The Anderson Research Grant Program
2001 – 2003

**Project Title:** Storability Measurement of Shelled Corn as a Means of Improving Stored Grain Management Practices and Preventing Losses.

**Principal Investigator(s)**

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<th>Name</th>
<th>Institution/Agency/Other</th>
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<td>Richard Stroshine</td>
<td>Purdue Univ., Dept. of Agric. &amp; Biol. Engr.</td>
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Note: Although there are no other principle investigators, there several collaborators as described in the section on collaboration.

(Attach an additional sheet is more space if needed.)

**Project Contact:**

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**Period of Proposed Project Dates:**

Beginning: June 1, 2002  Ending: May 31, 2004

Amount Requested (maximum $20,000 per year for two years):

Year 1: $20,000  Year 2: $20,000

**Anderson Research Fund - Research Proposal Budget**
Problem Identification and Related Research

Fungal growth reduces the nutrient value of grain, consumes dry matter, and produces potentially harmful mycotoxins. The majority of grain bought and sold in the United States is co-mingled. As a result, elevator managers usually have little information on factors that affect propensity for invasion by storage fungi, such as how long and under what conditions the grain was stored prior to arrival at their facility. They have no good method of measuring or predicting the likelihood of spoilage and rely on experience and the moisture content when assessing risk. Then they monitor the grain condition using visual inspection, probe sampling, and temperature sensors that detect heating associated with spoilage. This research will develop tests that will permit better management of stored shelled corn by assessing its storability. For purposes of this proposal, storability will be defined as the likelihood that fungal growth will not occur during subsequent storage or shipment if the shelled corn is subjected to conditions conducive to fungal growth. Although this project involves only shelled corn, for which fungal deterioration is a major concern, the techniques developed could be adapted for use on other grains.

A test that could quantify the storability of shelled corn would help the manager of a grain storage facility to determine whether corn presently in storage can remain in storage or withstand stress during shipment to distant markets. Shelled corn that is found to be low in storability could be utilized before it deteriorates. Processors could use the storability test to help them decide whether they can safely hold the corn in storage for processing at a later date. When shelled corn is shipped overseas, particularly to tropical climates, it can be subjected to warm, high humidity environments conducive to fungal growth. In such situations, a test of storability would be particularly beneficial. If rapid tests (<15 min) for storability could be developed, they could be utilized by exporters and the Grain Inspection, Packers and Stockyards Association (GIPSA) to monitor the condition of grain intended for shipment overseas.

This project will evaluate a 3-day test for storability along with several rapid tests that, when taken together could provide a quick, albeit less precise, prediction of storability. The 3-day test involves a simple and cost-effective technique for monitoring carbon dioxide (CO₂) evolution in a rewetted sample of corn. It is described in more detail below. The “rapid” tests are electrolyte leakage, Near Infrared Reflectance (NIR), breakage susceptibility, and kernel and pericarp damage. Results of these tests will be examined for their correlation with more rigorous storability indicators (ergosterol content and percent kernel infection) in an effort to determine which tests or combination of tests are good indicators of shelled corn storability. Background information justifying the choice of these tests is provided in subsequent paragraphs. Those rapid (<15 min) tests that are correlated with storability could serve as broad indicators used to screen samples and identify those with the greatest potential for deterioration. More thorough, although slower, test kit evaluations could then be used to verify or negate the results of the screening tests.

Both the slower 3-day storability test and the more rapid screening tests would benefit the industry. A 1993 survey of 124 randomly selected elevator managers indicated that 9% would use a storability test if it required 3 days to complete (Marks et al. 1994). The percentage increased to 61% for a test that could be completed in 15 minutes or less. However, it seems likely that a substantial percentage of managers (more than the 9%