

Preliminary Trials On
Upgrading *Platanus Occidentalis* With¹The
Helmuth Electrostatic Seed Separator²

by

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Abstract

The electrostatic seed separator is a recently invented seed conditioning machine which uses the force of an electrostatic field separate particles of different area and weight. It has been successfully used to size, and improve germination of seed of *platanus occidentalis*. It should be useful on other tree seed also.

Introduction

Upgrading refers to steps that are taken beyond basic cleaning which improve the quality of seed. Therefore, upgrading would include removing empty seed, fungus or insect damaged seed, and stones or pitch. Sizing seed can also be considered upgrading because speed of fermentation can be different for different seed sizes. Other authors have stressed the importance of upgrading and how to accomplish it (Belcher, 1978; Bonner, 1978).

Sycamore (*Platanus Occidentalis* L.) seed is generally low in viability and is difficult to upgrade because of its small size. The electrostatic seed separator was tested on sycamore to determine how suitable it might be for resolving this problem.

Principles of Electrostatic Separation

An elementary demonstration of the electrostatic movement of particles is the picking up of pieces of paper with a piece of plastic that has been charged by rubbing it with a dry cloth. The paper is drawn to the plastic by an electrostatic field. Heavier seed can be separated from lighter seed by the same principle if the strength and design of the electrostatic field is carefully controlled.

The Helmuth electrostatic seed separator is composed of a hanging electrode and adjustable ground plates (Fig. 1). Voltage applied to the stationary electrode creates an electrostatic field between the electrode and the ground. As seed is poured between the ground and the electrode by the towards the ground. The

¹Mention of trade names is only to identify equipment used and does not imply endorsement by the U.S. Department of Agriculture.

²U.S. patents have been granted on this equipment. Vibratory feeder, the static field carries the lighter seed and impurities.

stronger the static field, the farther the particles will be pulled. The strength of the field is controlled by adjusting the voltage applied to the electrode. For each seed lot there is a voltage that will produce a maximum distance between the lightest and heaviest seeds being separated. This voltage must be determined by trial when processing just like adjusting other seed conditioning equipment. Using a voltage higher than the one giving this maximum spread will only move all the seeds closer to the movable ground and not give any better separation. The purpose of the ground being moveable is to allow for adjusting the distance in which the seed can separate. When the seeds have reached the bottom of the static field they are collected in a tray. There are adjustable vanes in the collection tray to keep the fractions separated.

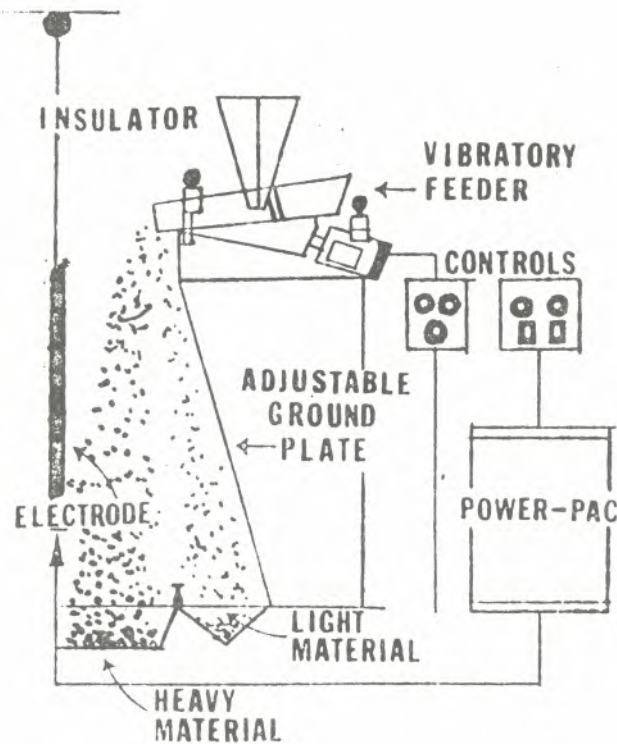


Figure 1. Diagram of the electrostatic seed separator.

Materials and Methods

One lot of sycamore was rough cleaned on a clipper office tester using a 5/64 X 3/4 slotted screen on top and a number 7 round hole screen on the bottom. This removed the bulk of the fluff which prevented the seed from flowing freely. A sample of seed was taken from this seed and designated as the original sample. This original lot was upgraded on the Helmut electrostatic separator. The electrode is 80 CM by 130 CM. Voltage is variable from 0 to 120,000 volts to accommodate many sizes of particles. The voltage setting and feed rate used were determined by preliminary trials and X-ray analysis to determine full seed percentages. Although voltages are high, there is no danger to the operator if the machine is used properly.

After these preliminary trials, six fractions were obtained from the original lot. Each was evaluated separately for germination, Czabator's germination value (Czabator, 1962), purity, full seed percentage, and seed per pound. Tests were conducted according to association of official seed analysts rules. Stratification was for 60 days at 3 C on the germination media. Germination was on crepe cellulose paper with a temperature of 20 C at night and 30 C during the 8 hour light period. Germination counts were made daily. The final count was made on day 12. No statistical analysis was made. The data are presented in Table 1.

Results and Discussion

Notable accomplishment was made with all seed quality measurements. The results are summarized in Table 1. Purity was improved from 88 to 99 percent or better, and full seed percentage from 34 to a maximum of 52. The larger seed are almost twice as large as the smaller seed. The best germination was 18 percent better than the original lot. The largest 3 sizes of seed were also the most vigorous as shown by their larger germination values.

The improvement in viability and vigor is best understood when we look at the data on a full seed basis (Table 2). The pattern in germination is substantially modified. Instead of the best lot germinating 25 percent higher than the poorest lot, it is only 7 percent better on a full seed basis. The germination value computed using full seed data is actually higher for the smaller seed. This is because the smaller seed reached 90 percent of their total germination sooner than did the larger seed. Therefore, the higher full seed percentage of the best lots is largely responsible for the better germination and germination values.

Removal of empty seed was not, however, the only effect of the seed separator. The fact that the smaller seed germinated the fastest, shows that there were also physiological differences among the seed sizes.

According to the data obtained, the electrostatic separator appears to have definite potential to effectively upgrade small tree seed. Other hardwood species that might be effectively upgraded would include birch sweetgum, and conifers like white spruce. In a preliminary trial redwood purity was visually much improved with the Helmuth separator. Laboratory test data was not obtained. In the nursery the upgraded seed will give more uniform germination which will in turn provide more uniform seedling densities, greater numbers of plantable seedlings per pound of seed, and more efficient use of nursery space.

Tables 1 and 2 on following page.

TABLE 1.--Seed test results of the original seed lot and the 6 samples obtained by electrostatic seed separation. Values are based on actual germination data.

FRACTION #	ORIGINAL	1	2	3	4	5	6
Actual Germination	30	48	40	43	37	33	23
Germination Value	8.23	22.28	16.65	18.94	15.92	13.28	7.05
Percent Full Seed	34	52	46	46	40	37	26
Seed Per Pound (M)	147.0	94.9	99.0	101.7	118.7	152.2	168.0
Purity	88	99	99	100	100	100	100
Days to Reach 90% of Total Germination	10	9	8	8	7	7	6

TABLE 2.--Germination and germination value computed on full seed basis.

FRACTION #	ORIGINAL	1	2	3	4	5	6
Germination	88	92	87	93	93	89	85
Germination Value	71.17	83.15	78.66	88.58	100.75	96.46	95.58

Publications Cited

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