Investigation of Instrumental Measurements to Determine Aflatoxin in Florisil Columns

ABSTRACT

Investigation has shown that fluorescence of aflatoxin, in small columns layered with florisil, can be measured with a low cost fluorometer. Aflatoxin levels approaching the 1 ppb level were detected in these micro columns with a simple fluorometer constructed in our laboratory.

Since our initial report (1) on the use of small florisil columns, or tubes, to detect aflatoxin in cottonseed, our investigation has extended to other seed products.

In a recent collaborative study (2) this method was found to be the most sensitive of three screening methods tested for detection of aflatoxin in corn. As a result the florisil tube method has been officially adopted by the Association of Official Analytical Chemists (3) as a first action laboratory method.

The increasing use of the florisil tube method by the grain industry, coupled with the excellent stability of aflatoxin fluorescence in the florisil layer, prompted us to investigate the possibility of making instrumental measurements.

Preliminary measurements indicated that the intensity of fluorescence, in the florisil layer, could readily be measured with standard photofluorometers now on the market. However it should be possible to develop a lower cost instrument specifically for this measurement. We therefore tested a concept for a minimum cost unit.

A fluorometer was assembled from available components, and the design followed the normal layout described in instrumentation text books. The irradiating source was a General Electric 4 W "blacklite" fluorescent lamp filtered through a Corning 5970 glass filter. The fluorescence from the sample was measured at 90° to the irradiation by a selenium solar cell (International Rectifier Co. B2PL) filtered with a Corning 3389 glass filter. The solar-cell output was monitored with a simple photometer similar to that described by Norris (4), using a low cost, high quality operational amplifier. The components for such a fluorometer can be purchased for less than $150 retail.

Measurements with this simple fluorometer gave readings of 14, 32, 46, and 94 on standards 5, 10, 20, and 30 ppb, respectively. The instrument was adjusted to give a zero reading on a blank. The zero reading was stable within ±1, so it should be possible to detect contamination near the 1 ppb level.

Development of a fluorometer employing the system outlined, together with necessary refinements for fluorescent measurements of the florisil layer in the micro columns, is currently underway. A report will be made upon completion and testing of this instrument.

JAMES VELASCO
KARL H. NORRIS
ARS, USDA
Agricultural Marketing
Research Institute
Beltsville, Maryland 20705

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