Uses of the Westrup Brush Machine

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Description:

The Westrup brush machine can be used as the first step in the conditioning process of seeds. Eventhough there are various sizes of the machine, only the laboratory model (LA-H) is described. The machine is designed to separate seed from pods or flowers, dewing tree seed, remove appendages or hairs from seed, split twin seed, de-lint cotton seed, scarify hard coated seed, and polish seed.

Westrup manufactures the machine in Denmark. Unfortunately the shipping charges and money exchange rate increases its price. It weighs 90kgs. The motor, table, and vacuum cleaner can be purchased locally to reduce the cost. For use in the United States, it is equipped with 110 volt, 1 phase electrical connection, a US 3 prong wall plug, and operates at 1300 watts . The entire brush machine is constructed of steel. The outer casing can easily be disassembled so the inside of the machine can be cleaned.

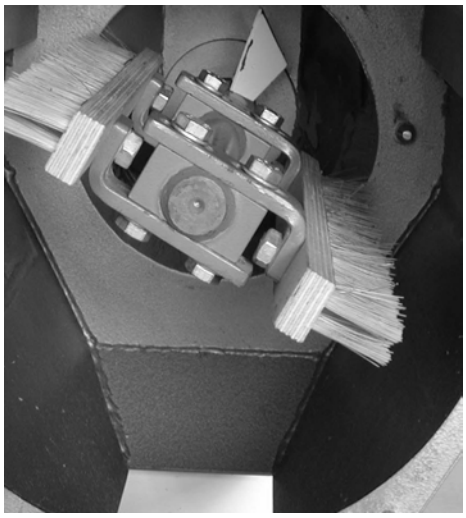
Operation:

The seed is placed in the feed pan hopper positioned at the top of the machine. A larger 25 liter feed hopper pan is available for large seed amounts. As the seed falls through the feeding funnel, the small metal paddles located at its mouth push seed into the shaft that houses the rotating blades. A vacuum cleaner hose attached to an opening above the mantle jacket removes fine dust. A powerful shop-vac works very well. Small seed and debris fall through the mantle into a collection pan.

The rotating brushes push the seed against the wire mantle creating a cutting action. Large seed and debris are expelled through the discharge gate into a collection pan at the front of the machine. A knob above the discharge gate turns to adjust the gate opening. The length of time the seeds remain in the shaft determines the amount of cleaning the seeds receive.

Brushes:

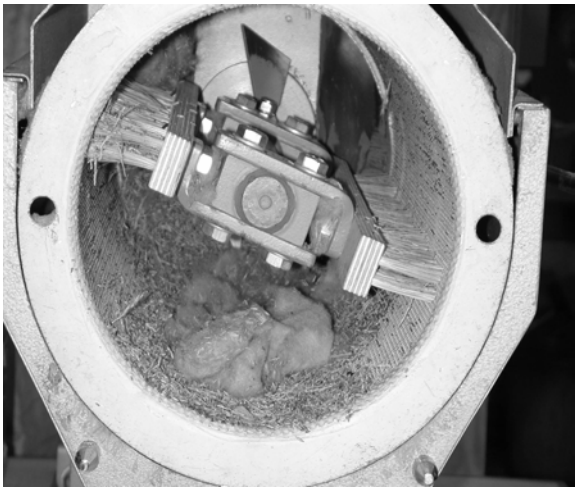
Two nylon brushes are mounted on a main shaft which rotates inside a wire mantle. The operator can adjust the revolutions by turning the speed knob located at the back of the machine. The brushes are adjustable in two directions, independent of each other and can be tilted in relation to the longitudinal direction of the shaft. Brushes vary in stiffness from soft, medium (0.50 mm) and stiff (0.90 mm). Medium brushes work best for most native plants that the National Tree Seed Laboratory personnel have tested. A metal setup gauge is used to space the brushes so they are the same measurement from front to back within the mantle. Brush width currently used at the National Tree Seed Laboratory is 23mm. As the nylon brushes wear the width needs to be adjusted.



Mantles:

The mantles are made out of square or round wire, perforated metal, or carborundum coated. The heavy square wire mesh has been used most frequently for conditioning native plants. Square wire is currently not made in the United States, so the mantles cannot be purchased separately from the machine. The mantle is not completely round which aids in the movement of the seed inside. The mantles perch on two metal prongs on each side near the funnel, and the discharge gate has a set of the same prongs which slide into the front of the mantle holding it in place. When the jacket is removed the mantle can be easily removed from the machine and cleaned. For most

native plants the best cutting action is achieved with the heavy square wire mantle and run at a high speed. Speed 11 out of a range of 1 to 12 is most frequently used. One exception was *Schizachyrium scoparium* (Michx.)Nash which was conditioned at speed 8 and the seed was run through the machine twice. Sometimes the seed does not completely separate from its other parts during the first run so more passes are necessary.



Species:

Many species of native plants can been conditioned with the machine. Conditioning orthodox seed(seed that can be dried below 10% moisture content) with wings, pods, awns, and husks works best. Orthodox seed of many wildflowers and native grasses have been successfully conditioned with the brush machine at the National Tree Seed Laboratory. The fleshy fruit of eastern redcedar *(Juniperus virginiana* L.) can be removed from seed, except the flesh gums up the machine and makes it hard to clean. Masceration is still recommended for fleshy fruited seed.

Conditioning protocols for several hardwood seed have been developed with this machine. Yellow-poplar cones (*Liriodendron tulipera,* L) can be broken apart and the samaras dewinged with at least two passes through the machine (Karrfalt 1992). Fine strings are left from the cutting action of the wing in its first pass necessitating more runs. Once the wing is removed, the seed becomes more flowable and can be further conditioned with a specific gravity table.

Yellow-poplar is notorious for having a low seed set. A separation between full and empty seed can be accomplished on the gravity table because empty seeds weigh less than full seeds. For example, a 1000 pound seedlot with 3% seed set will end up

to be 30 pounds after the gravity table removes the empty seed. The higher viability seeds are easier to sow and manage in the nursery beds which results in more uniform trees.

A difficult seed to clean, like the American sycamore fruiting heads (*Platanus occidentalis,* L), can be easily conditioned with the brush machine. The fruiting heads are broken up by the brushes rubbing them against the wire mantle (Karrfalt 1992). Dropping too many fruiting heads down the funnel at once can stop up the machine and break the brushes and metal paddles. The fine dust is sucked out by the vacuum cleaner and the user does not come in contact with the dust which may be harmful if inhaled. The individual achenes can be separated by weight with the specific gravity table.

Winterfat (*Eurotia lanata* (Pursh)Moq.) is a seed with hairs that can be successfully run through the brush machine (Karrfalt 1992). The fruit is a one-seeded utricle enclosed in 2 bracts each bearing fluffy white hairs. The pubescent, membranous pericarp is fused to the seedcoat. Again the rubbing action separates the hairs and bracts from the seed.

Winged seed, such as white ash (*Fraxinus americana* L) and green ash (*Fraxinus pennsylvanica* Marsh.), can be singularized and dewinged with the brush machine to produce a flowable product that can be upgraded with other seed equipment (Karrfalt 1992). The key to successful dewinging is to dry the seeds enough so the wings break off instead of bending. This way the wings are snapped and not shredded which may damage the embryo.

The brush machine can substitute for a mascerator for dry legumes such as honeylocust (*Gleditsia triacanthos* L) and redbud (*Cercis canadensis* L). The pods are easily shredded allowing clean seed to emerge out of the discharge gate. Dust is removed by the vacuum cleaner. Long pod parts mixed with the seed can be extracted with a indent cylinder.

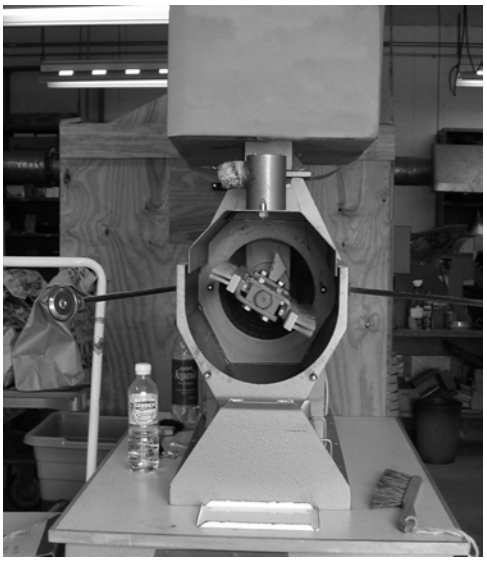
Seed Problems:

Soft coated seed such as red maple (*Acer rubrum* L.) and lacebark elm (*Ulmus parvifolia* Jacq.) can be easily damaged with the brush machine if run the same way as for hard coated seed. Sometimes the small seed falls through the holes in the mantle along with the fine particles and the larger seed emerges out the discharge gate with the larger chaff. Both bins have to be cleaned with aspirators, screens, etc. to extract the seed. For very small seed such as penstemon (*Penstemon canescens* (Britton) Britton), the brush machine is run without the vacuum so the seed is not

sucked away. In this case the machine should be operated in a well ventilated room or outside for the protection of the operators.

Cleaning:

The laboratory model of the brush machine is easily dismantled for cleaning between seedlots. There are no nooks or crannies for seeds to lodge which makes cleaning fast and easy.



The discharge gate is first removed by unscrewing the two metal arms that secure it to the body of the machine. The vacuum hose can be disconnected from the top jacket before it is lifted off exposing the mantles. Mantles are pulled straight out from the machine's body. Hand rubbing the wire mesh and vacuuming is all that is required for cleaning. Counter brushes come in handy for removing stray seed and chaff around the machine.

People of both sexes and all heights can easily use the laboratory model. Extensive training and supervision is not necessary to learn how to operate the machine; however, a two person operation is recommended – one person to stand on the ladder and dump seed into the hopper: the other person to observe the seed expulsion so the bins do not overflow.

Very small seed, such as *Campanula divaricata* Michr. and *Penstemon canascens* (Britton) Britton, are hard to see with the naked eye, therefore, magnifying equipment is needed to distinguish seed from chaff. Magnifying lamps, dissecting scopes, and microscopes are most commonly used for viewing seed. Magnifiers allow the operator to view the condition of the seed, and evaluate the conditioning operation. More passes through the brush machine or additional equipment may be needed to remove the

chaff.

Additional equipment:

When seed and chaff are mixed together from the brush machine operation, additional seed conditioning equipment is needed. Aspirators are used frequently to separate trash from seed. Robert Karrfalt, director of the National Tree Seed Laboratory, built the aspirator pictured here for use with wildflowers and native grass seed. A fan is positioned on the top of the box to draw air instead of blowing it upward. The negative pressure created draws the small particles into the box and the seed falls to the floor in a pan. With this aspirator a vibratory feeder delivers seed to the opening in the aspirator. Depending on the amount and size of trash mixed with seed, several attempts may be required to get the seed clean enough for sowing.

Large sticks can be removed with air screen equipment or hand screening. Seed and trash shape determine the type and size of the screen hole. Sticks and chaff that are longer than the seed are removed with an indent cylinder. Soil sieves come in handy for removing very small trash. Several sieve sizes and passes through the sieve may be needed to get the seedlot clean enough for sowing.

Conclusion:

The Westrup brush machine is ideal for conditioning a wide range of orthodox hardwood, wildflower, and native grass seed. Many parts of the machine are adjustable enabling the operator to customize the process for each species. The operator can adjust the flow rate of seed in the funnel, type of brushes used, speed of brush revolutions, brush width, mantle types, discharge gate opening, The laboratory model (LA-H) can condition small or large seedlots which is very useful at a nursery that handles many different size seedlots. The steel construction is very durable, so it should operate a long time. Parts are easy to replace. Assembly or disassembly can be performed quickly and requires minimal cleaning between seedlots. Extensive training and supervision are not necessary, so various skilled workers can operate the machine. The price is prohibitive which is a drawback.

The brush machine can be ordered in the United States from Westrup Inc. 1400 Preston Road Suite 400, Plano, TX 75093-5160, phone:972-985-7887, fax:972-985-7991, Email: westrupinc@aol.com. Website:www.westrup.com

Literature Cited

Karrfalt, Robert P. 1992. Increasing hardwood seed quality with brush machines . Tree Planters' Notes 43(2):33-35.