

HARVESTING SEED

Ginseng seed is produced on two year and older plants and are harvested by hand between mid August and mid September. Usually it is not economical to harvest seed from two year-old plants. Seed is produced on a simple convex umbel (see figure 1 page 3) containing up to fifty flowers. The flowers are self-fertile and each one has the capability to produce a berry with one to five seeds. There is usually one to three seeds and two is the average for each berry.

The berries start out green and ripen in the same sequence as flowering, from the bottom to the top of the umbel, so they are not all ripe at the same time. From green they turn to a bright shiny red and when fully ripe are a dark red and will eventually fall off and deteriorate on the ground if not harvested. These fallen berries will grow as is readily seen when harvesting a four year-old crop, as it contains many one and two year-old plants.

Early in the ginseng industry in Canada seed was stratified as whole berries (from a bulletin dated around 1915), a too bulky process in today's industry. It takes about 120 frost free days to produce seed on an American ginseng plant in British Columbia.

Each root generally has one leaf stem with one seed umbel growing upwards from the centre of the leaf whorl. There may on larger healthy roots, be two or even three leaf stems all with flowers and seed production. See the whole plant diagram on page 3.

Timing of Seed Harvest

Seed is picked when the berries are crimson to deep red and generally are left until all are ready, then harvested at one time. There may be some loss from older berries dropping off, but not sufficient to warrant two pickings. At most, you would only pick in two passes through the garden for economic reasons. The ratio of ripe berries to clean seed is about 4.5:1, thus 45 pounds of red berries yield 10 pounds of actual seed. Newly picked and depulped seed is called 'green' seed.

Labour Requirements

Picking seed is done by hand though attempts at mechanization have been made. They are usually placed into five gallon buckets and can be left there for a few days if they are kept shaded and cool. This is a possible source of future problems if left in the sun or a hot place too long.

A good labourer in a good seed crop can easily pick up to 100 lbs of seed per day. This process may involve piece work at a set rate per pound or can be

an hourly rate with a bonus for over a set number of pounds per day.

Note: *There are regulations in the latest Labour Standards Act of the Province of British Columbia that must to be adhered to, so make sure you know what they are.*

Flower Removal Vs Seed Production

There is a trend today where a grower, rather than produce seed on all the plants, uses a labour crew and physically removes the flowers at an early stage. This will do two things, eliminate the cost of picking and handling seed (although there is the cost of flower removal) and with the extra energy normally used for seed production the plant will produce larger roots. Reports of increases of 25 to 30% more root mass per acre have been achieved. Be sure though that you leave enough seed production to satisfy your own needs. There may eventually be those in areas where seed production is abnormally and consistently good, become seed producers for the industry and others will produce no seed.

Stratification of Seed

The stratification of seed is one of the most important aspects of ginseng production. You can not afford a garden with 10 to 20 or even 30% germination as costs will outweigh potential returns. Paying extremely close attention to detail here will help to ensure success but there are no guarantees.

The reason ginseng seed needs to be stratified is that it has an immature embryo which has to develop before germination can take place. This process takes 18 to 22 months under the following controlled conditions where seed goes through cold/warm/cold periods during this time.

Improper stratification methods can do various things to ginseng seed:

- give no to poor germination in year one or later
- give low germination in year one with considerable seed germinating the second spring (Normally 5 to 10% of the plants in a two year garden are first year plants from seed that did not germinate the first year.)

There are other unexplainable variances seen in germination such as:

- side by side rows being good and poor respectively when sown with same seed and identical conditions

- poor germination in a section of a garden, where no physical and chemical differences can be found
- slow germination over a long period of time, seeing new plants arriving as late as August but — as we progress with this new crop answers eventually will come.

Purchasing Ginseng Seed

Seed can be purchased in three different forms:

- previously stratified, ready to sow
- “green” seed (current year’s production) with the pulp removed
- “green” seed with the red pulp still on

If you purchase green seed or own green seed with the red pulp still on you will have to follow all the stratification procedures below starting at A. If you have a depulper or purchase depulped seed start at ‘B’ below in seed stratification procedures.

Pulp can be fermented off, mechanically removed with a mechanical depulper, or pulp removal can be or a combination of these two processes. Once the pulp is off you are ready for the actual stratification process.

Seed Stratification Procedures

The suggested basic steps of seed stratification are as follows:

A. Start here if you are going to use the fermentation process of removing the berry pulp or go to B below if using mechanical depulpers.

- Pick berries when ripe (changed from bright shiny red to deep red), place in jute sacks, tie securely.
- Lay these sacks preferably on a wood or cement floor in an unheated building. Keep them moist by soaking with water for 5 to 10 days. Turn and knead these bags by walking on them two times per day to assure all berries are being fermented evenly and to help break down the pulp.
- After the pulp is all broken down, remove the mass from the bags and place on a 1/8 inch screen. If it will not screen out easily it may need more fermentation. Use a spray gun or other high pressure device to separate the seed from the pulp. This seed mass can

also at this point be put through a mechanical depulper for separation.

Note: do not stack the bags in a pile as they will overheat.

B. If you have your own depulper or have purchased depulped seed start at this point:

- After depulping, soak the depulped seed in a 0.3% formaldehyde solution for 10 to 15 minutes and let them surface dry before proceeding to the next step. Do not let the seed itself dry out.

Note: *Be sure you do not have over a 1% formaldehyde solution or damage to the seed can occur. If you are using Formalin (34% formaldehyde) you would use a dilution rate of 1 part formalin to 100 parts of water, to get a 0.3% solution. If you are using Formaldehyde (100%), use a dilution rate of 300 parts water to 1 part formaldehyde to get a 0.3% solution.*

At the stage when seed is dry, some people have used thiriam, vitavax or carbathiin plus captan. None of these, including formalin/formaldehyde are registered and none are long lasting chemicals in any case.

At this point seed should be stored at about 5°C (41°F) until ground temperature is below 15°C before it is put into the stratification box. This is to prevent heating of the seed allowing bacteria and other pest organisms to start.

- Now seed is ready to go into a stratification box and be buried in the ground. Mix with clean sand (3 parts sand to 1 part seed) no coarser than half the size of the seed for ease of separation. Really fine sand should be avoided. Less sand can be used but this will put seed in closer contact as sand volume is reduced. Put 4" of plain sand in the bottom of the box for drainage or have adequate drainage below the box and 2 to 4" on the top of the box to protect the seed from drying out over the next year. Seed will have to be checked periodically for wetness, temperature, disease problems, mice, slugs, etc. while in the stratification box.

Stratification boxes can be various sizes and materials but should not be too big for handling purposes and isolation of problems.

Note: *USE CLEAN SAND with no soil particles in it. Purchase washed sand from a cement company, if another reliable source is not available.*

- Bury outdoors over winter in a protected area with the top screened. This allows moisture and air to move freely and keeps out rodents. This box is buried to ground level or slightly below, with 2 to 4" of sand and

6 to 24" of straw mulch over the top to stop surface evaporation and to stop seed from getting too warm. More straw will keep the ground temperature more even over the year.

- During the summer a shade canopy of some kind should be built over the top for temperature control.
- Check periodically to see what the moisture content is. It must not be allowed to dry, so water as necessary.
- At seeding time (September) remove seed, separate from sand, float off all non-viable seeds in water and let seed surface dry. A very weak solution of formaldehyde, 0.25%, is sometimes used at this point, but the actual benefits have not been determined. (See also seed treatments in the Pest Management section page 94.)

When seed is stratified and cleaned, ready for seeding, there is tremendous variation in colour, size (especially thickness) and an overall general look. These differences in themselves are not always indicators of quality seed but can give some assurance. The major indicator is whether the seed has matured enough to split (called splitters). The seed coat consists of two parts and will open to let the new plant expand. A high percentage of splitters is generally an indicator of good germination. There is also a lab test to determine whether a seed is viable or not at that time. A great deal that can go wrong over winter as this seed is placed in the soil in August/September and sits until April or May before germination. Things like site selection, soil preparation, proper mulching, watering, etc. can help to protect a good stratification process (see Site Selection page 9 for details).

Cold Storage Stratification

Recently, researchers and some growers have begun to use controlled storage as an alternative to in-ground stratification. It has certain advantages but other costs are involved. The process after seed and pulp has been separated is as follows:

- Mix seed with clean sand as per the in-ground process @ 1:3 seed/sand ratio, using a clean sand that is smaller than the seeds for future separation.
 - Place in plastic or wooden boxes (apple bins) and ensure the seeds never dry out.
 - Hold at 2°C until April 15.
- Increase temperature to 15°C until seeding time, then separate seed and sand and seed into field (August/September).
 - This process gives the cold-warm-cold regime that is needed. Seeds over-wintering in the soil will give the second cold period.

Note: *Once seed is separated from the sand in the fall treat as in-ground seed above.*

Checklist of Concerns

The following is a checklist of possible areas of concern in the process of picking and handling seed:

- do not pick too early as there is some concern that early seed does not germinate as well
- do not allow unpulped seed to sit in buckets etc. and get too hot, possibly damaging the seed
- once seed is depulped do not put it in the stratification boxes until the soil temperature is below 15°C (59°F)
- be sure the seed is well depulped as this material attached to seeds is a source of food for fungal organisms
- do not leave the seed in the formaldehyde mixture too long or have the solution too strong
- use only sand you know is clean to eliminate this as a possible source of contamination
- make sure the stratification box is well drained below to get rid of any excess water that may accumulate
- keep records of what you do so problems can potentially be diagnosed
- do not have the sand too fine as oxygen can be depleted enough to allow anaerobic bacteria (ones that grow in the absence of oxygen) to survive
- do not let the stratification box dry out as this can cause death of seeds
- surface sterilize the stratification boxes each year before use (see page 129 for products to use).



A seedling garden under a steel post structure. Notice the solid set irrigation in place.



A close-up of seedling plants. This is the total growth each seed will produce in the first year, a very inefficient plant.