

Layering Chestnuts

Why layer chestnuts?

- Grafted trees have high failure rate
- Clone superior traits
- Lower cost than a seedling
- Produces nuts sooner

How to Clone chestnuts

Cloning your best trees is possible through stool bed layering or what we simply call "layering". Cloning your best chestnut trees allows you to make identical copies of a tree that you believe is a superior tree. Clones of a superior tree you can plant on final spacing to increase productivity or expand your orchard and share or trade the best genetics with other growers. In only a few easy steps we can do this by encouraging sucker (a.k.a. shoot) growth, then encouraging root growth on the suckers and then dig them up before they start to grow again in the following spring. Of course, there are more details we need to know to be successful, but it isn't difficult to do. Cloning a known tree via layering is lower cost than most seedlings without the unknown production, disease resistance and double planting needed for seedlings. There are four main steps to cloning your best trees.

1. Winter pruning or coppice

You want the roots to have excess energy so they will send up new suckers for you to clone. Now that we know we really like a tree and want to copy it, we want to encourage sucker growth. If your tree doesn't produce suckers at the base of the tree it usually means the tree is getting mature and the base is shaded enough that sucker growth is hindered. To encourage sucker growth, you will need to prune the tree back by 30% to 50% during dormancy. If the tree is deformed from a storm or has other serious life-threatening issues you may want to coppice (otherwise known as cutting down the tree). Heavily pruned and coppiced chestnut trees almost always produce many suckers the following spring. There are many references for pruning¹, you can find one reference here: [Tips On Chestnut Tree Pruning - Learn About Trimming A Chestnut Tree | Gardening Know How](#)

2. Spring mulching

What you need: Mulch, tarpaper or similar, two or three stakes per tree that are 16" long. Most orchards mulch their trees anyway in the spring, except this year you will mulch six to eight inches deep in a circle that is 12 to 16 inches outside the bark of the tree before buds break if possible. For example, if your tree has a diameter of 6 inches then you will form a circle a minimum of 30 inches (6" + 12" + 12") in diameter. You will then need to hold the mulch in place using tarpaper or plastic. To hold the tarpaper or plastic in place you will need a minimum of two stakes pounded into the ground and staple the tarpaper/plastic to the stakes. The suckers will sprout through the mulch and develop stems in the mulch that allow us to have easy access, to apply hormone and then have easy access to dig up the roots. Check the depth of the mulch monthly to maintain a minimum of six inches of mulch.



Figure #1 Mulching in the spring



Figure #2 Putting Zip Ties on etiolated chestnut stems.

3. Summer hormone application

What you need: 75 lb. strength nylon zip ties, Petroleum Jelly (a.k.a Vaseline), IBA-K hormone. Timing of when to put hormone on the suckers is very important. It is best to check when the average first frost is in your area and then go back 60 days. For example, in Cortland, New York the average first day of frost is October 1st. Therefore, you want to start layering August 1st through August 14th. This time period will allow six weeks to eight weeks for roots to form. Too early the suckers are growing too fast and will only choke and die. Too late in the year and the roots won't form in time. If you have coppiced your tree, leave one or two suckers alone to grow to replace the original tree. You will be applying a hormone known as salt of indole-3-butyric acid (IBA-K) to the base of the stems with a small brush. Before applying to the base of the tree you will need to order the IBA-K from your local hydroponics store or on-line retailer like Amazon or eBay. Purchase heavy duty nylon zip ties with a minimum strength of 50 lbs. at your local hardware store or online retailer. Do not use lighter weight nylon zip ties or they will probably break due to stem growth, wasting your time. Strip off the bottom third of leaves from each stem. This will allow you to see the stems and apply the hormone.

How to prepare the hormone and petroleum jelly. The typical Petroleum jelly you buy at your local drug store or your "dollar" or "value" store is 262 ml (7.5 oz.) of Petroleum jelly. To have 4000ppm of solution of IBA-K in 262 grams (7.5 oz) of petroleum jelly you will need 0.848 grams of IBA-K. If you have very accurate scale to measure fractions of a gram, you are good to go. Otherwise, a close approximation is measure out 1/8 teaspoon and also a ¼ teaspoon of IBA-K into 2 tablespoons of room temperature water and stir until dissolved. Then mix solution into 262 gram (7.5 oz.) jar of Petroleum jelly until smooth. Careful not to splash hormones while mixing. It is highly advised to warm up the Vaseline to a liquid prior to mixing. How to melt petroleum jelly into a liquid according to Bing is to, "Fill a small container with petroleum jelly, then empty the petroleum jelly into a microwavable bowl. Microwave at 30 second increments until just melted. Alternatively, you could melt the petroleum jelly over low heat in a double boiler." In previous studies 2000ppm of IBA didn't generate roots, while 5000ppm of IBA can kill suckers, so measuring properly is very important.

Prior to putting on hormone, pull away mulch from suckers and expose the lightly colored stems. Hopefully the lightly colored part of the stem is four to six inches long and is the part of the stem that is hidden in the mulch. An inch or two from the very bottom of the exposed stem place a nylon zip tie snugly to the base without crushing or breaking the stem. Too loose and the stem won't form roots. Lightly scrape the stem about ½ inch above the nylon zip tie for two inches in length, and scrape again on opposite sides of the stem. Liberally apply the IBA-K Vaseline mixture with a small brush the hormone mixture ½ inch above the scrape, all around the stem and down to the zip tie. Replace restraining tarpaper or plastic and refill mulch to the original levels as shown in Figure 3.



Figure #3 Measuring IBA-K and Petroleum Jelly



Figure #4 Rooted chestnut suckers.

Figure 3 Nylon zip ties, stem scrapping in preparation for 4000ppm IBA-K hormone to be applied to stem. Note leaves on the ground from stripping the bottom third of the stems leaves.

4. Fall/spring dig up rooted clones.

After the leaves have turned brown and are falling off in the fall and before the buds swell in the spring, you will dig up the suckers. You will need to gently pull back the mulch with your hands gingerly to not break the tender roots. Once you see roots, work your way under the roots to the nylon zip tie. Cut the sucker below the nylon zip tie and gently lift the cloned tree from the rest of the suckers. Sometimes you have to cut a few suckers and pull them out at the same time as the roots are so intertwined you cannot pull them apart separately without damaging the roots. If you do pull up a few trees at once you can sometimes shake the soil/mulch off and then separate the roots. If you cannot separate them after shaking off the soil/mulch, then dip the roots into a bucket of water and they will separate much easier for replanting.

Aftercare

Although not part of the actual cloning, there may be some efforts of protecting the less than ideally rooted trees you may not be used to dealing with. Heavily rooted trees can be planted out in their forever home directly and care as normal for any tree you plant. If the new clone has less than six main roots with secondary roots then we suggest temporarily planting in mulch or potting them while keeping them well watered and protected from wind and too much direct sun. Also pruning back the stem to only a few buds helps match the roots to the stem, as should be done for the second from the left of clone in Figure 4. One way to protect is to put on a tree tube that is the same height at the stem, with two or three stakes for a couple of weeks, while the buds elongate and slowly open the tube over a few more weeks to be more exposed to the wind and sun.

Figure 4 Well rooted stems on three of the five suckers, with one without roots and one poorly rooted that will need extra care. Disclaimer: Follow manufacturer directions fully for all products purchased. We are not responsible for any injury or death of tree or any damage to person or property. Always wear proper personnel protection equipment that includes but not limited to eye protection, gloves and air filtration.

"This material is based upon work supported by the National Institute of Food and Agriculture, U.S. Department of Agriculture, through the Northeast Sustainable Agriculture Research and Education program under subaward number FNE22-033. "Any opinions, findings, conclusions, or recommendations expressed in this publication are those of the author(s) and do not necessarily reflect the view of the U.S. Department of Agriculture." A brochure is available for downloading at [znutty.com](#) on the blog page.

Foot Notes:

1. [Tips On Chestnut Tree Pruning - Learn About Trimming A Chestnut Tree | Gardening Know How; https://www.gardeningknowhow.com/edible/nut-trees/chestnut-trees/pruning-chestnut-trees.htm](#)

2 Takao Li, Hyogo Agricultural University, July 5, 1959, "Propagation of chestnut by layer."

Four easy steps to layer trees!

- Young trees produce suckers, older trees need pruning
- Spring mulch deep around stem
- Summer hormone application
- Fall/Spring dig rooted clones

A three-year study on how to successfully clone chestnuts

Chestnut suckers were initially layered using the same method and timing for hazelnuts using 2K ppm IBA and layering in mid-July, 2021. The 31 of the 34 suckers layered died having been choked by the nylon zip tie used to constrict the stem and encourage root growth. A near complete failure.

Year two the process was repeated with a matrix of hormone concentrations and a search for relevant papers on how to layer chestnuts. Of the 332 suckers that were layered only 10 rooted. There was a complication with a very dry summer and many suckers died again due to choking.

A reference by Takao Li² that growth of the sucker must be monitored for proper timing of when to layer. We did periodic measurements of sucker growth. The purpose of monitoring sucker growth is to hold off layering until sucker growth slows and yet layer the suckers with a minimum of one months growing season left and ideally two months growing season to increase root yield and quality. This knowledge was used in 2023.

Layered suckers in 2023 were repeated the second years hormone treatments done in 2022' and adding additional treatments with adjuncts were needed to make up for the terrible growing season. Efforts in 2022' were not totally lost as the farmer and technical staff team combined efforts yielded knowledge for very good results in 2023'. Technical reference papers and European practitioner research combined with previous years layering efforts solved the unknown problem of when to layer, as the most important item to successfully layer chestnuts.

Having monitored the growth of shoots at Z's Nutty Ridge it appeared that shoot growth was slowing at the beginning of August. Chestnut suckers were layered from August 6th through August 11th, 2023'. Various treatments of hormones were tried as shown in Table 1 below.

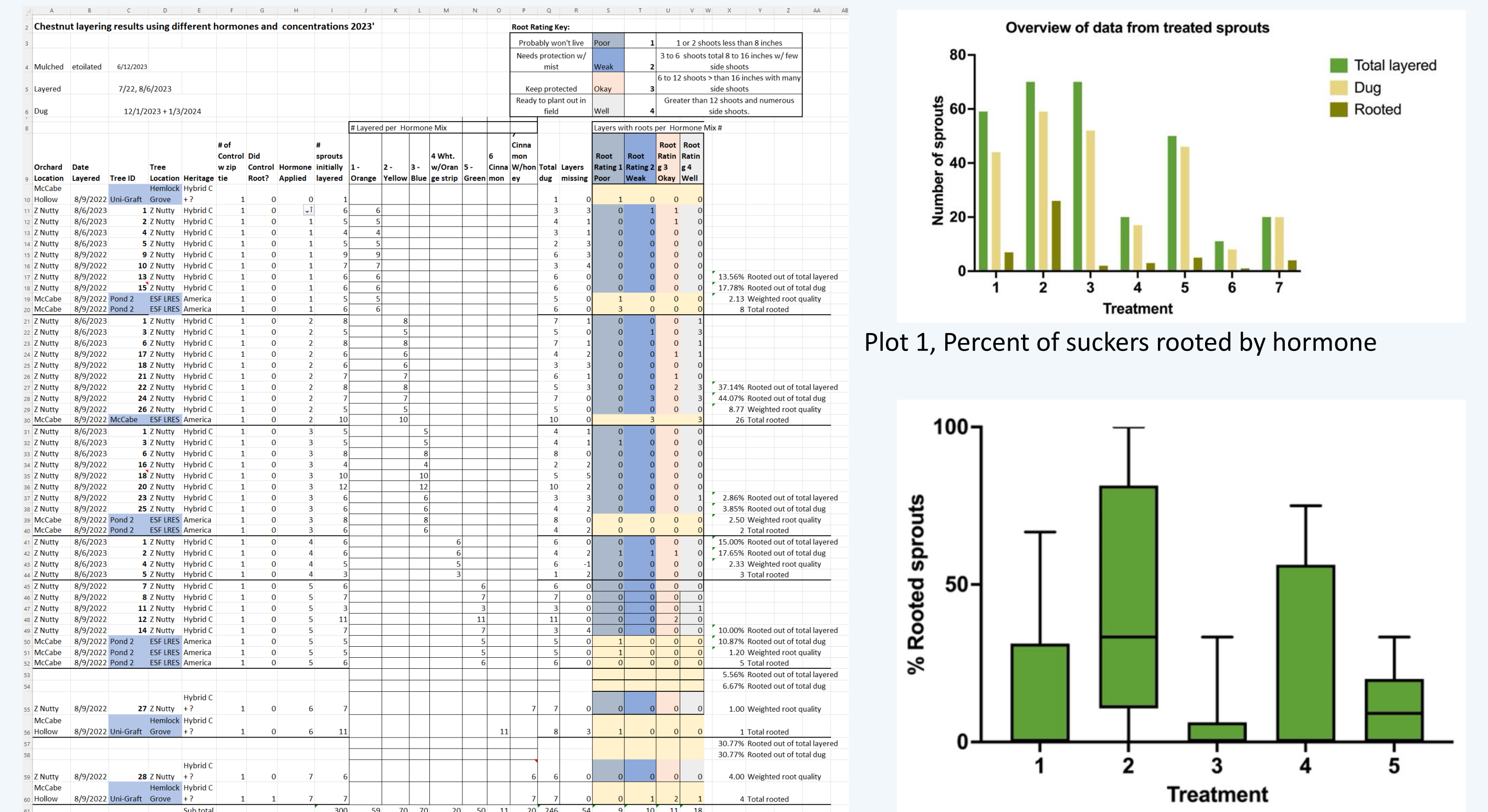
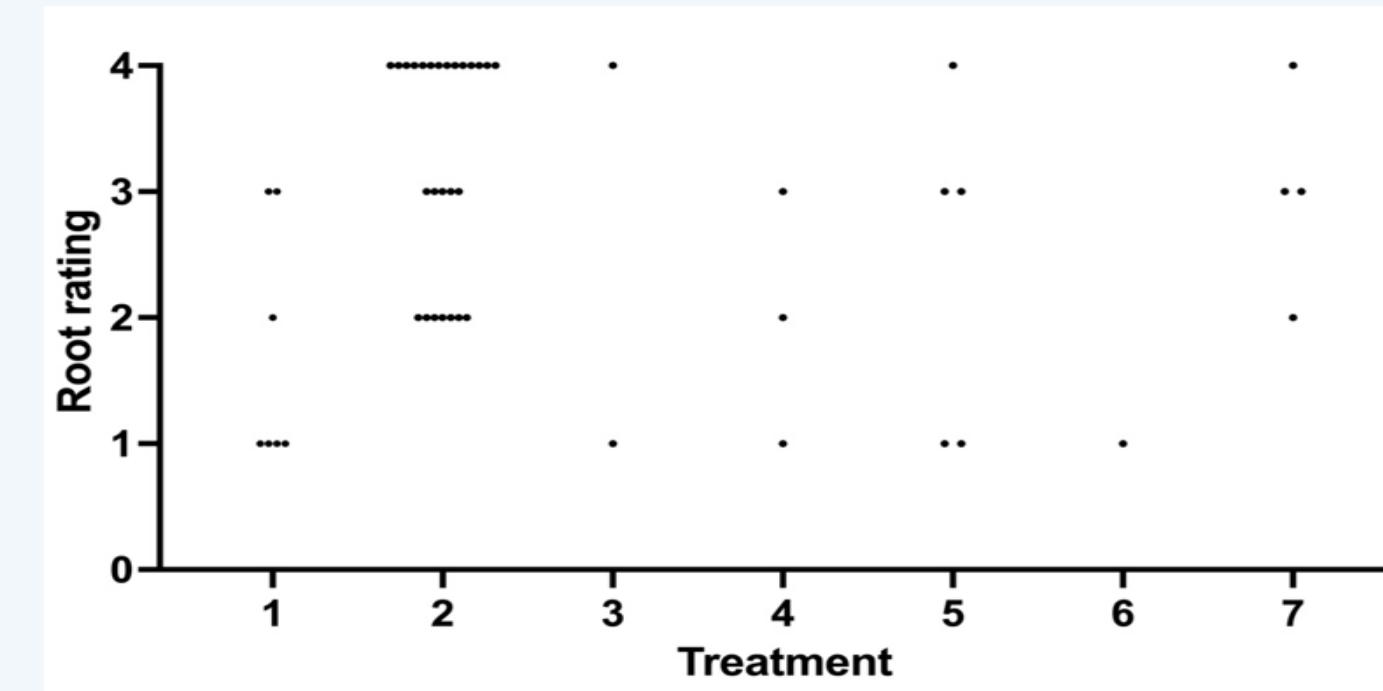


Table # 1 A matrix of different hormone concentrations used to layer chestnut suckers in 2023

When to Layer Chestnut Suckers

Layering procedure was the same as 2022' but sucker growth was monitored. A tall stake was made and had inch markings on it so the tallest two suckers of a tree could be measured periodically. The tallest suckers were chosen as they were the first to appear and were easiest to identify from week to week. Suckers emerge from the base of the tree continuously over the spring and summer months. Some suckers sprout after layering. Layering Chestnut trees in 2023 was initially looking to be a disaster with a hard 24 degree Fahrenheit frost on May 18th. Spring came early and all fruit and nut trees budded out early and became susceptible to a hard frost. The May 18th frost burnt all or most all leaves and flowers on all fruit and nut trees in the surrounding area except for hazelnuts. The sucker or two that wasn't layered per tree in 2022' was burnt and most didn't regrow. New suckers took over delaying the start of the seasons growth by no less than two weeks even with an early start. Weather events only further strengthen the need to monitor the sucker growth.



Plot #3 showing chestnut sucker rooting grade by hormone treatment.

Data Analysis

A summary table of chestnut layering results by hormone treatment is shown in table # 1. One can see that Treatment # 2 using 4000ppm IBA-K was by a large margin the best treatment to produce rooted suckers. With the assistance of Patricia Fernandes, Ph.D. and Dakota Mathews using ANOVA analysis, using information from Table # 1, the above data was ascertained.

Northern Nut Growers Association Chestnut Growers of America 2024 Annual Joint Conference

July 21-24, 2024

SUNY – Environmental Science & Forestry
Syracuse, New York

By: Jeffrey & Dawn Zarnowski of Z's Nutty Ridge LLC
Technical Advisors

Patricia Fernandes Ph.D. SUNY ESF

Dakota Matthews MS. SUNY ESF

Brian Caldwell, Hemlock Grove Farm

Gabriel Smith, Ag. Educator, CCE Tompkins Co.

Disclaimer: Follow manufacturer directions fully for all products purchased. We are not responsible for any injury or death of tree or any damage to person or property. Always wear proper personnel protection equipment that includes but not limited to eye protection, gloves and air filtration. "This material is based upon work supported by the National Institute of Food and Agriculture, U.S. Department of Agriculture, through the Northeast Sustainable Agriculture Research and Education program under subaward number FNE22-033. "Any opinions, findings, conclusions, or recommendations expressed in this publication are those of the author(s) and do not necessarily reflect the view of the U.S. Department of Agriculture."



Sustainable Agriculture Research & Education