

# **Acquisition of SDmatic Apparatus for Measurement of Starch Damage**

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## **Principal Investigators**

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## **Purpose:**

The purpose of the request is to acquire the SDmatic Apparatus for the measurement of damaged starch in flour.

The recovery of flour ingredients from wheat during processing is not without deleterious effects. High speed rollers and mechanical disruption of the wheat kernel bring about some damage to starch granules. While milling procedures are designed for maximum recovery of starch and the minimum inclusion of bran, they invariably result in a small but significant amount of starch damage. Regardless of what type of milling is used 5 to 12% of the starch granules are damaged (Viot 1992). This in turn changes flour characteristics in dough mixing and bread baking. This phenomenon is also true for the production of noodles and tortilla which are also sensitive to small changes in starch chemistry.

The SDmatic uses a method of analysis based on the work of Metcalf and Gilles (1965) to measure the damaged starch in flour. It uses an amperometric method. The technique consists of measuring the amount of iodine absorbed by the starch in a solution at a temperature of 35°C. The probe generates and electrochemically measures the amount of iodine complexed with the starch moiety. Weak values indicate high levels of damaged starch.

The test requires only 1 gram of flour, is totally automated and performs the full analysis in less than 10 minutes.

The SDmatic is a new apparatus, it is more user-friendly and much more precise and accurate than other techniques. It removes the liquid solution dependence of testing by working with granular chemicals, reduces the need of external accessories, operates under completely controlled conditions and self-calibrates at the beginning of each test.

## **Justification:**

Numerous flour quality tests focus on the quality and quantity of the flour protein. Since starch accounts for more than 75 percent of the flour, starch quality is also very important to flour and end product quality. Starch represents 67-68 percent of the wheat kernel and 78-80 percent of the flour. The milling of wheat causes physical damage to a proportion of the starch granules of the flour (5-12 percent). The level of starch damage directly affects the water absorption and the dough mixing properties of the flour and is of technological significance. Damaged starch absorbs 2 to 4 times more water than regular starch granules. Sticky doughs, high water absorption, longer proofing times, and red bread crust color are just some of the effects of

damaged starch. Damaged starch granules are susceptible to enzymatic degradation in comparison to native starches.

Starch damage will have a strong influence on most dough and baking processes. Therefore it will affect the quality of most finished product. Better knowledge of levels of damaged starch in flours is essential for better screening of flour and breeding lines.

Both the Spring and Winter Wheat Breeding Programs at SDSU will use this instrument in evaluating all of their lines. They will be able to use that information to identify which lines are more appropriate for the production of different end products (tortillas, bread, noodles, flat breads, etc.).

This is an official method of the American Association of Cereal Chemist International (AACC Method 76-33).

Figure 1. SDmatic apparatus

