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Use of a Simple Blowing Device to Facilitate Inspection of Wheat For Internal Infestation

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USE OF A SIMPLE BLOWING DEVICE TO FACILITATE INSPECTION OF WHEAT FOR INTERNAL INFESTATION*

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Enforcement of sanitary practices in the commercial handling of wheat, particularly with reference to insect infestation, requires a method of inspection of wheat for internal or hidden insect infestation which is reliable, yet rapid enough for routine use. A number of inspection methods have been developed for this purpose, and a review has been published (1) of those proposed up to two years ago. A rigorous evaluation of several of these technics has been made recently (2).

The rapid inspection method suggested to the grain trade by the Food and Drug Administration (2), based on the results of an extensive study of the sources of insect fragments in mill products (3), involves gross examination of 100 grams of wheat for insect exit holes. More than three of such insect-emerged kernels in the sample indicate excessive internal or hidden infestation. This inspection method has been criticized as too time-consuming, and difficulty has been experienced in differentiating exit holes from deep insect feeding punctures.

An adjunct to the emergence hole test has been proposed by the Bureau of Entomology, United States Department of Agriculture (4), which involves the use of a solution of ferric nitrate as a flotation medium to cause the insect-emerged kernels to float to the surface. A device designed to facilitate the examination of grain samples for insect exit holes consists of a glass tray upon which the grain is placed and about which are arranged lights and mirrors so oriented that the inspector can view all surfaces of the kernels on the tray without manipulating them.§

Previous studies at Kansas State College on the problem of detection of internal infestation have led to the development of a fluorescent staining technic essentially specific for insect egg plugs (5), an X-ray inspection procedure (6–8) which is gaining widespread use in the milling industry and grain trade for inspection of grain in car-lot quantities, and an aural detection method using electronic technics (9) which shows considerable promise for evaluating the effectiveness of fumigants and for research studies on internally feeding insects.

The present communication deals with the discovery that a simple blowing device commonly used in seed testing laboratories[1] may be em-

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§ This device is manufactured by the Stedman Laboratories, Kansas City, Mo.
[1] In these experiments a machine manufactured by the Ames Powercount Co. of Brookings, S. D., was used.

ployed to produce a rapid and fairly quantitative segregation of wheat kernels containing exit holes, thus significantly reducing the quantity of material to be examined and hence the time required to complete the examination. Kernels containing only feeding punctures apparently tend to remain with whole or non insect-emerged kernels. The commercial apparatus used in this study is shown in Fig. 1.

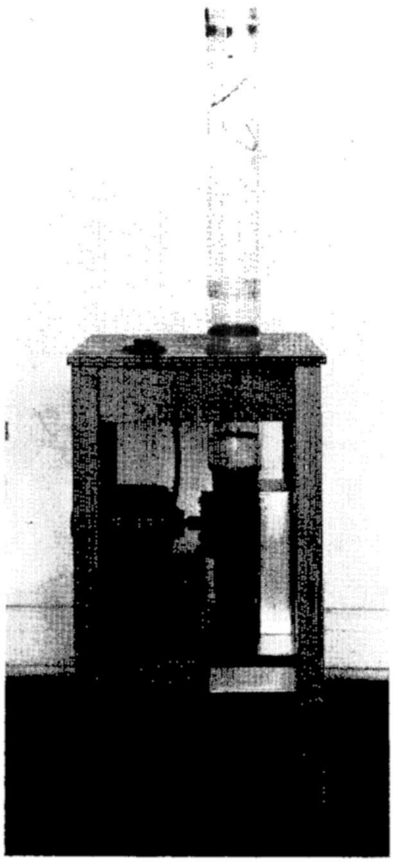

FIG. 1.—Seed blowing device used to separate insect-emerged kernels. Note separate vanes in column.

Since the blowing device is designed primarily to separate grain and seeds of different size and shape, it is necessary beforehand to make a rough separation of the infested sample into its component kernel sizes by sieving. Usually only two sieves are required, since for normal wheat the separations obtained with No. 8 and No. 9 mesh sieves are adequate. The fractions obtained in this manner are then blown separately.

Evidence of the kind of separation achieved by this blowing technic

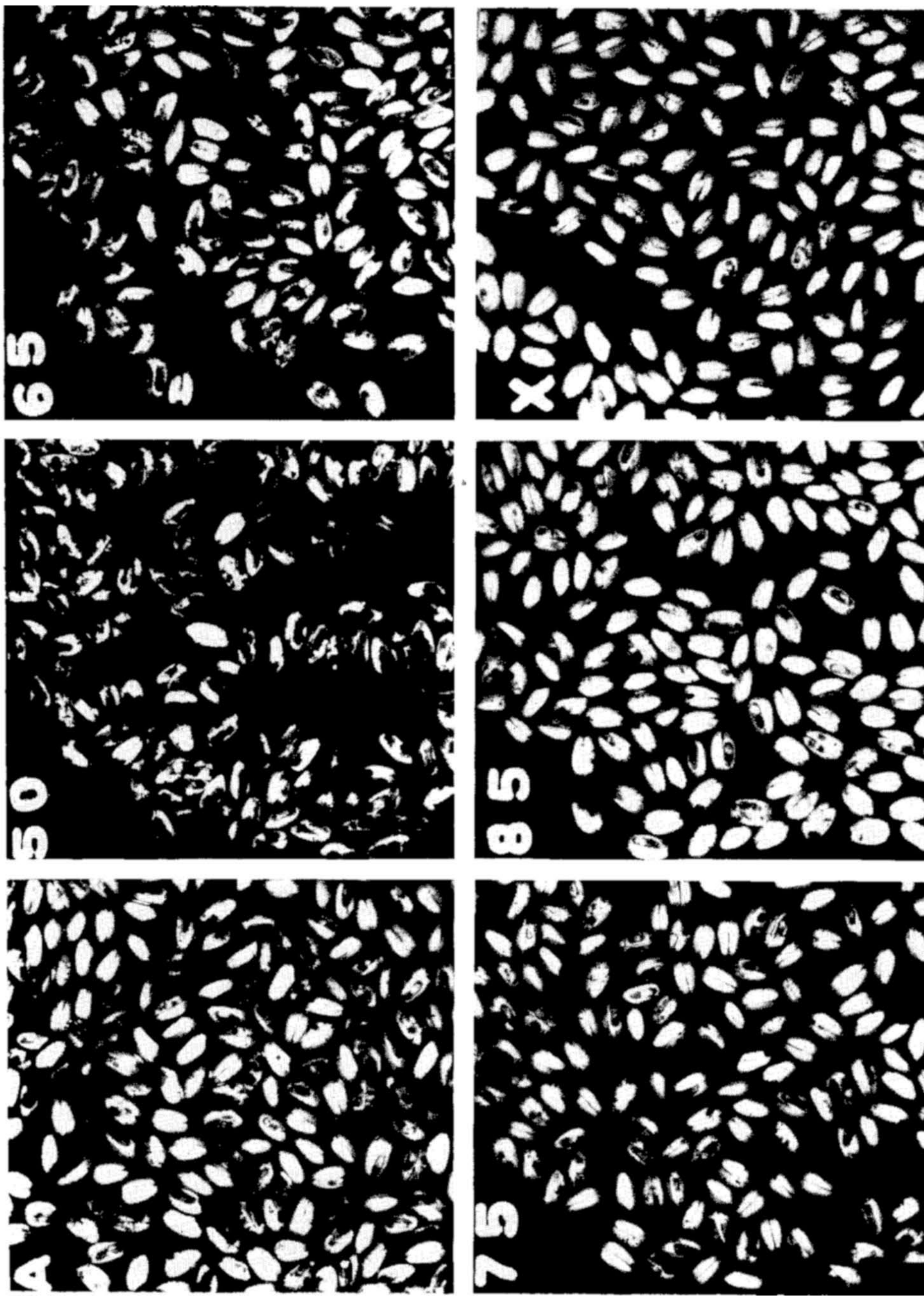

FIG. 2.—Radiographs showing separation of insect-emerged kernels achieved by blowing. Picture A is the original sample. Pictures marked 50, 65, 75, 85, and X are the fractions obtained by progressive increases of intensity of blowing, using an arbitrary scale of designation.

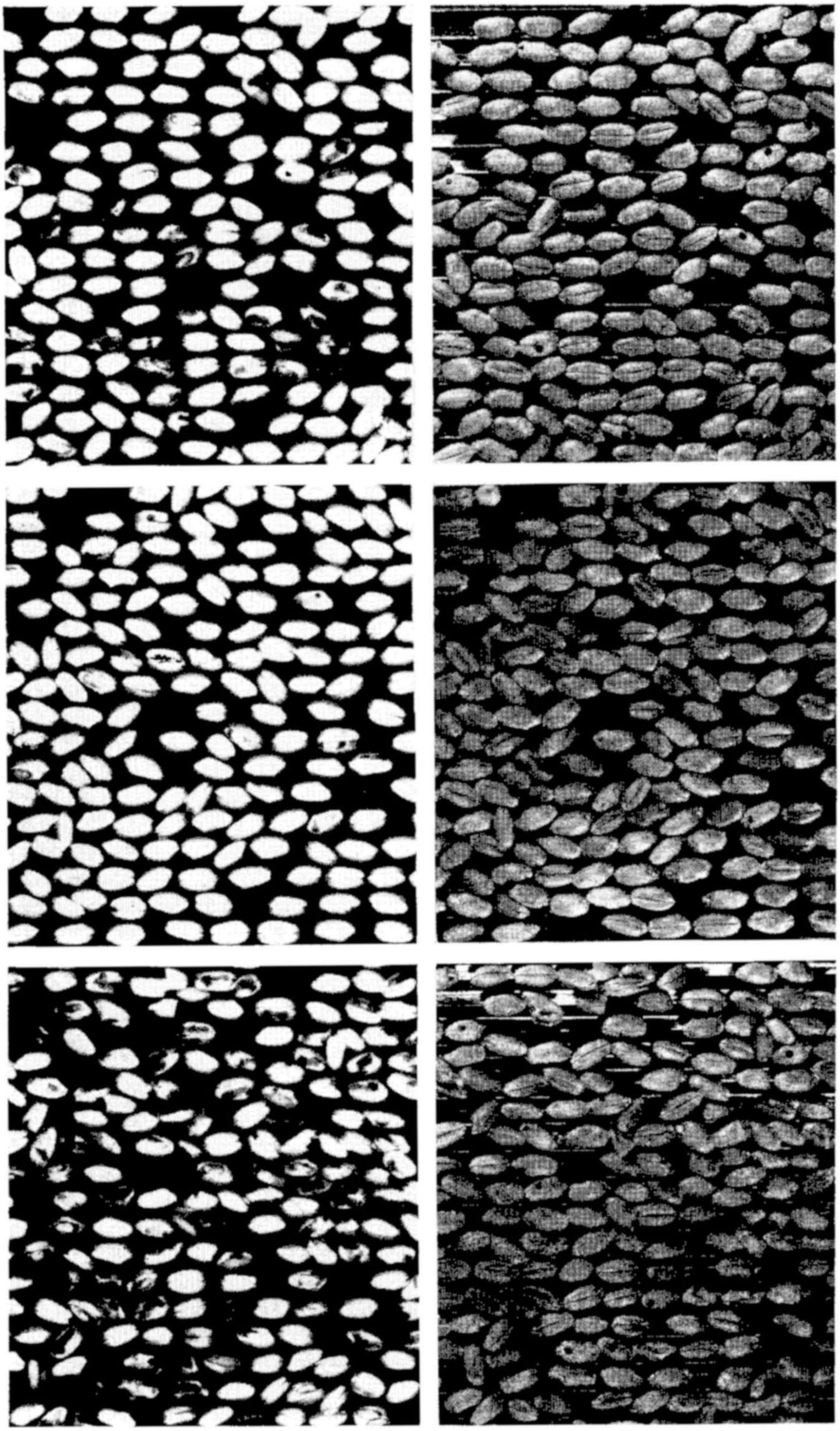

FIG. 3.—Radiographs and ordinary photographs of a one-step separation of insect-emerged kernels from a sample of infested wheat. The left vertical row of radiographs (top to bottom) shows the original sample, the residue after blowing, and the material removed by blowing respectively. The photographs on the right are of the precise field shown in the radiographs immediately to the left.

appears in Figs. 2 and 3. The series of radiographs in Fig. 2 includes an X-ray picture of the original sample of infested grain (A), in which various stages of infestation due to rice weevil, including numerous insect-emerged kernels, are shown. The subsequent pictures of this series are of fractions recovered from the original sample by progressively increasing the intensity of blowing. It is to be noted that virtually all the insect-emerged kernels are removed in the first two fractions, marked 50 and 65. This operation, while not precise, does produce an excellent separation of insect-emerged kernels from those in which no emergence has occurred.

The pictures in Fig. 3 provide an indication of the separation achieved with a single setting of the blower on a sample of mixed wheat containing various degrees of internal infestation. The vertical row of pictures on the right in Fig. 3 are ordinary photographs of the identical portions of the samples shown in the radiographs immediately to the left. In the left row, the radiograph at the top shows a portion of the original sample, and the radiograph at the bottom is representative of the material removed, which in this case constituted 22 per cent of the original 100 gram sample. This fraction contained nearly all the insect-emerged kernels present in the original sample. The X-ray picture in the center is of the residue remaining after blowing, which constituted 78 per cent of the original sample.

The sieving and blowing of grain samples in the simple manner outlined achieves a concentration of the insect-emerged kernels into a fraction of the original sample, in which detection of the kernels with exit holes is relatively quick and easy. An apparatus designed specifically for this purpose would probably produce an even better separation. The efficiency with which a concentration of insect-emerged kernels was achieved from the samples used in this study, which contained infestation far in excess of that normally found in commercial grain, indicates that the insect-emerged kernels in commercial samples could be removed in a much smaller fraction. It would appear, therefore, that this technic of concentrating the defective kernels speeds up the exit hole inspection procedure in commercial samples by a factor of ten or better.

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