INTRODUCTION

Green baby lima beans are the keystone crop for Delaware processing vegetable growers. In 2004 and 2005 Delaware planted over half of the US green baby lima bean acreage. The availability of green baby limas in Delaware has kept regional processors interested in Delaware growers and has attracted new processors to the state. Regional processors are increasing baby lima acreage in 2008.

Fordhook lima beans for processing are currently produced almost exclusively in Ventura County, CA. Delaware growers and regional processors are interested in producing Fordhooks in the East; however, the currently available Fordhook varieties produce poorly in Delaware.

Another class of limas of interest in the state is the large seeded pole limas. Pole limas are grown commercially by numerous fresh market growers in Delaware and bring premium prices at farm markets.

Baby Lima Bean Breeding
Breeding of baby lima beans in Delaware was initiated in 2004. In 2008 about a dozen baby lima lines from the Delaware breeding program will be included in the replicated lima variety trial. A project is also underway to develop baby lima lines that are homozygous resistant to lima bean downy mildew \textit{(Phytophthora phaseoli)} races E and F. Resistance to each race is conferred by a single dominant gene.

Fordhook Lima Bean Breeding
Breeding of Fordhook lima beans in Delaware was initiated in 2005. Some promising F4 lines and F2 plants were selected in the field in 2007. The F6 and F4 generations from these selections will be grown in the field in 2008, as well as additional F2 Fordhook crosses.

Hybrid Pole Limas
Pole limas are typically planted on a trellis with four to six feet between plants. It is not uncommon for growers to transplant, rather than direct seed, pole limas. In 2006 some pole lima crosses were made and the F1 hybrid plants were grown in the greenhouse. We experimented with propagating these hybrid plants by taking cuttings. A few F1 hybrid plants, successfully propagated from cuttings, were grown in two different locations in summer 2007. More pole lima F1 hybrids are being generated for testing in summer 2008.

Lima Bean Mapping Populations
Three lima bean RIL populations are under development for future genetic mapping. The F4 generations of these populations were grown in the greenhouse in fall 2007.
Table 1. Parents of the three lima bean mapping populations.

<table>
<thead>
<tr>
<th>Cultivar</th>
<th>Growth Habit</th>
<th>Seed Size</th>
<th>Seedcoat Color/Pattern</th>
<th>Origin</th>
<th>Downy Mildew Resistance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bridgeton</td>
<td>Determinate</td>
<td>Small/Flat</td>
<td>Green/Self</td>
<td>Mesoamerican</td>
<td>Resistant to races A, B, D &amp; E</td>
</tr>
<tr>
<td>Dr. Martin</td>
<td>Indeterminate</td>
<td>Large/Flat</td>
<td>Greenish-white/Self</td>
<td>Andean</td>
<td>Reaction unknown</td>
</tr>
<tr>
<td>Fordhook 242</td>
<td>Determinate</td>
<td>Medium/Thick</td>
<td>Greenish-white/Self</td>
<td>Andean</td>
<td>Susceptible</td>
</tr>
<tr>
<td>Jackson Wonder</td>
<td>Determinate</td>
<td>Small/Flat</td>
<td>Buff &amp; dark purple/Speckle</td>
<td>Mesoamerican</td>
<td>Susceptible</td>
</tr>
</tbody>
</table>

Segregation for observable phenotypic traits is apparent in all three populations. The Dr. Martin x Bridgeton population segregates for seed size, seedcoat color, and plant habit, including determinate/indeterminate growth habit. Indeterminate growth habit is conferred by a single dominant gene in this population, based on the segregation ratio in the F2 generation ($\chi^2$ p-value =0.53 for a 3:1 ratio). This inheritance pattern in lima beans was reported previously by Erickson (1992). The Bridgeton x Fordhook 242 population segregates for seed size, seed thickness, seedcoat color and plant habit.

The Bridgeton x Jackson Wonder population segregates for seedcoat color, seedcoat pattern and plant habit. Self-colored seedcoat is conferred by a single recessive gene in this population based on the segregation ratio in the F2 generation ($\chi^2$ p-value =0.21 for a 3:1 ratio) and the fact that plants with self-colored did not segregate for seedcoat pattern in subsequent generations. One of the parents of this cross, presumably Jackson Wonder, carries genes conferring red and light purple seedcoat colors. It also seems that the red/purple seedcoat color genes are tightly linked to the gene for the speckled seedcoat pattern, as there are no self-colored red, dark purple or light purple seeded plants in the hybrid population. The dark purple and buff seedcoat colors appear to be dominant to the other seedcoat colors.

Plants with crinkled leaves, stunted growth or sterile racemes were observed in the two populations generated from Andean x Mesoamerican crosses (Dr. Martin x Bridgeton and Bridgeton x Fordhook 242). Plants with crinkled leaves and stunted growth were also reported by Erickson (1992) in populations derived from crosses between U.S. baby lima cultivars and indeterminate accessions from Brazil. Some of the stunted plants in our lima mapping populations recovered and produced seed after treatment with napthaleneacetic acid, similar to the method used for P. vulgaris dwarf lethal plants described by Beaver (1993).

REFERENCES
