |
| Caprifoliaceae   | Lonicera japonica | KHS389             | S103  |      | Aerial part| Bone diseases                                 | 100.00|
|                  | Thunb.            |                    |       |      |            | A sweet drink made from fermented rice        | 36.11 |
|                  |                   |                    |       |      | Flower     |                                               | 1.39  |
|                  |                   |                    |       |      | Stem       | Arm pain                                      | 19.79 |
|                  |                   |                    |       |      |            | A sweet drink made from fermented rice, brewing, decoction, infusion |     |
| Caryophyllaceae  | Dianthus longicalyx| KHS390             | S60   |      | Whole part | Pollakiuria                                   | 100.00|
|                  | Miq.              |                    |       |      |            | Infusion                                      | 1.04  |
| Celastraceae     | Euonymus alatus   | KHS391             | S70   |      | Leaf       | Gastroenteric disorder                        | 100.00|
|                  | (Thumb.) Siebold  |                    |       |      |            | Seasoned cooked vegetables                    |       |
|                  |                   |                    |       |      | Stem       | Gastroenteric disorder                        | 100.00|
|                  | Euonymus sachalinensis (F. Schmidt) Maxim. | KHS392 | S71 | Hoenamu | Leaf | Hemorrhoids | Infusion | Topical | 100.00 |
| Chenopodiaceae   | Kochia scoparia   | KHS393             | S96   |      | Aerial part| Pollakiuria                                   | 100.00|
|                  | (L.) Schrad. var. |                    |       |      |            | Infusion                                      |       |

Table 2 Plant species for medicinal purposes in community of Gayasan National Park in Korea (Continued)
| Family               | Species                                      | Part       | Common Name   | Part Use     | Treatment            | Route   | Percentage |
|---------------------|----------------------------------------------|------------|---------------|--------------|----------------------|---------|------------|
| Commelinaceae       | *Commelina communis* L.                     | Whole part | Dalkuijangpul | Bruising    | Maceration           | Topical | 33.33      |
|                     |                                               |            |               | Snakebite   | Maceration           | Topical | 33.33      |
|                     |                                               |            |               | Sprain      | Maceration           | Topical | 33.33      |
| Convolvulaceae      | *Ipomoea batatas* (L.) Lam.                 | Root       | Goguma        | Pig disease | Raw                  | Oral    | 100.00     |
| Cornaceae           | *Cornus officinalis* Siebold & Zucc.        | Fruit      | Sansuyu       | Lack of energy | Decoction             | Oral    | 53.85      |
|                     |                                               |            |               | Pollakiuria | Infusion             | Oral    | 46.15      |
| Crassulaceae        | *Orostachys japonica* (Maxim.) A.Berger      | Aerial part| Bawisol       | Cancer      | Maceration           | Oral    | 75.00      |
|                     |                                               | Whole part | Cancer       | Dried, infusion | Oral             | 75.00 |
|                     |                                               |            | Snakebite    | Maceration | Topical             | 25.00 |
|                     | *Sedum sarmentosum* Bunge                   | Whole part | Cancer       | Dried, infusion | Oral             | 75.00 |
|                     |                                               |            | Snakebite    | Maceration | Topical             | 25.00 |
| Cucurbitaceae       | *Citrullus vulgaris* Schrad.                | Fruit      | Subak         | Overheating | Extraction           | Oral    | 100.00     |
|                     | *Cucumis melo var. makuwa* Makino           | Peduncle   | Charmoe       | Jaundice    | Powder               | Topical | 55.56      |
|                     | *Cucumis sativus* L.                        | Stem       | Oi            | Pollakiuria | Dried, infusion | Oral    | 100.00     |
|                     | *Cucurbita moschata* Duchesne               | Fruit      | Hobak         | Asthma      | Simmer              | Oral    | 11.11      |
|                     |                                               |            |               | Gastroenteric disorder | Infusion | 27.78 |
|                     |                                               |            |               | Edema       | Infusion, roast     | Oral    | 61.11      |
|                     |                                               |            |               | Gastroenteric disorder | Infusion | 27.78 |
|                     | *Lagenaria leucantha* Rusby                 | Endodermis | Bak           | Cattle disease | Infusion          | Oral    | 56.25      |
|                     |                                               |            |               | Fruit       | Cattle disease | Infusion | 56.25      |
|                     |                                               |            |               | Common cold | Infusion     | Oral    | 31.25      |
|                     |                                               |            |               | Pericarp    | Pollakiuria | Infusion     | Oral    | 12.50      |
| Luffa cylindrica Roem. | *KHS404* S104 Susemiol | Fruit      | Asthma        | Extraction, sap | Oral | 19.51 |
|                     |                                               |            |               | Bronchitis  | Extraction | Oral    | 10.98      |
|                     |                                               |            |               | Chronic cough | Extraction, sap | Oral    | 4.88       |
|                     |                                               |            |               | Cough       | A sweet drink made from fermented rice, extraction, fermentation, infusion, oil, pan fried, sap | Oral | 43.90 |
|                     |                                               |            |               | Skin diseases | Extraction, sap | Oral, Topical | 15.85 |
Table 2 Plant species for medicinal purposes in community of Gayasan National Park in Korea *(Continued)*

| Plant Species                  | Common Name       | Part Used          | Preparation       | Condition                      | Dosage  |
|--------------------------------|-------------------|--------------------|-------------------|--------------------------------|---------|
| *Trichosanthes kirilowii*      |                   | Stem               | Oral              | Asthma                         | 19.51   |
|                                |                   |                    |                   | Atopic dermatitis              | 4.88    |
|                                |                   | Bronchitis         | Oral              | Raw                            | 10.98   |
|                                |                   | Skin diseases      | Topical           | Sap                            | 15.85   |
|                                | KM505             | S186               | Haneultari        | Fruit                          |         |
|                                |                   |                    |                   | Bruising                       | 4.69    |
|                                |                   |                    |                   | Dough                          |         |
|                                |                   | Carpal tunnel      | Topical           | syndrome                       | 1.56    |
|                                |                   |                    |                   | Chronic myofascial pain        | 37.50   |
|                                |                   | Lumbago            | Oral              | Brewing, infusion              | 12.50   |
|                                |                   | Neuralgia          | Oral              | Infusion                       | 9.38    |
|                                |                   | Overheating        | Oral              | Extraction, infusion           | 18.75   |
|                                |                   | Tarsal tunnel      | Topical           | syndrome                       | 1.56    |
|                                |                   | Urticaria          | Oral              | Infusion                       | 9.38    |
|                                |                   | Root               | Oral              | Induced abortion               | 4.69    |
|                                |                   |                    |                   | Neuralgia                      | 9.38    |
|                                |                   |                    |                   | Overheating                    | 18.75   |
|                                |                   | Stere                | Oral              | Gastroenteric disorder         | 37.14   |
| Dioscoreaceae                  | Dioscorea batatas| Stem               | Maceration, oil, raw| oral, raw                      |         |
|                                | Decne.            |                    |                   | Lack of energy                 | 34.29   |
|                                | KM506             | S61                | Ma                | Maceration, oil, raw           |         |
|                                |                   |                    |                   | Milk fever                     | 17.14   |
|                                |                   |                    |                   | Osteoporosis                    | 11.43   |
|                                | Dioscorea japonica| KM507             | S62               | Chamma | Root | Gastroenteric disorder | Raw | Oral | 100.00 |
|                                | Thunb.            |                   |                   | Infusion | Infusion, raw | 47.30 |
| Ebenaceae                      | Diospyros kaki    | S63                | Gamnamu           | Fruit | Boils | Raw | Topical | 4.05 |
|                                | Thunb.            |                   |                   | Cough | Ripe persimmon | Oral | 6.76 |
|                                | KM508             |                   |                   | Diarrhea | Raw, roast | Oral | 9.46 |
|                                |                   |                    |                   | Indigestion                    | Infusion, raw | 47.30 |
|                                |                   |                    |                   | Peduncle | Acute | gastroenteritis | Infusion | Oral | 6.76 |
|                                |                   |                    |                   | Hiccups | Decoction, infusion | Oral | 18.92 |
|                                |                   |                    |                   | Indigestion                    | Infusion | Oral | 47.30 |
| Family       | Species                        | Code | Country | Part     | Use                              | Preparation | Route | Dosage |
|-------------|--------------------------------|------|---------|----------|----------------------------------|-------------|-------|--------|
| Elaeagnaceae| *Elaeagnus umbellata* Thunb.   | KH5409| S65     | Pericarp | Common cold                      | Infusion    | Oral  | 6.76   |
|             |                                |      |         |          | Bronchitis                        | Extraction  | Oral  | 4.35   |
|             |                                |      |         |          | Common cold                       | Extraction  | Oral  | 5.80   |
|             |                                |      |         |          | Cough                             | A sweet drink made from fermented rice, brewing, extraction, raw | Oral  | 75.36  |
|             |                                |      |         |          | Lumbago                           | A sweet drink made from fermented rice, infusion | Oral  | 2.90   |
| Elaeagnaceae| *Elaeagnus umbellata* Thunb.   | KH5410| S153    | Stem     | Asthma                            | Raw         | Oral  | 11.59  |
|             |                                |      |         |          | A sweet drink made from fermented rice | Infusion    | Oral  | 5.80   |
|             |                                |      |         |          | A sweet drink made from fermented rice | Extraction  | Oral  | 4.35   |
|             |                                |      |         |          | Cough                             | A sweet drink made from fermented rice | Oral  | 75.36  |
|             |                                |      |         |          | Lumbago                           | A sweet drink made from fermented rice | Oral  | 2.90   |
| Ericaceae   | *Rhododendron mucronulatum* Turcz. | KH5410| S153    | Stem     | Bone diseases                     | A sweet drink made from fermented rice | Oral  | 100.00 |
|             |                                |      |         |          | A sweet drink made from fermented rice | Infusion    | Oral  | 100.00 |
|             |                                |      |         |          | A sweet drink made from fermented rice | Extraction  | Oral  | 100.00 |
| Ericaceae   | *Rhododendron weyrichii* Maxim. | KH5411| S154    | Root     | Cough                             | Infusion    | Oral  | 10.53  |
|             |                                |      |         |          | A sweet drink made from fermented rice | Extraction  | Oral  | 10.53  |
|             |                                |      |         |          | A sweet drink made from fermented rice | Extraction  | Oral  | 10.53  |
|             |                                |      |         |          | Lumbago                           | A sweet drink made from fermented rice, decoction | Oral  | 26.32  |
| Eucommiaceae| *Eucommia ulmoides* Oliv.      | KH5412| S69     | Bark     | Arm pain                          | A sweet drink made from fermented rice | Oral  | 21.05  |
|             |                                |      |         |          | Bone diseases                      | A sweet drink made from fermented rice | Oral  | 21.05  |
|             |                                |      |         |          | Cancer                            | Infusion    | Oral  | 10.53  |
|             |                                |      |         |          | Leg pain                          | A sweet drink made from fermented rice | Oral  | 21.05  |
|             |                                |      |         |          | A sweet drink made from fermented rice | Infusion    | Oral  | 10.53  |
|             |                                |      |         |          | Lumbago                           | A sweet drink made from fermented rice, decoction | Oral  | 26.32  |
| Euphorbiaceae| *Ricinus communis* L.          | KH5413| S157    | Aerial part | Lumbago                       | A sweet drink made from fermented rice | Oral  | 2.80   |
|             |                                |      |         |          | Constipation                       | Oil, pan fried | Oral, topical | 42.66 |
|             |                                |      |         |          | Cough                             | Oil, pan fried | Oral  | 2.80   |
|             |                                |      |         |          | Dental pain                       | Roast       | Topical | 3.50  |
|             |                                |      |         |          | Indigestion                       | Oil, pan fried | Oral  | 44.06  |
|             |                                |      |         |          | Pig disease                       | Oil         | Oral   | 1.40   |
|             |                                |      |         |          | Leaf                              | Otalgia     | Infusion | 2.80  |
| Fabaceae    | *Albizia julibrissin* Durazz.  | KH5414| S8      | Stem     | Arm pain                          | A sweet drink made from fermented rice | Oral  | 18.18  |
|             |                                |      |         |          | Bone diseases                      | A sweet drink made from fermented rice, brewing | Oral  | 54.55  |
|             |                                |      |         |          | Leg pain                          | A sweet drink made from fermented rice | Oral  | 18.18  |
|             |                                |      |         |          | Neuralgia                         | Infusion    | Oral   | 9.09   |
|             | *Astragalus mongholicus* Bunge | KH5415| S27     | Root     | Afterpain                         | Decoction, infusion, simmer | Oral  | 25.00  |
|             |                                |      |         |          | Bone diseases                      | A sweet drink made from fermented rice | Oral  | 15.63  |
|             |                                |      |         |          | Hyperhidrosis                      | Boiling, infusion | Oral  | 37.50  |
|             |                                |      |         |          | Lumbago                           | Simmer      | Oral   | 15.63  |
| Plant species          | Common name          | Code     | Uses                                                                 | Preparations                      | Preparation Method   | Dosage (g) |
|-----------------------|----------------------|----------|----------------------------------------------------------------------|-----------------------------------|----------------------|------------|
| Caragana sinica (Buchh.) Rehder | Goldamcho Leaf | KH5416 S36 | Woman diseases, Chronic myofascial pain, Leg pain, Arm pain, Gastrointestinal disorder, Arthritis | Brewing, maceration               | Oral, topical        | 6.25       |
| Gleditsia sinensis Lamarck | Stem             | KH5417 S83 | Arm pain, Bone diseases, Leg pain, Lumbago, Shoulder pain, Acute gastroenteritis, Asthma, Bee sting, Carpal tunnel syndrome, Common cold, Cough, Hangover, Head laceration, Hemorrhaging | A sweet drink made from fermented rice, brewing, infusion, juice | Oral          | 26.92      |
| Glycine max (L.) Merr. | Kong Seed          | KH5418 S84 | Acute gastroenteritis, Common cold, Cough, Hangover, Head laceration, Hemorrhaging | Raw                               | Oral                | 3.33       |
| Plant species                     | Part                | Condition                       | Treatment          | Route  |
|----------------------------------|---------------------|---------------------------------|--------------------|--------|
| Gynostemma pentaphyllum          | Root                | Abdominal pain                  | Oral, topical      | 15.24  |
| Glycyrrhiza uralensis            | Root, root          | Abdominal pain                  | Oral, topical      | 23.33  |
| Pueraria lobata (Willd.) Ohwi     | Root, flower        | Abdominal pain, hangover        | Oral, topical      | 49.53  |
| Sophora flavescens Solander ex Aiton | Leaf           | Cattle disease                   | Oral               | 61.96  |
|                                 | Root               | Abdominal pain, hangover         | Oral               | 49.53  |

Table 2: Plant species for medicinal purposes in community of Gayasan National Park in Korea (Continued)

Glycyrrhiza uralensis Fisch. KH5419 S85 Gamcho Root Abdominal cold hypersensitivity Infusion Oral 19.23
Snakebite Fermentation Topical 0.95
Tarsal tunnel syndrome A sweet drink made from fermented rice, infusion Oral 3.81
Urticaria Infusion Oral 2.86
Whitlow Boiling Topical 1.90
Young leaf Common cold A sweet drink made from fermented rice, extraction, fermentation, infusion, roast Oral 2.33
Milk fever Fumigation, infusion, soup Oral, topical 15.24
Abdominal cold Infusion Oral 19.23
Anorexia Infusion Oral 5.77
Poisonings Infusion Oral 5.77
Sterility Infusion Oral 5.77
Hangover Decoction Oral 49.53
Abdominal pain Grain syrup, infusion Oral 15.89
Anorexia Infusion Oral 2.80
Gastroenteric disorder Boiled rice, brewing, decoction, infusion, juice Oral 14.95
Hangover Clear soup with flour dumplings, grain syrup, infusion, juice, maceration, raw, tea Oral 49.53
Indigestion Clear soup with flour dumplings, juice, tea Oral 16.82
Cattle disease Infusion Oral 61.96
| Table 2 Plant species for medicinal purposes in community of Gayasan National Park in Korea (Continued) |
|-----------------------------|-----------------------------|-----------------------------|-----------------------------|-----------------------------|
| Chronic myofascial pain     | Dissolution                 | Oral 2.17                   |
| Gastroenteric disorder      | Infusion                    | Oral 3.80                   |
| Hansen’s Disease            | Dried, infusion             | Oral 3.80                   |
| Leg pain                    | Infusion, maceration        | Oral 5.43                   |
| Lumbago                     | Juice, maceration           | Oral 7.61                   |
| Neuralgia                   | Infusion, juice             | Oral 5.43                   |
| Paralysis                   | Infusion                    | Oral 2.72                   |
| Pruritus                    | Dried, maceration, mixed in liquor, pill | Oral 1.63 |
| Pus                         | Maceration                  | Oral 2.72                   |
| Skin diseases               | Maceration, raw             | Oral 2.17                   |
| Vigna angularis (Willd.) Ohwi & H.Ohashi | KH5422 S190 Pat Seed Cattle disease Infusion Oral 100.00 |
| Castanea crenata Siebold & Zucc. | KH5423 S38 Bamnamu Bark Indigestion Infusion Oral 6.02 |
| Fagaceae                    | Lacquer poisoning           | Infusion                    |
| Fruit                       | Abdominal cold hypersentivity | Decoction, grain syrup, infusion, pill, simmer Oral 36.14 |
| Anorexia                    | Simmer, pill                | Oral 6.02                   |
| Lack of energy              | Simmer, pill                | Oral 6.02                   |
| Measles                     | Panbroiled                  | Oral 3.61                   |
| Sterility                   | Grain syrup, infusion, Simmer, pill | Oral 14.46 |
| Leaf                        | Lacquer poisoning           | Infusion                    |
| Leaf                        | Lacquer poisoning           | Infusion                    |
| Leaf                        | Lacquer poisoning           | Infusion                    |
| Quercus acutissima Carruth.| KHS424 S148 Sangsurnamau Fruit Cattle disease Raw Oral 100.00 |
| Ganodermataceae             | Ganoderma lucidum (Curtis) P. Karst. | KHS425 S77 Bulrocho Whole part Abdominal pain Boiling Oral 4.35 |
| Bone diseases               | A sweet drink made from fermented rice | Oral 13.04 |
| Cancer                      | Boiling, decoction          | Oral 26.09                   |
| Common cold                 | Boiling                     | Oral 26.09                   |
| Indigestion                 | Infusion                    | Oral 13.04                   |

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Table 2 Plant species for medicinal purposes in community of Gayasan National Park in Korea *(Continued)*

| **Family**     | **Genus**                      | **Species** | **Collection No.** | **Location** | **Part** | **Indication**                                                                 | **Preparation** | **Route** | **Dosage** |
|----------------|--------------------------------|-------------|--------------------|--------------|----------|--------------------------------------------------------------------------------|----------------|-----------|------------|
| Gentianaceae   | Gentiana scabra Bunge          | KHS46       | YS00               | Leaf         | Pollakiuria Infusion | A sweet drink made from fermented rice, infusion Oral 45.45 |
| Geraniaceae    | Geranium thunbergii Siebold & Zucc. | KHS27       | S81                | Leaf         | Abdominal pain Infusion | Oral 100.00 |
| Geraniaceae    | Geranium thunbergii Siebold & Zucc. | KHS28       | S82                | Fruit        | Asthma Brewing | Glycosuria Infusion, roast Oral 66.67 |
| Hymenochaetaceae | Phellinus linteus (Berk. & Curt.) Teng | KHS429      | S124               | Whole part   | Cancer Boiling, infusion Infusion Oral 68.97 |
| Juglandaceae   | Juglans regia L.               | KHS430      | S94                | Fruit        | Lack of energy Raw | Oral 100.00 |
| Lamiaceae      | Leonurus japonicus Houtt.       | KHS432      | S100               | Aerial part  | Abdominal cold hypersensitivity A sweet drink made from fermented rice, decoction, dried, grain syrup, infusion, juice, maceration, pill, raw, simmer, taffy Oral 42.17 |

Woman diseases Dried, infusion Oral 17.39
Gentianaceae Gentiana scabra Bunge KHS46 S80 Yongdam Leaf Pollakiuria Infusion Oral 45.45
Geraniaceae Geranium thunbergii Siebold & Zucc. KHS27 S81 Ijilpul Leaf Abdominal pain Infusion Oral 100.00
Geraniaceae Geranium thunbergii Siebold & Zucc. KHS28 S82 Eunhaengnamu Fruit Asthma Brewing Glycosuria Infusion, roast Oral 66.67
Hymenochaetaceae Phellinus linteus (Berk. & Curt.) Teng KHS429 S124 Mokjiheulheokseot Whole part Cancer Boiling, infusion Infusion Oral 68.97
Juglandaceae Juglans regia L. KHS430 S94 Hodunamu Fruit Lack of energy Raw Oral 100.00
Lamiaceae Leonurus japonicus Houtt. KHS432 S100 Ikmocho Aerial part Abdominal cold hypersensitivity A sweet drink made from fermented rice, decoction, dried, grain syrup, infusion, juice, maceration, pill, raw, simmer, taffy Oral 42.17

A sweet drink made from fermented rice, brewing, decoction Oral 6.36
A sweet drink made from fermented rice, brewing, decoction, infusion Oral 60.31
A sweet drink made from fermented rice, brewing, decoction, infusion Oral 3.82
A sweet drink made from fermented rice, brewing, decoction, infusion Oral 0.51
A sweet drink made from fermented rice, brewing, decoction, infusion Oral 16.03
A sweet drink made from fermented rice, infusion Oral 10.43
A sweet drink made from fermented rice, decoction, dried, grain syrup, infusion, juice, maceration, pill, raw, simmer, taffy Oral 42.17
A sweet drink made from fermented rice, brewing, decoction, dried, grain syrup, infusion, juice, maceration, pill, raw, simmer, taffy Oral 2.07
A sweet drink made from fermented rice, decoction, dried, grain syrup, infusion, juice, maceration, pill, raw, simmer, taffy Oral 1.61
| Condition               | Preparation                                                                 | Route | Quantity |
|-------------------------|-----------------------------------------------------------------------------|-------|----------|
| Anorexia                | Maceration, pill, simmer                                                    | Oral  | 3.00     |
| Bone diseases           | A sweet drink made from fermented rice, dried, infusion                      | Oral  | 0.92     |
| Cattle disease          | Brewing, maceration                                                          | Oral  | 1.38     |
| Dysmenorrhea            | Infusion                                                                    | Oral  | 1.61     |
| Fatigue                 | Maceration                                                                  | Oral  | 1.38     |
| Jaundice                | A sweet drink made from fermented rice, infusion, juice, pill, tea           | Oral  | 1.84     |
| Lack of energy          | A sweet drink made from fermented rice, dried, infusion, pill, simmer        | Oral  | 2.07     |
| Leukorrhea              | Infusion                                                                    | Oral  | 2.53     |
| Liver diseases          | Infusion, pill                                                              | Oral  | 0.46     |
| Raynaud’s Phenomenon    | A sweet drink made from fermented rice, infusion, juice                      | Oral  | 4.84     |
| Sterility               | A sweet drink made from fermented rice, decoction, infusion, juice, pill, simmer | Oral  | 21.20    |
| Woman diseases          | Boiling dried, grain syrup, infusion, juice, pill, simmer, taffy             | Oral  | 10.60    |
| Leaf                    | Abdominal cold hypersensitivity                                             | Oral  | 42.17    |
| Anorexia                | Juice                                                                       | Oral  | 3.00     |
| Irregular menstruation  | Infusion                                                                    | Oral  | 0.46     |
| Raynaud’s Phenomenon    | Infusion                                                                    | Oral  | 4.84     |
| Sterility               | Grain syrup, infusion, simmer                                               | Oral  | 21.20    |
| Woman diseases          | Grain syrup                                                                 | Oral  | 10.60    |
| Root                    | Sterility                                                                   | Oral  | 21.20    |
| Stem                    | Raynaud’s Phenomenon                                                        | Oral  | 4.84     |
| Sterility               | Grain syrup, juice                                                          | Oral  | 21.20    |
| Whole part              | Abdominal cold hypersensitivity                                             | Oral  | 42.17    |
| Paralysis               | Decoction, grain syrup, infusion, juice                                     | Oral  | 0.92     |
| Sterility               | Grain syrup, juice                                                          | Oral  | 21.20    |
| Overheating             | Juice                                                                       | Oral  | 0.92     |
| Plant Species | KHS Code | Collection Code | Part | Disease | Application | Dosage |
|---------------|----------|-----------------|------|---------|-------------|--------|
| Mentha piperascens (Malinv.) Holmes | KHS433 | S107 Bakha | Stem | Woman diseases | Decoction, juice | Oral 10.60 |
| Perilla frutescens var. acuta Kudo | KHS434 | S121 Soyeop | Leaf | Dental pain | Maceration | Topical 100.00 |
| Perilla frutescens var. japonica (Hassk.) H.Hara | KHS435 | S122 Deulggae | Seed | Abdominal pain | Raw | Oral 13.73 |
| Salvia plebeia R.Br. | KHS436 | S164 Baeamchajeugi | Leaf | Bone diseases | A sweet drink made from fermented rice, dried, infusion, | Oral 7.22 |
| Salvia plebeia R.Br. | KHS436 | S164 Baeamchajeugi | Leaf | Gastroenteric disorder | Infusion | Oral 5.15 |
| Salvia plebeia R.Br. | KHS436 | S164 Baeamchajeugi | Leaf | Hypofunction | A sweet drink made from fermented rice, dried, infusion, | Oral 10.31 |
| Salvia plebeia R.Br. | KHS436 | S164 Baeamchajeugi | Leaf | Root | A sweet drink made from fermented rice | Oral 19.59 |

| Disease | Application | Dosage |
|---------|-------------|--------|
| Cattle disease | Infusion | Oral 25.00 |
| Common cold | Decoction, infusion | Oral 57.69 |
| Headache | Decoction | Oral 1.92 |
| Pruritus | Infusion, juice | Oral, topical 7.69 |
| Convulsion | Decoction, oil | Oral 31.37 |
| Gastroenteric disorder | Seasoned cooked vegetables | Oral 7.84 |
| Lacquer poisoning | Maceration, powder, raw | Topical 47.06 |
| Gastroenteric disorder | Infusion | Oral 5.15 |
| Hypofunction | A sweet drink made from fermented rice, dried, infusion, | Oral 10.31 |
| Ankle pain | A sweet drink made from fermented rice | Oral 19.59 |
| Abdominal pain | Infusion | Oral 7.22 |
| Arm pain | A sweet drink made from fermented rice | Oral 5.15 |
| Asthma | A sweet drink made from fermented rice, dried, infusion, | Oral 4.12 |
| Bone diseases | Infusion | Oral 7.22 |
| Cough | Dried, grain syrup, infusion | Oral 28.87 |
| Empyema | Infusion | Oral 3.09 |
| Hypofunction | A sweet drink made from fermented rice, brewing | Oral 10.31 |
| Leg pain | A sweet drink made from fermented rice, infusion | Oral 19.59 |
| Woman diseases | Infusion | Oral 6.19 |
| Family            | Species                          | Accession | Use                                      | Preparation    | Route  | CTE (mg/kg) |
|-------------------|----------------------------------|-----------|------------------------------------------|----------------|--------|-------------|
| **Lardizabalaceae** | *Akebia quinata* (Houtt.) Decne. | KHS437    | Abdominal pain                           | Infusion       | Oral   | 4.84        |
|                   |                                  |           | Anorexia                                 | Infusion       | Oral   | 4.84        |
|                   |                                  |           | Arm pain                                 | Infusion       | Oral   | 6.45        |
|                   |                                  |           | Bone diseases                            | A sweet drink made from fermented rice, infusion | Oral   | 46.77        |
|                   |                                  |           | Leg pain                                 | A sweet drink made from fermented rice, infusion | Oral   | 6.45        |
|                   |                                  |           | Pollakiuria                              | Infusion       | Oral   | 20.97       |
|                   |                                  |           | Sterility                                | Infusion       | Oral   | 9.68        |
| **Lauraceae**     | *Cinnamomum cassia* Presl.       | KHS438    | Common cold                              | Decoction      | Oral   | 100.00      |
|                   | *Lindera obtusiloba* Blume       | KHS439    | Arm pain                                 | A sweet drink made from fermented rice, infusion | Oral   | 28.00       |
|                   |                                  |           | Leg pain                                 | Brewing        | Oral   | 28.00       |
|                   |                                  |           | Lumbago                                  | Infusion       | Oral   | 28.00       |
|                   |                                  |           | Postpartum myofascial pain syndrome      | Infusion       | Oral   | 16.00       |
| **Liliaceae**     | *Allium fistulosum* L.           | KHS440    | Common cold                              | Decoction, infusion | Oral   | 65.52       |
|                   |                                  |           | Cough                                    | Infusion       | Oral   | 12.07       |
|                   |                                  |           | Hyperthermia                             | Infusion       | Oral   | 22.41       |
|                   | *Allium scorodoporus* var. viviparum Regel | KHS441 | Lymphnodes                              | Maceration      | Topical | 100.00      |
|                   | *Allium thunbergii* G.Don       | KHS442    | Angina pectoris                          | Kimchi, raw, seasoned cooked vegetables | Oral   | 100.00      |
|                   | *Allium tuberosum* Rottler ex Spreng. | KHS443 | Leaf                                     | Epistaxis, Juice | Oral   | 18.18       |
|                   |                                  |           | Lacquer poisoning                        | Maceration, raw | Topical | 48.48       |
|                   |                                  |           | Leaf                                     | Pruritus        | Topical | 12.12       |
|                   |                                  |           | Root                                     | Pollakiuria, Infusion, juice | Oral   | 21.21       |
|                   | *Asparagus schoberioides* Kunth | KHS444    | Pollakiuria                              | A sweet drink made from fermented rice, infusion | Oral   | 73.08       |
|                   |                                  | S25       | Whole part                               | Edema          | Infusion | 13.46       |
|                   |                                  |           | Pollakiuria                              | A sweet drink made from fermented rice, infusion | Oral   | 73.08       |
|                   |                                  |           | Sexual enhancement                       | Infusion       | Oral   | 13.46       |
|                   | *Scilla scilloides* (Lindl.) Druce | KHS445   | Root                                     | Edema          | Simmer  | 100.00      |
Table 2 Plant species for medicinal purposes in community of Gayasan National Park in Korea (Continued)

| Family          | Species                                      | Accession | Type          | Part           | Condition                              | Preparation                      | Route  | Price |
|-----------------|----------------------------------------------|-----------|---------------|----------------|-----------------------------------------|-----------------------------------|--------|-------|
| Loranthaceae    | Viscum album var. coloratum (Kom.) Ohwi      | KH5446    | Leaf          | Edema          | A sweet drink made from fermented rice  | Oral                             | 100.00 |
|                 |                                               |           | Stern         | Edema          | A sweet drink made from fermented rice  | Oral                             | 100.00 |
| Magnoliaceae    | Magnolia obovata Thunb.                     | KH5447    | Fruit         | Heart disease  | Infusion                               | Oral                             | 100.00 |
| Malvaceae       | Althaea rosea (L.) Cav.                     | KH5448    | Root          | Leukorrhea     | Infusion                               | Oral                             | 50.00  |
|                 |                                               |           | Whole part    | Sterility      | Infusion                               | Oral                             | 50.00  |
|                 |                                               |           | Leaf          | Sterility      | Decoction                              | Oral                             | 50.00  |
| Mellaceae       | Cedrela sinensis Juss.                      | KH5449    | Fruit         | Heart disease  | Infusion                               | Oral                             | 100.00 |
|                  |                                               |           | Root          | Acute          | gastroenteritis                        | Infusion, maceration              | Oral   | 47.06 |
|                  |                                               |           | Indigestion   | Juice          | Infusion                               | Topical                          | 5.88   |
|                  |                                               |           | Stem          | Acute          | gastroenteritis                        | Infusion                          | Oral   | 47.06 |
|                  |                                               |           | Food poisoning| Infusion       | Oral                                   | 11.76                            |
| Menispermaceae  | Cocculus trilobus (Thunb.) DC.               | KH5450    | Fruit         | Cough          | Mixed in ripe persimmon, raw           | Oral                             | 35.29  |
|                  |                                               |           | Root          | Acute          | gastroenteritis                        | Infusion                          | Oral   | 47.06 |
|                  |                                               |           | Indigestion   | Juice          | Infusion                               | Topical                          | 5.88   |
|                  |                                               |           | Stem          | Acute          | gastroenteritis                        | Infusion                          | Oral   | 47.06 |
|                  |                                               |           | Food poisoning| Infusion       | Oral                                   | 11.76                            |
| Moraceae        | Broussonetia kazinoki Siebold               | KH5451    | Fruit         | Hookworm       | Infusion                               | Oral                             | 100.00 |
|                  | Cudrania tricuspidata (Carr.) Bureau ex Lavallee | KH5452  | Bark          | Cancer         | Infusion                               | Oral                             | 25.31  |
|                 |                                               |           | Glycosuria    | Infusion       | Oral                                   | 33.44                            |
|                 |                                               |           | Liver diseases| Infusion       | Oral                                   | 6.56                            |
|                  |                                               |           | Leaf          | Extravasated blood | Dried, maceration                   | Oral                             | 1.25   |
|                  |                                               |           | Root          | Bone diseases  | A sweet drink made from fermented rice | Oral                             | 17.19  |
|                  |                                               |           | Cancer        | A sweet drink made from fermented rice, boiling, brewing, infusion | Oral                             | 25.31  |
|                  |                                               |           | Poor          | circulation   | Infusion                               | Oral                             | 1.88   |
|                  |                                               |           | Glycosuria    | A sweet drink made from fermented rice, boiling, decoction, infusion | Oral                             | 33.44  |
|                  |                                               |           | Hypofunction  | Infusion       | Oral                                   | 7.50                            |
|                  |                                               |           | Leg pain      | Infusion       | Oral                                   | 1.25                            |
|                  |                                               |           | Lumbago       | Infusion       | Oral                                   | 3.75                            |
|                  |                                               |           | Neuralgia     | Infusion       | Oral                                   | 1.25                            |
|                  |                                               |           | Paralysis     | Infusion       | Oral                                   | 0.63                            |
Table 2 Plant species for medicinal purposes in community of Gayasan National Park in Korea (Continued)

| Plant Species                              | Part/Comp.                        | Medicinal Uses                                      | Preparation | Route | % Effect |
|--------------------------------------------|-----------------------------------|-----------------------------------------------------|-------------|-------|----------|
| **Stem** Cancer                           | A sweet drink made from fermented rice, boiling, brewing, infusion | Oral 17.19 |            |       |          |
| Poor circulation Cancer                    | Infusion                          | Oral 1.88   |            |       |          |
| Glycosuria Cancer                          | A sweet drink made from fermented rice, boiling, brewing, infusion | Oral 33.44 |            |       |          |
| Hypofunction Cancer                        | A sweet drink made from fermented rice, infusion | Oral 7.50  |            |       |          |
| Leg pain                                   | Infusion                          | Oral 1.25   |            |       |          |
| Liver diseases                             | A sweet drink made from fermented rice, infusion | Oral 6.56  |            |       |          |
| Lumbago                                    | A sweet drink made from fermented rice, infusion | Oral 3.75  |            |       |          |
| Paralysis                                  | Infusion                          | Oral 0.63   |            |       |          |
| **Morus alba L.**                          | Dried, infusion                   | Oral 33.33  |            |       |          |
| Young leaf                                 | Dried, infusion, panbroiled, raw, tea | Oral 66.67 |            |       |          |
| Nymphaeaceae Nymphaea                    | Dried, infusion                   | Oral 66.67  |            |       |          |
| Nymphaea Nelumbo                           | Dried, infusion                   | Oral 66.67  |            |       |          |
| Oleaceae Forsythia koreana (Rehder) Nakai | Infusion, juice                   | Oral 100.00 |            |       |          |
| Orchidaceae Gastrodia elata Blume          | Brewing                           | Oral 100.00 |            |       |          |
| Paeoniaceae Paeonia abovata Maxim.         | Irregular menstruation            | Oral 37.50  |            |       |          |
| Papaveraceae Chelidonium majus var.        | Bone diseases                     | Oral 5.06   |            |       |          |
| asiaticum (H-Hara) Ohwi                    | A sweet drink made from fermented rice, dried, infusion, | Oral 5.06  |            |       |          |
| Chronic myofascial pain                    | Juice                             | Oral 68.35  |            |       |          |
| Hypofunction                               | A sweet drink made from fermented rice, dried, infusion, | Oral 5.06  |            |       |          |
| Root Chronic myofascial pain              | Brewing                           | Oral 68.35  |            |       |          |
| Stem                                       | Brewing                           | Oral 68.35  |            |       |          |
Table 2 Plant species for medicinal purposes in community of Gayasan National Park in Korea (Continued)

| Plant Family | Scientific Name | Accession Code | Location | Part | Condition | Preparation Method | Route | Incidence |
|--------------|-----------------|----------------|----------|------|-----------|--------------------|-------|-----------|
| Pedaliaceae  | Papaver somniferum L. | KH5459 S117 Yanggwibi | Fruit | Abdominal pain | Dissolution, dried, grain syrup, juice, maceration | Oral, topical | 53.76 |
|              | Pedaliaceae     | Sesamum indicum L. | S173 Chamggae | Seed | Abdominal cold hypersensitivity | Simmer | Oral | 21.05 |
| Phytolaccaceae | Phytolacca esculenta VanHoutte | KH5461 S128 Jarigong | Root | Abdominal pain | Infusion | Oral | 10.42 |

Additional notes:
- Oral: 68.35
- Topical: 21.05
- Oral: 5.06
- Topical: 10.53
- Oral: 8.33
- Topical: 12.50
Table 2 Plant species for medicinal purposes in community of Gayasan National Park in Korea (Continued)

| Plant Family | Plant Name | Species | Collection Code | Part Used | Medical Use | Preparation Method | Route | Percentage |
|--------------|------------|---------|----------------|-----------|-------------|-------------------|------|------------|
| Pinaceae     | Pinus densiflora Siebold & Zucc. | KH5462 S130 Sonamu Leaf | Dental pain | Raw | Oral | 39.58 |
|              | Pinus koraiensis Siebold & Zucc. | KH5463 S131 Jatnamu Pine resin | Boils | Raw | Topical | 11.11 |
|              | Plantago asiatica L. | KH5464 S132 Jilgyeongi Leaf | Heart disease | Infusion | Oral | 4.97 |
|              | Hordeum vulgare var. hexastichon (L.) Asch. | KH5465 S87 Bori Malt | Abdominal pain | Malted barley seedling | Oral | 0.62 |

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| Condition               | Preparation                                      | Route   | Unit |
|-------------------------|--------------------------------------------------|---------|------|
| Eye disease             | Boiling, dried                                   | Oral    | 0.78 |
| Fatigue                 | A sweet drink made from fermented rice           | Oral    | 1.09 |
| Finger pain             | Decoction                                        | Oral    | 1.24 |
| Gastric ulcer           | A sweet drink made from fermented rice           | Oral    | 0.16 |
| Gastritis               | A sweet drink made from fermented rice           | Oral    | 0.16 |
| Gastroenteric disorder  | A sweet drink made from fermented rice, infusion, pill | Oral    | 3.73 |
| Hemorrhaging            | Rubbing                                          | Topical | 0.78 |
| Hookworm                | A sweet drink made from fermented rice           | Oral    | 0.47 |
| Hyperthermia            | A sweet drink made from fermented rice           | Oral    | 0.16 |
| Hypofunction            | A sweet drink made from fermented rice, dried, infusion | Oral    | 1.87 |
| Indigestion             | A sweet drink made from fermented rice, infusion, maceration, malted barley seedling, raw | Oral    | 4.98 |
| Jaundice                | A sweet drink made from fermented rice           | Oral    | 2.33 |
| Leg pain                | A sweet drink made from fermented rice, decoction, infusion | Oral    | 14.46 |
| Liver diseases          | A sweet drink made from fermented rice, pill     | Oral    | 1.24 |
| Lumbago                 | A sweet drink made from fermented rice, brewing  | Oral    | 6.22 |
| Paralysis               | A sweet drink made from fermented rice, infusion | Oral    | 4.82 |
| Pollakiuria             | A sweet drink made from fermented rice           | Oral    | 1.09 |
| Pruritus                | A sweet drink made from fermented rice           | Oral    | 1.71 |
| Pus                     | Boiled rice, maceration                          | Topical | 1.87 |
| Raynaud's Phenomenon    | A sweet drink made from fermented rice           | Oral    | 0.31 |
| Sexual enhancement      | A sweet drink made from fermented rice           | Oral    | 0.31 |
| Shoulder pain           | A sweet drink made from fermented rice           | Oral    | 1.56 |
| Sinews and joint pain   | A sweet drink made from fermented rice           | Oral    | 0.16 |
| Skin diseases           | A sweet drink made from fermented rice           | Oral    | 0.93 |
| Tarsal tunnel syndrome  | A sweet drink made from fermented rice           | Oral    | 1.09 |
| Woman diseases          | Grain syrup                                     | Oral    | 0.47 |
Table 2 Plant species for medicinal purposes in community of Gayasan National Park in Korea (Continued)

| Plant Species | Taxonomy | Accession Code | Part Used | Condition | Preparation | Route | Dosage |
|---------------|----------|----------------|-----------|-----------|-------------|-------|--------|
| Hordeum vulgare var. nudum Spenn. | KH5466 S88 Ssalbori | Seed | Pollakiuria | A sweet drink made from fermented rice | Oral | 100.00 |
| Imperata cylindrica var. koenigii (Retz.) Pilg. | KH5467 S92 Tti | Flower | Bloody discharge | Infusion | Oral | 15.38 |
| | | | Burn | Burn, raw | Topical | 84.62 |
| Oryza sativa L. | KH5468 S113 Byeo | Root | Lacquer poisoning | Infusion | Topical | 48.98 |
| | | Seed | Carpal tunnel syndrome | Infusion | Oral | 4.08 |
| | | | Hangover | Powder | Oral | 4.08 |
| | | | Jaundice | A sweet drink made from fermented rice | Oral | 5.10 |
| | | | Lacquer poisoning | Maceration, raw | Topical | 48.98 |
| | | | Pollakiuria | Infusion, rice water | Oral | 9.18 |
| | | | Snakebite | Porridge, raw | Topical | 8.16 |
| | | | Tarsal tunnel syndrome | Infusion | Oral | 4.08 |
| | | Stem | Burn | Raw | Topical | 2.04 |
| | | | Hemorrhaging | Raw | Topical | 2.04 |
| | | | Indigestion | Dried, infusion | Oral | 2.04 |
| | | | Urticaria | Roast | Topical | 5.10 |
| | | | Wound | Raw | Topical | 5.10 |
| Oryza sativa var. glutinosa Blanco | KH5469 S114 Chalbyeo | Seed | Abdominal cold hypersensitivity | Pill, simmer | Oral | 31.25 |
| | | | Anorexia | Pill, simmer | Oral | 7.81 |
| | | | Carpal tunnel syndrome | A sweet drink made from fermented rice | Oral | 3.13 |
| | | | Lack of energy | Pill, simmer | Oral | 7.81 |
| | | | Paralysis | A sweet drink made from fermented rice | Oral | 12.50 |
| | | | Pollakiuria | Porridge | Oral | 7.81 |
| | | | Sterility | Pill, simmer | Oral | 7.81 |
| | | | Tarsal tunnel syndrome | A sweet drink made from fermented rice | Oral | 3.13 |
| | | Stem | Cattle disease | Fumigation | Topical | 7.81 |
| | | Urticaria | Fumigation | Topical | 7.81 |
| | | Young leaf | Epistaxis | Infusion | Oral | 3.13 |
| Plant Species | KHS Code | Type | Part | Disease | Use | Preparation | Oral/Topical | Percentage |
|---------------|---------|------|------|---------|-----|-------------|-------------|------------|
| *Phyllostachys bambusoides* Siebold & Zucc. | KH5470 S126 | Leaf | Common cold | Infusion | Oral | 38.46 |
| *Sasa borealis* (Hack.) Makino | KH5471 S167 | Root | Lumbago | A sweet drink made from fermented rice | Oral | 61.54 |
| *Sasa coreana* Nakai | KH5472 S168 | Stem | Cattle disease | Infusion | Oral | 100.00 |
| *Setaria italica* (L.) P. Beauv. | KH5473 S174 | Aerial part | Cattle disease | Infusion | Oral | 43.75 |
| *Triticum aestivum* L. | KH5474 S187 | Seed | Arm pain | A sweet drink made from fermented rice, brewing | Oral | 5.26 |

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http://www.ethnobiomed.com/content/10/1/74
Table 2 Plant species for medicinal purposes in community of Gayasan National Park in Korea (Continued)

| ZEA MAYS L. | KHS575 | S198 | OKSU SU | Fruit | Pollakiuria Tea A sweet drink made from fermented rice, brewing, dough | Oral, topical 94.62 |
|-------------|--------|------|---------|-------|---------------------------------------------------------------------|---------------------|
| Style       | Abdominal pain | Infusion | Oral | 2.31 |
| Tarsal tunnel syndrome | Infusion | Oral | 2.31 |
| POLYGONACEAE | FAGOPYRUM ESULENTUM Moench | KHS576 | S72 | MEMIL | PERICARP | PUS Maceration Topical 100.00 |
| FALLOPIA JAPONICA (Houtt.) RonseDecr. | KHS577 | S73 | HOJANGGEUN | AERIAL PART | Pollakiuria Infusion | Oral 100.00 |
| FALLOPIA MULTIFLORA (Thunb.) Haraldson | KHS578 | S74 | HASUO | ROOT | Pollakiuria Infusion | Oral 100.00 |
| RUMEX ACETOSA L. | KHS579 | S160 | SUYEONG | WHOLE PART | Pollakiuria Infusion | Oral 41.18 |
| RUMEX CRISPUS L. | KHS580 | S161 | SORIJAENGI | Root | Leg pain A sweet drink made from fermented rice Infusion | Oral 38.89 |
| Malaria | Infusion | Oral | 17.65 |
| Polyphoraceae | CORIOLUS VERSICOLOR (L.:Fr.) Quél. | KHS581 | S54 | GUREUMBOSEOT | Whole part Common cold Boiling, decoction | Oral 100.00 |
| Portulacaceae | PORTULACA OLERACEA L. | KHS583 | S138 | SOEBIREUM | AERIAL PART Cancer | Infusion | Oral 83.33 |
| PUNICA GRANATUM L. | KHS584 | S145 | SEOKRYUNAMU | Flower | Epistaxis Dried, infusion Topical 20.69 |
| Fruit | Abdominal pain | Raw | Oral | 13.79 |
| Common cold Extraction, infusion, raw | Oral | 41.38 |
| Cough | Infusion | Oral | 24.14 |
| Pericarp | Epistaxis Dried | Topical 20.69 |
| Plant Family | Plant Species | Genus, Species | GenBank Accession | Part | Disease | Preparation | Route | Dosage |
|-------------|---------------|----------------|-------------------|------|---------|-------------|-------|--------|
| Ramariaceae | Ramaria botrytis (Pers.) Ricken | Ramaria botrytis | KHS485 S149 Ssaribeoseot | Whole part | Diarrhea | Infusion | Oral | 100.00 |
| Ranunculaceae | Aconitum ciliare DC. | Aconitum ciliare | KHS486 S3 Notjeotgaraknamul | Root | Afterpain | Infusion | Oral | 1.08 |
| | | | | | Arm pain | A sweet drink made from fermented rice, infusion | Oral | 8.92 |
| | | | | | Bone diseases | A sweet drink made from fermented rice, infusion | Oral | 6.22 |
| | | | | | Carpal tunnel syndrome | A sweet drink made from fermented rice, decoction, infusion, simmer | Oral | 15.41 |
| | | | | | Leg pain | A sweet drink made from fermented rice, decoction, infusion | Oral | 14.05 |
| | | | | | Lumbago | Infusion | Oral | 0.81 |
| | | | | | Malgia | Infusion | Oral | 0.27 |
| | | | | | Paralysis | A sweet drink made from fermented rice, brewing, decoction, infusion, simmer | Oral | 37.84 |
| | | | | | Postpartum myofascial pain syndrome | Infusion | Oral | 1.08 |
| | | | | | Tarsal tunnel syndrome | A sweet drink made from fermented rice, decoction, infusion, simmer | Oral | 14.32 |
| | Pulsatilla koreana (Yabe ex Nakai) Nakai ex Nakai | Pulsatilla koreana | KHS488 S144 Halmikkot | Leaf | Facial nerve paralysis | Maceration | Topical | 2.99 |
| | | | | | Root | Abdominal pain | A sweet drink made from fermented rice, grain syrup, infusion | Oral | 11.19 |
| | | | | | Bone diseases | A sweet drink made from fermented rice, brewing | Oral | 2.99 |
| | | | | | Convulsion | Infusion | Oral | 2.99 |
| | | | | | Facial nerve paralysis | Maceration | Topical | 2.99 |
| | | | | | Gastroenteric disorder | A sweet drink made from fermented rice, infusion, simmer | Oral | 8.96 |
| | | | | | Hookworm | A sweet drink made from fermented rice, decoction, dissolution, grain syrup, infusion, juice, maceration | Oral, topical | 60.45 |
| | | | | | Hypoacusis | Brewing | Oral | 3.73 |
| | | | | | Lumbago | A sweet drink made from fermented rice, brewing | Oral | 2.99 |
| Plant family | Species | Accession | Year | Part | Disease | Use | Preparation | Dosage |
|-------------|---------|-----------|------|------|---------|-----|-------------|--------|
| **Ranunculaceae** | *Ranunculus sceleratus* L. | KH5489 S150 Gaegurijari Leaf | 3.73 | Lymphnoditis | Maceration | Topical |
| | | | 12.07 | Facial nerve paralysis | Maceration, raw | Topical |
| | | | 87.93 | Root | Facial nerve paralysis | Maceration | Topical |
| **Rhamnaceae** | *Hovenia dulcis* Thunb. | KH5490 S89 Heotgaenamu Fruit | 5.56 | Cancer | Decoction | Oral |
| | | | 69.44 | Liver diseases | Tea | Oral |
| | | | 5.56 | Stem | Cancer | Decoction | Oral |
| | | | 13.89 | Glycosuria | Infusion | Oral |
| | | | 11.11 | Hangover | Brewing, infusion | Oral |
| | | | 69.44 | Liver diseases | Infusion | Oral |
| | *Zizyphus jujuba var. inermis* (Bunge) Rehder | KH5491 S200 Daechunamu Fruit | 14.29 | Abdominal cold hypersensitivity | Decoction, grain syrup, infusion, pill, simmer | Oral |
| | | | 2.38 | Anorexia | Pill, simmer | Oral |
| | | | 2.38 | Common cold | Boiling, decoction, dried, roast | Oral |
| | | | 8.10 | Cough | Infusion | Oral |
| | | | 10.00 | Fatigue | A sweet drink made from fermented rice, boiled rice, raw | Oral |
| | | | 0.95 | Gastroenteric disorder | Infusion | Oral |
| | | | 3.33 | Lack of energy | Decoction, pill, simmer, tea | Oral |
| | | | 8.10 | Sterility | Grain syrup, infusion, pill, simmer | Oral |
| | | | 3.81 | Woman diseases | Infusion | Oral |
| **Rosaceae** | *Chaenomeles sinensis* (Thouin) Koehne | KH5492 S42 Mogwanamu Fruit | 45.36 | Common cold | Boiling, brewing, decoction, extraction, infusion | Oral |
| | | | 4.53 | Cough | Boiling, brewing, decoction, dissolution, extraction, infusion, steamed | Oral |
| | *Duchesnea indica* (Andr.) Focke | KH5493 S64 Baemddalgi Fruit | 46.15 | Dental pain | Infusion | Oral |
| Plant Species | Accession | Plant Part | Condition | Medicinal Use | Route | Frequency |
|---------------|-----------|------------|-----------|---------------|-------|-----------|
| Snakebite Maceration | Topical | 38.46 |
| Whole part Dental pain Infusion | Topical | 46.15 |
| Measles Infusion | Oral | 15.38 |
| *Potentilla chinensis* Ser. | S139 | Ttakjikkoch Root | Gastroenteric disorder Infusion, raw | Oral | 100.00 |
| *Prunus armeniaca* var. *ansu* Maxim. | S140 | Salgunamu Seed | Indigestion Maceration | Oral | 100.00 |
| *Prunus davidiana* (Carrière) Franch. | S141 | Sanboksanamu Fruit | Abdominal pain Extraction | Oral | 6.15 |
| Potentilla chinensis | KH5494 | S139 | Raw | Gastroenteric disorder Infusion, raw | Oral | 100.00 |
| *Prunus armeniaca* var. *ansu* Maxim. | KH5495 | S140 | Salgunamu Seed | Indigestion Maceration | Oral | 100.00 |
| *Prunus davidiana* (Carrière) Franch. | KH5496 | S141 | Sanboksanamu Fruit | Abdominal pain Extraction | Oral | 6.15 |
| Arm pain Brewing, extraction | Oral | 21.54 |
| Hypertension Brewing | Oral | 4.62 |
| Leg pain Brewing, extraction | Oral | 44.62 |
| Lumbago Brewing | Oral | 9.23 |
| Osteoporosis Extraction | Oral | 1.54 |
| Root | Leg pain Brewing | Oral | 44.62 |
| Lumbago Brewing | Oral | 9.23 |
| Stem | Asthma Grain syrup | Oral | 4.62 |
| Bone diseases Infusion | Oral | 7.69 |
| Leg pain Infusion | Oral | 44.62 |
| *Prunus mume* Siebold & Zucc. | KH5497 | S142 | Maesilnamu Fruit | Abdominal pain Extraction | Oral | 46.00 |
| Gastroenteric disorder Extraction | Oral | 10.00 |
| *Prunus mume* Siebold & Zucc. | KH5498 | S146 | Dolbaenamu Fruit | Abdominal pain Extraction | Oral | 46.00 |
| *Punus mume* Siebold & Zucc. | KH5499 | S147 | Baenamu Fruit | Bronchitis Extraction, infusion | Oral | 5.88 |
| Common cold A sweet drink made from fermented rice, decoction, fermentation, infusion, raw, roast | Oral | 56.86 |
| *Rubus coreanus* Miq. | KH5500 | S158 | Jijirekkot Root | Osteoporosis Infusion | Oral | 100.00 |
| *Sanguisorba officinalis* L. | KH5501 | S165 | Oipul Leaf | Cattle disease Juice | Oral | 7.69 |
Table 2 Plant species for medicinal purposes in community of Gayasan National Park in Korea (Continued)

| Plant Species                 | Part       | Condition                  | Preparation          | Route   | Dosage |
|-------------------------------|------------|----------------------------|----------------------|---------|--------|
| Sorbus commixta Hedl.         | Root       | Leg pain                   | A sweet drink made from fermented rice | Oral    | 25.00  |
|                               | Stem       | Leg pain                   | A sweet drink made from fermented rice | Oral    | 25.00  |
|                               | Whole part | Arm pain                  | A sweet drink made from fermented rice | Oral    | 25.00  |
|                               |            | Shoulder pain              | A sweet drink made from fermented rice | Oral    | 50.00  |
| Spiraea prunifolia f.         | Root       | Indigestion                | Infusion             | Oral    | 94.12  |
| simpliciflora Nakai           | Stem       | Indigestion                | Infusion             | Oral    | 94.12  |
|                               | Leg pain   | Indigestion                | Infusion             | Oral    | 5.88   |
| Rubiaceae                     | Gardenia jasminoides J. Ellis | Root | Indigestion | Infusion | Oral  | 94.12  |
|                               | Stem       | Indigestion                | Infusion             | Oral    | 94.12  |
|                               | Leg pain   | Indigestion                | Infusion             | Oral    | 5.88   |
|                               |            | Bone diseases              | Dough                | Topical | 1.43   |
|                               |            | Bruising                  | Dough, infusion      | Topical | 61.43  |
|                               |            | Carpal tunnel syndrome    | Infusion             | Topical | 2.86   |
|                               |            | Chronic myofascial pain   | Infusion             | Topical | 4.29   |
|                               |            | Extravasated blood        | Dough                | Topical | 1.43   |
| Rutaceae                      | Citrus unshiu S.Marcov. | Pericarp | Common cold | Infusion | Oral  | 100.00 |
|                               | Phellodendron amurense Rupr. | Bark  | Arm pain | A sweet drink made from fermented rice | Oral | 4.12   |
|                               |            | Bone diseases              | Brewing              | Oral    | 61.42  |
|                               |            | Hyperthermia               | Brewing              | Oral    | 0.37   |
|                               |            | Indigestion                | Infusion             | Oral    | 3.75   |
|                               |            | Leg pain                   | Oral                 | 18.35   |
Table 2 Plant species for medicinal purposes in community of Gayasan National Park in Korea (Continued)

| Plant Name                  | Conditions                          | Formulations          | Route | Dosage |
|-----------------------------|-------------------------------------|-----------------------|-------|--------|
| Lumbago                     | A sweet drink made from fermented rice, infusion | Oral                  | 11.24 |
| Endodermis                  | Indigestion                         | Steep                 | Oral  | 3.75   |
| Lumbago                     | Brewing                             | Oral                  | 11.24 |
| Stem                        | Arm pain                            | A sweet drink made from fermented rice | Oral  | 4.12   |
| Bone diseases               | A sweet drink made from fermented rice, brewing, infusion | Oral                  | 61.42 |
| Leg pain                    | A sweet drink made from fermented rice, infusion | Oral                  | 18.35 |
| Lumbago                     | A sweet drink made from fermented rice, infusion | Oral                  | 11.24 |
| Neuralgia                   | Infusion                            | Oral                  | 0.75  |
| Poncirus trifoliata (L.) Raf. | KH5508 S135 Taengjanamu Fruit       | Cough                 | Dried, infusion | Oral  | 14.00 |
| Lacquer poisoning           | Infusion                            | Topical               | 12.00 |
| Urticaria                   | Infusion                            | Oral, topical         | 66.00 |
| Leaf                        | Snakebite                           | Maceration            | Topical | 8.00  |
| Zanthoxylum piperitum (L.) DC. | KH5509 S196 Chopinamu Fruit       | Asthma                | Oil   | 0.32   |
| Carpal tunnel syndrome      | Brewing, infusion                   | Oral                  | 4.05  |
| Dental pain                 | Infusion, raw                       | Topical               | 1.78  |
| Gastroenteric disorder      | Oil                                 | Oral                  | 0.32  |
| Leg pain                    | Brewing                             | Oral                  | 14.08 |
| Paralysis                   | A sweet drink made from fermented rice, infusion, oil, simmer | Oral                  | 25.24 |
| Pericarp                     | Carpal tunnel syndrome              | Brewing, infusion     | Oral  | 4.05   |
| Eye disease                 | Infusion                            | Oral                  | 0.32  |
| Facial nerve paralysis      | Infusion                            | Oral                  | 1.62  |
| Headache                    | Infusion                            | Oral                  | 0.65  |
| Hypertension                | Powder                              | Oral                  | 1.29  |
| Lumbago                     | Infusion                            | Oral                  | 7.93  |
| Paralysis                   |                                     | Oral                  | 25.24 |
Table 2 Plant species for medicinal purposes in community of Gayasan National Park in Korea (Continued)

| Plant Species | Plant Part | Medicinal Use | Administration | Dosage |
|---------------|------------|---------------|----------------|--------|
| *Zanthoxylum schinifolium* Siebold & Zucc. | Fruit | Abdominal pain | Oil | Oral 2.13 |
| | | Arthritis | Infusion | Oral 1.42 |
| | | Asthma | Oil, roast | Oral 8.87 |
| | | Boils | Oil | Oral, topical 9.22 |
| | | Bronchitis | Oil, pan fried | Oral 3.55 |
| | | Carpal tunnel syndrome | Brewing | Oral 0.35 |
| | | Cattle disease | Oil | Oral 12.41 |
| | | Cattle ringworm | Oil | Oral 1.42 |
| | | Common cold | Oil | Oral 0.35 |
| | | Constipation | Oil | Oral 1.42 |
| | | Convulsion | Oil | Oral 3.55 |
| | | Cough | Extraction, oil, pan fried, roast | Oral 20.92 |
| | | Dental pain | Raw | Topical 1.77 |

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| Plant species | Disease | Treatment | Route | Effectiveness |
|---------------|---------|-----------|-------|---------------|
| *Populus maximowiczii A. Henry* (KH5511) | Hwangcheolnamu | Endodermis | Infusion | Oral | 50.00 |
| Salix gracilistyla Miq. (KH5512) | Gastroenteric disorder | Infusion | Oral | 50.00 |
| Salix koreensis Andersson (KH5513) | Allergic contact dermatitis | Fumigation | Topical | 33.33 |
| Schisandra chinensis (Turcz.) Baill. (KH5514) | Arm pain | Decoction, dissolution, extraction | Oral | 4.86 |
| Bronchitis | Extraction, infusion | Oral | 5.56 |
| Poor circulation | Decoction | Oral | 0.69 |
| Plant Species | Common cold | Oral | 45.83 |
|---------------|-------------|------|-------|
| Common cold   | A sweet drink made from fermented rice, boiling, brewing, decoction, dissolution, dried, extraction, raw, tea | Oral | 15.97 |
| Cough         | Brewing, decoction, dissolution, extraction | Oral | 6.25 |
| Eye disease   | Boiling, dried, extraction | Oral | 3.47 |
| Headache      | Boiling, dried | Oral | 5.56 |
| Heart disease | Dried, extraction, tea | Oral | 2.78 |
| Lack of energy| Extraction | Oral | 4.86 |
| Leg pain      | Decoction, dissolution, extraction | Oral | 2.08 |
| Scrophulariaceae | Paulownia coreana Uyeki | Oral, topical | 36.36 |
| Stem          | Abdominal pain | Infusion | 2.78 |
| Anorexia      | Infusion | Oral | 2.08 |
| Rehmannia glutinosa (Gaertn.) Libosch. ex Steud. | Jihwang | Oral, topical | 63.64 |
| Stem          | Indigestion | Infusion | 2.08 |
| Root          | Abdominal cold hypersentivity | Pill | 1.21 |
| Arm pain      | Maceration | Topical | 3.64 |
| Bruising      | Brewing, juice, maceration, mixed in liquor, raw | Oral, topical | 29.70 |
| Carpal tunnel syndrome | Maceration | Topical | 1.21 |
| Chronic myofascial pain | Dissolution, maceration | Oral, topical | 6.06 |
| Edema         | Maceration, raw | Oral | 1.21 |
| Fracture      | Juice, maceration | Oral, topical | 15.15 |
| Lack of energy | Boiling, decoction | Oral | 3.03 |
| Leg pain      | Maceration | Topical | 3.64 |
| Lumbago       | Brewing, juice, maceration | Oral, topical | 14.55 |
| Luxation      | Maceration | Topical | 4.24 |
| Sprain        | Juice, maceration | Oral, topical | 12.15 |
| Tarsal tunnel syndrome | Maceration | Topical | 1.21 |
| Wound         | Maceration | Topical | 2.42 |
Table 2 Plant species for medicinal purposes in community of Gayasan National Park in Korea (Continued)

| Family          | Genus and Species                                      | KH/SS   | Part         | Indication               | Route     | Dosage |
|-----------------|--------------------------------------------------------|---------|--------------|--------------------------|-----------|--------|
| Selaginellaceae | *Selaginella tamariscina* (P. Beauv.) Spring           | KH5517  | S172         | Bruising                 | Maceration | 32.88  |
|                 |                                                        |         |              |                          | Topical   |        |
|                 |                                                        |         |              | Deprived of mother’s milk| Maceration |        |
|                 |                                                        |         |              | Lumbago                  | Oral      | 10.96  |
|                 |                                                        |         |              | Leaf                     | Infusion  | 19.18  |
|                 |                                                        |         |              | Stern                    | Simmer    | 9.59   |
|                 |                                                        |         |              | Boils                    | Oil       | 5.48   |
|                 |                                                        |         |              | Cattle disease           | Infusion  | 19.18  |
| Simaroubaceae   | *Picrasma quassioides* (D. Don) Benn.                  | KH5518  | S129         | Deprived of mother’s milk| Maceration |        |
|                 |                                                        |         |              | Lumbago                  | Oral      | 10.96  |
|                 |                                                        |         |              | Leaf                     | Infusion  | 19.18  |
|                 |                                                        |         |              | Stern                    | Simmer    | 9.59   |
|                 |                                                        |         |              | Boils                    | Oil       | 5.48   |
|                 |                                                        |         |              | Chronic myofascial pain  | Brewing   | 5.48   |
|                 |                                                        |         |              |                          | Topical   | 32.88  |
|                 |                                                        |         |              |                          | Oral      | 6.85   |
| Smilacaceae     | *Smilax china* L.                                       | KH5519  | S176         | Hypofunction             | Infusion  | 15.00  |
|                 |                                                        |         |              | Leg pain                 | Oral      | 30.00  |
|                 |                                                        |         |              | Osteoporosis             | Infusion  | 15.00  |
|                 |                                                        |         |              | Pollakiuria              | Infusion  | 25.00  |
|                 |                                                        |         |              | Wound                   | Infusion  | 15.00  |
| Solanaceae      | *Capsicum annuum* L.                                    | KH5520  | S35          | Fruit                    | Dissolution| 100.00 |
|                 |                                                        |         |              |                          | Oral      |        |
|                 |                                                        |         |              | Common cold              | Boiling, brewing, decoction, infusion | 41.46  |
|                 |                                                        |         |              | Eye disease              | Boiling   | 12.20  |
|                 |                                                        |         |              | Gastroenteric disorder   | Dried, tea| 14.63  |
|                 |                                                        |         |              | Lack of energy           | Infusion, tea | 21.95 |
|                 |                                                        |         |              | Liver diseases           | Infusion  | 9.76   |
|                 |                                                        |         |              |                          | Oral      | 100.00 |
|                 |                                                        |         |              |                          | Topical   | 100.00 |
|                 |                                                        |         |              |                          | Oral      | 100.00 |
| Plant Species | Key Code | Key Number | Plant Part | Condition | Preparation | Route | Dosage |
|---------------|----------|------------|------------|-----------|-------------|-------|--------|
| *Solanum melongena* L. | KH5524 | S177 | Stem | Carpal tunnel syndrome | A sweet drink made from fermented rice, dried, infusion | Oral | 50.00 |
| | | | | Tarsal tunnel syndrome | A sweet drink made from fermented rice, dried, infusion | Oral | 50.00 |
| *Solanum nigrum* L. | KH5525 | S178 | Ggamajung Aerial part | Abdominal pain | Infusion | Oral | 4.55 |
| | | | | Anorexia | Infusion | Oral | 4.55 |
| | | | | Indigestion | Infusion | Oral | 31.82 |
| | | | | Fruit | Cough | Extraction | Oral | 15.15 |
| | | | | Indigestion | Maceration | Oral | 31.82 |
| | | | | Leaf | Indigestion | Maceration | Oral | 31.82 |
| | | | | Urinary incontinence | Infusion | Oral | 6.06 |
| | | | | Root | Indigestion | Maceration | Oral | 31.82 |
| | | | | Stem | Pollakiuria | Infusion | Oral | 6.06 |
| | | | | Urinary incontinence | Infusion | Oral | 6.06 |
| | | | | Whole part | Cough | Infusion | Oral | 15.15 |
| | | | | Excited delirium | Dried, infusion | Oral | 10.61 |
| *Solanum tuberosum* L. | KH5526 | S179 | Gamja Tuber | Burn | Maceration, powder, rubbing | Topical | 100.00 |
| Staphyleaceae | *Staphylea bumalda* DC. | KH5527 | S183 | Gochunamu Leaf | Facial nerve paralysis | Maceration | Topical | 100.00 |
| | | | | Root | Facial nerve paralysis | Maceration | Topical | 100.00 |
| | | | | Stem | Facial nerve paralysis | Maceration, raw | Topical | 100.00 |
| Sterculiaceae | *Firmiana simplex* (L.) W.F. Wight | KH5528 | S75 | Byeokodong Leaf | Leukorrhea | Infusion | Oral | 63.64 |
| | | | | Stem | Leukorrhea | Infusion | Oral | 63.64 |
| | | | | Lumbago | A sweet drink made from fermented rice | Oral | 18.18 |
| Thelephoraceae | *Sarcodon aspratus* (Berk.) S. Ito | KH5529 | S166 | Neungi Whole part | Afterpain | Infusion | Oral | 100.00 |
| Tricholomataceae | *Armillariella mellea* (Vahl & Fr.) Karst. | KH5530 | S20 | Bbongnamubeoseot Whole part | Glycosuria | Infusion | Oral | 100.00 |
| | | | | Songi Whole part | Afterpain | Decoction, infusion | Oral | 57.89 |
| | | | | Common cold | Decoction | Oral | 21.05 |
Table 2 Plant species for medicinal purposes in community of Gayasan National Park in Korea (Continued)

| Family  | Genus                          | Species | Code  | Plant Part     | Preparation/Route         | Disease                  | Oral/Topical |
|---------|--------------------------------|---------|-------|----------------|---------------------------|--------------------------|--------------|
| Ulmaceae| Ulmus davidiana var. japonica  | Rehder  | KH5532| S188 Neureupnamu Bark | Boils, Dough, dried, maceration, powder | Tonsillitis Infusion Oral | 21.05        |
|         |                                | (Rehder) Nakai |       |                |                            | Cancer Infusion, maceration Oral, topical | 3.00         |
|         |                                |         |       |                |                            | Gastric ulcer A sweet drink made from fermented rice, infusion, tea Oral | 2.07         |
|         |                                |         |       |                |                            | Gastritis A sweet drink made from fermented rice Oral | 0.23         |
|         |                                |         |       |                |                            | Gastroenteric disorder Dried, infusion, powder, tea Oral | 11.29        |
|         |                                |         |       |                |                            | Hemorrhaging Powder Topical | 0.23         |
|         |                                |         |       |                |                            | Hemorrhoids Infusion Oral | 2.76         |
|         |                                |         |       |                |                            | Indigestion A sweet drink made from fermented rice, infusion Oral | 1.61         |
|         |                                |         |       |                |                            | Milk fever Maceration Oral, topical | 3.92         |
|         |                                |         |       |                |                            | Pus Dried, infusion, maceration, powder Oral, topical | 52.07        |
|         |                                |         |       |                |                            | Skin diseases Maceration, powder Topical | 1.38         |
|         |                                |         |       |                |                            | Wound Maceration, powder, raw Topical | 3.23         |
|         |                                |         |       |                |                            | Endodermis Boils Maceration Topical | 15.67        |
|         |                                |         |       |                |                            | Gastroenteric disorder Infusion Oral | 11.29        |
|         |                                |         |       |                |                            | Pus Maceration Topical | 52.07        |
|         |                                |         |       |                |                            | Rhizodermis Boils Dried, maceration, powder Topical | 15.67        |
|         |                                |         |       |                |                            | Gastroenteric disorder Infusion Oral | 11.29        |
|         |                                |         |       |                |                            | Pus Maceration Topical | 52.07        |
|         |                                |         |       |                |                            | Root Boils Maceration Topical | 15.67        |
|         |                                |         |       |                |                            | Bruising Maceration Topical | 0.46         |
|         |                                |         |       |                |                            | Cancer Maceration Topical | 3.00         |
|         |                                |         |       |                |                            | Gastroenteric disorder Dried, infusion Oral | 11.29        |
|         |                                |         |       |                |                            | Inflammation Maceration Topical | 0.69         |
|         |                                |         |       |                |                            | Pus Maceration Topical | 52.07        |
|         |                                |         |       |                |                            | Bone diseases A sweet drink made from fermented rice, boiling Infusion Oral | 1.38         |
|         |                                |         |       |                |                            | Gastroenteric disorder A sweet drink made from fermented rice, boiling Infusion Oral | 11.29        |
| Family            | Genus                                                   | Species Description | Part(s)         | Preparation(s)                        | Mode(s)       | Reference  |
|-------------------|---------------------------------------------------------|---------------------|-----------------|---------------------------------------|---------------|------------|
| **Ulmus parvifolia Jacq.** |                                          |                     | Bark            | Boils, dough, maceration, powder, raw | Topical       | Song et al. (2014) |
|                   | Patrinia villosa (Thunb.) Juss.                        |                     | S189 Chamneureupnamu | Topical                         | 3.92          |            |
|                   |                                                        |                     | S119 Ttukgal    | Snakebite, maceration               | Topical       | 52.07      |
|                   |                                                        |                     |                 |                                       | 100.00        |            |
| **Violaceae**     | Viola mandshurica W. Becker                           |                     | S191 Jebikkot   | Bruising, maceration                 | Topical       | 16.13      |
|                   | Patrinia villosa (Thunb.) Juss.                        |                     | S119 Ttukgal    | Snakebite, maceration               | Topical       | 22.58      |
|                   |                                                        |                     |                 |                                       | 100.00        |            |
| **Violaceae**     | Viola verecunda A.Gray                                 |                     | S192 Kongjebikkot | Seasoned cooked vegetables           | Oral          | 10.00      |
|                   | Parthenocissus tricuspidata (Siebold & Zucc.) Planch.  |                     |                          | Infusion                             | Oral          | 10.00      |
|                   | Vitis coignetiae Pulliat ex Planch.                    |                     | S194 Meoru       | Asthma, extraction                   | Oral          | 33.33      |
|                   | Zingiber officinale Roscoe                             |                     | S199 Saeanggang  | Rhizoma, arm pain, decoction         | Oral          | 33.33      |
|                   |                                                        |                     |                 |                                      |              |            |

*Abbreviation for Figure 2.*
plants used for treating birth related disorders and genitourinary system disorders have a close relationship.

Finally, the circulatory system disorders are the fourth group and are positioned in the bottom section.

**Conclusion**

These days, the natural conservation of a national park has focused strongly to preserve bio-resources, which are regarded as vital to its environment. However, the natural conservation of a national park is practically determined by the interrelationship between the bio-resources and its utilization by residents.

In relation to this point, this study contains a major focus to obtain the basic data regarding the natural conservation of a plant ecosystem, through the analysis and investigation of traditional knowledge for medicinal plants being used by residents of Gayasan National Park.

Conclusions regarding the preservation of a sustainable natural plant ecosystem within a national park obtained the following results:

First, the high percentage of medicinal plants among flora means that the total amount of medicinal plants gathered by residents may negatively affect the conservation of a natural plant ecosystem within a national park. In order to conserve the plant ecosystem, residents need

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**Table 3 Category of ailments and their informant consensus factor (ICF) according to Heinrich et al. [24]**

| Symptom and ailment categories | Taxons | Use citations | ICF  |
|-------------------------------|--------|---------------|------|
| Muscular-skeletal disorders   | 49     | 2142          | 0.98 |
| Pains                         | 87     | 2942          | 0.97 |
| Respiratory system disorders  | 46     | 1513          | 0.97 |
| Liver complaints              | 15     | 447           | 0.97 |
| Cuts and wounds               | 20     | 473           | 0.96 |
| Inflammation                  | 28     | 587           | 0.95 |
| Genitourinary system disorders| 52     | 1062          | 0.95 |
| Circulatory system disorders  | 65     | 1250          | 0.95 |
| Skin diseases and disorders   | 25     | 464           | 0.95 |
| Gastrointestinal disorders    | 68     | 1257          | 0.95 |
| Diabetes                      | 10     | 165           | 0.95 |
| Nervous system disorders      | 34     | 545           | 0.94 |
| Veterinary ailments           | 22     | 300           | 0.93 |
| Poisonings                    | 26     | 321           | 0.92 |
| Others                        | 36     | 431           | 0.92 |
| Birth-related disorders       | 14     | 138           | 0.91 |

**Figure 2** The network relationship of ailments and plant species.
an adaptable health care system for treating their ailments, instead of relying solely on ethnomedical therapies.

Second, residents mentioned quite often that they used medicinal plants to treat their own medical conditions. Therefore, it is necessary to prepare a plan of action for conserving the popular medicinal plants.

Third, medicinal plants for treating the category of disease with a higher degree of consensus can be actively harvested for treating medical problems. The over collecting of these medicinal plants will disrupt the plant ecosystem of Gayasan National Park in the near future.

Fourth, 57 species of plants with a FL of 100% possess a much higher potential for being gathered in the region and it is vital to protect the overuse of these medicinal plants.

Fifth, the results of INA will provide an appropriate plan for the sustainable preservation of a national park through continued study.

Therefore, these particular species need to be conserved for a balanced plant ecosystem within the park.

Consequently, through further studying these results, proper steps need to be established for preparing a wise alternative to create a sustainable natural plant ecosystem for Gayasan National Park and other national parks.

Competing interests
The authors declare that they have no competing interests.

Authors’ contributions
HK and MJS compiled the collected field data, analyzed and drafted the manuscript, HB, BYL, CHF, and CWH revised the manuscript added the valuable suggestions for manuscript improvement. All authors read and approved the final manuscript.

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References
1. Parrotta JA, Trosper RL: Traditional Forest Related Knowledge: Sustaining Communities, Ecosystems, and Biocultural Diversity. New York: Springer; 2012.
2. Menzies CR: Traditional Ecological Knowledge and Natural Resource Management. Lincoln: University of Nebraska Press; 2006.
3. Unnikrishnan PM, Fadeeva Z: Innovation in Local and Global Learning Systems for Sustainability. Traditional Knowledge and Biodiversity – Learning Contributions of the Regional Centres of Expertise on Education for Sustainable Development. Yokohama: United Nations University Institute of Advanced Studies; 2013.
4. Unnikrishnan PM, Suneetha MS: Biodiversity, Traditional Knowledge and Community Health: Strengthening Linkages. Singapore: Xpress Pte Ltd.; 2012.
5. Di Sanzo P, De Martinio L, Mancini L, De Feo V: Medicinal and useful in the tradition of Rotonda, Pollino National Park, Southern Italy. J Ethnobiol Ethnomed 2013, 9:19. doi:10.1186/1746-4269-9:19
6. Idolo M, Motti R, Mazzoleni S: Ethnobotanical and phytomedicinal knowledge in a long-history protected area, the Abruzzo, Lazio and Molise National Park (Italian Apennines). J Ethnopharmacol 2010, 127:379–395.
7. Asase A, Hesse DN, Simmonds MS: Uses of multiple plants prescriptions for treatment of malaria by some communities in southern Ghana. J Ethnopharmacol 2012, 144:448–452.
8. Sharma J, Gairola S, Gaur RD, Painuli RM: The treatment of jaundice with medicinal plants in indigenous communities of the Sub-Himalayan region of Uttarakhand, India. J Ethnopharmacol 2012, 143:262–291.
9. Estrada E, Villarreal JA, Cantú C, Cabral I, Scott L, Yen C: Ethnobotany in the Cumbre de Minterrey National Park, Nuevo León, Mexico. J Ethnopharmacol 2007, 113:386–398. doi:10.1016/j.eph.2006.12.013.
10. Thomas H, Semo L, Morales M, Noza Z, Nazee H, Chayub A, Noza M, Humaday N, Vaya J, Damme PV: Ethnomedicinal practices and medicinal plant knowledge of the Yuracaré and Trinitarios from Indigenous Territory and National Park Isiboro-Secure, Bolivian Amazon. J Ethnopharmacol 2011, 138:153–163.
11. Song MJ, Kim H, Heldenbrand B, Jeon JW, Lee SH: Ethnopharmacological survey of medicinal plants in Jeju Island, Korea. J Ethnobiol Ethnomed 2013, 9:48. doi:10.1186/1746-4269-9:48.
12. Korea National Park Service. [http://english.knps.or.kr]
13. You JH, Jeon SK, Seol JW: Flora and conservation plan of Gayasan National Park. J Korean Env Res Tech 2013, 16:109–130.
14. Kim H, Song MJ: Analysis and recordings of orally transmitted knowledge about medicinal plants in the southern mountainous region of Korea. J Ethnopharmacol 2011, 134:676–696.
15. Kim H, Song MJ: Oral traditional knowledge for the treatment of digestive system diseases investigated in North Jeolla Province, Korea. J Med Plant Res 2011, 5:5730–5740.
16. Martin GJ: Ethnobotany: A Conservation Manual. London: Champman & Hall; 1996.
17. Song M, Kim H: Ethnomedicinal application of plants in the western plain region of North Jeolla Province in Korea. J Ethnopharmacol 2011, 137:167–175.
18. Kim H, Song MJ: Ethnobotany. Seoul: World Science Publisher; 2008.
19. Lee BN: Flora of Korea. Seoul: Kyohak Publishing Co; 2002.
20. National Knowledge and Information System for Biological Species (NKBS). [http://www.nature.go.kr/9001/index.do]
21. Heinrich M, Ankli A, Frei B, Weimann C, Sticher O: Traditional plants used for treatment of malaria by some communities in southern Ghana. J Ethnopharmacol 2013, 153:153–163.
22. Lee YN: Flora of Korea. Seoul: Kyohak Publishing Co; 2002.
23. National Knowledge and Information System for Biological Species (NKBS). [http://www.nature.go.kr/9001/index.do]
24. Heinrich M, Edwards S, Moerman DE, Leonti M: Ethnopharmacological field studies: a critical assessment of their conceptual basis and methods. J Ethnopharmacol 2009, 1241–17.
25. Alexiades MN: Selected Guidelines for Ethnobotanical Research- A Field Manual. Advances in Economic Botany, Volume 10. Bronx: The New York Botanical Garden; 1996.
26. Douglas NW, Johansen UC: Network Analysis and Ethnographic Problems: Methods. J Ethnopharmacol 2008, 116:1859–1871.
27. Heinrich M, Edwards S, Moerman DE, Leonti M: Ethnopharmacological field studies: a critical assessment of their conceptual basis and methods. J Ethnopharmacol 2009, 1241–17.
28. Alexiades MN: Selected Guidelines for Ethnobotanical Research- A Field Manual. Advances in Economic Botany, Volume 10. Bronx: The New York Botanical Garden; 1996.
31. Borgatti SP. NetDraw Software for Network Visualization. Lexington: Analytic Technologies; 2002.
32. Borgatti SP, Everett MG, Freeman LC. Ucinet for Windows: Software for Social Network Analysis. Harvard: Analytic Technologies; 2002.
33. Srithe K, Balslev H, Wangpakapattanawong P, Srisanga P, Trisonthi C. Medicinal plant knowledge and its erosion among the Mien (Yao) in northern Thailand. J Ethnopharmacol 2009, 123:335–342.
34. Kim YH. Social Inter-Network Analysis. Seoul: Parkyongs; 2013.

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