

North Korean Research Institutes for Plant Resources and the Actual Conditions of Their Agricultural Usage

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Abstract - The representative research institutes in North Korea are the Academy of Science and the laboratories of major universities. The National Academy of Science consists of headquarters, Academy of Medicinal Science, Academy of Forestry Science, and Academy of Agricultural Science. Under the authority of the National Academy of Science, Central Information Agency for Science and Technology (CIAST) has built up a database system integrating all the science technology data to provide scientific and technological information. The major universities of North Korea include Kim Il-sung University, Kim Chaek University of Technology, Pyongyang Agricultural College, and Wonsan Agricultural College, and an agricultural college is situated in each province. Out of 3,860 plant species in North Korea, 158 species which amounts to approximately 4% of the total are rare and endangered, and deforestation is under a critical situation. The Oriental Medicine (Koryo Medicine) has been well developed using medicinal plants, and practical researches on biotic pesticide are largely conducted as an alternative to tackle the shortage of farming materials. Hereafter, a South-North joint research on the amount of plant resources and the methods of its conservation is needed and the North Korean research areas of biotic pesticide are worth adopting to the South Korean eco-friendly organic agriculture.

Key words - Academy of Science, CIAST, North Korea, Plant resources

Introduction

Along with the edibility, plant sources are recycleable with unlimited usage for medicine, engineering, natural dyes, and animal feed. Their importance is emphasized as plant resources are ingredients for development of new medicines and food, which is a key area of 21st century-biological industries. For the continuous use of plant resources, preservation and conservation of plants are required as well as investigating flora and securing the resources. In reality, however, destruction of resources is accelerating due to the rapid development processes and misuses under industrialization, and the number of endangered and threatened plant species are on the gradual increase. Developed countries, for example, put effort at a national level to secure the pool of foreign plant resources along with the domestic ones, and they are performing up-to-date researches in the areas of exploration, classification, evaluation, and utilization.

South Korea is relatively abundant in the number of plant species considering the size of the country's territory. Unfortunately, neither a South-North joint research and use of plants on the Korean Peninsula, nor any exchange of related information has taken place since the two nations were divided into two for nearly 60 years. This article would like to introduce major research institutes for North Korean plants, and to discuss the actual state of agricultural usage of plants.

North Korean research institutes in the field of Botany

National Academy of Science (NAS)

The best scientific technology research institute is the National Academy of Science (NAS). It was founded in December 1st of year 1952 and renamed as 'National Academy of Science' in November of 1993. In February 1994, State Administration Council has expanded the organization by integrating research institutes of each department committee. Later in October 1998, State Science

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and Technological Committee was absorbed and the original name was changed into 'Academy of Science.' 'Academy of Agricultural Science (AAS)' was transferred to Ministry of Agriculture, and 'Academy of Medicinal Science (AMS)' to Ministry of Public Health, 'Academy of Forestry Science (AFS)' to Ministry of Land Environment Protection, and thus Academy of Science became a research institute for pure science. The scientific administration, 'State Science and Technology Committee,' became independent from Academy of Science on September 19 in 2009, and was raised to the status of managerial organization controlling the overall scientific and technological areas of North Korea. Under the union of NAS, there are 9 branch institutes, 39 directly attached research institutes, and 7 affiliated organizations such as an Engineering College, a Science Library, 3 major Revolution Museums, Central Information Agency for Science and Technology (CIAST), Central Research Laboratory for Synthesized Microorganism, New energy development center (NEDC), and Patent Office. AMS integrated Medical Science research institute and Medicinal Plant Garden, and started to function as Institute of Medical Science. Under the authority of AMS, 23 research institutes, 2 branch institutes, 1 attached hospital and blood transfusion center, 5 manufacturing factories, and 2 testing grounds for medicinal herbs are included.

AFS was established in May 1954, and has 4 research institutes, 5 testing grounds, and 3 branch institutes.

AAS began as Academy for Agricultural Research in March of 1952 as Central Agricultural Research Laboratory under Ministry of Agriculture and Research Institute of Academy of Science were merged. The headquarter of AAS is organized by 3 Offices, 6 Boards and 5 Divisions for technological administration, 36 research institutes, 18 branch institutes, one comprehensive examination room, 5 special examination rooms, one pure breed room, one livestock breeding farm, and manufactory for veterinary medicine.

CIAST has built up a database system with latest science and technology data. It provides information about science and technology by publishing domestic and foreign abstracts of dissertation on it. Under CIAST, 7 centers are in charge such as Computer Center, Database Center, Announcement and Publications Editing Center, Publishing Center, Infor-

mation Service Center, Training Center, Data Analysis Center, and the key is the Computer Center. The Computer Center comprises System Programming Department, Applied Programming Department, Multimedia Department, Ordered Program Department, Information Technology Service Department, and Network Management Department.

Science and Technology Information Service System, 'Kwangmyeong' was developed around the middle of 1980s, and it has been in service to network among each committee of the Cabinet, central organization of ministry, major universities, and Grand People's Study House. Its development was mainly focused on searching scientific technology, but now it is a portal website for searching, e-mailing, online library, live chatting service, and electronic commerce.

Major university

The major universities of North Korea include Kim Il-sung University, Kim Chaek University of Technology, Pyongyang Agricultural College, and Wonsan Agricultural College, Sariwon Agriculture college and an agricultural college is situated in each province. The best key university is '*Ligoo (Technology)*' university. It was founded in January 17th 1967 as of branch school of Kim Il Sung university and became independent from Kim Il Sung University in 1985. *Ligoo* university was transferred to NAS, and thus this university comprised 6 divisions of physics, mathematics, automatics, computer science, chemistry, and biology. Biological is division is comprised of biochemistry, general genetics, cytogenetics, molecular genetics, biophysics, statistic genetics, and bioinformatics.

The amount of Plant Resources of North Korea and the actual state of the usage

The Amount of Plant Resources

The phanerozoic living organism systematologically consists of one plant community that was originated from the Central Asia area and migrated to the east, and another from the northern part of Asia and migrated to the south. There has been no detailed outcome of investigation and research on North Korean plant resources, but it is known that relatively ample plant resources exist in North Korea compared to those

of South Korea. Surveyed plants recorded so far total 8,875 species, of which 3,900 are higher plant species, Vascular vegetation covers 3,176 species, with 790 genera in 204 families (UNEP, 2003). In other data, there growth 4,200 species of higher plants in 1,050 categories in over 230 families, of which the species of trees number 1,000 (Academy of forestry of DPR Korea, 1992).

Under IUCN criteria, fauna and flora of North Korea can be divided into critically endangered species, endangered species, rare species and regionally based species. For higher vegetation, 10 critically endangered species, 42 endangered species, 76 rare species and 26 species of region based populations, giving a total of 158 species, representing 4 percent of threatened higher vegetation species worldwide (UNEP, 2003).

Since 2000, informationalization of biological diversity is quite actively in a process and building database for biological diversity is under process. The recent North Korean data show that the so-far-known naming information to classify angiosperm is not unified and causes confusion, and results in an obstacle to businesses such as researches and preservation of species diversity. It also states that ‘inspection on Chosun angiosperm diversity and program for analysis,’ “Mokran” 1.0 was developed, and 1 subclass, 7 orders, 22 families and 327 genera were added to what was previously investigated in ‘Chosun flora,’ totaling 3,562 species (Shin *et al.* 2006).

The ecosystem of North Korea contains 70% of forest ecosystem, 0.47% high mountain ecosystem, 4.8% rice field ecosystem, 10.2% dry-field farming ecosystem, and the rest of wetland ecosystem, watercourse ecosystem, sea ecosystem, and city ecosystem (NK Tech Newsletter No. 82, 2006. 11). In the past, North Korea had a rich variety of flora due to high mountains and wide range of vertical and horizontal climate, yet the environment is seriously bare and destroyed. The size of forest of North Korea was up to 9,773 ha in 1970, but it was reduced to 7,533 ha in 1997, and most of the mountains around villages with private residences turned into barren hills. North Korea is dealing with grave energy crisis and uses coal for the energy source. For this reason, firewood and charcoal are used to supplement the needs and a number of woods are lumbered recklessly. Moreover, deforestation

persists for the demand of using woods for mine pillars and war supplies. Cultivation of mountain slopes to turn them into orchards and terracing for the purpose of taking most out of mountains and expanding the acreage of under cultivation causes the aggravated frequent natural disasters (Lim, 1995).

The actual state of usage (usage as phytopesticide)

North Korea also uses plants in a diverse way for table uses, medicine, sugar and starches, natural dye, animal feed and so on. Plants are more frequently used for non-official medicine compared to the practice of South Korea. The Oriental Medicine is particularly called “Koryo” Medicine and many of profound researches and commercialization have been going on. In this section, the use of plants as biotic pesticide will be introduced. The biotic pesticide called ‘Myungrok’ contains the principal ingredient using mugwort extract with insecticidal ingredients such as coumarin mixed with complementary ingredients, and it is known to be effective in killing cabbage worms (Han *et al.*, 2006). For heightened effect of destroying aphids, extracts from corn-stalks and leaves of tobacco mixed with chemical pesticide are recommended (Kang and Kim, 2005). There are ongoing researches projected to use vegetable extracts such as the ones from mugwort, garlic, potatoes, and ginkgoes for vegetable insecticide.

The commonly used plants for vegetable pesticide are woody plants. Most plant species like queritrons, pines, pseudo-acacia, black spruce, khingan fir, spruces, ginkgoes, willows, popular, platanus, apple trees, pear trees, apricot trees, and peach trees are used to produce natural pesticide. Among herbaceous plants, roots of pasque flowers, irises, *Phryma leptostachya* var. *asiatica* Hara, *Chelidonium majus* var. *asiaticum*, *Sophora flavescens* are used. From agricultural by-products, rice bran and straw, corn stalk, wheat and barley straw, Perilla stem, potatoes, cucumbers, pumpkin vines, red peppers, tomatoes, tobacco, egg plants are used. As North Korea has faced a shortage of resources, the research and commercialization of vegetable pesticide using agricultural by-products have been much in progress. Bio pesticide using plants is particularly called ‘Koryo Vegetable Pesticide.’ Its insecticidal and sterilizing effect is not great enough and duration is short, yet it is desirable in terms of recycling

Table 1. Useful plant materials for Crop diseases.

Sector	Crop disease	Plant materials
Bacterial disease	root gall (fruit tree)	rape, korean barberry, draba nemorosa, morning glory, pomegranate, oak, magnolia
	clubroot (tomato)	hemp, magnolia
	rot disease (potato)	rape, korean barberry, morning glory, magnolia, oak, water lily, pomegranate, knot grass, bracken, ginger, japanese yew
	blight disease (tomato)	water lily, aster yomena, rose of sharon, sun flower, rose, potato, salsola komarovi, goldenrod
	root gall (stone fruits)	magnolia, water lily, pomegranate, oak, asarum sieboldii, polygonum
	late bright (potato)	bean, hypericum ascyron, juglans sinensis
	bacterial rot (cabbage)	palm, japanese bead tree
Fungus disease	bread mold (chinese cabbage)	amaranthus lividus, pseudo acacia, oat
	fruit rot (peach)	goosefoot, clematis, magnolia, pea, cone, clover, oak
	black rot (welsh onion)	sugar beat, hope, turmeric
	rot disease (welsh onion)	amaranthus mangostanus, japanese white birch
	brown ring rot (tomato)	mugwort, white birch, mint, mayoran, rowan tree
	leaf spot (rice)	potato, ranunculus sceleratus,
	anthracnose (bean)	white goosefoot, oriental melon, peach tree, magnolia, cone, oak
star spot (apple)	maple, medicago hispida, pasque flower, chinese sweet leaf, caltha palustris, insect flower, primula sieboldii, potato, wild radish	

※ recompiled from 'Koryo phytopesticide', DPR Korea, 2001.

processes and eco-friendly uses of resources.

Nowadays, the need for the eco-friendly agriculture is increasing rapidly, especially for vegetable pesticide for eco-friendly farming materials. Considering the current trend, it is believed that a further South-North joint study for the field of vegetable pesticide is required.

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