SHELLED CORN STORABILITY AND QUALITY

Richard Stroshine, Project Leader

Cooperators:

D.E. Maier, *ABE*; C.W. Woloshuk, *Botany & Plant Pathology*; LW. Seitz, *US Grain Marketing Research Laboratory*, M.W. Paulsen, *University of Illinois*.

Graduate Student:

Dale Moog

Goals:

- To develop techniques for measuring shelled corn storability.
- To determine typical values and ranges of storability of shelled corn found in marketing channels.

Recent Publications:

Moog, D.J.P., R.L. Stroshine, M.R. Paulsen, L.M. Seitz, and C.P. Woloshuk. 2004. Storability Measurement of Shelled Corn. Paper presented at the International Quality Grains Conference, July 19 to 22, 2004 in Indianapolis, Indiana.

Statement of Problem:

Storage fungi can grow on shelled corn during storage and shipment, decreasing the value of the corn and making it unfit for many end uses. These losses could be reduced or prevented if methods were available for rapidly determining the corn's "storability." (Storability refers to the susceptibility of the shelled corn to invasion by storage fungi.) Shelled corn found to be more susceptible to mold invasion could be utilized appropriately, before its quality deteriorates.

Current Activities:

Several methods for measuring shelled corn storability are being evaluated. One common method involves measurement of the carbon dioxide (CO_2) produced by the growth of fungi on the corn kernels. In the early 1990's an accelerated storage test was developed in which samples were re-wetted to 22% moisture and incubated at temperatures conducive to fungal growth. The CO_2 production rate was measured for the first three days after re-wetting and used as an indicator of storability. Currently, a relatively simple test kit developed by Woods End Research Laboratory (Mt. Vernon, Maine) is being adapted for use in measuring storability by means of the accelerated storage test procedure. At the present time, the kit is being used for determining fungal activity in soil and compost. The procedure being used for shelled corn involves rewetting a 100 g sample to either 16% or 21% moisture and placing it in a sealed jar. In tests at 21% moisture, a plastic "paddle" is inserted into the jar after 48 hours. This is replaced with a new paddle after 72 hours. The paddle is coated with a film (Figure 1) that changes color in response to changes in CO_2 concentration. The color change is quantified by comparing the film color to colors on a card supplied with the kit. A more rapid change in color number indicates greater CO_2 production and therefore more rapid fungal growth and greater susceptibility to fungal invasion. Plots of color number versus

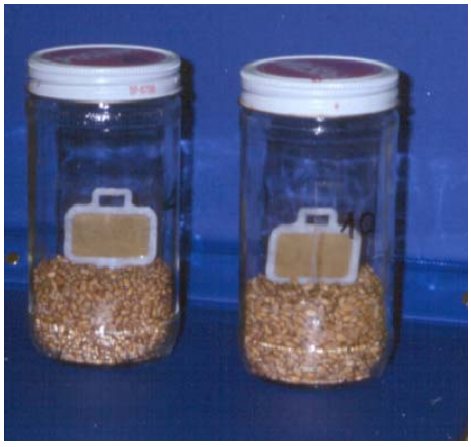

Figure 1. One pint jars containing shelled corn samples and CO_2 indicator paddles.

incubation time for four samples of shelled corn are shown in Figure 2. Note the differences in the color numbers 72 and 73 hours after rewetting. These are indicative of differences in CO_2 production and therefore differences in susceptibility to invasion by storage mold (storability). The test kit is being used to evaluate samples of shelled corn collected from research facilities, elevators and grain inspection services. These samples have a wide range of storability and the kit has revealed those differences. Furthermore, the differences are consistent with expectations based on storage history. Modifications to the procedure are also being evaluated. These include use of a spectrophotometer to quantify the color changes in the gel indicator.

The same samples evaluated with the test kit are also being evaluated using several rapid tests that may give an approximate indication of storability. All of these tests can be conducted in 15 minutes of less. They include percent weight of fine material and damaged kernels, electrolyte leakage and Near Infrared Reflectance (NIR-R). Correlations between these tests and more rigorous storability indicators (CO_2 evolution, ergosterol content, percent kernel infection) are being examined. The objective is to determine whether a combination of two or more of these measurements will give a general indication of shelled corn storability. If this is the case, the rapid tests could be used to screen samples and identify those with the greatest potential for deterioration. The slower yet more accurate test kit evaluations could then be used to verify the results of the screening tests and to provide a quantitative measure of storability.

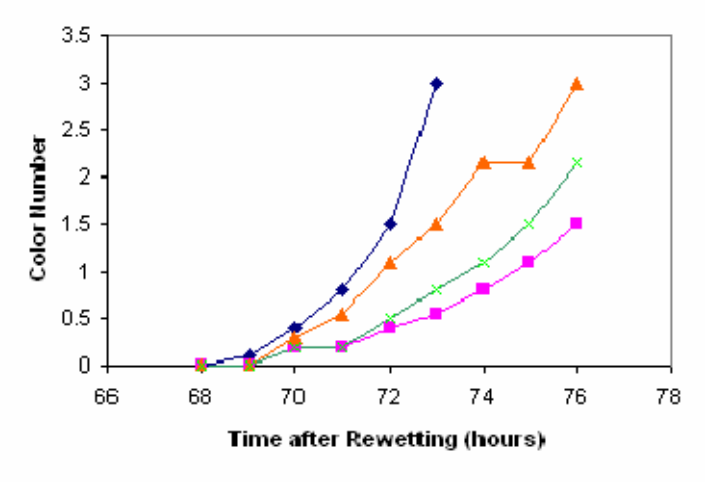

Figure 2. Graph showing color number versus time after Rewetting for four samples of shelled corn with different