

All-pneumatic laboratory seed cleaner successful

by
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A laboratory seed cleaner and separator (a two-stage aspirator) has been developed at the Forestry Sciences Laboratory, Corvallis, Oreg., combining characteristics of the South Dakota blower and the Silen seed separator apparatus. The two-stage aspirator is constructed of Plexiglas tubing and uses a commercial vacuum cleaner to separate seed and debris. Coniferous seed lots of many species have been processed to 98- to 99-percent filled seed using this device.

There is a need for a convenient, compact, gentle seed-cleaning apparatus for small seed lots of various species. Beginning with hand dewinged seed and debris from tumbled cones, such a device should be able to prepare lots which are 98 percent or more filled and pure enough to sow by hand methods. To meet our needs for such a device, we have developed a two-stage aspirator (fig. 1) based on features of the South Dakota blower² (SDB) and a laboratory-scale seed separator developed by Silen (SA) ³ The first stage (SDB)

accomplishes most of the rough cleaning as a batch process, and the second stage (SA) separates filled and empty seed as a continuous process. Both are powered by vacuum from a commercial 1/4horsepower vacuum cleaner.

Equipment

The two-stage aspirator was constructed from Plexiglas tubing (4-1/2-inch outside diameter, 50 inches long for the center column (SDB); 2 3/4-inch outside diameter, 33 inches long for the left column (SA)). A vacuum cleaner regulated by a laboratory rheostat is connected to the right column, and a seed container of about 1-quart capacity fits into a cutout section of the SDB (fig. 1). The various Plexiglas pieces were cut by the dealer, then assembled by laboratory technicians using Plexiglas cement. The entire mechanism is secured on 1/2-inch Plexiglas, then mounted on a wooden support. The cost of the Plexiglas is under \$75. The vacuum, rheostat, vibrator, wooden support, and the cutting of the Plexiglas are additional costs.

Operation

All seed is processed similarly. In Douglas-fir for example, large debris is first removed by screening through a 1/2-inch hardware cloth. After handdewinging, the seeds and small remaining debris are then placed in the SDB container after the SA is closed with a large rubber plug. The Vacuum rheostat begins at 20-percent capacity,

then is gradually raised. Depending upon the species, the highest setting for the SDB is between 32- and 60percent capacity (table 1). The needles, wings, bracts, etc. are drawn into the vacuum cleaner, leaving filled and most empty seeds and debris with similar aerodynamic characteristics in the SDB. The vacuum motor is then turned off.

For final separation, the filled and unfilled seeds from the SDB are placed in the vibrator with the SDB plugged. The vacuum rheostat is set between 22- and 60-percent capacity, and the filled seed enters the venturi of the SA. Mostly filled seed fall into the cup below. Cull seeds are drawn over to the SDB, and lighter trash material is pulled into the vacuum cleaner. A sample of seed is cut from each fraction. The rheostat is adjusted, if needed, providing more or less air to further purify the filled seed fraction or to salvage lightweight filled seed from the SDB fraction. Unless there is need for reseparator, filled but lightweight seed is discarded after it is pulled over into the SDB.

Test Results

With seed lots of very high filled-seed percentage, separation to more desirable percentages can sometimes be obtained by using the SDB mechanism alone at higher rheostat settings (see footnote 2 of table). The entire process for a quart-size lot of seed requires between 1 and 3 minutes.

Trials using the two-stage aspirator

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² E. L. Erickson. The South Dakota seed blower. Proc. 35th Annu. Meet. Assoc. Off. Seed Anal., p. 92-95, 1944.

³ Roy R. Silen. A laboratory seed separator. Forest Sci. 10 (2):222-223, illus., 1964.

MODIFIED
SILEN SEED
SEPARATOR

MODIFIED
SOUTH
DAKOTA
BLOWER

VIBRATOR

VENTURI

SEED CONTAINER

WIRE SCREEN

VACUUM

RHEOSTAT

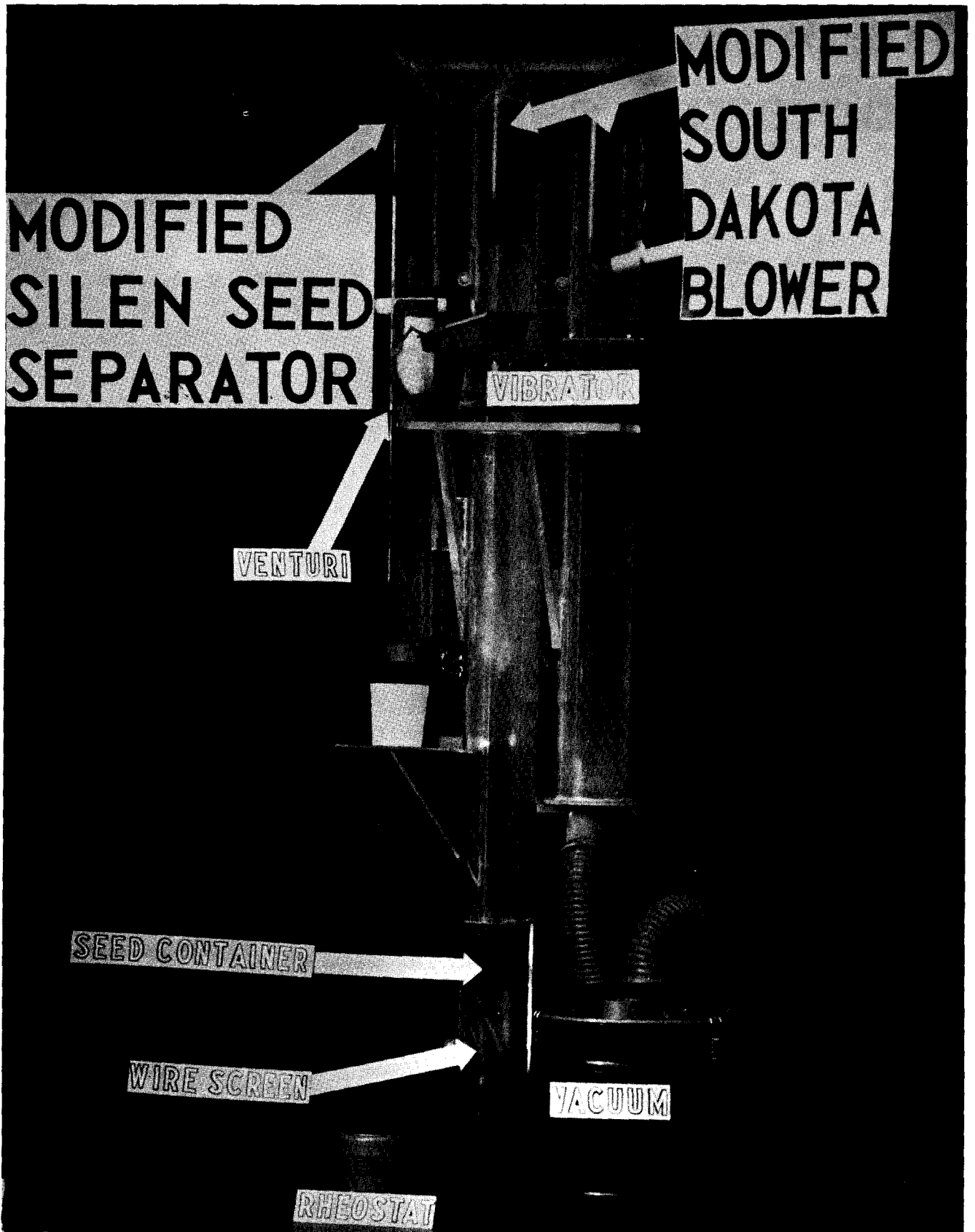


Figure 1.-Two stage laboratory seed cleaner combines the principles of the south Dakota blower and and Silen seed separator to accomplish fairly complete seed cleaning a single all-pneumatic machine.

on species shown in table 1 indicate that over 98 percent filled seed lots are attainable for conifer seed ranging from 4,500 to 300,000 seeds per pound. Since the final rheostat setting was only 60 percent of the vacuum capacity, even heavier seed than California red fir

(*Abies magnifica*) could probably be handled.

Since only air separation is involved after an initial screening and hand dewinging, this process is a gentle one. However, a small percentage of needles and pitch usually remain in the final

product. Minor amounts of such impurities are ordinarily quite acceptable in seed lots for our laboratory needs. Some additional machine separation techniques or hand separation would be required for complete trash removal. In a season of use by personnel of both our laboratory and the Siuslaw National Forest, the major advantage found over fanning and screening devices previously used was the gentle processing, speed of operation, and compactness of the apparatus.

TABLE 1.—Seeds per pound and filled-seed percentages before and after processing for various species cleaned with the two-stage aspirator

Species	Seeds per pound	Filled seed before cleaning	Rheostat setting ¹		Filled seed after cleaning ²
			South Dakota blower (SDB)	Separator apparatus (SA)	
		Percent			Percent
<i>Abies magnifica</i>	4,500	78	51	60	98
<i>Abies procera</i>	7,400	80	48	35	98
<i>Pseudotsuga menziesii</i>	42,000	88	43 (60) ³	—	98
<i>Pseudotsuga menziesii</i>	42,000	26	43	27	99
<i>Pseudotsuga menziesii</i>	42,000	73	43	22	99
<i>Picea stichensis</i>	200,000	72	35	14	98
<i>Tsuga heterophylla</i>	300,000	85	32	12	99

¹Rheostat setting is in percent voltage capacity (110V) applied to the vacuum machine.

²Filled-seed percent could be raised to 100 percent by increasing air velocities of the SA. Range of 98-99 percent represents desirable compromise between seed purity and loss of light but filled seed.

³A resetting of the rheostat (shown in parentheses) eliminated the use of the SA.

