Chilling injury is a physiological disorder which occurs when seeds are sown in cold and wet soils in the field. Symptoms associated with this disorder are reduced germination, seedlings with less emergence force and poor seedling establishment (3). Imbibition is the period of germination in which the seeds are sensitive to chilling injury (1). Seeds with low initial moisture content, less than 8% (fresh weight basis), are more susceptible than high moisture content seeds (1).

There are several methods that could be employed to alleviate chilling injury. This discussion will focus on manipulation of the seed rather than the soil environment. One method to reduce this problem is to increase the seed moisture content prior to sowing (1). There are, however, logistical problems in humidifying large quantities of seeds on a commercial basis. Another strategy is to reduce the initial imbibition rate which caused the injury.

There are genetic differences in seed coat characteristics that influence imbibition rate. Research has been conducted on the susceptibility of semi-hard bean seeds (SHS) to imbibitional chilling injury (4). SHS are those seeds that imbibe water slowly when the initial seed moisture is 8% or less. SHS hydrate readily when the moisture content is above 10%. It was found that SHS were not injured when subjected to a cold and wet environment, even when the initial moisture content was 8%. SHS appear to avoid chilling which was attributed to slow imbibition rates.

A seed technology approach to decrease seed coat permeability and alleviate chilling injury is to treat seeds with a material which would retard imbibition. In this manner, commercial cultivars that are susceptible to chilling may be treated rather than relying on long term plant breeding projects.

Soybean, cotton and corn seeds have been coated with lanolin to reduce chilling injury (2). Improvements in seedling establishment were observed in soybean and cotton but not corn. Though the technique was generally successful, the treatment was not practical. The lanolin was applied in acetone heated to 55°C and the seeds were cooled to 2-4°C prior to treatment.

Research has been conducted to develop a practical hydrophobic seed coating to alleviate chilling injury. Polymeric solutions were obtained from Gustafson Inc. (Dallas, TX) and applied on snap bean 'Bush Blue Lake 47' seeds in a tumbling drum apparatus. It was found that a small quantity of sand added during tumbling reduced agglomeration of seeds. A chilled germination test was performed on seeds with 8% initial moisture content (3). Polymeric coatings improved germination compared to non-coated seeds, however, improvements were slight (Table 1).
Table 1. Chilled germination of coated BBL-47 seeds with 8% moisture content.

<table>
<thead>
<tr>
<th>Coating</th>
<th>Rate</th>
<th>Additive</th>
<th>Percent</th>
<th>germination</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>-</td>
<td>-</td>
<td>34</td>
<td>34</td>
</tr>
<tr>
<td>Polymer</td>
<td>2%</td>
<td>-</td>
<td>36</td>
<td>36</td>
</tr>
<tr>
<td>Polymer</td>
<td>2%</td>
<td>sand</td>
<td>43</td>
<td>43</td>
</tr>
</tbody>
</table>

The purpose of the coating is to retard water uptake during the early phases of germination. To achieve this goal, it is necessary to have uniform coverage of the polymer over the entire seed surface. A Hitachi S-530 scanning electron microscope was used to observe the uniformity of the polymer coating on seeds. Scanning electron microscopy revealed that the polymer was not evenly deposited over the hilum and around the hilum (Fig. 1). This lack of uniformity would result in uneven hydration through the seed tissue.

Figure 1. Lack of uniformity of polymer covering the hilum and the area around the hilum.

References