Ginseng Production in Korea

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Ginseng (*Panax ginseng* C.A. Meyer) "has been a mysterious cure-all medicine in Asia for several thousand years" (Hong, 1978). Early reports from Koguryo (which includes present-day Korea) state that wild-growing ginseng was taken to China in 435-546 (Hong, 1978). Inevitably, collecting the native plant depleted the natural stand (this was noted in 1567-1608) and led to cultivation under artificial shade. Today the plant is protected worldwide by CITES, the Convention on International Trade in Endangered Species (Singer, 1982). Most production of ginseng is under artificial shade modified by local requirements and expertise (for China, see Proctor et al., 1988). A small amount of ginseng is still collected from native stands or cultivated under forest canopies. The purpose of this report is to provide information about the Korean ginseng industry as part of our continuing attempt to make information about world ginseng cultivation readily available (Proctor and Bailey, 1987; Proctor et al., 1988).

Growing ginseng in the Republic of Korea. Ginseng is native to Korea and, although somewhat rare, can still be found in mountainous areas, particularly in northern parts. The area within which it is cultivated is from 36° to 38°N (Fig. 1). Inside this area are two regions of ginseng production—one in the south centered around Daejeon and one in the north, the major area, bounded by the demilitarized zone and the two coasts. Local soil types and microclimate within these two regions dictate which type of ginseng,

red or white, is cultivated. At harvest, ginseng root is naturally yellowish white and is dried in sunlight or placed in forced-air driers. The resultant product is called white ginseng. At harvest in Korea, an alternative procedure is to select 6-year-old yellowish white roots and steam them to a reddish-brown before drying them in the sun. This product is known as red ginseng. Major production of red ginseng is in the north.

The Office of Monopoly of the Korean Government regulates all aspects of ginseng collection, cultivation, manufacturing, sales, and export. This control ensures development of an export strategy for an entire industry and stable returns to growers. Red ginseng is classified as a monopoly item. Government approval is required for cultivating red ginseng and it must be grown 1

year in a seedling nursery and 5 years in transplanted raised beds covered with shade (Figs. 2 and 3). The amount that is authorized to be seeded is determined by demand and supply and is aimed at guaranteeing stable income for growers and increasing the national revenue. White ginseng is grown for 4 to 6 years.

Planting area, particularly for red ginseng, increased dramatically between 1982 and 1984, but has decreased somewhat since then (Table 1). This change has not been reflected greatly in the amount harvested, e.g., 917 ha planted in 1984 and only 461 ha (50%) harvested in 1988. Disease incidence has been high during this period and probably accounts for much of the area not meeting the high grades required for red ginseng and, therefore, being harvested and handled as

Fig. 1. Map of South Korea showing the two major ginseng-producing regions, types of ginseng grown within these regions, and the major cities. (DMZ = demilitarized zone; border with North Korea).

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Fig. 2. A typical ginseng garden in Korea occupying ≈ 2 ha.

Fig. 3. Korean ginseng plants, from 1 (left) to 6 years old (right). Seed production is obvious by year 4. Root fresh weights during years 1 through 6 are ≈ 0.5 , 8, 40, 70, 100, and 125 g, respectively.

Table 1. Area of Korean red and white ginseng planted and harvested and total yield of root from 1982 to 1988.²

	Year						
	1982	1983	1984	1985	1986	1987	1988
	<i>Area planted (ha)</i>						
Red	240	700	920	830	890	800	700
White	1900	2100	2,690	2,840	2,850	2800	2,800
Total	2140	2800	3,610	3,670	3,740	3600	3,500
	<i>Area harvested (ha)</i>						
Red	240	280	420	460	440	403	460
White	2180	2040	2,910	2,990	3,180	2720	3,190
Total	2420	2320	3,330	3,450	3,620	3120	3,650
	<i>Total yield (t)</i>						
Fresh ²	7330	7020	10,100	10,470	10,950	9730	11,060
Dry ³	2200	2100	3,030	3,140	3,280	2920	3,320

¹Data supplied by the Korea Monopoly Corp.

²Root yield is based on an average yield of 1.5 kg fresh weight per 3.3 m² and that 0.66 of the total area was cropped.

³Yield dry weight was calculated using a dry matter content of 30%.

white ginseng. Standards for producing red ginseng are very high and include application for producing only in specified areas and government approval to harvest. There are no such restrictions on cultivating areas for white ginseng, and digging has to be reported, not approved.

Total production has been fairly constant at ≈ 3000 t since 1984 (Table 1). Using 1988 figures, this gives 908 kg·ha⁻¹. As noted previously (Proctor et al., 1988), this is a low yield, but does not take into account root size or other characteristics of quality.

Marketing. At harvest, the fresh roots must be dried to maintain quality and avoid breakdown in storage. Quality grading of white roots is done mainly by external characteristics, such as the thickness and length of the main and lateral roots, surface color, and degree of blemishing by diseases and insects. The five grades for red ginseng are known as "Heaven" (1st), "Earth" (2nd), "Good" (3rd), "Cut" (4th), and "Tails" (5th). A wide range of processed products are made from both red (4th and 5th grades) and white ginseng—for specific examples, see Table 2.

The export value of Korean ginseng has increased steadily since 1965 (Table 3). In 1987, 41% of total exports was whole red ginseng roots followed by 30% manufactured products of white ginseng, 23% whole white ginseng roots, and 7% manufactured products of red ginseng.

Manufactured white ginseng products. There are many types of products made from Korean ginseng, including extracts, tea, drinks, gum, and candy. The extracts are originally made with a solvent and then concentrated. They are easy to dissolve in water and have the characteristic ginseng flavor with a slightly bitter taste. Ginseng tea is a major product and is usually in a granulated or powdered form with sugar (Song, 1978). The value of some of these products in 1985 indicates that domestic worth was about twice that of export (Table 3).

Production practices. Present-day practices for cultivating ginseng in Korea have been developed over centuries. However, there remain problems, challenges, and opportunities from which Westerners can learn.

Seed propagation. The principal means of propagating ginseng is by seed (Proctor and Bailey, 1987). Seed germination is not easily achieved because of dormancy-controlling mechanisms that are poorly understood. Normally, American ginseng germinates 18 to 22 months after seed harvest (Polczinski, 1982). In Korea, the Oriental ginseng is stratified in sand outdoors in a wooden box or drained cement cylinder (Fig. 4) from seed harvested in mid-July until early November (Park and Lee, 1981; Korea Monopoly Corp., 1987). The freshly harvested seed must not be treated with fungicides because such applications decrease subsequent germination. The seed and sand are mixed 1:3 (v/v) and placed in the container (Fig. 4). Water is added to the container until the excess is observed draining out, twice daily from late July to mid-September, once per day until

Table 2. Value (unit, US\$1000) of various Korean manufactured white ginseng products exported or sold domestically in 1985.*

Manufactured product	Sales (US\$1000)		
	Export	Domestic	Total
Extract	16,800	5,740	22,540
Powder	1,360	352	1,712
Capsule/tablet	534	329	863
Extract powder	1,540	---	1,540
Tea	5,930	17,000	22,930
Tang-sam (boiled water extract)	234	1,490	1,724
Drink	900	27,600	28,500
Nectar	22	1,760	1,790
Leaf powder	14	---	14
Ginseng chicken soup	79	---	79
Gum and candy	83	6,630	6,713
Tonic	44	413	457
Others	260	183	443
Total	27,800	64,400	92,200

*Data supplied by the Korea Monopoly Corp.

Table 3. Export value (unit, US\$1000) of Korean red and white ginseng and their manufactured products in selected years from 1965 to 1987.*

Year	Red ginseng	Manufactured products of red ginseng	White ginseng	Manufactured products of white ginseng	Total
<i>Export value (US\$1000)</i>					
1965	1,280	15	840	9	2,140
1970	4,100	56	5,060	705	9,930
1975	11,500	4,000	5,970	20,300	41,800
1980	29,100	6,000	2,440	28,400	65,900
1981	20,700	5,490	5,790	25,200	57,100
1982	33,300	6,000	5,650	24,500	69,400
1983	33,500	7,210	9,010	25,500	75,300
1984	33,800	8,000	19,100	25,900	86,800
1985	20,000	8,830	16,400	27,800	73,000
1987	46,600	8,000	25,900	34,200	115,000

*Data supplied by the Korea Monopoly Corp.

Fig. 4. After-ripening treatment of "green" Korean seed immediately following fruit harvest and seed extraction. (left) Large concrete containers filled with seed, sand, gravel, and stones to which water is added frequently. All are protected by a roof. (right) Diagram of the container and its contents.

Fig. 5. Experimental black plastic shade arranged like a quonset greenhouse. Shades with light transmission from 5% in the right rear to 20% in the front right arc being evaluated.

Pest control. Generally, the pest problems of ginseng, particularly diseases, are similar wherever ginseng is grown (Proctor and Bai-

ley, 1987; Proctor et al., 1988). Within each growing area, specific climatic factors may accentuate pest problems. For instance, in

China (Proctor et al., 1988), summer monsoons may restrict pesticide application and allow spread of diseases. Korea also experiences summer monsoons (Proctor and Lee, 1981), and similar disease problems exist.

A list of major pest problems in Korea and chemicals applied for their control is given in Table 4. Because of the size and importance of the ginseng industry to Korea, a large arsenal of control chemicals has been developed. In contrast, only three chemicals (anilazine, iprodione, and mancozeb) are registered in Canada, and a few registered chemicals have limited use in the United States (Heize, 1984). In spite of the availability of chemicals in Korea, disease control remains the central problem in production, as it does in the rest of the world.

Pesticide application is usually by a spray gun attached by a hose to a central spray mixing and pumping station, similar to that described and illustrated for spraying of fruit trees (Proctor and Lee, 1981). The parallel in North American ginseng production, until ≈20 years ago, was the tractor-drawn tank and pump to which was attached a hose and spray gun. The tractor was parked next to the ginseng gardens and spraying carried out by pulling the hoses through the gardens.

Table 4. Some common pest problems in Korean ginseng production and chemicals used for control.

Pest ^z	Common name	Scientific name	Chemical applied for control ^y
Diseases	Alternaria blight	<i>Alternaria panax</i> Whetzel	Bordeaux mixture, Captafol, Iprodione, Mancozeb, Polyoxin
	Anthracnose	<i>Colletotrichum panaciocola</i> Uyeda et Takimoto	
	Grey mold	<i>Botrytis cinerea</i> Persoon	
	Phytophthora blight	<i>Phytophthora cactorum</i> Cohn. et Lebt.) Schroter	Benomyl Metalaxyl
	Rhizoctonia stem rot	<i>Rhizoctonia solani</i> Kuhn	Rizolex
	Root rot complex	<i>Fusarium solani</i> (Mart.) Sacc.	Benomyl, Captafol, Gyron
	Seedling rot	<i>Phythium ultimum</i> Trow	Captafol, Metalaxyl
	Sclerotinia white	<i>Sclerotinia sclerotiorum</i> (Lib.) DeBary	
	Phoma stem blight	<i>Sclerotinia minor</i> Jagger <i>Phoma panacis</i> Nakata et Takimoto	Rizolex Deltamethrin
	Damping-off	<i>Rhizoctonia solani</i> Kuhn	
Insects	African mole cricket	<i>Gryllotalpa africana</i> Palisot de Beauvois	
	Black cutworm	<i>Agrotis ipsilon</i> Hüfnagel	Diazinon, Etoc
	Common cutworm	<i>Agrotis fucosa</i> Butler	
	Dark gray cutworm	<i>Agrotis tokionis</i> Butler	
	Japanese wheat wireworm	<i>Agriotes sericeus</i> Candaze	
	Korean black chafer	<i>Holotrichia diomphalia</i> Bates	
	Larger black chafer	<i>Holotrichia morosa</i> Waterhouse	
	Small velvety chafer	<i>Serica orientalis</i> Motschylsky	
	European corn borer	<i>Pyrausta nubilalis</i> Hubner	Brodifacoum
Rodents and other pests	Striped field mouse	<i>Apodemus agrarius</i> Thomas	
	Snail	<i>Bradybaena sieboldiana</i> Pfeifer	
Nematodes	Slug	<i>Limacella agrestisuarians</i> Adams	Mocap
	Potato rot nematode	<i>Ditylenchus destructor</i> Thomas	
	Northern root-knot nematode	<i>Miloidogyne halpa</i> Chitwood	

^zPests listed are taken from Korean Monopoly Corp. et al., (1984).

^yAlthough specific chemicals are mentioned, they should be regarded only as examples and in no way are to be considered as recommendations. The primary source for this listing was the "Standard methods of ginseng cultivation", Korea Monopoly Corp. (1987).

Changes in garden structure and sprayer development in North America have seen the advent of the cart-mounted sprayer and wide boom that is driven through the gardens (Proctor et al., 1988). Such developments have not occurred yet in Korea because of the necessary radical changes needed in garden design and shade structure.

The future. Korea is the largest or second largest producer of ginseng in the world (Proctor et al., 1988). Expanding production, strong field and laboratory research programs, product development, and a highly organized and aggressive world-wide marketing system should ensure continuation of this leadership. Markets should expand because of a gradual shift towards a holistic approach in Western medicine and use of ethnic herbal medicines rather than Western synthetics.

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