

Nut-Grafting

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Introduction

The term “nut-grafting” is applied to a means of grafting scion wood from a chestnut tree directly into a chestnut. The resulting product will replicate the tree from which the scion wood is taken. The resulting root system is provided by the chestnut seed to which the scion wood is grafted. There are four distinct phases to this process of arriving at a desired chestnut tree in its ultimate planned location:

- **Grafting** --The nut-grafting process including the storage until the bud swells;
- **Potting** – The transfer of individual grafts to small pots kept in a humidity-controlled environment;
- **Transferring** – The transfer of 2” high grafts to larger individual containers holding a potting medium of 2 or 3 gallons;
- **Planting** – The planting of the resulting trees in their planned locations in the fall of the year.

Preparations for the Grafting Process

Preparing the seeds -- The harvested chestnut seeds that will be utilized must be prevented from drying out and must receive at least 60 days of refrigeration to assure good germination. This is achieved by packing the chestnuts in moist peat moss and storing them in a ziplock bag with a few pinholes. The bag should be refrigerated at about 35 degrees F. The crisper drawer of a refrigerator serves this purpose nicely. Do not freeze.

Anytime following the minimum of 60 days of refrigeration, you may remove the chestnuts from the refrigerator and place the bag on a surface at a normal room temperature. After 2 to 3 weeks, many of the chestnuts will have sprouted.

Since harvesting is usually achieved about 1 October, then adding 60 days of refrigeration, followed by 2 to 3 weeks at room temperature, it is evident that the actual grafting process could not begin until mid-December.

Cutting the scion wood – Harvesting scion wood must be pursued when its source is dormant. For nut-grafting purposes, optimum features are:

- Diameter of about 1/8th inch
- Buds about one inch apart

Larger diameters often result in splitting the chestnut during grafting. Buds that are close together leave insufficient distance between the bud and the chestnut to which it is grafted; thus, when planting such a graft, the nut cannot have adequate depth below the surface of the potting soil.

Scion wood must not be permitted to dry out from the time it is being harvested to the time it is grafted. This is achieved by wrapping the pieces of scion wood in plastic cling wrap (for example, Glad wrap or Saran wrap) and putting these bundles into a ziplock bag and storing it at about 35 degrees F. until you schedule your grafting.

Before discussing the 4 distinct phases of the nut-grafting process, please be advised that this is not an exact science. There are significant differences in detailed processes as applied by various grafters. In the discussion below, I will detail the methods that I utilize. As a matter of possible interest, my overall success rate is about 50%. I typically lose about 25% in the first phase, and another 5-10% in each of the later three phases.

Phase 1 – Perform the Grafting Process

Assemble tools -- Let us begin by identifying the required tools:

- A good pair of light-weight **pruning shears** for cutting individual increments of scion wood;

- A very soft, very small **brush** for brushing peat moss off of the swollen buds when switching to the initial potting phase;
- A container with moist **peat moss**;
- A supply of clear quart **ziplock bags**;
- A very sharp **knife** or a single edge safety **razor blade** attached to an appropriate handle;
- A heavy-duty sharp **knife** for cutting off the rooted end of the chestnut seed;
- A square pointed razor-sharp device with a **blade** about 3/16th of an inch in width for providing a slit through the petal stubs for insertion of the scion wood;
- A large hat **pin** (or the end of a large paper clip) for punching vent holes in ziplock bags.

Prepare seeds -- It is assumed that you removed the stored chestnut seeds from the refrigerator about 2 to 3 weeks before planned grafting. Typically, these bags will have held 25 to possibly 50 chestnuts. Having been refrigerated for 60 days or more, and held at room temperature for 2 or 3 weeks, at least half of these chestnuts will have sprouted.

Select those chestnuts that have a root of one inch or more and return the remainder to the ziplock bag and cover with the same peat moss that previously covered them. Check the moisture content of the peat moss and add a small amount of water if it is too dry. Close the ziplock bag, and continue storing these chestnuts at room temperature for further aging.

The rooted chestnuts are the ones that you will use immediately for grafting purposes. They will be rather messy from having been stored and rooted in moist peat moss.

Using your pruning shears, snip the roots off close to the nut and:

- Dispose of the roots;
- Rinse the chestnuts off, place them in a clean container, and rinse your hands;

- Using a heavy-duty sharp knife, cut off about ¼ of the chestnut from its pointed end and dispose of the pointed end. The remainder of the nut is used in the graft.

This operation should be completed for the whole batch, assuming that you will be completing these grafts within 15 minutes or so. Temporarily put all of the cut seeds on a clean sheet of Glad cling wrap (or similar material) with the cut side down to prevent drying out.

Before proceeding further, we should take a close look at the cut side of these grafting seeds. Locating the pair of petal stubs is a most vital need, and they appear in several variations:

- Their color can vary from an off-white to pink, rose, orange, red, or almost black.
- Most often, each petal stub is about 1/16th inch in diameter, and the two are barely touching, having an appearance of a figure 8.
- They can, of course, be so close together that they merge into a single dot or have significant separation.
- And, of course, we do not know the precise direction of a petal stub below the surface that we can see. The best estimate is to assume that they are perpendicular to the surface that we are observing.

In about one out of every 25 seeds, you will observe two pairs of petal stubs, thus depicting two independent kernels. Plan to graft only one of these kernels. The unused kernel is unlikely to be a problem.

Prepare scion wood – Before the above preparation of the grafting nuts, you should assure that you have enough scion wood to graft into the batch of grafting nuts. Mark a clear quart-size ziplock bag with the identity of the scion wood, the identity of the grafting nut, and the date of the grafting. Have a container of moist peat moss available nearby.

A word of caution is in order at this stage of grafting. It is vital that cut surfaces of the scion wood and the cut surface of the chestnut have minimum exposure to dry air. This is particularly critical for the scion wood. If you plan a slow methodical process, you may wish to

prepare the scion wood for grafting and drop it into a container of clean water. Then, sling the excess water off just before grafting. Following each graft, you should move the graft into its ziplock bag and cover with moist peat moss.

Make graft -- Let us now proceed with the actual grafting. Make a fresh cut of scion wood with the stem extending an inch or more below the single bud. Assuming that the scion wood is about $1/8^{\text{th}}$ inch in diameter, carve a symmetrical wedge on the lower end about $3/16^{\text{th}}$ of an inch long. The end of the wedge should be sharp, but not so sharp that it will bend easily. Clean the blade between cuts with 70% ethyl alcohol.

Utilizing the square pointed $3/16^{\text{th}}$ of an inch wide razor-sharp device, form a slit precisely through the centers of the chestnut petal stubs. Force the wedge of the scion wood into this slit, maximizing contact between the petal stubs and the cambium of the scion wood wedge.

Store grafts -- Put all the grafts from a single source of scion wood into your previously marked ziplock bag and then mark the bag with the number of grafts it contains. Each of the grafts should be covered with moist peat moss, minimizing direct contact among grafts, insofar as practicable. This will minimize losses in the event that one of the grafts gets moldy.

The ziplock bag containing the grafts should have a few pin holes to permit a small amount of air exchange. The bag should then be stored at room temperature. Avoid direct sunlight.

After about two weeks, check to determine the extent to which the buds are swollen. For small batches, this can be determined without opening the bag by carefully observing while the bag is being rolled around. For larger batches, carefully, dump the contents of the bag on a clean surface. Swollen buds that are beginning to open are ready to transfer to jiffy pots. Swollen buds at this stage are about $3/16^{\text{th}}$ inch in diameter. (The petal stub would normally have a beginning of a root system at this time.) Those buds that are not swollen should be left in the ziplock bag and checked weekly for subsequent swollen buds. Add a small amount of water if the peat moss is too dry at this time.

Phase 2 -- Transfer Swollen Bud Grafts to Jiffy Pots

Jiffy pots are small pots, about 2” high and 2” wide, made of compressed peat moss. Count out the number of jiffy pots equal to the number of grafts ready for potting. Thoroughly soak these pots in a container of water before the potting operation.

Be sure to protect the swollen bud grafts from drying out while you are potting one at a time. Proceed with each potting by carefully stuffing the roots of the graft into the jiffy pot while packing moist peat moss around the roots and filling the pot with moist peat moss, and leaving the graft bud above the top of the pot.

Prepare a clear quart-size ziplock bag for each swollen bud graft by marking the scion wood source, the source of the nut to which the bud is grafted, and the date of grafting. Place each potted graft into its own bag and apply a curtain hook, or similar hook, on top for hanging on a wire at room temperature in a daylight environment but not in direct sunlight. In hanging the bag, be sure that the jiffy pot inside is in an upright position.

In instances in which the graft’s root system is excessive at the time of potting, it is appropriate to substitute a larger water-soaked peat pot. I usually toss a few of these over-size peat pots into the soaking container just in case I need them.

Following the potting process, the bud normally grows into a little chestnut tree after a few weeks. In the event that the bud is not growing into its tree status after two weeks or so, you may wish to check the moisture of the peat moss in which it is potted. If it has lost moisture, it is often helpful to add a few drops of water. When the bud has grown into a little tree of about 2 inches or so, it is outgrowing this particular stage, and we need to proceed to the next phase by planting it in a much larger pot.

Phase 3 -- Transfer the Grafted Chestnut Tree to a Large Pot using Potting Mixture

Moving the grafted tree to a much larger pot is essential to permit it to fully develop into a sizable plant for planting in its planned location to grow into a full size tree. For this purpose, we normally utilize standard plastic pots that will accommodate 2 or 3 gallons of potting material.

This is the most critical of the four phases of nut-grafting. Up to this point, the graft has been in a high-humidity and low-light environment. You must carefully introduce it to low humidity and full sunlight. You must be patient and not rush this process.

The following procedure has been very successful:

- Fill the plastic pots with your chosen potting material and wet it down several times to ensure that it uniformly retains moisture. If it sinks below your desired fill level, add additional potting material and ensure that it retains moisture as well.
- If you plant the whole jiffy pot with its edges at or near the surface, it will have a wicking effect that will dry out the jiffy pot enough to make it impossible for the grafting roots to penetrate, thus the graft will become root-bound and die. This problem can be avoided by carefully peeling off ½ inch or more of the upper portion of the jiffy pot and then planting the graft with the remainder of the jiffy pot intact. Potting material should be to a level very near to the point that the little tree is attached to the scion wood.
- Place the potted graft in a daylight location but not in direct sunlight. Cover the tree with a clear plastic or glass bowl and press downward enough to form a semi-sealed environment that will assure a high humidity environment for the plant. Check the moisture of the potting material regularly. Assuming the tree is showing no signs of stress (such as wilting), begin introducing it to sunlight. Expose it for only a short time at first, and increase exposure over a period of about two weeks to full

sunlight. Likewise, introduce the graft to lower humidity on a gradual basis by removing the bowl cover.

In the spring, when the threat of frost has gone, move the grafting outside. You must, of course, provide protection from squirrels and deer. I utilize a cage on my patio that is made of ½ inch mesh hardware cloth. The cage is 3' high, 10' long, and 6' wide. It has a hardware cloth cover as well. This cage will hold many dozen potted chestnut plants.

When I have exceeded the capacity of the cage, I have utilized 36" wide hardware cloth and made individual cylinders that are 36 inches high and fit snugly around each potted plant. I originally made hardware cloth tops for each of these cylinders; however, I ceased this refinement when it became evident that the squirrels never climbed up and into these small cylinders. I assume they feel trapped if they climb in.

Phase 4 – Plant the Grafted Trees in Their Planned Location after Dormant in the Fall

The only word that I offer here is that you must protect nut grafts from squirrels. They are attracted to the chestnut seed utilized in nut-grafting to about the same degree as a regular seedling.

There is one unique feature of a nut graft. It is somewhat more susceptible to damage from high winds for its first year after planting, as compared to seedlings.

I have a 24-acre plot of land in Shenandoah County that I utilize for my chestnut orchard. About three acres of it are cleared for my chestnut work.

Most often my plantings are 15 feet apart. Planting holes are prepared by pulverizing a circular area about 3 or 4 feet in diameter and to a depth of at least 10 inches throughout the area, but to a depth of 12-15 inches toward the center.

Using a 2½ gallon zinc bucket for measuring purposes, one bucket full of peat moss is blended uniformly throughout the planting hole. I then use another bucket full, but concentrate it toward the center of the hole. A shovel is then used to open a space in the center of the planting hole, and the plastic pot containing the graft is set in the hole to assure that the grafting will be at the proper level.

The plastic pot, with its graft still in it, is lifted from the hole and turned upside down so that the pot can be lifted from its contents. Then using both hands, the contents of the pot, including the grafting, is turned upright and returned to its measured position in the planting hole.

The net effect is to have the grafting in the exact center of the planting hole with its former potted surface several inches above the level of the surrounding terrain.

If the grafting is less than 6 inches tall, I do not provide additional support to protect it from winter winds; however, taller grafts are more susceptible to damage, thus requiring appropriate support.

In this case, I push 4 bamboo canes into the planting area, equally spaced around the outside of the root ball. Then a strong but soft cotton string is looped around the plant at about 2/3rds of its height and secured to the 4 canes. In instances of very large grafts, such as 4 or 5 feet high, I only put one cane outside the root ball and secure these plants directly to the bamboo cane with strong, soft cotton string. The strong, soft cotton string is about 1/8th of an inch in diameter and decomposes by the time the grafts cease needing support of a stake.

Protection from rodents and deer is provided by cages made of 60" wide and 25' long rolls of half inch mesh hardware cloth. One roll yields 4 cages that are 60" high and about 2' in diameter. Each cage is held in position by 4 bamboo stakes equally spaced around the grafting at a 12" radius. Pilot holes are made for these bamboo stakes by a 30" steel spike driven by a sledge hammer.

After the bamboo stakes are tamped in place, pine bark mulch is applied over the whole planting area in a layer that is about one inch thick, being careful, however, to avoid contact with the graft stem.

After watering thoroughly, the cage is slipped over the 4 bamboo stakes. Twist ties are utilized to secure the cages to each of the bamboo stakes. This precludes the cages from blowing over in strong winds.

Beginning about the first of May in the following spring, Miracid solution is applied twice per month until the first of August. In subsequent years, a long-lasting fertilizer is applied each spring.

Two years after planting the graft, the half-inch mesh hardware cloth cage is removed. Rodents no longer dig for the grafting nut; however, deer will bite the top out of grafts that are shorter than about 6 feet tall. In the case of these shorter grafts, a larger cage made of garden wire is provided. A ten foot section of garden wire is coiled into a circular cage that is about 38" in diameter. After two additional years, this cage is also removed.

As a matter of possible interest, my property has a pH of about 5.5, which is optimum for chestnut growth, and there are dozens of native American chestnut sprouts growing.

All the cages are saved for reuse on newer grafts and seedlings. I have over a hundred of each cage size. Six foot bamboo stakes are good for two years. I buy them in bundles of 250.