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PHYSICAL SCIENCES

Methods for Detecting the Extent of Contamination and Penetration of Wheat by Rodent Urine

The results of studies of wheat contamination by rodents have been recently reported in two publications from the Department of Biochemistry, University of Minnesota (1, 2). To detect the contaminated grains a large number of individual kernels, on a spot plate made of clear plastic, were treated with a buffered urease solution for 5 minutes, followed by a drop of Nessler's reagent. The latter forms a yellow to orange complex with the ammonia liberated from the urea present. Contaminated kernels could be more easily differentiated by the use of ultra violet light or by viewing the color with incandescent light which has passed through a blue or blue green filter. As a measure of sensitivity wheat kernels dipped into a 0.1% solution of urea or into rat urine diluted with 50 parts of water, after draining and drying, gave positive tests.

The accuracy of the method has been demonstrated by tests on wheat samples containing known percentages of contaminated kernels. Adult rats allowed to roam over the surface of wheat contaminated approximately 10,000 kernels per rat per day.

To determine the degree of penetration, kernels which had been infiltrated under various conditions with rat urine containing C^{14} as urea or P^{32} as inorganic phosphate were embedded in celloidin. Histological sections, exposed to autoradiographic plates by direct contact showed C^{14} and P^{32} penetration into hair-line surface cracks as well as around the germ and along the crease. Washing reduced radioactivity on the surface but had no effect on interior contamination.

Determinations of urea and radioactivity were made on the various mill fractions obtained on the Buhler experimental mill from red spring wheat tempered for milling with solutions containing or-

thophosphate P^{32} and urea at levels occurring in rat urine. Results indicated that while bran presents a considerable barrier to their entry, both constituents penetrated the endosperm at different rates to contaminate the flour. With P^{32} the bran contained 92.6 percent, the shorts 4.2 percent, and the flour 3.2 percent of the total activity. Of the total urea, 67.7 percent, was found in the bran, 7.6 percent in the shorts, and 24.7 percent in the flour. Washing the kernels at 28° for 30 seconds with vigorous agitation removed about 60 percent of the total urea but the loss was almost entirely from the bran layers. Neither dry scouring nor washing prior to milling had any appreciable effect on the above values. Because of the high level of contamination and the short experimental milling system employed in these experiments, the degree of penetration cannot be interpreted as a measure of flour contamination in commercial milling practice.

LITERATURE CITED

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