Proceedings of the Workshop on the Conservation of Medicinal Plants

25 November, 1998

Seoul, Republic of Korea

TRAFFIC EAST ASIA

WWF

IUCN

The World Conservation Union

Proceedings of the Workshop on the Conservation of Medicinal Plants

25 November, 1998
Seoul, Republic of Korea

TRAFFIC EAST ASIA

WWF
IUCN
The World Conservation Union

Proceedings of the Workshop on the Conservation of Medicinal Plants

25 November, 1998
Seoul, Republic of Korea

Compiled by Sue Kang & Samuel Lee

Edited by Marcus Phipps & Melanie Pong

Produced by TRAFFIC East Asia

The designation of geographical entities in this publication, and the presentation of the material, do not imply the expression of any opinion whatsoever on the part of TRAFFIC or its supporting organizations concerning the legal status of any country, territory, or area, or of its authorities, or concerning the delimitation of its frontiers or boundaries.

The TRAFFIC Network is the trade monitoring programme of WWF - World Wide Fund for Nature and IUCN - The World Conservation Union. It works in close co-operation with the CITES Secretariat. TRAFFIC East Asia is part of 19 TRAFFIC Network offices worldwide.

For further information contact:

TRAFFIC East Asia
Room 2001, Double Building,
22 Stanley Street, Central,
Hong Kong

Tel : (852)2530-0587
Fax : (852)2530-0864
E-mail : tea@asiaonline.net
Web site : http://www.traffic.org

CONTENTS

ACKNOWLEDGEMENTS

The Workshop on the Conservation of Medicinal Plants held in South Korea on Nov. 25 1998 was made possible with the support of the following agencies and organizations.

* Bundesministerium für wirtshaftlich Zusammenarbeit und Entwicklung (BMZ), Germany

* Association of Korean Oriental Medicine, Republic of Korea

* Ministry of Environment, Republic of Korea

* Ministry of Health and Welfare, Republic of Korea

Preface

There is no doubt that medicinal plants have played an important role in the history of human health care. However, until recently, he conservation of medicinal plants in the wild has received little attention from either the traditional medicine (TM) community or the conservation community. Given the estimates of future human population growth, especially in those areas where various forms of TM are widely practiced, the demand for medicinal plant resources will inevitably increase. In addition, TM, sometimes referred to as alternative medicine, is also becoming increasingly popular in some developed countries. Conservation of medicinal plants is not an Asian issue but a global one.

Made possible with generous support from the BMZ (Bundesministerium für wirtshaftlich Zusammenarbeit und Entwicklung), the Workshop on the Conservation of Medicinal Plants took place in Seoul, the capital city of South Korea, in November 1998. S. Korea has long played a significant role in the global medicinal trade. It was encouraging to see the tremendous support the workshop received from the government and the TM community as well as the conservation community in South Korea.

Nevertheless, recognizing that the issue needs to be addressed it merely the first step. Action which need to follow include an assessment of level of reliance on medicinal plant resources, exchange of information between the TM and conservation communities, and most importantly, the search for ways to ensure the utilization of such precious resources is sustainable both for existing and future generations.

Samuel K.H. Lee
Program Officer
TRAFFIC East Asia

Opening Remarks

Thank you representatives of the relevant organizations, very much for attending the "Workshop on the Conservation of Medicinal Plants" which is jointly organized by TRAFFIC East Asia and the Association of Korean Oriental Medicine and supported by the Ministry of Environment and the Ministry of Health and Welfare.

At present, the world is facing a serious pollution problem as a result of industrialization and urbanization. In addition, habitats of wild fauna and flora are shrinking rapidly due to the destruction of natural ecosystems.

Human activities such as reckless development worldwide resulted in an environment which has brought rapid decreases in bio-diversity, thus causing a detrimental effect on human beings and threatening the existence of mankind. Mankind can stay healthy through balanced environment and I cannot overstress the importance of the conservation of the medicinal plants that are the basic tools for curing illness. I believe that everyone must join hands to conserve medicinal plants and this conservation movement must spread throughout the world. In addition, we must invest heavily in developing substitutes, which will also contribute to the conservation of medicinal plants. Reckless over-harvest should be restrained as well.

I firmly believe that today' s "Workshop on the Conservation of Medicinal Plants" will be a cornerstone to contribute to human health.

Once again, I would like to thank Ms. Kang Tae Suk, Korea Representative of TRAFFIC East Asia, who has made great efforts to organize this workshop, as well as those representatives from the Ministry of Health and Welfare, the Ministry of Environment, Korea Customs Service, Korea Institute of Oriental
Medicine, Agrarian Development Administration, Korea Pharmaceutical Manufacturers Association, Korea Pharmaceutical Traders Association, Korea Herb Association, etc.

25. Nov. 1998
Choi Hwan-young
Chairman of the Association of Korean Oriental Medicine

Congratulatory Message

Dear Chairman Choi Hwan-young of Association of Korea Oriental Medicine, Kang Tae-suk, Korea Representative of TRAFFIC East Asia, Prof. Lee Young-jong, Chairman of Phytology Association and Dr. Sung Nak-sool,

And dear participants, thank you for coming to this workshop despite your busy schedules.

For quite some time, environment and conservation have become important issues domestically and internationally as a result of the highly developed industrialization

The Republic of Korea, with the Ministry of Environment as a focal point, acceded to the Convention on International Trade in Endangered Species (CITES) and the Convention on BioDiversity and is making great efforts in implementing both Conventions.

East Asian countries such as Japan, China, Taiwan and South Korea have striven to develop traditionally inherited medicine and folk medicine. It is true that these traditional medicines contributed greatly to the public health in each country using natural fauna and flora.

However, indiscriminate over-harvesting of these medicinal flora & fauna have driven many of them to the brink of extinction. Recently South Koreans were criticised by the international community for consuming endangered species such as bears while touring overseas, which should be taken as a serious matter.

The government of Republic of Korea has made great effort in implementing CITES by strengthening the penalties and raising public awareness in a bid to protect endangered fauna and flora. In April of this year, "Ordinance of Hanyakjae in relation to its quality, distribution and management" was amended so that bear gall bladder and musk listed in the CITES Appendice should be distributed with Import Approval Label. The import of CITES-listed Hanyakjae is strictly regulated with a mandatory permit system from the relevant CITES authorities.

As for the medicinal fauna and flora used in Traditional Korean Medicine as traditional knowledge, we plan to inform the CBD Secretariat of the usage method and the list so as to obtain international understanding about Hanyakjae.

In the future, the Ministry of Health and Welfare will join the conservation movement by reviewing farming and/or cultivation of endangered fauna and flora; by encouraging the prescription of substitutes of endangered species, and by stepping up public awareness about the misuse and abuse of Hanyakjae.

I am sure there will be a meaningful discussion in this workshop, and I thank with my heart the AKOM staff and the Korea Representative of TRAFFIC East Asia for making the effort to organize it.

I wish everyone here good health and thank you very much.

11. 25. 98
Kim Yong-ho
Director of Traditional Korean Medicine Bureau
Ministry of Health and Welfare

THE IMPORTANCE OF CONSERVING MEDICINAL PLANTS

Lee Yong-jong
Chairman of Phytology
Korean Oriental Medicinal Society

Introduction

With rapid industrialization and urbanization, the world is now experiencing destruction of habitat for fauna and flora, and aggravated environmental pollution as well as a decline in bio-diversity. In this regard, South Korea is not an exception. This unchecked development across the world is resulting in a drastic decrease in bio-diversity and could eventually threaten the existence of mankind. That is why it will require some urgent countermeasures. In this sense, the 1992 UN Environmental Development Forum is recognized as a meaningful cornerstone as it reinforced efforts against the extinction and reduction of wild plants and animals.

In particular, with the development of genetic engineering, the competition over securing biological resources, the very raw materials of genetic engineering, is expected to be ever more intensified in the upcoming twenty-first century. With creation of the Convention on Bio-diversity, biological resources have been recognized as a sovereign property of a nation. The Convention has also brought about a significant impact on international exchanges in terms of communal utilization of these resources.

South Korea should focus with keener attention on the conservation and sufficient supply of plants used for Hanyakjae (materia medica for Traditional Korean Medicine) since it uses numerous natural plants and animals as ingredients for its traditional medicine. There is a strong need for wild plants and animals that are used as medicinal resources or usable for medicinal purposes to be conserved and spared for mankind.

Overview of Eco-systems and Medicinal Plants in Korea

Overview of major eco-systems

Korea is a peninsula with mountainous relief with an average height of 420 m above sea level. It is located between 33° 07' and 43° 01' north latitude, connecting the northeastern part of the Eurasian continent and the Pacific Ocean. In botanical geographic terms, it belongs to the Sino-Japanese forest region which includes southern Siberia, Japan, central and northern China, Manchuria, and parts of the Himalayas. Thus, the plant distribution in the Korean peninsula is closely related to the neighboring regions mentioned above (Jee Hyung-joon, 1996).

The forest area in South Korea amounted to 6,456,000 ha as of the end of 1995, accounting for 65% of the total land area of 9,939,000 ha, and 97% (6,274,000 ha) of the total woodland is well covered with

forest trees. The distribution of woodlands by type shows that conifer trees are distributed in 2,894,000 ha (46% of the total woodlands), broad-leaved trees in 1,673,000 ha, and mixed types in 1,722,000 ha. The forests in South Korea were almost completely destroyed during the Japanese Occupation and the Korean War. However, with the introduction of the "Afforestation for Erosion Control Act" in 1962, and, in particular, the "Afforestation Project" from 1973 to 1987, South Korea managed to regain wide areas of greenery in mountain areas across the country. The forests in South Korea are composed mostly of trees less than 30 years of age due to reforestation efforts during that period.

The Korean peninsula belongs to a typical temperate region, but the vegetation of the forests ranges widely from subtropical zone forest to frigid zone forest. The subtropical zone forest is an evergreen broad-leaved tree zone where camellia and silver magnolia grow, covering the southern part of 34° north latitude horizontally, and in particular, the area below the south of 35° 30' north latitude along the coast with annual temperature above 14°. Low areas of Cheju Island and southern coastal islands belong to this zone. The frigid zone forest belongs to an evergreen conifer tree zone where fir and pine trees grow, covering the high hills and mountains in North Korea horizontally. Other parts of the country are in the temperate zone forest, with the distribution of deciduous broad-leaved trees, covering almost 85% of the total woodland (Ministry of Environment, 1997).

Overview of biological species

There are at least 215,000 species of phanerogamous plants named and recorded globally (Cronquist, 1981). Including unnamed species, the total number is estimated to be more than 500,000 (Schultes, 1972). Amongst them, the number of biological species in Korea that have been identified so far is 29,828 species including 18,029 fauna, 8,271 flora, 1,625 fungi, and 736 protists.

The number of biological species in Korea is less than the number of species identified in Japan, which has similar bio-geographical conditions. However, the number of domestic species is on a gradual decrease due to rapid economic development. Tigers and leopards are already deemed extinct while foxes and wolves are no longer sighted, and wild sheep and musk deer are almost on the brink of extinction.

The Nature Conservation Association of Korea estimates that 179 biological species are either extinct or near extinction, and a far larger number of biological species are estimated to be endangered since no research has been conducted on insects or lower animals and plants.

The reasons behind the decline of bio-diversity are multifold. Deforestation and destruction of natural eco-systems caused by excessive development of land as well as reckless exploitation of biological resources and environmental pollution are amongst the recognized problems.

In 1894, a Russian biologist, Schlippenbach, first reported A plant distribution survey to Western academic circles. He sent 50 kinds of plants collected from the eastern coast of Korea to Miguel to be introduced to an international academic association (Jung et al, 1986). Before the Japanese annexation of Korea, research on plants in Korea had been mostly conducted by western collectors

and academics including Palibin (1898-1901), and, afterwards, until the Korean Liberation from the Japanese Occupation, research was continued mostly by Japanese scholars such as Nakai. It was only after the Liberation that Korean biologists such as Jung Tae-hyun took up their research.

Overview of research on medicinal plants

As mentioned previously, out of the 8,000 plants distributed in Korea, higher plants above the level of ferns plus gymnospermous plants (excluding mosses) amount to a total of 3,971 species. Out of those, it is reported that there are over 1,000 plant species suitable for use in Traditional Korean Medicine or folk treatments (Lee, 1998). This means that as many as 25% of the plant species are medicinal plants. The total number of medicinal plants to be protected as medicinal resources would be larger if potential medicinal plants have proven to be effective after testing.

Nakai conducted a comprehensive study on all Korean plants, which provided the foundation for the later scientist, Ishidoya, who built the framework for the study of Korean medicinal plants. Ishidoya worked in the Experimental Forestry Station, and showed a keen interest in the study of Korean plants, Korean medicinal plants in particular. He attempted to identify the origin of these plants, gave them scientific names, collected and classified original plants used as Hanyakjae across the Korean peninsula and Manchuria, and systemized the taxonomy of the plants he identified. His efforts resulted in the publication of four volumes of "Chinesische Drogen" in 1941. Through these books, he completed the identification table of 515 kinds of Hanyakjae used in the Korean peninsula and Manchuria after having studied their morphological and anatomical characteristics and identified scientific names by confirming the taxonomy of original plants. His literature is highly regarded in the study of original plants of Hanyakjae.

As for Korean scholars in those days, Do Bong-sup, who had been working at the Herb Research Institute of Kyongsung College of Pharmacy, compiled the list of Korean medicinal plants; while Jung Tae-hyun who was working at the Experimental Forestry Station, compared the Korean, Chinese and Japanese names of Korean wild plants and provided commentaries on their usages and characteristics together with Hayashi (Jee, 1996). The study of medicinal plants was temporarily suspended after the Liberation due to the Korean war, but Lim Ki-hong (1953) and Jung Tae-hyun (1965) resumed the study on the origin and morphology of medicinal plants. Do Sang-hak (1977) disclosed that approximately 1,069 out of 4,594 plants (almost one-fourth) distributed across South Korea are medicinal plants.

Recently, Ahn Duk-kyun (1998) published the "Illustrated Book of Korean Medicinal Herbs" providing commentaries on 1,003 types of Hanyakjae and 1,600 kinds of medicinal plants. This book provides illustrations of the plants with their flowers and seeds for clearer distinction. The commentaries on Hanyakjae are based on smell and taste in terms of Oriental medicine theory paving the way for establishing the firm structure of medicinal resources.

The study of ingredients of medicinal plants has been actively conducted since the end of the Japanese Occupation. The study of ingredients of Hanyak and folk medicine mainly focused on blueberry,

Vaccinium Vitis-Idaea, Ziziphi Semen and Akebiae Caulis,
and was conducted by the "Sanitation Laboratory" established in 1910 and the "Herbal Research Institute of Kyongsung Imperial University" established in 1939.

After the Liberation until the early 1960s, the methods applied to identify ingredients and chemicals of plants were conventional ones including measurement of melting point, color reaction, precipitation reaction, molecular weight measurement, elementary analysis and simple synthesis of conductors.

From late 1960, however, spectral data obtained through instrumental analysis has been applied to chemical identification, and plants studied at this time included were Panax Schinseng, Acanthopanax, Codonopsis, Cirsium, Siegesbeckia, Polygonum, Anglelica, and Zizyphus (Woo Won-shik, 1996). Polygagallin, a tanin separated from the leaf of Acer ginnala of the maple trees, was discovered by Han Koo-dong (1962) in 1962 for the first time in Korea. Another study conducted by Korean scholars on the ingredients of Korean plants is " The Fifth Volume of Academic Bibliography" published by Korea Academic Institute (1971) and "A Study on ingredients of higher Korean plants for 50 years" by Woo Won-shik (1988). "The Fifth Volume of Academic Bibliography" published all the abstracts of theses related to pharmaceuticals studied by domestic and foreign scholars within Korea from 1901 to 1970, while "A study on ingredients of higher Korean plants for 50 years" summarized all the research done by Korean academics between 1945 and early 1988 relating to plant ingredients as well as introductions to newly separated ingredients. In papers published between late 1988 and 1992, approximately 500 new ingredients have been separated from 133 medicinal plants, among which 144 were new chemical compounds. These achievements should be highly recognized compared to the whole researches made in the 42 years after the Liberation. (Woo Won-shik, 1996).

An Overview of Medicinal Plants Cultivation

Korea has numerous herbal resources as mentioned previously, but not many of them are properly utilized. The volume of Hanyakjae collected from the wild after 1990s dwindled drastically due to lack of price competitiveness, and even the number of cultivated species became limited to 26 including Angelica Koreanae Radix, Lycii Fructus, Angelicae Gigantis Radix, Araliae Continentalis Radix, Eucommaie Cortex, Liriopis Tuber, Moutan Cortex, Saposhnikoviae Radix, Cynanchi Wilfordi Radix, Angelicae Dahuricae Radix, Atractylodis Rhizoma Alba, Corni Fructus, Paeoniae Radix Rubra, Peoniae Radix, Rehmanniae Radix, Atractylodis Rhizoma, Cnidii Rhizoma, Gastrodiae Rhizoma, Gardeniae Fructus, Alismatis Rhizoma, Polygoni Multifrori Radix, Cyperi Rhizoma, Scuterllariae Radix, and Astragali Radix.

The remaining 300 kinds of Hanyakjae, excluding the above 26 items, still grow in the mountains and fields of Korea, but they are imported from other countries such as China etc. due to the lack of price competitiveness. Production volumes of Korean Hanyakjae increased by 3.3 times from 12,000 tons in 1985 to 42,000 tons in 1995, while import volumes surged almost 12 times from 3,400 tons in 1985 to 41,700 tons in 1995.

As of 1996, the cultivation area for Hanyakjae was 10,668 ha, accounting for 0.54% of the total farm

land and involved 52,567 farming households, which is 3.6% of the total farming households. Major cultivated crops in South Korea consist of approximately 30 items, mostly focused on the 26 items listed under the government' s Supply/demand Management System. Among them, the production volume of Platycodi Radix, Paeoniae Radix, Adenophorae Radix, Astragali Radix, Angelicae Gigantis Radix, Dioscoreae Rhizoma, Eucommiae Cortex, and Cnidii Rhizoma account for 70% of the total production(Table 1).

Table 1. Overview of supply, demand, and cultivation of domestic medicinal plants

		unit	'90	'93	'94	'95	'96
cultivation	no.of farming household	1,000 households	54	64	69	64	53
	cultivation area	1,000 ha	9.2	14.1	14.1	15.0	14
supply & demand	domestic production (production amount)	1,000 ton (100million won)	22.8 (1,280)	37.4 (2,394)	37.4 (2,427)	42.0 (3,565)	43 (1,852)
	import (import amount)	1,000 ton (100million won)	10.3 (18)	28.5 (51)	29.3 (59)	28.8 (84)	57.2 (114)
	export (export amount)	1,000 ton (million $)	3.5 (19)	1.9 (18)	2.0 (15)	1.4 (11)	2.2 (12)
	demand	1,000 ton	29.6	64.0	62.6	69.4	98.0
	self-sufficiency rate	%	77	59	56	71	44

Source: Ministry of Agriculture

The average price of the 30 main items domestically cultivated was ₩ 7,077 per 600g of Hanyakjae, but it dropped to ₩ 6,260 in 1995, almost an 88.4% decrease compared to 1991. The reason behind the price reduction, despite an increases in the overall market consumption volume and consumer prices, seems to be the lack of price competitiveness with imports. South Korea' s self-sufficiency rate for Hanyakjae went down gradually from 77% in 1990 to 59% in 1993, 56% in 1994, 55% in 1995, and 44% in 1996 and now it only stands at 50% (Agricultural Cooperative, 1977).

The importance of preserving herbal plants

CITES and endangered medicinal resources

A natural resource can no longer be utilized if it becomes extinct through overexploitation, no matter how high its efficacy is. There are numerous Hanyakjae that can be no longer internationally traded used under CITES. CITES is a convention designed to regulate the trade in endangered wild animals and plants as well as protecting ecosystems by restricting indiscriminate hunting, collection and commercial trade in wild species. It differentiates between species listings based on the degree of

vulnerability. Since Korea is a party to CITES and wishes to faithfully implement the Convention, trading in endangered wild animals and plants is strictly regulated. Under the terms of the Convention, international commercial trade in rhinoceros horn and tiger bone is not allowed and trade in bear gall bladder, musk and pangolin is strictly regulated through a permitting system.

The majority of endangered medicinal resources are parts sourced from wild animals, but some plants are also included in the CITES appendices. Among all the plant-sourced Hanyakjae that are commonly used in Korea, wild Saussurea lappa of Compositae, Cibotium barometz of Dicksonia sp., wild aloe, Euphorbia kaansui of Euphorbiaceae, Euphorbia fischeriana, Euphorbia lathyris of Euphorbia sp., Bletilla striata of Orchidaceae, Dendrobium nobile and Gastrodia elata are listed in the CITES appendices(TRAFFIC East Asia' s CITES Seminar Proceedings, 1995).

Conservation and application of medicinal resources

The simultaneous application and conservation of animals and plants might seem contradictory, but ultimately the issue should be positively reviewed from a human perspective. Biological diversity is the source of life and a fundamental resource for the welfare of mankind as well as for economic development. It is in this spirit that the "Convention on Biological Diversity", established at the Nairobi Conference on May 22, 1992, states that, "The importance of the contribution that indigenous and local communities make to the protection and sustainable use of biological diversity is recognized. In addition, their knowledge, technological innovation and practices need beidentified and protected" (Life Science Institute, 1997). Accordingly, traditional knowledge using animals and plants should be protected, preserved and developed (through technological innovation) and then handed down to the next generation. This means that supporting and protecting animals and plants by seeking ways to conserve specific biological resources is more significant than simply prohibiting the use of those species.

The importance of conserving Korean Hanyakjae

Securing bio-diversity

Hanyakjae is a precious cultural resources inherited from our ancestors. As mentioned previously in relation to the Convention on Bio-Diversity, biological diversity should be protected in order to further develop the application of Hanyakjae that is acknowledged through long tradition.

The conservation of bio-diversity accompanies the pragmatism of preserving genetic resources. Recent developments in genetic engineering have enabled researchers to move an arbitrary gene from one individual object to another. Therefore, securing of genetic resources is now being seen as a criteria that determines the success of genetic engineering.

The necessity of self-sufficiency in Hanyakjae

South Korea' s current self-sufficiency in Hanyakjae stands at less than 50%. If the country relies on

imported Hanyakjae simply because of lower prices, the medicinal resources growing on our soil will no longer receive our attention, leading to the gradual extinction of these species.

During the Japanese invasion of Korea in 1592 and the Manchu War of 1636, the number of war patients grew rapidly. However, the inland route to Beijing where Hanyakjae was imported from was blocked by Ching Dynasty soldiers. Choi Myung-gil lamented the situation in the introduction of the republished Collection of Folk Medicine that "King Sejong compiled the Collection of Folk Medicine to help people in the East to cure their illness with the medicine of the East. But, large quantity of precious materia medica rushes in from Yonkyung, leaving our local medicine useless. Now, the access to Liaotung is denied since the way to Yonkyung is blocked by Ching Dynasty soldiers. Moreover, the high seas make it difficult to bring in medicines. Now, famous and outstanding medical books (from China) are of no use." This shows the frustration of not being able to obtain materia medica when urgently needed as well as the importance of securing local materia medica for local people.

Materia medica are indispensable in protecting public health as is food. Thus, giving up the domestic production of food and relying on imports due to the high production cost is just like mortgaging people' s lives to foreign countries. It is the same with Hanyakjae.

The excellence of Korean Hanyakjae

Hanyakjae in Korea are more effective for Koreans than imported ones since local products are better suited to local use. The affinity between Korean Hanyakjae rooted down in this soil for long years and the people of Korea who have adapted themselves to the climate and environment of the Korean peninsula has a synergistic treatment effect.

Besides, Korea has four distinctive seasons which allow medicinal plants to thoroughly adopt to the four steps of sprouting, growing, blossoming, harvest and storing; like mankind, to sprout [SOW?] in spring, grow in summer, reap fruits in autumn, and rest in winter. If a plant whose root is used medicinally is cultivated in a green house, it will fail to sense seasonal changes and store nutrients in the root. This theory can be applied to fruits, seeds, and leaves, not simply to the case of roots. The medicinal plants such as Bupleuri Radix, Corni Fructus, Ginko Folium, Hoelen have well known efficacy across the world as well as Panax schinseng.

Feasibility of the standardization of Hanyakjae

Medicine needs to be standardized. The standardization of Hanyakjae should be based on a uniformed efficacy. However, since China is a very large country with diverse climates and soil conditions, the quality of materia medica varies depending on the different regions, which makes it far more difficult to standardize materia medica. This is why the provincial letter is placed in front of the name of materia medica such as Chuk-Fritillariae Thunbergii Bulbus, Chun-Achyranthis Radix, Kwan-Stemonae Radix, Hwoi-Rehmanniae Radix, Kwang-Agastachis Herba, Woon-Sassureae Radix, Bun-Carthami flos. In this sense, standardization of Korean Hanyakjae is more feasible since they are produced under relatively uniform conditions.

Increase the income of farming households

The number of farm households cultivating medicinal plants at present amounts to 52,567 or 3.6% of the total farm households. South Korea' s self-sufficiency rate for Hanyakjae stands below 50%. In order to meet the balance of supply and demand, farmers should be provided with a firm production base to cultivate new items of Hanyakjae in large volumes by improving cultivation technologies, which will eventually bring higher income to farmers.

Countermeasures for the conservation of medicinal plants

Securing bio-diversity

Securing ways to preserve genes

The preservation of genes from a biological species can be divided into two categories, 'preservation within the region through conservation of the eco-system' and 'preservation through setting up a seed bank' . Aggressive protection measures for habitat should be implemented, and various technologies and facilities should be introduced.

Promoting a sense of ownership by the users of medicinal resources

First of all, a biologically sound management structure in using traditional medicinal resources should be established so as to encourage users to voluntarily protect medicinal resources because low ownership awareness of the medicinal resources will lead to extinction of species resulting from excessive collection and reckless exploitation.

Establishing a network among the industry, academia and research institutes for the efficient management of genes

Endangered medicinal resources can be protected by making use of the information from the established network among the industry, academia and research institutes for a systematic preservation, exploration and management of gene pools.

Cultivation of medicinal plants

Increase of production volumes through cultivation

Production volumes should be increased through cultivation of medicinal plants by selecting the right medicinal plants suitable to local soil, studying cultivation methods, and promoting appropriate technologies to farmers.

Specialization of cultivated items

The labor force in villages of South Korea is going down while the labor costs are going up, weakening the production foundation of farming. This situation requires specialization in cultivating the right items suitable for the local soil conditions to establish a 'cultivation complex' in order to enhance competitiveness.

References

Central Agricultural Cooperative (1997). Master plan of Fostering Medicinal Plant Industry by the Agricultural Cooperative.

Korea Academy Institute (1971). Pharmacy Edition of Academic Compilation, 1901-1970, Volume 5.

Do, Sang-hak (1977). A study on Korean Medicinal Plant resources and utilization method, Collection of Learned Papers by Dongduk Women' s Univ., Vol.7:161-222

Life Science Institute (1997). Proceedings of Workshop on Traditional Knowledge and Bio-diversity

Ahn, Duk-kyun (1998). An Illustrated Book of Korean Medicinal Herbs. Kyohaksa, Seoul

Woo, Won-shik (1988). A Study on Ingredients of Korea' s Higher Plants during 50 Years, Natural Resources & Science (compiled by Kang Sam-shik)

Woo, Won-shik (1996). A Study on Korea' s Natural Resources & Science (Natural Resources & Science Study Institute of Seoul National University., 1996)

Lee, Yong-jong (1998). Listing of Animals and Plants used for Traditional Korean Medicines or Folk Therapy and their Methodology. Association of Korean Oriental Medicine.

Lim, Ki-hong (1953), A Study on Origins and Roots of Herbs in South Korea and Manchuria. Pharmaceutical Journal, 2(1-2):28-33

Jung, Young-ho (1986). A Study on Bundle Plants, Revised History of Korean Plant Classification. Academy Books, Seoul.

Jung, Tae-hyun (1956). On Korean Wild Medicinal Herbs. Sungkyun Biology 7

Jee, Hyung-joon (1996). A Study on Korean Medicinal Plants Resources, A Study on Korea' s Natural Resources & Science (Natural Resources & Science Study Institute of Seoul National University.,1996)

Han, Koo-dong (1962), Chemical Structure of new tannin polygagallin separated from Acer ginnala Max.. Pharmaceutical Journal, 6.1-4

Ministry of Environment (1997), National Strategy of Bio-diversity

Cronquist, A.(1981). An integrated system of classification of flowering plants. Columbia University, N.Y.

Palibin, J.W (1898-1901). Conspectus florae Koreae, Parsprima Act. Hort. Petrop

Schultes, R.E. (1972). The future of plants as sources of new biodynamics compounds. Harvard University, Massachuesetts.

TRAFFIC East Asia (1995). Proceedings of the Seminar on the Convention of International Trade in Endangered Species of Wild Flora and Fauna (CITES).

TRAFFIC and Its Medicinal Plant Work

Kang Tae Suk
Korea Representative of TRAFFIC East Asia

Introduction to TRAFFIC and its Partner Organizations

TRAFFIC, the acronym for Trade Records Analysis of Flora and Fauna in Commerce, is the wildlife trade monitoring programme of WWF, World Wide Fund for Nature (known in North America as the World Wildlife Fund), and IUCN, the World Conservation Union.

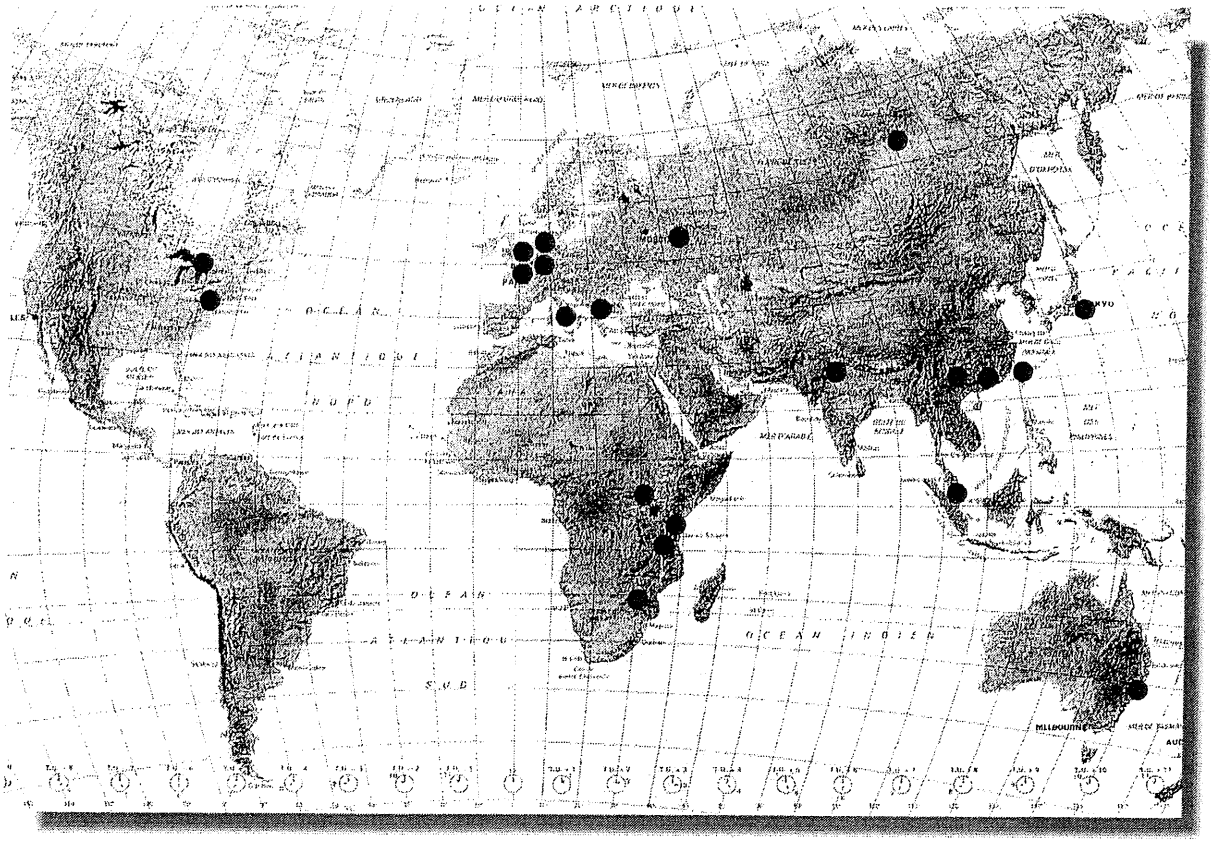
When human beings first appeared on the Earth, the impact of our species on others may have been relatively small. However, the situation has changed dramatically. According to a recent report released by the United Nation, the world' s human population stands at about six billion and is expected to reach approximately eight billion by the year 2020 (Lee, 1988). Escalating human populations have had a major impact on wild places and wild species. As the planet Earth itself cannot expand, numbers of many wildlife species are decreasing rapidly.

Individuals concerned about the impact of our species on the planet set up IUCN in 1948 and WWF in 1961. IUCN is a unique organization whose membership is made up of state members, government agency members, and non-governmental organizations while individual scientists and experts make up IUCN' s specialist groups. For example, the Ministry of Environment of South Korea is a member of IUCN.

WWF, on the other hand, is an organization whose membership consists of the general public. It has 29 national offices around the world and is active in over 100 countries. It avoids extreme approaches and concentrates on cooperation with governments, corporations, other NGOs, etc.

These two organizations played an important role in the creation of the Convention on International Trade in Endangered Species of Wild Fauna and Flora, or CITES, in 1973 and have continued to support the Convention since it came into force in 1975. In support of the implementation of CITES, WWF and IUCN jointly set up the TRAFFIC Network in 1976 in a small office in Cambridge, UK. Since then, the TRAFFIC Network has expanded to 19 offices on five continents. Figure 1 shows the locations of the various TRAFFIC offices. Offices are located in areas such as Europe and East Asia which are active wildlife trading areas and major wildlife consuming regions. TRAFFIC, with its global network, is the largest wildlife trade monitoring organization in the world.

TRAFFIC' s mission is to help ensure that wildlife trade is at sustainable levels and in accordance with domestic and international laws and agreements. TRAFFIC also investigates, monitors and reports on illegal wildlife trade to ensure the sustainable use of wildlife in coming generations.



TRAFFIC Network Offices

Currently, TRAFFIC organizes its work around four major themes: fisheries, timber, medicinals and implementation of CITES. TRAFFIC works in close co-operation with the CITES Secretariat and CITES parties. The work that TRAFFIC does in support of CITES includes:

1. Trade monitoring
2. Capacity building for CITES Parties
3. Assistance with developing wildlife trade laws and regulations
4. Assistance with CITES enforcement
5. Support to the CITES Secretariat and Parties
6. Liaison with consumers/suppliers
7. Background and & discussion documents for CITES committees and conferences
8. Review of CITES listing proposals

TRAFFIC' s reports and recommendations are valuable tools in effective wildlife conservation policies and programmes.

The TRAFFIC Network works closely with various governments and assists with necessary changes to laws related to wildlife trade to bring them in line with international wildlife trade trends. For example, in the USA, it has become illegal just to claim that tiger bone and/or rhino horn is included in a medicinal product. In the past, the government had to prove the authenticity of the claim

forensically. Now, the legal assumption is that the product does contain Tiger or rhino parts or derivatives if it claims to contain such ingredients.

In recent years, TRAFFIC has expanded its area of work to include species not listed in the CITES Appendices. In the future, TRAFFIC plans to become more involved in the Convention on Biological Diversity (CBD) as it relates in wildlife trade.

South Korea and the Convention on International Trade in Endangered Species (CITES)

CITES started with 9 Parties and, after 25 years, it had 145 parties in 1998. It is important to remember that the major objective of the Convention is not to ban trade in wildlife but to regulate trade to ensure the fauna and flora in the wild do not become extinct as a result of overexploitation.

South Korea acceded to CITES in 1993. At the time of South Korea' s accession to CITES, there was resistance from the traditional medicinal communities and pharmaceutical industries. General information on wildlife trade was scarce. South Korea (together with Yemen, China and Taiwan) was being threatened with trade sanctions by the US government for continued domestic use of Tiger bone and rhino horn despite a ban on international trade. South Korea undertook to accede to CITES and avoided trade sanctions under the terms of a piece of U.S. domestic legislation known as the Pelly Amendment.

Background on Medicinal Plants

All cultures from ancient times to the present day have used plants as a source of medicine. Today, according to the World Health Organization (WHO), as many as 80% of the world' s population depend on traditional medicine for their primary health care needs.

This trend does not occur only in developing countries. Use of medicinal plants in developed countries has also increased at a rapid rate. The World Health Assembly has passed a number of resolutions in response to a resurgence of interest in the study and use of traditional medicine in health care, and in recognition of the importance of medicinal plants to the health systems of many developing countries. In answer to WHO' s call, health authorities and administrators in developing countries have decided to take traditional forms of medicine more seriously and to explore the possibility of utilizing them in primary health care.

However, this great surge of public interest in the use of plants as medicines has been based on the assumption that these plants will be available on a continuing basis. Today, many medicinal plants may face extinction or severe genetic loss, but detailed information about them is lacking. For most endangered medicinal plant species, no conservation action has been taken. For example, there is very little material stored in gene banks (Anon., 1993). Also, too much emphasis has been put on potential discovery of new wonder drugs, and too little on the many problems involved in the use of traditional

medicines by local populations.

In light of this situation, WHO, IUCN and WWF decided that it would be timely to collaborate in convening an International Consultation on the conservation of medicinal plants, bringing together leading experts in different fields to exchange views on the problems, determine priorities and make recommendations for action. The Consultation took place in Chiang Mai, Thailand in May 1988, and a wide range of topics were covered. For IUCN and WWF, this meeting was an important part of their Plant Conservation Programme.

The Chiang Mai Declaration

The Ministry of Public Health of the Royal Thai Government invited experts in various fields to the Consultation in March 1988 in Chiang Mai and issued the "Chiang Mai Declaration - Saving Lives by Saving Plants" which offered guidelines on the conservation of medicinal plants (Anon., 1993).

The Chiang Mai Declaration calls on the United Nations, its agencies and member states, as well as other international organizations, to take action for the conservation of medicinal plants. The Declaration states that the participants:

- Recognize that medicinal plants are essential in primary health care, both in self-medication and in national health systems;
- Are alarmed at the consequences of loss of plant diversity around the world;
- View with grave concern the fact that many of the plants that provide traditional and modern drugs are threatened;
- Draw the attention of the United Nations, its agencies and member States, other international agencies and their members and non-governmental organizations to:
  - The vital importance of medicinal plants in health care;
  - The increasing and unacceptable loss of these medicinal plants due to habitat destruction and unsustainable harvesting practices;
  - The fact that plant resources in one country are often of critical importance to other countries;
  - The significant economic value of the medicinal plants used today and the great potential of the plant kingdom to provide new drugs;
  - The continuing disruption and loss of indigenous cultures, which often hold the key to finding new medicinal plants that may benefit the global community;
  - The urgent need for international cooperation and coordination to establish programmes for conservation of medicinal plants to ensure that adequate quantities are available for future generations.

The Forty-first World Health Assembly (1988) in its resolution WHA41.19 drew attention to the Chiang Mai Declaration and endorsed the call for international cooperation and coordination to establish a basis for the conservation of medicinal plants so as to ensure that adequate quantities are available for future generations. This placed medicinal plants, their rational and sustainable use, and their conservation, firmly in the arena of public health policy and concern.

The IUCN/SSC Medicinal Plants Specialist Group

The Medicinal Plants Specialist Group (MPSG) is one of 102 Specialist Groups within IUCN's Species Survival Commission (SSC). The SSC network encompasses 6,000 volunteer member scientists, field researchers, government officials and conservation leaders from 169 countries. SSC members provide technical and scientific counsel for biodiversity conservation projects throughout the world and also serve as resources to governments, international conventions and conservation organizations.

MPSG was formed in May 1994 with the current 53 members concentrating on the conservation of medicinal plants in collaboration with international organizations. It publishes its own newsletters and is involved in various projects.

MPSG focuses on the category where the greatest conservation threat is faced with high demand for slow-growing, slow-reproducing, habitat-specific species. At the same time, the MPSG promotes the need to deal with threats to medicinal plants at an early stage rather than focussing purely on taxa that are already in decline.

Once the focus has been defined, the MPSG identifies the casual factors behind declining populations and habitat threats. The four main factors are demand, demographic dynamics, economic and social factors. The goal of the MPSG is to conserve medicinal plants throughout the world. As an international body, it hopes to achieve this by:

- Identifying threatened taxa and the highest priority regions for urgent action for medicinal plant conservation;
- Identifying common causes, solutions and research survey methods for medicinal plant conservation;
- Promoting the rational and sustainable utilization of medicinal plants;

The MPSG will do this first by drawing up a conservation Action Plan with both taxonomic and geographic focus. The Action Plan will review the conservation needs of taxa and recommend conservation actions sufficient to ensure the long-term survival of these species. As a first step, national reports will be drawn up to review existing information on medicinal plants in local, regional and international trade, and short-list species for special attention.

The MPSG will not carry out field projects under its own auspices. Instead, it will be catalytic through provision of background information and methods for national and regional organizations to implement medicinal plant conservation measures. The Action Plan and on-going advice provided by MPSG members will form the basis for:

- Assisting other groups and authorities to design and implement their own programs;
- Motivating the creation of national regional groups and coordinating actions with the existing networks of medicinal plant conservation;

- Raising awareness among the public, especially in source countries, for the need for medicinal plant conservation;
- Stimulating medicinal plant issues in international conservation agreements (e.g. CITES, CBD).

Medicinal Plants in the CITES Context

The Plant Committee is responsible for the conservation of CITES-listed plant species. During the tenth Conference of the Parties (COP) to CITES, held in Harare (Zimbabwe) in June 1997, the parties passed a number of resolutions directed to the Plants Committee. These included instructions to continue reviewing the status of plant species listed in the Appendices including timber. during the eighth CITES Plants Committee meeting held in November 1997 in Chile, the Committee set a number of priorities with regard to the projects decided at the tenth CITES COP. Those projects directly related to medicinal plants include:

1. Trade in Nardostachys and Picrorhiza;
2. Trade in Chinese Orchids;
3. Trade in Aloe and Euphorbia spp.;
4. Medicinal plants in demand for roots;
5. Medicinal Plants in demand for parts and derivatives;
6. Trade in Prunus africana
7. Trade in Aquilaria malaccensis;
8. Trade in Hydratis

The TRAFFIC Network has started research on trade in medicinal plants in cooperation with the CITES Secretariat and the Scientific Authority of Germany. This research involves not only medicinal plants used by traditional medicine but also plants used by the pharmaceutical industries. The number of projects the TRAFFIC Network is involved in mean its medicinal plant work is comprehensive and global in scope. A Network-wide database is being set up.

Reports from the World Bank related to Medicinal Plants

Below is a summary of World Bank report (Lambert et al, 1996):

1. According to the World Health Organization, as many as 80% of the world' s population rely for their primary health care on traditional medicine, most types of which use remedies derived from plants. The use of traditional medicine in developing countries is increasing due to an increase in population. It is also because governments want to encourage local forms of medicine rather than to rely on imported drugs.

2. Two of the largest users of medicinal plants are China and India. Traditional Chinese medicine (TCM) uses over 5,000 plant species; India uses some 7,000. In China, sales of traditional medicines

have more than doubled in the last five years, while India's booming export trade in medicinal plants has risen almost three times during the last decade. In 1990, TCM doctors used 700,000 tons of plant material. China has about 250,000 traditional medicine doctors, India about 460,000.

3. World trade in plant medicines is worth billions of dollars. In 1994 China exported US$2 billion of plant drugs. Germany imports around $100 million of plant drugs. The number of medicinal plants in trade too is astonishing. Germany imports at least 1,560 plant species for medicinal purposes, but experts there estimate that only 50-100 of them are cultivated on a large scale; the remainder are thought to be collected from the wild.

4. This boom in local use and export trade is depleting many species from the wild, bringing some to the edge of extinction. Few are cultivated; 80% of the species used in China and 95% of those in India are collected from the wild. Data on threatened species are rare but national studies show 120 medicinal plants are rare or endangered in India, at least 77 in China and 75 in Morocco. It is reasonable to assume that at least 1,000 plant species used in medicine today are threatened with extinction. Threatened species include Tetu lakha (Nothatodytes foetida), a small tree from rainforests in South India and Sri Lanka used for anti-cancer drugs in Europe, Saussurea lappa from India whose root is used for chronic skin disorders, and Fritillaria cirrhosa from Sichuan, China, used for respiratory infections.

5. Latin America, home of a third of the world' s plants, also has a long-standing tradition of use of plants as medicine, especially among the indigenous peoples. R.E. Schultes found nearly 2,000 species used in the Colombian Amazon for medicinal purposes.

6. The use of herbal remedies is booming in developed countries. Consumers now have a smorgasbord of medical systems from which to choose. Principal indigenous systems are homeopathy, herbal medicine and aromatherapy. In Germany, over 80% of all physicians regularly use herbal products. Indeed, most of Europe (except Britain and Ireland) has never lost its herbal tradition. In USA, herbal remedies are worth $1.6 billion and rising. The situation is similar in Japan.

What is worth noting is that in Western countries, use of Traditional Chinese Medicine (TCM), Ayurveda, Unani, and Sidda has been growing at a rapid rate. In Britain the use of TCM has increased tremendously, especially for the treatment of eczema - an estimated 1 million TCM prescriptions were written in 1995 and the number of TCM doctors has doubled in the past five years.

The Situation in South Korea

International trade

South Korea imports 13 CITES-listed medicinal plants species and 96% of its total CITES-listed medicinal plant imports are from China. As an example, as much as 572,000 kg of Cibotium barometz was imported from China during the last three years (Ministry of Environment). At the eighth CITES

Plants Committee meeting (November, 1997), China and South Korea were encouraged to sit down and discuss the sustainable use of this particular species.

The following table shows South Korea's position as an importer and China's position as an exporter in the global medicinal plants trade.

Table 1: Ten leading Countries of Medicinal Plant Trade for the years 1992-1995

EXPORT			IMPORT		
Country	Volume (tonnes)	Value (US$1,000)	Country	Volume (tonnes)	Value (US$1,000)
China	121,90	264,50	Hong Kong	77,25	133,70
India	32,60	45,95	Japan	43,50	114,15
Germany	14,40	68,50	Germany	42,80	96,25
Singapore	13,20	54,00	USA	35,00	95,20
Egypt	11,25	12,35	South Korea	27,35	41,95
Chile	11,20	23,50	France	15,95	39,50
USA	10,15	35,70	Pakistan	12,00	12,95
Morocco	6,85	12,85	Italy	9,50	34,40
Mexico	6,30	9,30	Singapore	7,30	36,15
Pakistan	4,80	3,30	China	7,20	7,10

Source: Schippmann (1998)

In China, the output of cultivated medicinal plants is estimated to be between 300,000 and 400,000 tonnes whilst in 1994 the total demand for medicinal plants was 1,600,000 tonnes (Medicinal plants for Forest Conservation and Healthcare, FAO, Trade in Medicinal Plants)). This huge gap must be made up from wild-harvested material. What is particularly worrying is that TCM tends to use the roots of plants which are the most difficult plant parts to harvest sustainably.

South Korea imports 96% of its CITES-listed medicinal plants from China. This situation arises for economic reasons given the relatively low price of imports as compared with the price of the same species cultivating domestically. However, other factors point to the need for South Korea to increase domestic production. For example, China has been harvesting a large amount of timber, a harvest that many may resulted in the serious flooding which took place in 1998. If the flooding continues for more than three years, then China will not have the required supply of medicinal plants to export to South Korea and the public health of South Koreans will be affected.

South Korea should start to look at its long-term medicinal security, instead of just considering the relative price of imported versus domestically cultivated medicinal plants.

Domestic trade

The situation facing wild Korean plants is also worrying. Among the 58 endangered or threatened plants designated by the Ministry of Environment, 33 species are medicinal plants or mentioned as in use for medicinal purpose occasionally (Ministry of Environment & Dr.Lee Yu-mi, Per.comm.)

Conclusions

It has been ten years since WWF, IUCN and WHO have gathered in Chiang Mai and the response has been disappointing. Something has to be done to ensure that medicinal plants do not follow the same path as medicinal animals did.

The main objective of CITES and the conservation organizations introduced in this presentation is not to ban the trade in medicinal plants, but to ensure that there are and will be sufficient medicinal resources available for current and future generations. Many species that are in short supply can be cultivated. Others may require alternative sources or substitutes. In order to work toward achieving this objective, the South Korean government should undertake the following actions:

1. Organize domestic and international cooperation between the government, the traditional medicine community, the agricultural sector, and conservation organizations.
2. Obtain relevant and accurate data related to medicinal plants and make it available to concerned parties.
3. Work toward eradicating illegal trade through improved monitoring.
4. Review domestic legislation on medicinal plants and improve where necessary.
5. Continue to participate in meetings of the CITES Plants Committee on a regular basis.

Reference:

Anonymous (1993). Guidelines on The Conservation of Medicinal Plants World Health Organization, The World Conservation Union and World Wide Fund For Nature, Gland, Switzerland.

Lambert, John, Jitendra Srivastava and Noel Vietmeyer (1996). Medicinal Plants: Rescuing a Global Hertiage. The World Bank, Washington, D.C., USA.

Lee, Samuel K. H. (1998). Medicinal Plants Becoming a Focus of World Attention. About Life. Issue: Summer 1998, World Wide Fund For Nature Hong Kong, Hong Kong.

Schippmann, Uwe (1998). Ten Leading Countries of Medicinal Plant Trade for the Year 1992-1995. (an overhead transparency presented to Medicinal Plants for Survival, Bangalore, India, 16-19 Febrary 1998).

Annex : Endangered and Protected Wild Plants in South Korea

Endangered Wild Plants in South Korea

1. Cymbidium kanran Makino
2. Aerides japonicum Rchb. f.

3. *Cypripedium japonicum Thunb.*
4. *Ranunculus kazusensis Makino*
5. *Cotoneaster wilsonii Nakai*
6. *Diapensia lapponica var. obovata F. Schmidt*

Protected Wild Plants in South Korea

1. *Psilotum nudum (L.) Griseb.*
2. *Isoetes japonica A. Braun*
3. *Asplenium antiquum Makino* #
4. *Crypsinus hastatus (Thunb.) Copel.* #
5. *Arisaema negishii Makino)* #
6. *Lilium cernuum Kom.)* #
7. *Smilacina bicolor Nakai)* #
8. *Trillium tschonoskii Maxim.)* #
9. *Lycoris chinensis var. sinuolata K.H. Tae et S.C. Ko)* #
10. *Iris odaesanensis Y.N. Lee)* #
11. *Iris dichotoma Pall.)* #
12. *Cypripedium guttatum var. koreanum Nakai)*
13. *Galeola septentrionalis Rchb. f.* #
14. *Vexillabium nakainaum F. Maek.*
15. *Gastrodia elata Blume* #
16. *Cymbidium nipponicum (Franch. et Sav.) Makino*
17. *Cymbidium lancifolium Hook.*
18. *Sarcanthus scolopendrifolius Makino*
19. *Neofinetia falcata (Thunb.) Hu*
20. *Saururus chinensis (Lour.) Baill.* #
21. *Chloranthus glaber (Thunb.) Makino* #
22. *Quercus gilva Blume*
23. *Brasenia schreberi J.F. Gmel.* #
24. *Thalictrum coreanum Lev.* #
25. *Aconitum austro-koreense Koidz.* #
26. *Paeonia obovata Maxim.* #
27. *Jeffersonia dubia (Maxim.) Benth. et Hook.* #
28. *Leontice microrhyncha S. Moore*
29. *Wasabia koreana Nakai* #
30. *Drosera peltata var. nipponica (Masam) Ohwi* #
31. *Sedum rotundifolium D.B.Lee* #
32. *Rodgersia tabularis Kom.*
33. *Kirengeshoma koreana Nakai*
34. *Corylopsis coreana Uyeki*
35. *Echinosophora koreensis Nakai* #

36. *Euchresta japonica Benth.*
37. *Milletia japonica (Siebold et Zucc.) A. Gray*
38. *Astragalus membranaceus (Fisch.) Bunge* #
39. *Paliurus ramosissimus (Lour.) Poir.* #
40. *Berchemia berchemiaefolia (Makino) Koidz.*
41. *Hibiscus hamabo Seibold et Zucc.*
42. *Viola websteri Hemsl.* #
43. *Eleutherococcus senticosus (Rupr. et Maxim.) Maxim* #
44. *Bupleurum latissimum Nakai* #
45. *Rhododendron aureum Georgi* #
46. *Arctous ruber (Rehder et E.H. Wilson) Nakai*
47. *Trientalis europaea L.*
48. *Osmanthus insularis Koidz.* #
49. *Abeliophyllum distichum Nakai*
50. *Scrophularia takesimensis Nakai* #
51. *Lasianthus japonicus Miq.*
52. *Leontopodium coreanum Nakai* #

Note: # = species are used as medicinal plants or mentioned for medicinal purposes

Source: Ministry of Environment and Dr.Lee Yu-mi at Kwangnung Arboretum, Forestry Research Institute)

PROSPECT AND AGRICULTURAL BACKGROUND OF MEDICINAL PLANTS

Dr. Sung Nak-sool
Senior Agriculture Researcher
Crops Laboratory
Agriculture Promotion Administration

Introduction

Demand for Hanyakjae (materia medica for Traditional Korean Medicine) has been increasing in recent years due to overall improvements in living standards, a preference for natural products, and a desire for better health and the maintenance of good health. For these reasons, expansion of the TKM (Traditional Korean Medicine) sector and development of Hanyakjae-related industries have both helped fuel the demand for Hanyakjae.

Korea has a long history as a TEAM (Traditional East Asia Medicine) using country and continuous efforts have been made to establish TKM as a part of its traditional culture and to develop it as the national medicine. Hanyakjae is also becoming a valuable source of income. At the same time, the rapidly increasing volume of international trade in recent years has sparked an international trend to conserve Hanyakjae as medicinal and functional natural resources. International organizations and groups have voiced concern over trade volumes from the conservation point of view and expressed the need for regulating international trade in rare species of medicinal flora in order to protect these resources.

The current presentation reiterates the importance of medicinal plants, namely Hanyakjae, reviews the status of cultivation in South Korea and the supply/demand situation from a long-term perspective, and offers possible measures for the conservation of medicinal plants.

Agriculture in South Korea and the production of Hanyakjae

General status

The total area of South Korea is 9,931,000 ha and cultivated land is a mere 19.6% of the total area or 1,945,000 ha. Paddy field comprises 1,1176,000 ha whereas upland fields account for 769,000 ha(Table 1).

Table 1. Utilization of national land (unit: 1,000 ha)

National land	Cultivated land	Paddy fields	Upland fields
9,931	1,945	1,176	769

Source: Ministry of Agriculture

Income from upland crops

The main crops cultivated in upland areas are barley, soybean, sesame, pepper and green onion, and medicinal plants growing in area of 14,000 ha together with other types of vegetables. Among the various kinds of upland crops, the area used for medicinal plants is minimal, but they are the biggest cash crop worth KRW400 billion annually(Table 2).

Table 2. National gross income of upland crops

	Barley	Soybean	Sesame	Pepper	Garlic	Medicinal crops
Area (1,000ha)	50	98	42	91	10	14
Production (M/T)	149	160	29	218	579	39
Income (billion ₩)	145	376	297	1,335	320	400

Source: Ministry of Agriculture

Special features of Hanyakjae agriculture

Until recently, unlike other common crops, demand for Hanyakjae had been stable with a narrow range of price fluctuation depending on the harvest. Since the 1990s, however, demand for Hanyakjae increased substantially resulting in an imbalance between supply and demand.

In the past, moreover, main supplies came from the wild areas in the remote mountains. But in modern times, due to the lack of farm labour and an aging population, collection from the wild has decreased dramatically and medicinal plants have been produced in large sites to provide a source of income.

The task of cultivating the large variety of species for Hanyakjae has traditionally been a very labour-intensive one. The real situation is that majority of Hanyakjae cultivation is scattered around the country in small plots with a variety of species, which renders it extremely uncompetitive in the current free international trade environment.

It also takes long experience because quality can vary depending on the way crops are dried, the time of harvest, etc. In addition, each crop needs a different climate and potential cultivation sites can be limited to certain regions. According to the current regulatory system of Hanyakjae, medicinal plants are considered as medical products after the harvest with possible loss of additional value during simple process such as drying and cutting.

Cultivation status of Hanyakjae

Production by year

Compared to the 1980s, the overall cultivation area has increased to 13,000 ha or by 3.4 times as of 1997. Production volumes have jumped by 6.2 times totalling 39,500 tons. This can be interpreted as a result of several changes in the economic environment after 1990 such as the Uruguay Round, entry to WTO, etc(Table 3).

Table 3. Changes in production by year

Year	'80 (A)	'85	'90	'95	'97(B)	B/A
Area(ha)	3,966	4,010	9,179	13,741	13,600	3.43
Amount(M/T)	8,380	12,616	22,822	42,769	39,492	6.19

Source: Ministry of Agriculture

Production by province

Each medicinal plant has its own ecological requirements. Most of them grow in cold/cool mid-mountainous areas where day and night temperatures differ greatly. The main areas of cultivation are northern Kyungbuk Province, and mountainous Kangwon Province. The reason for the expansion of the cultivation area in Kyunggi Province is that cultivation of annual crops such as Astragali Radix is expanding to the civilian-controlled regions of the Demilitarized Zone and riverbanks such as Pocheon, Yoncheon, Chulwon, etc(Table 4).

Table 4. 1997 production by province

( ) is the production percentage by province.

Province	Planted area (ha)	Harvested area (ha)	Production amount (MT)
Kyunggi	1,693	1,626	4,624 (12.8)
Kangwon	2,856	2,223	6,396 (17.6)
Chungbuk	1,059	943	2,282 (6.3)
Chungnam	839	753	3,442 (9.5)
Chonbuk	1,264	647	3,108 (8.6)
Kyungbuk	3,294	2,660	10,830 (29.8)
Kyungnam	752	381	1,748 (4.8)

Source: Ministry of Agriculture

Production by crop

It is estimated that there are about 60-70 Hanyakjae species domestically produced. The Government includes about 30 species in its statistics. Among those 30 species, medicinal plants that occupy more than 1,000 ha are Platycodi Radix, Angelicae Gigantis Radix, Eucommiae Cortex, Adenophorae Radix, Coicis Semen and Astragali Radix. Those occupying more than 500 ha are Coicis Semen, Lycii Fructus, Paeoniae Radix, Cnidii Rhizoma, whereas Dioscoreae Rhizoma, Schizandrae Fructus, and Araliae Continentalis Radix takes more than 300 ha cultivation area respectively.

Currently, some portions of Liriopis Tuber, Moutan Cortex, Corni Fructus, Bupleuri Radix Schizandrae Fructus, Rehmanniae Radix, Polygoni Multifrori Radix and Atractylocis Rhizoma Alba are imported (among the Supply/demand Managed Species) due to the lack of domestic production and insufficient areas of cultivation. All of these species could be produced domestically in sufficient quantities, but are imported as a result of weak price competitiveness. Expertise to cut production cost of these species is desperately needed(Table 5).

Table 5. Main medicinal plants cultivated in 1997

Crops	Planted area(ha) 13,600	Harvested area(ha) 10,855	Unit yield (kg/10a)	Production (M/T) 39,492
Angelica Koreanae Radix	97	82	249	204
Lycii Fructus	476	471	219	1,033
Platycodi Radix	1,133	721	513	3,702
Angelicae Gigantis Radix	1,520	1,452	331	4,812
Eucommaie Cortex	1,575	760	328	2,489
Euphedrae Herba	1	1	200	2
Liriopis Tuber	89	89	449	400
Moutan Cortex	23	16	725	116
Saposhnikoviae Radix	112	104	453	471
Angelicae Dahuricae Radix	62	57	519	296
Adenophorae Radix	1,283	762	515	3,922
Corni Fructus	153	142	281	399
Dioscoreae Rhizoma	351	346	608	2,104
Bupleuri Radix	142	124	198	246
Coicis Semen	1,138	1,138	242	2,754
Schizandrae Fructus	377	348	123	429
Paeoniae Radix	511	400	745	2,978
Rehmanniae Radix	91	90	604	544
Anemarrhenae Rhizoma	13	11	500	55
Cnidii Rhizoma	798	653	351	2,294
Alismatis Rhizoma	143	141	527	743
Polygoni Multifrori Radix	206	199	341	679
Cyperi Rhizoma	200	200	542	1,084
Astragali Radix	1,809	1,603	286	4,579
Scuterllariae Radix	171	169	263	444
Cassiae Semen	38	38	208	79
Araliae Continentalis Radix	352	154	411	633
Gastrodiae Rhizoma	115	76	282	214
Gardeniae Fructus	288	203	308	626
Atractylodis Rhizoma Alba	20	15	627	94
Others	313	290	367	1,064

Source: Ministry of Agriculture

Import and export of Hanyakjae

Import and export trends

Import and export trends between 1985 and 1997 show increasing exports until 1990 and this increasing trend continued to a peak of over US$70 million, and decreased slightly to US$53 million in 1997. At present, the import has slowed due to the economic recession affected by the IMF. In the long run, it is expected that imports will continue to increase and appropriate counter-measures should be prepared accordingly(Table 6).

Table 6. Changes in import and export volumes by year

Year	Export		Import	
	Amount (M/T)	Value (1,000$)	Amount (M/T)	Value (1,000$)
'85	1,936	7,378	2,651	5,905
'90	3,418	19,161	9,477	19,264
'95	1,407	11,336	90,252	70,883
'97	858	5,872	31,591	49,928

Source: Ministry of Agriculture

Exporting countries

In 1997, 50,000 tons of medicinal plants were imported from overseas and 69% of the total import volume came from China with the rest from Vietnam, North Korea, etc(Table 7).

Table 7. Main countries exporting medicinal plants to South Korea in 1997

(unit : US$1,000)

Country	Total	China	Vietnam	D.P.R.K	Others (30 countries)
Amount (M/T)	49,928	34,631	2,809	3,112	9,376
Portion (%)	100	69.0	5.6	6.9	19.0

Source: Ministry of Agriculture

Super' import items from China

Among all the medicinal plants imported from China, Glycyrrhizae Radix and Cinnamoni Cortex account for the largest volumes. In 1997, imports of these two items equalled US$ 8 million. These statistics are based on Hanyakjae import records from the KPTA (Korea Pharmaceutical Traders Association) excluding the volume imported as food. Therefore, domestic demand for Glycyrrhizae Radix and Cinnamomi Cortex is estimated to be enormous. Other 'super' import items include Atractylodis Rhizoma Alba, Atractylodis Rhizoma and Rehmanniae Radix, although it is quite possible to cultivate them domestically.

It is impossible to domestically produce Cinnamomi Cortex and Longanae Arillus, however Glycyrrhizae Radix, Atractylodis Rhizoma Alba, Atractylodis Rhizoma, and Rehmanniae Radix are four super items which could be cultivated by South Korea. Research and investment into those species is needed desperately(Table 8).

Table 8. Main medicinal herbs imported from China in 1997

	Glycyrriza	Cinnamomum	A. japonic	A. lancea	Rehmania	Euphoria
Amount(M/T)	3,620	1,381	600	601	1,710	802
Value(1,000$)	5,900	2,285	1,849	734	1,893	3,336
Price(₩/kg)	2,118	2,151	4,006	1,596	1,439	4,180

Source: Ministry of Agriculture

Import reliant plants and the possibility of self-sufficiency

Main imported crops and measures for self-sufficiency

In 1997, about US$25 million was paid for over 13,000 tons of the ten main imported herbs. All of these, except Longanae Arillus and Cinnamomi Cortes, could be cultivated domestically. The reason for the import of these species is the weak price competitiveness of domestic production.

Up to now, no Glycyrrhizae Radix has been produced domestically, but the Agriculture Promotion Administration is reviewing the adaptability of this species. Analysis showed that it would be possible to produce this species domestically and prices could be competitive.

Polygonati Rhizoma, Hoeln, Pinelliae Tuber and Rehmanniae Radix, Atractylodis Rhizoma Alba, Corydalis Tuber, Asiasari Radix are species native to Korea and substantial amounts of these species are cultivated. Still, due to insufficient production, supply is dependent on imports. Active measures such as the development of technology to reduce production costs and expansion of cultivation areas should be adopted to ensure production levels sufficient to meet domestic demand(Table 9).

Hanyakjae related organizations and systems

Organizations

Production

Medicinal Herb Association of Korea, Agriculture Cooperative Committee, National Medicinal Society

Processing

Table 9. Main Crops Imported and Countermeasure for Self-supply.

Crop	Import volume (M/T)	Import value ($1,000)	Price ($/kg)	Counter measure
Glycyrrhizae Radix	3,620	5,900	1.62	self-supply possible (need to develop expertise in cultivation)
Longanae Arillus	803	3,337	4.15	relying on imports (need to develop substitute)
Polygonati Rhizoma	2,266	3,216	1.41	domestic production possible (need to develop expertise)
Cinnamomi Cortex	1,381	2,285	1.65	relying on import
Hoelen	1,636	2,240	1.36	weak competitiveness (need expertise to cut production costs)
Pinelliae Tuber	451	1,930	4.27	expand domestic cultivation
Rehmanniae Radix	1,710	1,893	1.10	promote consumption (production expertise finished)
Atractylodis Rhizoma Alba	600	1,850	3.08	promote consumption (expertise being developed)
Corydalis Tuber	412	1,307	3.17	cultivation expertise being developed
Asiasari Radix	276	1,194	4.32	cultivation expertise being developed

Korea Medicinal Industrial Cooperative, Korea Pharmaceutical Manufacturers Association

Retailing

Association of Korean Oriental Medicine, Korea Pharmacists Association

Distribution

Korea Pharmaceutical Traders Association, Wholesalers Association

MANAGEMENT systems

Hanyakjae Supply/demand Management Committee and its management

Twenty six kinds of medicinal plants are included as Supply/demand managed items. Despite sufficient domestic production of these herbs, when the weak price competitiveness of these 26 items drives a market price surge (over 5% of the usual market price) or when there is an absolute insufficiency of the items, then the allocated volume will be imported upon approval by the Supply/ demand Management Committee.

Supply/demand managed items

Angelica Koreanae Radix, Lycii Fructus, Angelicae Gigantis Radix, Araliae Continentalis Radix, Eucommaie Cortex, Liriopis Tuber, Moutan Cortex, Saposhnikoviae Radix, Cynanchi Wilfordi Radix, Angelicae Dahuricae Radix, Atractylodis Rhizoma Alba, Corni Fructus, Paeoniae Radix Rubra, Peoniae Radix, Rehmanniae Radix (crude, dry), Atractylodis Rhizoma, Cnidii Rhizoma, Gastrodiae Rhizoma, Gardeniae Fructus, Alismatis Rhizoma, Polygoni Multifrori Radix, Cyperi Rhizoma, Scuterllariae Radix, Astragali Radix

The Supply/demand Management Committee consists of two representatives of production groups, two from distribution-related organizations, two from processing industries, four from consumer organizations, one from the Ministry of Agriculture, one from the Ministry of Health and Welfare and two from the Agriculture Promotion Administration.

Duties of this Committee are:

to fully understand the production and consumption quantities of Hanyakjae;
to conduct market surveys at any time;
to facilitate the distribution and consumption of adequate quantities of Hanyajae at the appropriate time by contract cultivation and purchase inducement.

Production and management systems for standardized Hanyakjae

Since Hanyakjae is distributed as medical products directly related to hygiene and health of the general public, its distribution is regulated as raw medicinal material with standard requirements. This applies to 514 items listed in Korea Pharmacopoeia and Standard Crude Drug Manual. Among those 514 items, only specialized manufacturing companies (Pharmaceutical Industries Cooperative) can handle manufacturing and packaging for 69 Hanyakjae that can be altered, forged, abused and for those that need numerical regulation and others determined by the Ministry of Health and Welfare. These are described in detail below.

Items regulated by law - 18 items

Zingiberis Rhizoma, Cervi Cornus Colla, Rhei Rhizoma, Eucommiae Cortex, Pinelliae Tuber, Pasoraliae Semen, Aconiti Lateralis Radix Preparata, Rehmanniae Radix Preparata, Massa Medicata Fermentata, Evodiae Fructus, Fel Tauri, Polygalae Radix, Cinnabaris, Sanguisorbae Radix, Cuscutae Semen, Morindae Radix, Schizonepetae Spica, Siegesbeckiae Herba

Items of concern for alteration and forgery - 24 items

Puerariae Radix, Chrysanthemi Flos, Cinnamomi Ramulus, Cinnamomi Cortex, Pogostemonis Herba, Cervi Cornu, Cervi Parvum Cornu, Persicae Semen, Ephedrae Herba, Pinelliae Tuber, Amomi

Cardomomi Fructus, Hoelen, Adenophorae Radix, Perillae Herba, Acanthopanacis Cortex, Langanae Arillus, Bezoar Bovis, Polyporus, Scorpion, Aurantii Nobilis Pericarpium, Plantaginis Semen, Cuscutae Semen, Armeniacae Semen, Carthami Flos

Items of concern for addiction - seven items

Euphorbiae Kansui Radix, Aconiti Lateralis Radix preparata, Arisaematis Rhizoma, Aconti Tuber, Aconiti Ciliare Tuber, Tiglii Semen

Items of concern for form and origin - two items

Cinnamomi Cortex Spissus, Magnoliae Cortex

Items specified by the Minister of Health and Welfare - 18 itemsGlycyrrhiza Radix, Zingiberis Rhizoma, Lycii Fructus, Platycodi Radix, Angelicae Gigantis Radix, Eucommaie Cortex, Peoniza Radix, Corni Fructus, Dioscoreae Rhizoma, Zizyphi Semen, Bupleuri Radix, Cnidii Rhizoma, Alismatis Rhizoma, Cyperi Rhizoma, Scutellariae Radix, Astragali Radix, Coptidis Rhizoma, Phellodendri Cortex

The rest of Hanyakjae is distributed by each organization under its own regulations that are in accordance with the standard products of specialized manufacturing companies(Table 10).

Table 10. Self-sufficiency rates of Supply/demand managed Hanyakjae (1997)

	Item	Sufficiency rate (%)	Import volume (M/T)		Item	Sufficiency rate (%)	Import volum (M/T)
	Angelica Koreanae Radix	259	0	#	Lycii Fructus	115	0
	Angelicae Gigantis Radix	191	31		Araliae Continentalis Radix	456	47
	Eucommaie Cortex	279	10	#	Liriospis Tuber	122	0
	Saposhnikoviae Radix	159	0	#	Moutan Cortex	90	598
	Angelicae Dahuricae Radix	193	0	#	Atractylodis Rhizoma Alba	38	4,305
#	Corni Fructus	106	0	#	Bupleuri Radix	127	855
#	Schizandrae Fructus	82	571		Paeoniae Radix	204	0
	Cnidii Rhizoma	159	0		Gastrodiae Rhizoma	263	20
	Alismatis Rhizoma	163	0		Anemarrhenae Rhizoma	178	0
#	Rehmanniae Radix	7,993	1.1	#	Atractylodis Rhizoma	18	3,915
	Gardeniae Fructus	130	0		Fritillariae Thunbergii	120	29
	Polygoni Multifrori Radix	278	2.5		Cyperi Rhizoma	144	0
	Scuterllariae Radix	106	50		Astragali Radix	132	350

Note: Supply of # items were insufficient in 1998 due to reduced production resulting from weakening price competitiveness.

Source: Ministry of Agriculture

Importance of Hanyakjae agriculture

Conservation of medicinal plants

It is reported that there are about 1,000 medicinal plants distributed domestically. Plants provide various benefits to human beings such as air purification. Medicinal plants, in particular, have attracted a lot of attention lately as their derivatives are known to produce additional efficacy which has encouraged scientists around the world to actively research the functions of their derivatives. For example, Taxol has been extracted from Taxus walichiana, Shikonine from Lithospermum erythrorhizon, an anti-AIDS component from Glycyrrhiza Radix, and an anti-malaria ingredient from Artemisia annua. The results of these research activities have been commercialized and mark the beginning of a new era. Research into secondary derivatives of plants has been moving forward day by day as the development of natural chemistry advances rapidly.

Therefore, it can be said that Korea has treasures in our country where these medicinal plants are distributed nationwide. It is important to protect these native plant resources so cultivation, even at a small scale, is important as a means to manage plant resources.

Utilization of cultivated land and income sources for our farmers

Seventy percent of Korea is made up of mountains and much of the area under cultivation is distributed around developed mountainous or hilly areas. In addition, grain farming is not suitable around limestone areas such as Kangwon Taebaik, and the Jeongsun area. Except for medicinal plants, there are not many kinds of grains suitable for cultivation in this cool mid-mountainous climate. Moreover, large scale grain farming requires heavy machinery whereas medicinal plants cultivation is suitable in remote areas where large machinery cannot frequent. By cultivating medicinal plants in these areas, land can be utilized to the utmost.

Despite the difficulties in cultivating medicinal plants and the large initial investment into production, they can bring much higher income compared with other upland crops. It is estimated that about 50,000 farmers produce a total revenue of KRW400 billion annually.

National Health

Medicinal plants occupy an important role in national health. In national medicine which should be inherited and developed as part of traditional culture, Hanyakjae is a necessary means of treatment and should be produced and supplied domestically at any cost.

There are about 30,000 traditional medicine related specialists who are involved in Hanyakjae-related industries, or provide health care service for the public in this specific field.

In current situation, the majority of materia medica is imported from abroad such as China because of low prices. However, the international situation should be carefully monitored from now on. In the not

too distant future, China is expected to face a domestic shortage of medicinal plants, not to mention being able to export to other countries. It is easy to anticipate such a trend considering China' s 1.2 billion population and the higher living standards resulting from economic development.

In addition, changing consumption patterns of medicinal plants in developed countries such as the USA and Europe should not be overlooked. Relying on imports for Hanyakjae supply could result in mortgaging our citizens' health to foreign countries. Therefore, active countermeasures should be taken to maintain domestic production in the interests of our countrymen.

Future plans to develop Hanyakjae cultivation

Develop mass consumption of domestically sufficient crops

As reviewed previously, there are numerous native medicinal plants distributed nationwide, and 50-60 species are already cultivated by farmers. Expertise on production and cultivation of several species has been accumulated and they are produced in excess domestically. Promoting the consumption of these species for purposes other than as Hanyakjae is very much needed.

Main medicinal plants that are excessively produced are Angelicae Gigantis Radix, Astragali Radix, Cnidii Rhizoma and Paeoniae Radix. They are indispensable materia medica with distinct pharmacological efficacy. Extracts of these plants are developed and produced in some areas, but in reality the result is not so successful because of insignificant scale. It is necessary that researchers in nutrition and food science pay more attention to this issue and develop products that would require those excessively produced medicinal plants in large volumes.

Research on developing self-sufficiency in import reliant crops

Supplies of some indispensible ingredients in Hanbang (TKM) are reliant upon imports due to a weak domestic production base or unsuitable climate. Glycyrrhizae Radix, Cinnamomi Cortex, Atractylodis Rhizoma Alba, Rehmanniae Radix, Longanae Arillus, Amomum villosum Lour, Cinnamoni Cortes, Amomi Semen and Longanae Arillus are imported due to unsuitable climatic conditions. On the other hand, Glyrrhizae Radix, Rehmanniae Radix and Atractylodis Rhizoma Alba can be cultivated domestically and could be supplied locally. It is fortunate that agriculture promotion institutes are expanding their research into Glycyrrhizae Radix, Atractylodis Rhizoma Alba and Rehmaniae Radix.

Development of new usages for medicinal plants

Research in this field is being fuelled by other countries with keen interest in research into natural resources. Great added value can be discovered in researching use of natural resources as food ingredients, spices, dyestuffs and cosmetics as well as medical products. Good examples are Taxol from Taxus walichiana, anti-AIDS virus from Glycyrrhizae Radix, anti-malaria component from Artemesia annua and Shikonine from Lithospermum erythrorhizon. At present, research into

extracting an activator from Viscum, an anti-aging component from Schizandrae Fructus, developing traditional Korean scent from native Korean plants and producing pigment from Acorus Graminei Rhizoma and Persicaria tinctoria are under way and show promises of success.

In addition, it is possible to develop various food and beverage additives, alcoholic liquors, and supplementary ingredients for cosmetics out of plants.

Recommendations

1. Establish a stable production foundation and expand consumption for domestically sufficient medicinal plants by creating new demand.

   New demand and usage should be developed for those important crops with cultivation areas over 500 ha and demand volume of over 1,000 tons (Angelicae Gigantis Radix, Astragali Radix, Cnidii Rhizoma, Dioscoreae Rhizoma, Paeoniae Radix) to prevent price slumps due to excessive production. The Government- supported Price Maintenance System (e. i. production cost guarantee system, minimum price guarantee system) could be reviewed.

2. Raise the self-sufficiency rate of import reliant Hanyakjae consumed on a large scale and aim for self-supply.

   Active measures should be taken for those items with over 1,000 ton demand volumes and over 500 ha cultivation area (Glycyrrhiza Radix, Rehmanniae Gigantis Radix, Atractylodis Rhizoma Alba) as they rely heavily on imports despite possible domestic production due to weak international price competitiveness. Possible measures could be to improve the species, develop and support cultivation technology, expand and induce Hanyakjae cultivation.

3. Develop and induce new Hanyakjae and let the Supply/demand Management System settle in. The Supply/demand Management System of 26 Hanyakjae items should be maintained until the domestic production base becomes stabilized in a bid to encourage domestic cultivation. Demand organizations should first consume domestically grown medicinal plants, and then import should be allowed only for shortages, while incrementally increasing percentage of self-sufficiency annually. In addition, low labour cost production expertise should be developed so as to strengthen price competitiveness. Cultivation technology of wild-collected Hanyakjae with huge domestic production shortages and high import price such as Pinellia Tuber, Polygonatum Rhizome and Asiasarum should be developed.

4. Development of technology

   Technology for the mass production of high-quality, disease-resistant species should be advanced. At the same time, the quality of processing technology and expertise in ingredient analysis should be improved.

Appendix I

WORKSHOP AGENDA

25 Nov. 1998, (Wed.) 09:30 - 12:00

Opening Session

09:30 - 09:50	Opening Remarks: Mr.Choi Hwan-young Chairman of the Association of Korean Oriental Medicine Congratulatory Message: Mr.Kim Yong-ho Director of Korean Oriental Medicine Bureau, Ministry of Health and Welfare

Plenary Session

09:50 - 10:00	Introduction of Participants
10:00 - 10:20	Importance of Conservation of Medicinal Plants Prof. Lee Young-jong Chairman of the Association of Phytology
10:20 - 10:30	Break
10:30 - 11:00	TRAFFIC's Work on Medicinal Plants, Kang Tae Suk, Korea Representative of TRAFFIC East Asia
11:00 - 11:30	Dr. Sung Nak-sool Agriculture View and background of Medicinal plants Senior Researcher, Agriculture Promotion Administration Ministry of Agriculture
11:30 - 11:50	Questions & Answers
11:50 - 12:00	Conclusion

Appendix II

LIST OF WORKSHOP PARTICIPANTS

Mr.Choi Hwan-young
Chairman
Association of Korean Oriental Medicine

Mr.Sung Chi-yong
Secretary General
Association of Korean Oriental Medicine

Mr.Kim Ki-sang
Senior Manager
Academic Affairs Division
Association of Korean Oriental Medicine

Ms.Ahn Hye-kyung
Manager
Academic Affairs Division
Association of Korean Oriental Medicine

Mr.Yoon Tae-ho
Junior Manager
Academic Affairs Division

Dr.Lee Young-jong
Chairman
Association of Phytology

Dr.Sung Nak-sool
Senior Researcher
Medicinal Plants Laboratory
Ministry of Agriculture

Ms.Kang Tae-suk
Korea Representative
TRAFFIC East Asia

Mr.Ryoo Ha-sun
Deputy Director
Trade Cooperation Division
Korean Customs Service

Dr.Kim In-rak
Senior Researcher
Korea Institute of Oriental Medicine

Mr.Park In-seok
Deputy Director
Korean Oriental Medicine Division
Ministry of Environment

Mr.Nam Jung-hak
Executive Director
Korean Herb Association

Ms.Chung Yon-kook
Senior Manager
Korea Pharmaceutical Traders Association

Ms.Kim Min-jeong
Deputy Director
Global Environment Division
Ministry of Environment

Dr.Suh Min-hwan
Senior Researcher
Environmental Biology Division
National Institute of Environmental Research

Ms.Byun Sung-hee
Professor
Kyungsan University

Dr.Shin Dae-hee
Chief Researcher
The Institute of Life Science Research
Choseon Pharmaceutical & Trading Co.

Mr.Lee Je-hyun
Junior Researcher
Korea Institute Oriental Medicine

Mr.Lee Dong-hee
Senior Pharmacist
Food and Drug Industry Division
Ministry of Health and Welfare

Dr.Je Jong-gil
Chairman
Green Korea

Dr.Kang Sung-hyun
Senior Researcher
KORDI

Ms. Yim Mi-jeong
Director
Environment Education Association

Ms.Kim Eun-hee
Director
Environment Education Association