Table 1.—Reactions of Michigan Amber, Coker 47-27 and their
F₃ progenies to leaf rust in the field.

<table>
<thead>
<tr>
<th>Variety or cross</th>
<th>No. of plants or lines</th>
<th>P from χ² for goodness-of-fit to a 1:2:1 ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Resistant</td>
<td>Segregating</td>
</tr>
<tr>
<td>Michigan Amber</td>
<td>63</td>
<td></td>
</tr>
<tr>
<td>Coker 47-27</td>
<td>70</td>
<td></td>
</tr>
<tr>
<td>Michigan Amber × Coker 47-27, F₃</td>
<td>24</td>
<td>71</td>
</tr>
</tbody>
</table>

races were scattered in border rows and infected potted plants were set in several places throughout the nursery.

Though the cross segregated for reaction to powdery mildew, development of mildew in the F₃ nursery was so irregular that a genetic analysis could not be made.

In the F₂ generation grown in 1953, a ratio was obtained of 67 resistant and highly resistant to 13 intermediate to 40 susceptible plants. There were too many susceptible plants for a good fit to a one factor pair segregation. No other genetic explanation seems apparent. The observations obtained in 1954 on F₃ lines are summarized in table 1. One major factor pair governing leaf rust reaction and dominance of the resistant reaction was indicated by the F₃ data. There were 24 lines of doubtful classification. Four of these lines were considered susceptible though each contained one or two resistant plants. These resistant plants might have been due to natural crossing or mechanical mixing. Eighteen of the segregating lines contained more susceptible than resistant plants. Sampling variation may have accounted for this type of divergence from expected. Segregation for an inhibitor factor entering the cross from the susceptible parent could also be postulated and various expected ratios obtained. The exact ratio would depend upon whether the inhibitor was inherited independently, closely associated with a resistance factor carried by both parents, or was linked with a susceptibility factor in Michigan Amber allelic to one of two resistance factors possessed by Coker 47-27. Expected ratios based upon these three possibilities did not fit the data within reasonable limits.

Hashim's study of the resistance of Frontana to a collection of leaf rust races in the field revealed a two duplicate factor difference in the cross Newthatch × Frontana and a one factor difference in the cross Thatcher × Frontana. Thatcher was thought to carry one resistance factor closely linked with an inhibitor. Frontena was the sole source of resistance to leaf rust in both Frontana and Coker 47-27, the other parent of each variety having been susceptible. In the crossing of Frontana with Coker 47-27, one major factor pair governing leaf rust reaction and dominance of the resistant reaction was indicated by the F₂ data. There were 24 lines of doubtful classification. Four of these lines were considered susceptible though each contained one or two resistant plants. These resistant plants might have been due to natural crossing or mechanical mixing. Eighteen of the segregating lines contained more susceptible than resistant plants. Sampling variation may have accounted for this type of divergence from expected. Segregation for an inhibitor factor entering the cross from the susceptible parent could also be postulated and various expected ratios obtained. The exact ratio would depend upon whether the inhibitor was inherited independently, closely associated with a resistance factor carried by both parents, or was linked with a susceptibility factor in Michigan Amber allelic to one of two resistance factors possessed by Coker 47-27. Expected ratios based upon these three possibilities did not fit the data within reasonable limits.

In LEGUME breeding work, many small lots of seed, ranging from a few to several hundred seeds in number, are scarified before planting. As these seeds are produced by hand crossing or selfing, it is important to avoid loss or damage to the seed. The scarifying cup, lined with emery cloth and using a blast of compressed air, has been designed and used successfully for scarifying small lots of seed of alfalfa, sweetclover, and birdsfoot trefoil. Apparently it can be used for scarifying seed of seeded legume.

The scarifying device, consisting of a cup, an air inlet tube, was constructed by personnel of the Instrument Shop, Iowa State College, at a cost of approximately $15 for labor and materials. The cup was made of O.D. brass tubing with a brass disc soldered for a bottom. The cap was made of a perforated brass disc soldered to a ring of 2 1/4-inch I.D. brass tubing fitted over the cup. A pin and slot arrangement was used to lock the cap securely to the cup. Two locking pins were placed on opposite sides of the cup slightly above the cap. A push-twist motion of the cap allows the cap ring to interlock with the pins of the cup to provide for a compressed air inlet, the center of which is drilled (11/32-inch drill) to admit a 1/4-inch O.D. brass tube with a 1/16-inch orifice tipped brass tube. Thin-walled rubber tubing was used as an air escape from the cup, 124 holes were drilled in a symmetrical pattern around the brass tube and the inlet hole of the cap. Fewer holes did not allow sufficient air escape rate. Size of the holes should be determined by the size of the seed to be scarified.

The major items required for operation are listed in order from the source of compressed air to the air inlet nozzle (figure 1), are: air hose, pressure regulator and gauge, shutoff valve, and thin-walled rubber tubing. The adjustments found to be appreciably greater than that of the sides, the air inlet nozzle must be precisely fitted to prevent wedging of seeds in the seams. Since the rate of wear of the bottom lining was found to be appreciably greater than the sides, additional bottom linings will be needed.

The bottom and the sides of the cup were lined with 60-grit emery cloth. A circular piece was cut from the bottom and a rectangular piece to the sides, and fitted to the proper size to be scarified satisfactorily. The seed was scarified by placing the seed in the cup and rotating the cup 10 to 20 times. The scarifying time varied from 30 seconds to 2 minutes, depending on the size of the seed. Fewer holes did not allow sufficient air escape rate for labor and materials. The cup was 2 1/4 inches in diameter, and the bottom and sides of the cup were lined with 60-grit emery cloth. A circular piece was fitted to the bottom and a rectangular piece to the sides, and fitted to the proper size to scarify seed of any small-seeded legume.