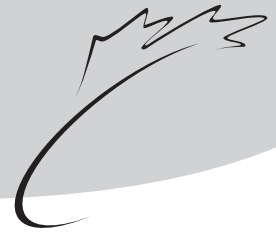




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GINSENG FROM CANADA

Over the past decade, Canada has become the world's largest grower of North American ginseng, accounting for over 60% of world production. Sales of ginseng rank as Ontario's fifth largest cash crop, while in British Columbia (B.C.) ginseng sales rank as its seventeenth largest. Total ginseng exports have increased from about CAN\$15 million (M) in 1988 to more than \$68M in 2001. However, with increased production, prices have fallen significantly over the past seven years. The ginseng industry has proven to be remarkably resilient and innovative during this period, increasing yields from 10-30% and lowering costs of production by as much as 50%. With continued research, combined with a strong marketing plan, the ginseng industry will be well positioned to capture new marketing opportunities.

Background

North American ginseng (*Panax quinquefolius*) a species in the *araliaceae* family is a slow-growing *herbaceous perennial*, indigenous to the eastern areas of North America, growing in Ontario, Quebec, and Wisconsin. For thousand of years, Native Indians used wild North American ginseng for its healing properties. In 1716, the existence of North American ginseng was documented by a Jesuit priest. Exports of wild ginseng to China began in 1721 and their export value was soon second only to fur. In time, wild ginseng became severely depleted from over-harvesting and is now considered an endangered species. The export of truly wild ginseng is prohibited in Canada. Under the Convention on International Trade in Endangered Species (CITES), a permit is required for the export of forest and field cultivated ginseng, but not for the processed root or seeds.

Uses and Properties

Scientific research has documented the active ingredients in ginseng. The therapeutic effects of the herb are attributed to a group of saponins, complex carbohydrates combined with either alcohol or phenol, that are known as ginsenosides. Ginsenosides are present throughout the plant but levels are highest in the root. During its lifespan, concentrations of ginsenosides shift from each part of the plant as it goes through its annual growth cycle.

Ginseng is an adaptogen, i.e. it has the ability to regulate and balance body functions, and increase capacity to adjust to stress. For example, some ginsenoside compounds increase blood pressure, while others decrease blood pressure. It is theorized that the body selects the ginsenoside which is needed to normalize blood pressure. The University of Toronto is conducting clinical trials on the affect of ginseng on diabetes. Preliminary trials have been encouraging and have indicated that

ginseng does have an effect on the symptoms of adult-onset diabetes.

Although North American and Asian ginseng are similar in appearance, they differ in their chemical properties. North American ginseng is known to contain more ginsenosides than Asian ginseng, (30 compared to 20 compounds identified), and is considered to be the more potent of the two. Each of these different compounds appear to have their own individual benefits. North American ginseng is considered to be distinct and complementary to Asian ginseng because of differences in ginsenoside content and levels.

According to traditional Chinese medicine, North American ginseng relieves stress and calms the body. The Asian grown ginseng is thought to have a healing effect that invigorates, stimulates and heals the body. Asian and North American ginseng are therefore not competing but rather complementary products. While the

active compounds have been identified, ginseng is not yet recognized by Western pharmacology. Instead it is used primarily in herbal and health food applications in powder or pill form. It can also be purchased in dry root form in herbal specialty stores.

In traditional Chinese usage, ginseng in fresh or dried root form is consumed after immersion in hot or boiling water or included in chicken or beef soup. It is also available in tea bags or in candy form.

In many countries there is a new demand for natural and safe substances that can relieve high stress related to the workplace and improve the quality of life after age 55. Recent scientific research at the universities of Alberta, British Columbia, McMaster and Toronto has indicated that ginseng grown in Canada can reduce fatigue, improve short-term memory and blood circulation, help maintain normal blood sugar levels, reinforce the immune system and increase longevity through strong anti-oxidant properties. Preliminary research at New York University identified that *ginsenoside Rc* has an anti-tumor effect on breast and prostate cancers, and plays a role in preventing recurrence of the disease.

Agronomics

Native ginseng is found in the hardwood forests of North America where only 20-30% of natural light reaches the plant. The high organic matter of the forest floor moderates the soil temperatures in summer and winter, provides a well drained environment and prevents excessive moisture loss. In order for ginseng to be successfully cultivated in field production, the environment must be modified to resemble its natural habitat.

Field grown ginseng is cultivated in raised beds with a one foot gutter on each side. This improves drainage

and air circulation which helps to keep diseases at manageable levels. After seeding, 2-4 inches of mulch is added. In winter, the mulch insulates the roots from dropping below the critical temperature where change occurs {about -5 Celsius (C)} and in summer it has a moderating effect by keeping the soil temperatures 5-10 C below that of open areas. The mulch also helps to retain moist soil levels and prevents excessive moisture loss.

The soil acidity or PH level should be between 5.5 and 6.5. PH levels below this range can result in unhealthy plants and are more susceptible to disease. Soil fumigation, fungicides, crop hygiene and good drainage are all considered essential in the control of disease, which can reduce yields from 30% to 60%. Soil composition is also critical for good production. Studies have determined that the levels of soil nutrients can directly affect the levels of the individual 30 known ginsenosides in ginseng. However, little work has been carried out as to the optimum levels and types of nutrients required. There are interesting efforts to study plant species interactions in a forest situation. Remarkable observations have been made of interactions between ginseng plants and other forest plants (e.g. jewel weed) which somehow prevent disease problems to wild-simulated ginseng production.

Micropropagation

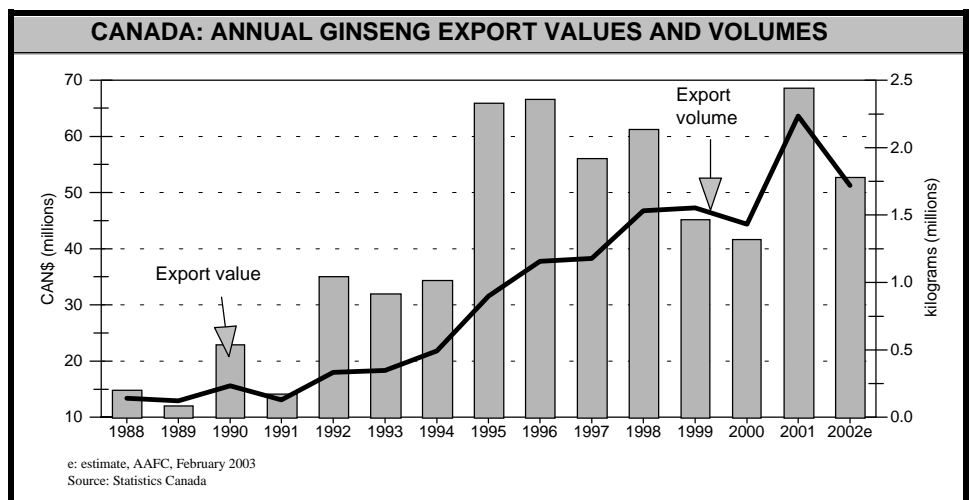
Currently, there are no cultivars of ginseng. Field cultivation began by moving wild roots into protected gardens. Further expansion of acreage was achieved by using seeds from domesticated wild roots. Selection of superior strains has not been achieved with this process.

The high cost of seed, poor germination, and limited yields due to high disease rates can make the establishment of micropropagated transplants an effective approach to boost the expansion, efficiency and profitability of the ginseng industry.

Propagation of the micro plant is carried out in aseptic conditions which allows cultures to be treated to cure the plant of viral and bacterial contaminants, producing plants which can be certified as pathogen-free. The rate of in vitro propagation is much greater than traditional seed propagation and allows the ability to rapidly multiply specific and unique plants with specific ginsenosides or plants with enhanced disease resistance. Studies have further shown that micropropagation procedure results in the production of a two-year equivalent plant in the first year.

Economics of Production

Ginseng must be grown in 70-80% shade. The plant will die when



exposed to direct sunlight. Shade structures of wooden lath or a polypropylene cloth shade are often used. The cost of erecting shade structures varies depending upon the type of material chosen. Most shade structures can cost between \$15,000 and \$18,000 per acre (/ac.) and are a significant investment when choosing to grow ginseng. Ginseng is also commonly grown in hardwood forests where growers can take advantage of the organic rich soils and the natural shade provided by the surrounding trees.

The cost of producing ginseng is high, making this a risky operation. Seed cost can be as high as \$8,000/ac when seed is limited. The total cost of production (direct), is estimated to be about \$40,000/ac. Yields can range anywhere from 2,000 to 4,000 pounds/ac.

The ginseng root is usually harvested at three years because of diseases that threaten older gardens. As the age increases, the root has more time to draw upon the soil nutrients and manufacture higher levels of ginsenosides. The root shape is determined in the first two years of plant life. It is contractile (shrinks vertically) and develops concentric wrinkles as it ages. Such features are desirable in the market place. As its root ages, the ginsenosides levels increase. On average, 3-year old, 4-

year old, and 5-year old roots will have a ginsenoside level ranging from less than 4% to 11% by weight. The age, chunkiness, and amount of concentric wrinkles are three factors that are important in the Asian market and it is by such characteristics that the ginseng root will be valued.

Production

Over the past decade, Canada has become the world's largest producer of North American ginseng, accounting for about 60% of world production. In terms of all ginseng produced globally, Canada remains third behind China and South Korea. Almost all ginseng is produced in Ontario and B.C., with a smaller amount in Quebec. Ontario produces about two-thirds of total Canadian production and it is Ontario's fifth largest cash crop after soybeans, corn, tobacco, and wheat. In B.C., the first crops were seeded in 1982 and production now accounts for almost one-third of the Canadian total.

Canadian production has increased from about 212,000 kilograms (kg) in 1987 to about 2.3 million kilograms (Mkg) in 2001. This rapid growth in production is due to a larger seeded area and an improvement in yields. Looking ahead, production is expected to remain static due to lower prices as a result of higher production levels. The US is the world's second largest producer of North American ginseng. After reaching a high of about 1.0 Mkg

in 1994, production has fallen to about 0.7 Mkg in 2001. China has attempted to grow North American ginseng since 1947, but it was not until the late 1970s that grade and quality standards comparable to North America were achieved. China accounts for about 15% of total North American ginseng production. However, the Chinese prefer North American *grown* ginseng and are prepared to pay a premium for it.

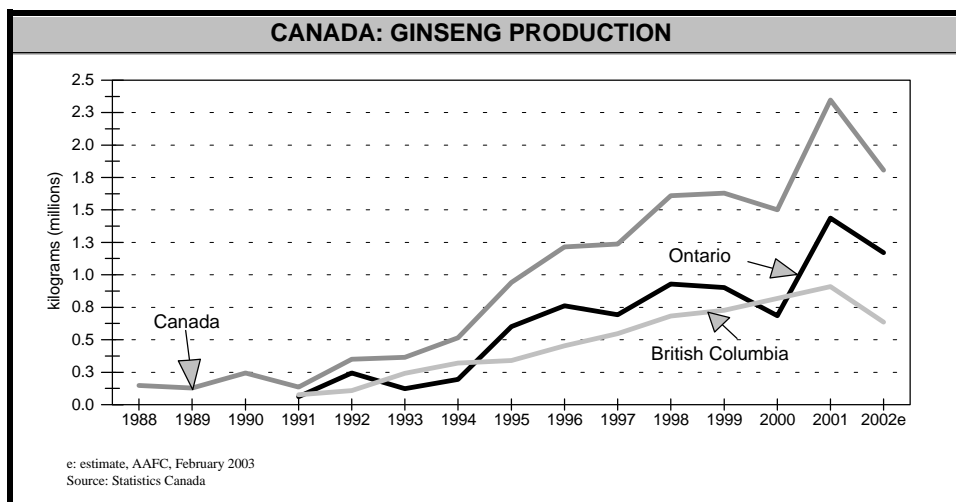
Prices

Production of ginseng in North America peaked in 2001 and has since fallen. This is in direct response to lower prices due to market saturation. Export prices have stabilized at about \$31 per kilogram (/kg) since 1999. However, this is an average annual export price, in high volumes, which can vary greatly depending on quality and disease considerations. Prices for the Canadian domestic market are higher. Woods-grown ginseng is in high demand in China and can command on average five times the price of field cultivated roots.

Exports

In 2001, Canadian exports to China at just over 2.1 Mkg represented over 96% of total Canadian exports. Taiwan, Singapore, the United States (US), and Japan accounted for the majority of the remainder of the exports. Hong Kong is by far the largest destination for ginseng exports, accounting for about 80% of all exports and is the hub of the North American ginseng trade in Asia. Canadian ginseng is sold in bulk to major Hong Kong buyers, where it is sorted, graded, and shipped to China and other destinations for further grading and processing. This has forged strong loyalty between Canadian export associations and Hong Kong buyers.

China's accession into the World Trade Organization has provided greater market access for Canadian ginseng exporters. The tariff rate for



ginseng in 2003 will be 10.7%, down from 11.8% in 2002 and 36% in 2001. For the years 2004-2006, the tariff rate will be reduced to 9.7%, 8.6%, and 7.5% respectively. A value-added tax of 13% will continue to be applied. The reduction in the tariff rates should help to make Canadian grown ginseng more competitive with North American ginseng produced in China.

Canadian exports to European and Latin American markets in 2001 were about 2,945 kg, compared to about 1,036 kg in 1999. These markets hold Asian ginseng varieties in higher regard. This is likely based on the misconception that North American ginseng competes with Asian ginseng varieties. There is a need to provide education in these markets regarding the complementary nature of North American ginseng through scientific studies which show the benefits of using North American varieties. Currently, Europe and Latin America are small export markets for Canadian ginseng, but they have significant future potential.

The US may become a significant market for Canadian ginseng. This is mostly due to lower production in the US over the past seven years. Exports to the US reached a high of over \$2.5M, or 56,000 kg, in 2000. Nevertheless, sales can vary considerably based on variations in US production and demand.

Marketing

In B.C., the Associated Ginseng Growers of B.C. provide growers with quarterly newsletters providing updates on industry and market developments.

The Ontario Ginseng Growers Association (OGGA) (www.ginsenggrowers.com) became

the official representative of Ontario ginseng producers on August 30, 2001. A mandatory annual licensing fee of \$50/ac is charged to producers who grow one-quarter of an acre or more of ginseng. The key elements of the OGGA program are: 1) grower communication; 2) market development; and 3) research.

The goal of market development is to gather and disseminate all available information on current market conditions to growers. Information on acreage, production figures and root availability aids in ginseng sales planning. The association also provides services which match buyers with growers.

The approach to ginseng research is to provide production and medical research. Production research involves the analysis of issues such as pesticide residues on ginseng and registration of chemicals for use with the crop. Medical research involves examining the benefits associated with consuming ginseng.

Seeds

The production of seeds for sale can also be a valuable source of income. Seeds are produced on plants aged three years or older and occasionally on two year old plants. The seeds are harvested and require a process of stratification, (undergoing a series of hot and cold temperatures ranging over 16-22 months) before they are mature enough to initiate germination. Yields average about 180 kg/ac and in years of low supply seeds can sell for higher prices than the root. In 1999, seeds sold for about \$60/kg, almost double the price of ginseng root. Nevertheless, on average, seed prices are generally below the price of roots.

Outlook

Increases in reported yields from 10-30% over the past five years, with a cost per hectare decrease as much as 50%, have positioned many producers for a challenging and rewarding future. By maximizing technology, innovation, and decades of ginseng experience with a national collective marketing effort, Canadian ginseng is expected to continue as an attractive option for Canadian growers who invest and develop the necessary expertise in this specialized crop.

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