SEED and SEED HANDLING TECHNIQUES IN PRODUCTION OF WALNUT SEEDLINGS

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For the past 30 years, I have been specializing in the growing of walnut trees. It is, indeed, an honor to speak to this distinguished group. During this time, many changes have taken place in the techniques of growing trees; also some in the demands of different stocks used for walnuts.

With advancement of agricultural sciences and the extensive research work by our men in the University in the different departments, many things have been learned which we did not know 20 or 30 years ago. For instance, we know that certain organisms attack the roots of walnuts. The ones with which we are primarily concerned are nematodes, more specifically, the lesion nematodes, *Pratylenchus vulnus* and *Pratylenchus penetrans* which are the most damaging to walnuts There are, of course ,other disorders with which we are concerned, such as crown gall, rootknot nematodes, crown rot, etc.

We learned also of the desirability of other rootstocks which possess resistance to some of these diseases as well as adaptability to certain soil conditions, not shown by the stocks that we were using

Our principle rootstock was Northern California Black Walnut (*Juglans hindsii*) but due to extensive research by the departments of the University, they have discovered advantages in the Paradox Hybrid, which is a resultant cross between Black and English Walnuts. To define it further, we use seed from Black Walnut trees that have been naturally cross-pollinated by the English, which gives us the first generation seedling.

This stock has many advantages, namely, (1) its very good vigor (2) resistance to the disorders that we are mostly concerned with, i e, the two nematodes previously mentioned, and crown rot, and (3) adaptability to heavy, wet and shallow soils.

While we in the past used from 30 to 50 sacks of seed at an approximate cost of about $50 we now use hundreds of sacks which results in a cost of approximately $7,000 to $10,000 per year.

This presented other problems, such as having to obtain seed from many trees (as many as several hundred) with nearly as many different locations to secure the scarce Paradox producing seed. Variation from year to year in the percentage of hybrids produced from a given source placed us in a position of not knowing what we may be able to depend on as to the number of Paradox produced.

It also presented us with the problem of obtaining good germination so that we would not lose our most expensive seed because it is purchased and paid for on a sliding scale based on percent Paradox produced. Thus the better seed (that is with higher percentage of Paradox), is very expensive, and we had to be sure that we could take full advantage of its potentiality. We have learned how to pick our better lots before the time that the seed must be taken from the beds to

be planted in the field; this gives us the advantage in using the better lots.

Knowing more about the specific walnut diseases, in the past few years, we have been following a rigid program of fumigation in all areas of our operation. This insures us, as much as possible, against these pests, mainly the lesion nematodes, crown gall and others. This in turn has placed a very high initial cost on the land that is to be used, because of the extensive preparation, cost of material used, and the necessary precautions that must be taken to prevent contamination.

In order to avoid contamination of the growing grounds from the seed, we have extended our program of fumigation and sterilization to include treating stratification beds and dipping seed to guard against any possible avenue infestation.

Our seed stratification beds are made of redwood material constructed to make them 12 feet long, 5 feet wide, and 15 inches high. These are nailed to 2″ x 4″ material on its edge in order to elevate them to facilitate the drainage, in excessively heavy moisture conditions. Holes 1 inch in diameter are drilled along the sides, just above the bottom boards to provide drainage to the seed. These beds are filled with coarse, sterilized sand to a depth of 4 inches. All of these beds are provided with wire covered top frames to prevent rodents, squirrels, dogs, cats, and whatever else from walking over the seed and contaminating it.

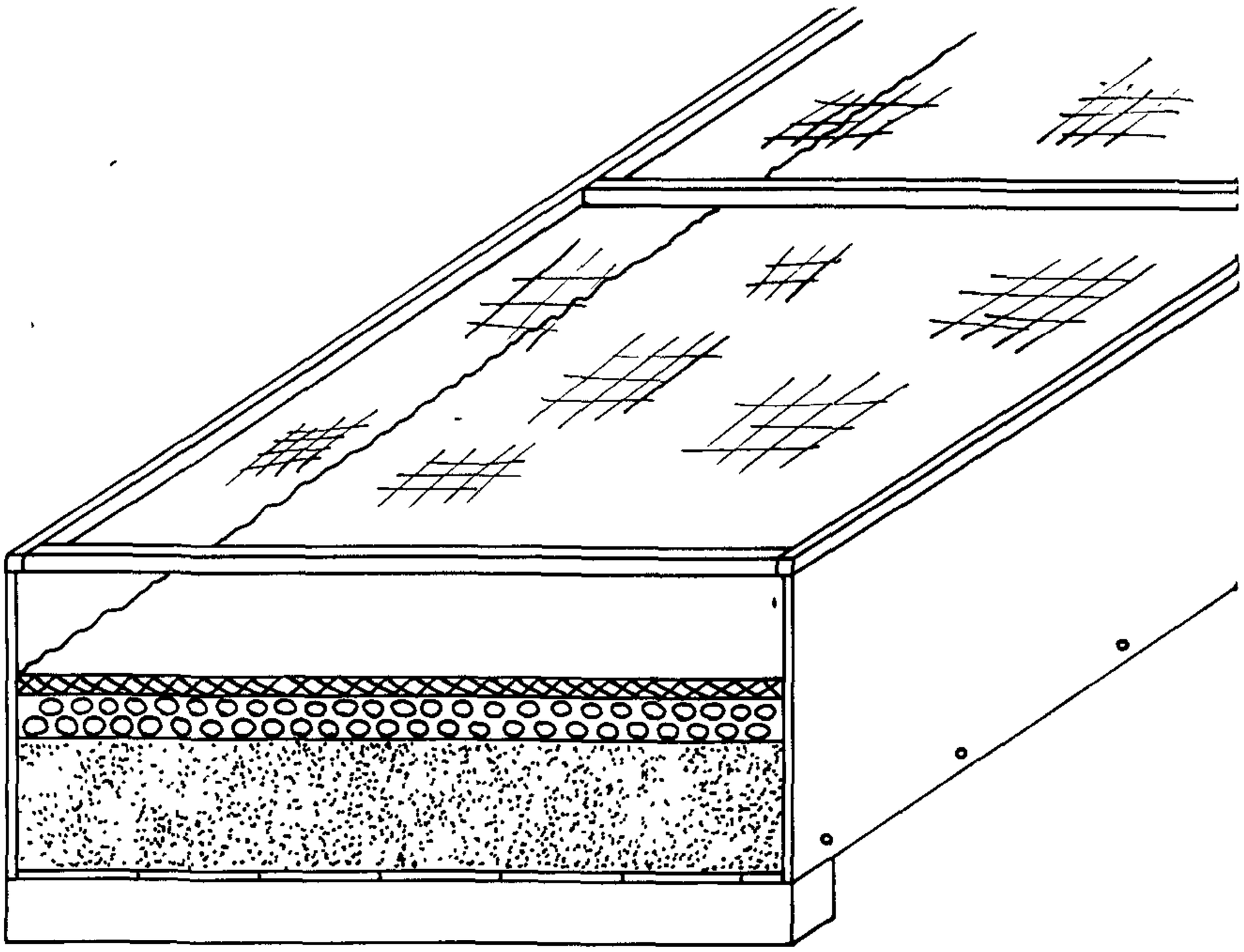

Figure 1.—Cross-section of seed stratification bed showing sand, seed, top covering of vermiculite, and screen.

In the past we have fumigated the beds with Shell D.D. fumigant 60 days prior to stratification time. Last year, we changed our procedure to use Methyl Bromide and applied it in the following manner:

1) The beds were covered with gas-tight plastic tarps and the edges were sealed with sand.
2) Methyl Bromide was applied through a hot water coil, at the rate of 1½ lb. per 100 square feet of area.
3) An electric fan under the tarp was run for about 30 minutes during and after the gas was injected, to thoroughly disperse the gas under the tarp
4) A halide leak detector (using propane) was used to detect any leaks along the edges of the tarp.
5) The tarp was left over the beds for a minimum of 36 hours

SEED HARVEST

Our Black Walnut seed is gathered in October, November, and December from Northern California Black trees, either known to produce Paradox seedlings or to test new potential sources As the seed is gathered, each bag is tagged, so that the identity of the seed is maintained through all the different stages of handling In this way, we know the Paradox productivity of every single tree source. A lot number is given each individual tree, and this number is carried through seed beds, and fields and maintained until the trees are sold. Wet seeds or those with green hulls are air-dried (we do not remove the hulls from our seed) by placing the bags of seed in bins over a pot hole drier, and air forced through until dried. Heated air is not used: this could reduce germination. After being dried and weighed, seeds are stored in a dry place until the time for stratification.

STRATIFICATION PROCEDURE

Seeds are dipped in hot water before stratification. This is done because seed gathered in many different locations under varying weather conditions accumulates mud and dirt which may serve as a source of infestation.

The equipment used is an iron dipping vat 10½ feet long, 18 inches deep and 18 inches wide, placed on brick supports a foot from the ground Under this are three butane burners, each supplying 36,000 BTU per hour to heat the water in which the seed is being dipped.

The water is brought to boiling temperature and maintained to 190° or more.

The seed, identified by its lot number, is brought out on pallets, by means of a fork lift. Seed is put into a wire basket constructed to fit inside the vat in order to submerge the seed in the boiling water. To insure complete submersion of all the seed, a lid is placed over the seed to force it under the water and agitated gently to make sure that all of it is submerged and receives the same amount of treatment. After 1½ to 2 minutes, the basket of seed is lifted out and poured into a box dumper, which is handled by a fork lift. This dumper has a spout attachment at the bottom, through which the seed is run out. The box itself can swivel 360° which makes it adaptable for working between two parallel rows of beds.

After any particular lot is dipped, it is placed in the bed or beds on top of the 4″ layer of coarse sand. The seed is spread out evenly over the sand, not more than two walnuts deep, covered with expanded vermiculite to a depth of 1″ and watered down During the winter months, frequent checks are made to see that adequate moisture is in the stratification beds. If they are too dry, the seed will not sprout uniformly — if too wet, much of the sand is apt to drown out.

Under normal conditions, the seed usually begins to sprout in early March. Unseasonably warm and moist weather encourages sprouting before normal planting time.

The sprouting seed is carefully taken out of the beds by use of a trowl. Each lot is handled separately as to maintain identity by lot number as originally given. All deformed or twisted sprouts are discarded and the good seed placed into field lugs, covered with a moist burlap bag and taken to the field In the field, a shallow furrow approximately 6″ deep is made with a cub cultivating tractor and the seed is hand planted, spaced from 3 to 4 inches apart in the row and covered with dirt.

Later when the seedlings have emerged, they are thinned to a final spacing of 9 to 12 inches apart. The identity of the seed is maintained in the field by placing a stake with its corresponding lot number. A map is made of our growing grounds, showing locations of all lots planted

This general procdure that we now follow has worked out well for the problems confronting us at this time. Other modifications may be needed in the future as conditions change

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CHAIRMAN HERB FOWLER: At what stage of germination do you prefer to move walnut seedlings?

MR STUKE: Seeds germinate over a period of time, so vary in their development. Some of the sprouts will be out 4 or 5 inches, whereas others are just beginning to show the tip. We try to remove the seedlings only at two times. We get approximately half of the seed out the first time. We put the rest of the seed back, take them out one more time and get all the sprouts out.

Chairman Stoutemyer introduced Mr. Hugh Steavenson of Forrest Keeling Nursery, Elsberry, Missouri.

FIELD PRODUCTION OF SEEDLINGS IN A CENTRAL STATES NURSERY

HUGH STEAVENSON
Forrest Keeling Nursery
Elsberry, Missouri

Each nursery, or certainly each region, evolves its own methods and techniques of propagation, according to local conditions of soils, climate, marketing opportunities, available skills and historic precedent.