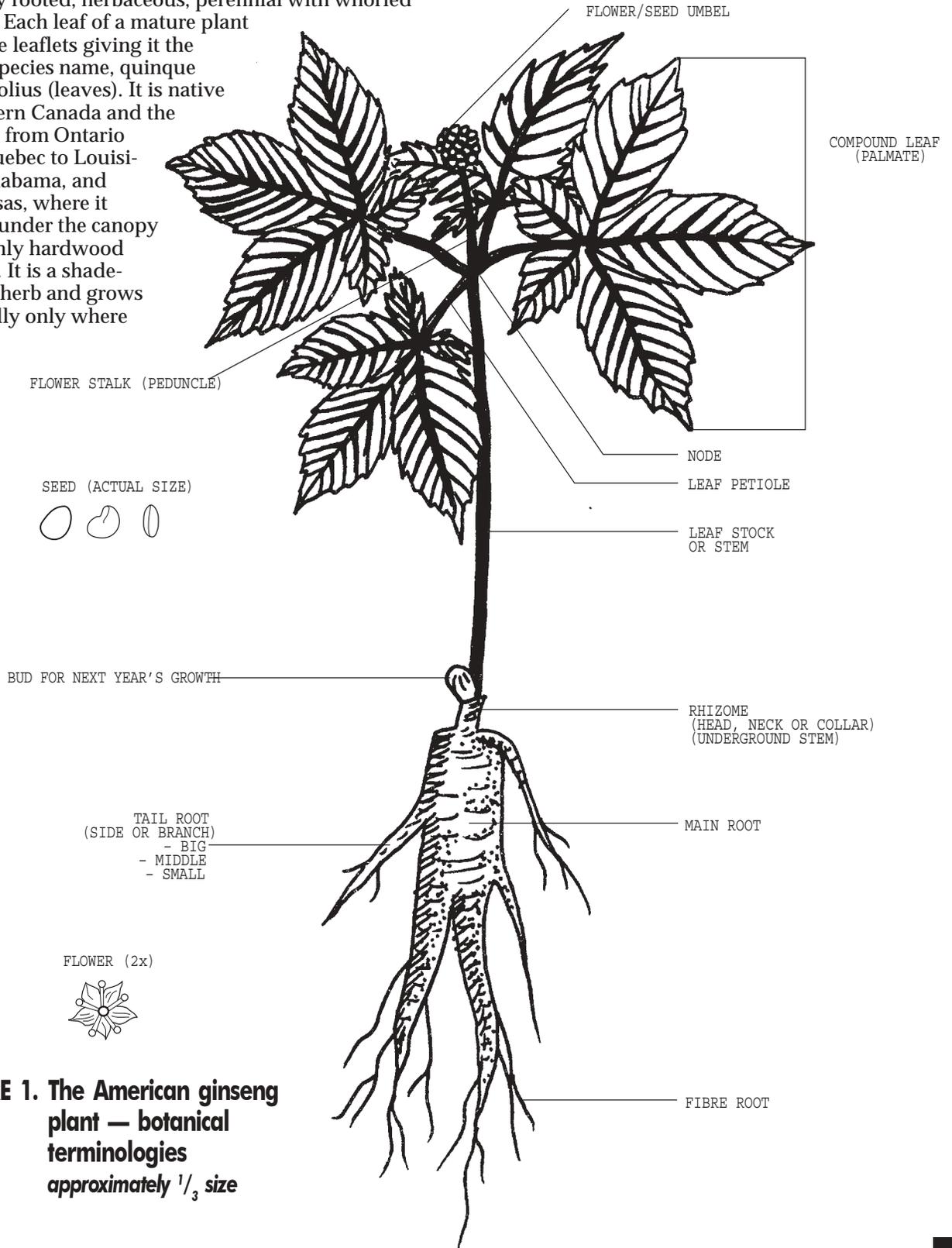


# ANATOMY AND CLASSIFICATION OF AMERICAN GINSENG

## Anatomy

The herb, American ginseng *Panax quinquefolius* L. is a fleshy rooted, herbaceous, perennial with whorled leaves. Each leaf of a mature plant has five leaflets giving it the Latin species name, quinque (five) folius (leaves). It is native to eastern Canada and the U.S.A., from Ontario and Quebec to Louisiana, Alabama, and Arkansas, where it grows under the canopy of mainly hardwood forests. It is a shade-loving herb and grows naturally only where

there is approximately 70-80% shade and well drained soils. It is part of the Araliaceae (Aralia) family of plants. See figure 1.



**FIGURE 1. The American ginseng plant — botanical terminologies approximately  $\frac{1}{3}$  size**

# Plant Characteristics

## FIRST YEAR PLANT

From seed the plant produces a single 3 leaflet leaf in the first year. This leaf and leaf petiole will be 5 to 10 cm (2 to 4 inches) high. There is no seed production in the first year. The root will generally be less than 1 g (fresh weight) after the first growing season. Technically the aerial stem that we see on 1 year old plants is the leaf petiole and the underground portion on the top of the root from which the yearly bud emerges, called a rhizome, has not yet formed. See figure 2.

## SECOND YEAR PLANT

The second year's growth will produce a 15 to 20 cm (6 to 8 inch) plant consisting of (usually) 1 aerial stem with 2 leaves on leaf petioles (radiating from a common node), each with 3 or 5 leaflets. There may be minimal seed production in this growing season on a short stem called a peduncle growing from the top of the same node as the leaf petioles. The flowers form on the top of the peduncle in a round cluster called an umbel. The underground rhizome will be evident at this stage though very short. This rhizome will never grow above ground as the root will by some mechanism pull itself into the ground as the rhizome increases in length. See figure 2.

## THIRD YEAR PLANT

In its third year the plant will consist of one aerial stem (sometimes two), 25 to 35 cm (10 to 14 inches) high, with a whorl of 3 leaves of 5 leaflets each, each attached to the node by a petiole. This growth year will generally see enough seed produced to yield approximately 1-2 times the amount of seed originally planted. See figure 2.

## FOURTH YEAR PLANT

The fourth year of growth will produce a 40 to 60 cm (16 to 24 inch) plant of one or more aerial stems, each generally having a whorl of 4 leaves of 5 leaflets each: a typical mature plant. Records indicate that about 85% of 4 year-old plants have only one aerial stem. This growing year should produce 3 to 5 times the amount of seed that was used to plant the field. Once a farm is established this can become a fairly important source of income, both as a source of your own seed and often extra seed to sell. See figure 2.

## ROOTS

The root may grow in the 4 years up to 120 grams (approximately 4 oz.) fresh weight, with the average about 14 grams ( $\frac{1}{2}$  oz.), but a wide range in root weights is evident. Planting density may play some part in individual root weight but not necessarily a fluctuation in a weight per hectare (acre) basis unless a low seeding rate or a germination problem occurred. The roots when dried will be about  $\frac{1}{4}$ – $\frac{1}{3}$  of the fresh weight so are approximately 24-32% dry matter. The root is a fleshy root similar in texture to a parsnip, often branched, with some smaller rootlets (tail) and root hairs (fibre). The roots will work their way down into the soil up to 3 inches in a four year period. See figure 1.

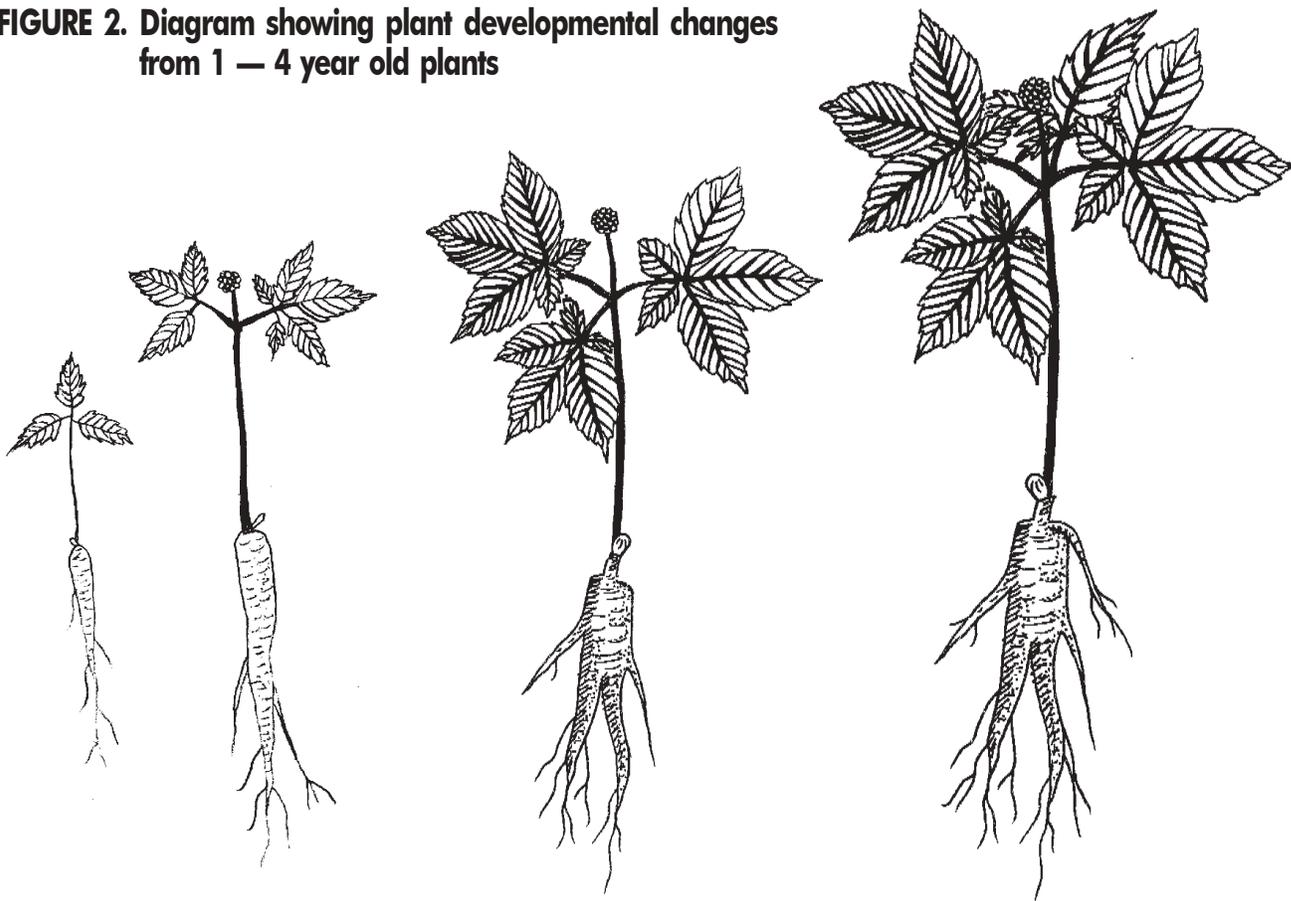
## SEEDS

Seeds of 3 and 4 year-old plants, are produced on a short peduncle (seed stalk) arising from the node at the top of the aerial stem and are borne in a round cluster called an umbel, of 10 to 50 berries. Each berry contains 1 to 3 seeds depending on the fertilization achieved earlier. The flower cluster is self-pollinating, but wind and insects will increase the transfer of pollen from flower to flower. See figure 1.



*The first commercial ginseng garden in British Columbia planted in the Botanie Valley at Lytton in 1982.*

**FIGURE 2. Diagram showing plant developmental changes from 1 — 4 year old plants**



## Buyer Purchasing Criterion

This long lived perennial plant gains in value with size, age, quality and shape of the root. An oriental name for ginseng is “Man Root,” and roots having a “man shape” have more value when sold as a whole root. They are purchased by age, colour, size, shape, texture, soil moisture %, freedom from visual disease, and taste, a relatively subjective process. There is some move today by manufacturers of ginseng products to purchase root by the ginsenoside content but this is not a common practice.

## Cultural Highlights

### PLANT HARDINESS

Ginseng has a zone 3 hardiness rating so will live almost anywhere in British Columbia except in the coldest areas. Its shortcomings as a crop is not with hardiness but rather with its susceptibility to diseases, especially in higher rainfall areas, its frost intolerance, and its soil type limitations. It is subject to winter injury and must have an adequate mulch cover over it.

Zone rating of plants refers mainly to their ability to withstand winter conditions. When we say a tree or

plant is hardy to zone 3 that doesn't necessarily mean it is totally immune to damage, as quite extreme weather conditions can cause problems. Late January 1989 saw the weather over a 10 day period, gradually rise to +16°C (61°F), followed by a cold front where the temperature plummeted to as low as -27°C (-16°F) in about 36 hours. Damage was done to the tops of the roots in some cases but more to the new bud that was to be the top growth for summer 1989. Ginseng does not form new buds quickly as some plants will, and one of the following three things happened:

- the root formed a new bud and was ready to grow again in 1990.
- the bud did not form and the root was still there in the fall of 1989.
- or the root rotted away and only a rotted shell was evidence of a previous root.

The severity of temperature variance would likely determine to what extent which of the above would happen. Learning from this experience, we suggest that an area designated zone 3 that gets a lot of temperature variances, i.e., chinooks, may not be suitable for growing ginseng. An early and extremely severe frost in the fall of 1985 did similar damage.

## DORMANCY REQUIREMENTS

Ginseng has a short dormancy requirement before it will begin to grow properly in the spring. This requirement is about 100 days at a temperature of 0 to 10°C or lower. This is not hard to achieve outdoors in British Columbia and by January 1, roots are ready to grow.

## WATER REQUIREMENTS

Another climate factor that ginseng cannot tolerate is having the root waterlogged. Literature suggests, and our experience can support this, that even 24 hours in a saturated condition is enough to do damage. We suggest then that it is imperative that the beds are well formed to allow drainage and a sloped field will help remove excess water from the garden.

## OTHER EXTERNAL FACTORS

Quality, shape and colour of ginseng root will vary with soil types, climate differences and garden management. It will also vary between different areas within the province and across North America. There are also some genetic difference between seed sources. These differences will influence the prices offered at individual farms, depending on buyer preferences.

## LIGHT REQUIREMENTS

Ginseng has a very low light requirement and is very easily damaged by high intensity light situations. This is the reason it is always grown under some type of shaded conditions (see the section on Garden Planning, page 57).

## Classification of Ginseng

In Chinese and South East Asian traditional medicines, ginseng is the king of the plant kingdom as gold and man are in the mineral and animal kingdoms respectively.

## TECHNICAL NOMENCLATURE

There is a world organization that determines how plants get their Latin or technical names, keeps records of them and decides if a reclassification is in order as someone may suggest. The following shows the basic classifications given to living organisms, in this case American ginseng:

- Kingdom — Plant (as opposed to animal)
- Division
- Class
- Order
- Family — Araliaceae (55 genus and approximately 700 species)

Genus — *Panax*

Species — *quinquefolius* L.\*

Sub Species — none recognized

Varieties (Cultivar) — none at this time

- \* — *ius ending denotes male and an ium ending denotes female, therefore ginseng, considered male with references to 'man root' or 'man essence,' should be spelled with ius at the end.*
- *the L. designates who actually first named the plant, in this case Linneaus.*

The genus and species categories are always underlined or put in *italics*, with the Genus always beginning in a capital letter and the species always lower case: i.e., Panax quinquefolius or *Panax quinquefolius*.

## GINSENG INDUSTRY TERMINOLOGY

- **RED GINSENG** Usually roots of *Panax ginseng* but can be other species. They are selected for good quality and steamed for 8 to 10 hours at approximately 105°C. Then they are dried, sorted and sold in twenty-seven different categories. They have three grades: heaven, earth, and good, with nine sizes in each grade.
- **CHINA WHITE** Has two meanings, one right and one wrong. China white refers to Asian ginseng grown in China, that is not processed onto a red ginseng product. It is dried normally in the open air or in a dryer. It is graded into many categories and is the most common way that Asian ginseng is sold in China. It is readily available in North American in whole root or processed forms.  
  
China white is not North American ginseng (*Panax quinquefolius*) grown in China. This is properly called, simply, North American ginseng grown in China.
- **ASIAN/KOREAN WHITE** This is generally *P. ginseng* roots that are not used in making 'Red' ginseng products. They are sold peeled and dried, not peeled and dried or fresh in the South East Asian marketplaces.
- **AMERICAN GINSENG** Roots of *P. quinquefolius* grown in North America and generally sold dried and field run, though some market is developing for fresh and graded product.
- **CATTY** A unit of weight equal to 600 grams. Red ginseng in particular is graded on how many roots it

takes to make one catty in weight. These are often in boxes or tin containers for sale.

- **TAEI** A Chinese unit of weight equal to 1/12 of a pound or 37.8 grams. When you see root prices in stores in Chinatown they are priced/tael not per gram or ounce. Multiply a tael x 12 to get a per pound rate.
- **FIBRE OR TAILS** Are the smaller side roots off the main root down in size to the small hair root. These are generally sold with the main root as field run, as they would be worth less by themselves. They are often the parts used to make tea and powder. They do have more ginsenoside content than the main root but are not a balanced product, like the main root is, for selling as a whole root. The users of whole root want a balance between the outer layers and the core of the root for most effect.
- **RADIX** A term used to designate a root of a plant.

## GINSENG TYPES

### The four types of Ginseng in North America are:

- **WILD** This is true wild ginseng growing in areas where it has always grown with no interference from man.
- **WILD SIMULATED** Where man takes seed and scatters it randomly where ginseng used to grow or might grow. This is the only interference from man as it is then left to its own defences.
- **WOODS GROWN** More effort here is done to space out the forest canopy, remove interfering brush, etc. and often build beds for planting. This can be virtually the same as cultivated except trees are used for shade instead of the man-made shade canopy.
- **CULTIVATED** Where man supplies all the needs of the crop from shade to mulch.

## Value and Yield of each Type (Cdn\$)

Cultivated	\$10-\$30.00/lb*	2500-3000* lbs/acre
Woods grown	\$50.00/lb	1500 lbs/acre
Wild Simulated	\$160.00/lb +	0-400 lbs/acre
Wild	\$450.00/lb	0-400 lbs/acre

\* From budget sheet page 192 and may not be representative of current industry averages.

- still have quality ranges in each category
- each step from cultivated to wild takes longer to produce a harvestable yield

## PANAX GENUS PLANTS

True 'Ginsengs' — plants that all have the same genus name of *Panax* (not a complete list).

	Common Names	Native to
• <i>Panax ginseng</i> C.A. Meyer	Asian ginseng Chinese ginseng Korean ginseng jen-shen	Eastern China and North Korea
• <i>Panax quinquefolius</i> L.	American ginseng North American Ginseng sang	Eastern USA to Georgia and southern Ontario and Quebec
• <i>Panax notoginseng</i>	notoginseng sanchi ginseng	South West China
• <i>Panax pseudo-ginseng</i>	tienchi ginseng	Western China
• <i>Panax japonicus</i>	japanese ginseng Chu-chieh-jen-shen	Japan to India
• <i>Panax trifolius</i>	dwarf ginseng ground nut	Eastern USA and Canada
• <i>Panax zingiberensis</i>		Western China
• <i>Panax stipuleanatus</i>		Western China
• <i>Panax vietnamensis</i>		Eastern Vietnam
• <i>Panax</i> Sp. – 5 other minor species found in China		

**Note:** • If it is cheap it is probably not American or Asian ginseng at all or may contain very small amounts.

- If it is expensive it still may not be ginseng so read the label to be sure what it is.

## 'IMPOSTORS' USING THE NAME GINSENG

There are a multitude of products available in the marketplace made from real ginseng, or with ginseng as one of the ingredients BUT there are also products made from plants that are not ginseng or even related to the genus *Panax*, that use the common name of ginseng on the label or in their advertising.

Eleven other plants have been identified with ginseng as part of their common name. Some are related to ginseng some are not. They are as follows:

### Related:

- *Eleutherococcus senticosus* — Siberian Ginseng.
  - a related plant — Araliaceae family
  - different chemistry than panax and is used medicinally
  - similar results as panax, according to many people
  - native to East Russia and China as well as the north Japanese island of Hokkaido
- *Echinopanax horridum* a.k.a.: *Oplopanax horridum* — Alaskan Ginseng, Devil's Club.
  - related to ginseng — Araliaceae family
  - no similar chemistry but is used medicinally by some indigenous people
  - native to British Columbia and found widely in the Pacific North West
- *Aralia nudicaulis* — Wild Ginseng, Sarsaparilla.
  - related plant — Araliaceae family
  - no similar chemistry and not used medicinally
  - native to British Columbia and is a very widespread plant
  - do not confuse with other plants called by the same common name
  - the plant is often wrongly identified as Panax ginseng here in British Columbia (See figure 3).
- *Acanthopanax sessilifloris* — Wujiashen, Thorny Wuji Ginseng
  - native to China
  - related to ginseng but no similar properties

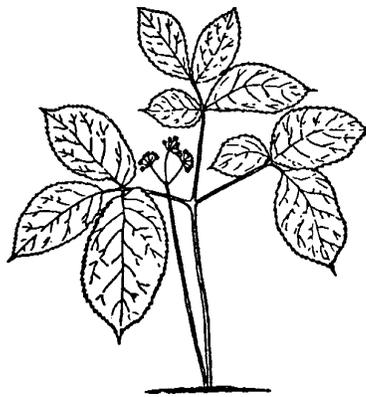
### Non-related:

- *Pfaffia paniculata* or *Pfaffia iresinoides* — Brazilian Ginseng, Suma, South America Ginseng.
  - not related to ginseng
  - no similar chemistry
  - native to Brazil
- *Rumex hymenosepalus* — Wild Red American Ginseng, Tanners Dock, Wild Red Desert Ginseng, Canaigre.
  - not related to ginseng
  - no similar chemistry
  - native to South Central USA

- *Withania somnifera* — Ayurvedic Ginseng, Indian Ginseng, Ashwangandha, Winter Cherry
  - not related
  - no similar chemistry but is used medicinally in Ayurvedic medicine
  - native to India
- *Lepidium meyenii* — Walpers — 'Ginseng of the Andes', Maca
  - not related to ginseng
  - no similar chemistry
  - native to Peru at 12,000 – 15,000 feet
- *Codonopsis Pilosula* — Bastard Ginseng, Poor man's Ginseng, False Ginseng, Dang Shen
  - native to China
  - similar properties and very cheap compared to true ginseng
- *Agnelica sinensis* — Women's Ginseng, Dong Quai
  - native to China
  - not related to ginseng, often used by menopausal women
- *Pseudostellaria heterophylla* — Prince's Ginseng, Tai ze Shen
  - native to China
  - not related to ginseng
  - no similar chemistry

*Note:* For more information on ginseng and its relatives go to the Ministry of Agriculture, Food and Fisheries website at <http://www.agf.gov.bc/croplive/plant/horticult/specialty/ginseng/ginseng-what.pdf> or go to <http://infobasket.gov.bc.ca> and click on special crops and search for ginseng.

**FIGURE 3. Line diagram of *Aralia Nudicaulis***



*Note:* Source of flower stock is from the base plant.

Reprinted from *Trees and Shrubs and Flowers to Know in British Columbia* by C.P. Lyons