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Table 2. Mean squares from analyses of variance of injury scores† for two diallels of alfalfa which were subjected to polluted, ambient, greenhouse air.

Source of variation	df	Mean squares
Four-parent diallel (Diallel 1)		
General combining ability	3	156.14**
Specific combining ability	2	17.16**
Maternal effects	3	5.56*
Reciprocal effects	3	8.43**
Error	93	1.57
Five-parent diallel (Diallel 2)		
General combining ability	4	147.00**
Specific combining ability	5	6.08*
Maternal effects	4	4.41 ns‡
Reciprocal effects	6	1.42 ns
Error	171	1.96

*,** F value significant at 0.05 and 0.01 levels. † Scored 0 to 9: 0 = no injury, 9 = severe foliar necrosis. ‡ ns = not significant.

variance (4); however, tolerant alfalfa strains were developed using simple recurrent selection in greenhouses at Beltsville, Md. (5). Specific combining ability was highly significant and significant in Diallels 1 and 2, respectively, indicating that progress might also be made using hybridization. Maternal and reciprocal effects for Diallel 1 were significant and highly significant, respectively. These effects could have been caused by differential selfing (2). Maternal effects also could be attributable to cytoplasmic inheritance. However, neither maternal nor reciprocal effects were a large source of genetic variation.

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DELINTING SMALL SAMPLES OF COTTON SEED WITH DILUTE SULFURIC ACID[1]

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ABSTRACT

The current procedure of using concentrated sulfuric acid to prepare numerous small samples of cotton seed for planting is tedious and is hazardous to both the seed and the technician. A dilute sulfuric acid process was adapted to delint small samples of cotton (*Gossypium hirsutum* L.) seed. Three to four hundred samples per day, each ca. 80 g of fuzzy seed, can be delinted using this process. More than 6,000 small samples were delinted and planted in 1976; germination was not affected.

***Additional index words:* *Gossypium hirsutum* L.**

THE adaptation of the dilute sulfuric acid process for industrial delinting of cotton seeds (Jones and Slater, 1976) to small samples of cotton seeds is reported. Cotton seeds were placed in individual containers for delinting. A reusable 2.5 × 2.5 cm heat engraved polypropylene tag was placed in each container to identify the sample. We used wide mouth 500-ml polypropylene bottles with the entire surface perforated with holes 3 mm in diameter located on 8-mm centers. This size container, which holds up to 80 g of fuzzy seed, allowed us to process 35 samples each cycle. Larger or smaller containers, with appropriate holes, can be used depending on the size of the cotton seed sample. The capped containers were then submerged in a tank containing a dilute (10%) sulfuric acid solution. A surfactant, Triton X-100[3] (any good non-ionic or anionic surfactant would have done equally well) at 0.15% by volume was added to the acid to assure complete wetting of the fuzzy seeds. The containers were removed from the tank after ca. 10 min (this allowed for adequate seed wetting) and were placed in an automatic, home-laundry type, washing machine. The machine's spin cycle was used to remove the excess acid from the fuzzy seed.

Containers were removed and placed in a home-laundry-type electric dryer set at 62 C. The temperature during linter removal must be carefully controlled. Jones and Slater (1976) reported that 65.6 C should not be exceeded during the linter removal or drying process. Jensen et al. (1952) reported that a temperature of 71.1 C could destroy viability of the seed; therefore, temperature should be monitored closely.

The dryer had an auxiliary, high-pressure direct-drive blower (1/3 HP, 19.68-cm diameter radial blade wheel) connected to the exhaust system to aid in the movement of air through the dryer. This increased air movement was necessary for the removal of linters from the dryer. The exhaust air from the dryer was passed through a scrubber that removed the linters and diluted the acid associated with them. Four 242-liter steel barrels were welded together to form the scrubber. Five spray nozzles (6× cone-type) were mounted in the scrubber to insure adequate mist in the chamber. The water from the scrubber was piped into a storm drain, which had a screen filter installed to remove the linters.

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[3] Mention of a trademark or proprietary product does not constitute a guarantee or warranty of the product by the USDA and does not imply its approval to the exclusion of other products that may also be suitable.

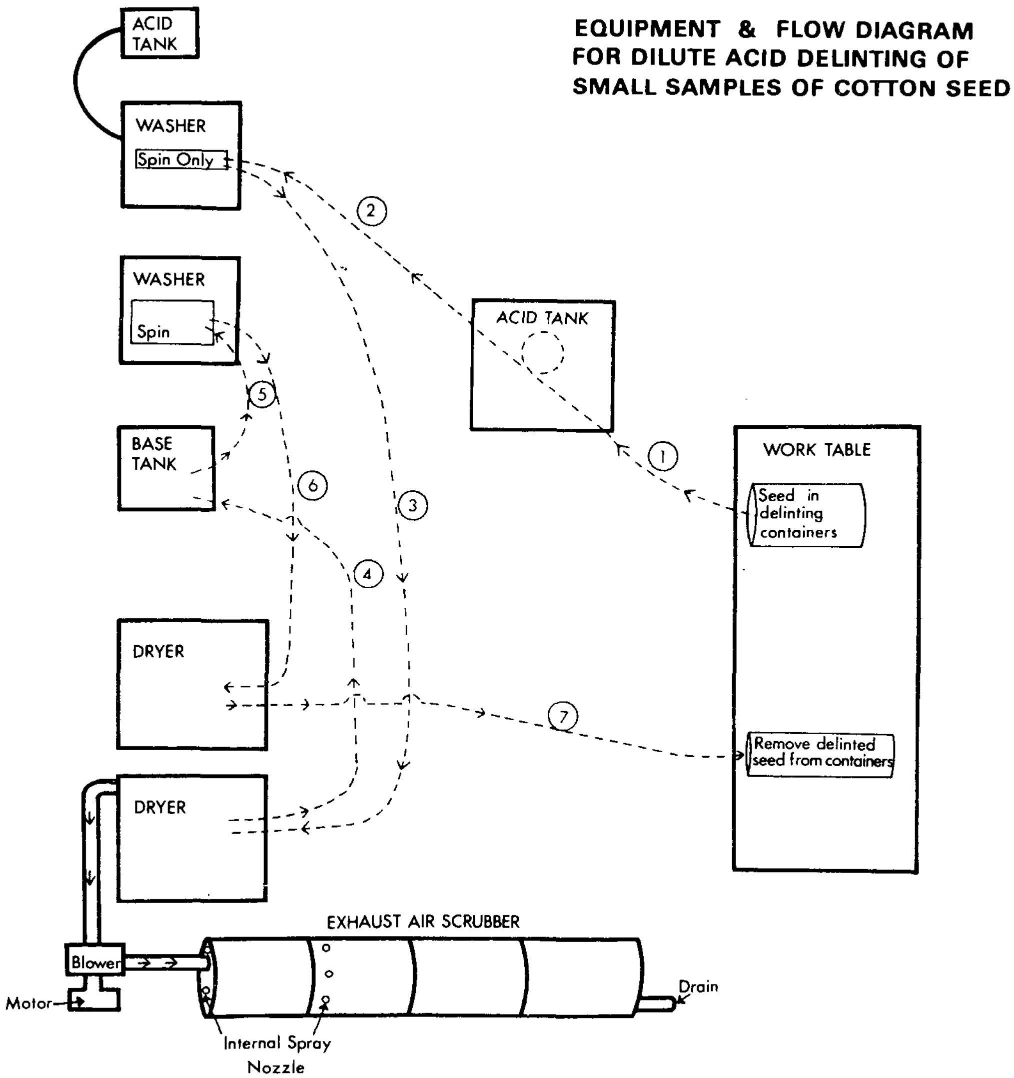

Fig. 1. Equipment and flow diagram for dilute acid delinting of small samples of cotton seed. The numbers and arrows represent the sequence and direction of delinting samples.

After the linters were completely removed (30 to 40 min) the containers were dipped in a base (saturated solution of bicarbonate of soda) to neutralize the remaining acid. Containers were then placed in the washer for a spin cycle to remove excess solution. From the washer, the containers were placed in a dryer (37 to 55 C) until the seed were dry (10 to 12% moisture). The dry seed were then removed from the containers and placed in storage bags. (See Fig. 1 for a flow chart of the process.)

Arndt (1954) reported that seed cotton with a moisture content of 16 to 18% could be dried to 10% in 20 min without reducing germination. The removal of the same amount of water in a shorter period resulted in lower germination. The moisture content of the seed before the final drying in our process ranged between 17 and 20% and the drying time ranged from 15 to 20 min.

Three to four hundred samples were delinted daily using the dilute acid delinting process. To obtain this capacity two washers and two dryers (Fig. 1) were used. If a limited number of samples are to be delinted, one washer and one dryer may be adequate. More than 6,000 small samples of seeds were prepared in 1976 and field planted ca. 2 to 4 weeks after delinting. We observed no adverse effects from the dilute acid delinting process.

The dilute acid delinting process described effectively delinted small samples of cotton seed. Waste disposal was minimized because the dilute acid was recycled. Risks to workers and equipment should be reduced because dilute acid is safer and less corrosive than concentrated acid.

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