Cytase in Wheat Grains.

By Katherine Golden Bitting.

The presence of cytase was tested on sections of the wheat grain, the petiole of the water lily, *Nymphae odorata*, and the stem of the castor bean, *Ricinus communis*. The cells of the endosperm of the grain were so full of starch granules that the changes in the walls were difficult to see. In the other sections there is considerable collenchyma developed, which is very clear and distinct, and any changes in its structure are easily followed. The extracts from the ungerminated grain, and from three to six days germinations were the ones which gave the most satisfactory results.

The first tests were made using hollow chambers in slides, so that the changes might be followed under the microscope. These proved unsatisfactory as the section went to the bottom of the chamber and only the low powers could be used. Preparation dishes were then used, 5 cubic centimeters of the extract being used and chloroform for an antiseptic, with the sections immersed. A control was also kept, using distilled water instead of an extract. After three days the following changes were noted:

Water Lily Extract, ungerminated seeds—

Collenchyma. Thickened walls much swollen, middle lamella distinct, like a bright thread through thickening.

Parenchyma. Walls swollen, middle lamella distinct, intercellular spaces nearly obliterated.

Xylem. No change.

Water Lily Extract, three days germination—

Collenchyma. Thickened walls nearly fill cavity of cells, cavities showing as narrow canals.

Parenchyma. Walls swollen.

Xylem. No change.

Water Lily Extract, six days germination—

Collenchyma. Structureless mass, separate cells indistinguishable.

Parenchyma. Cells entirely separated, middle lamella gone.

The sections were so badly disorganized in this last that they could not be transferred to a slide. The observations were made on the remnants.

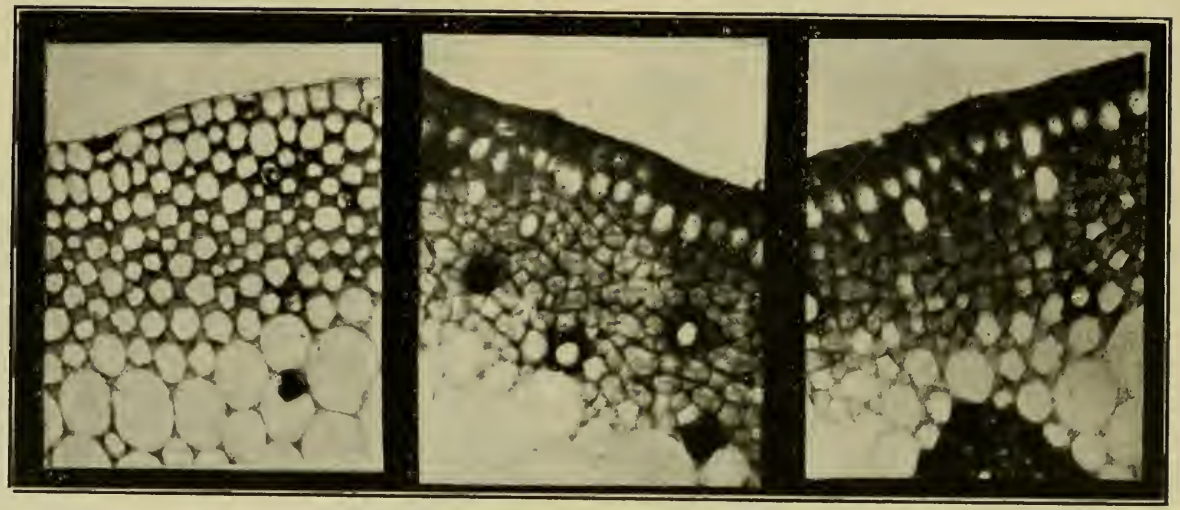
The castor bean is more resistive to the action of the cytase than is the water lily. The tissues of the castor bean showed practically the same effects as those of the water lily, but not quite so advanced.

The endosperm of the wheat sections was more susceptible to the action of the cytase than were the other sections. In the three days germination extract, parts of the endosperm had dropped out, so the sections could not be disturbed, while in the six days extract, only remnants were left adhering to the aleurone layer. The aleurone layer and the outer coats were unaffected. The middle lamella of the cells was attacked first, as was shown by the cells separating whole from one another.

Sections were tested in the extracts from the flours, but were acted on more slowly than those outlined, the white flour extract giving in nine days, results equal to those obtained from the ungerminated extract in three days.

The sections were made from alcoholic material, so that there was no protoplasmic action. Chloroform was used to prevent bacterial growth.

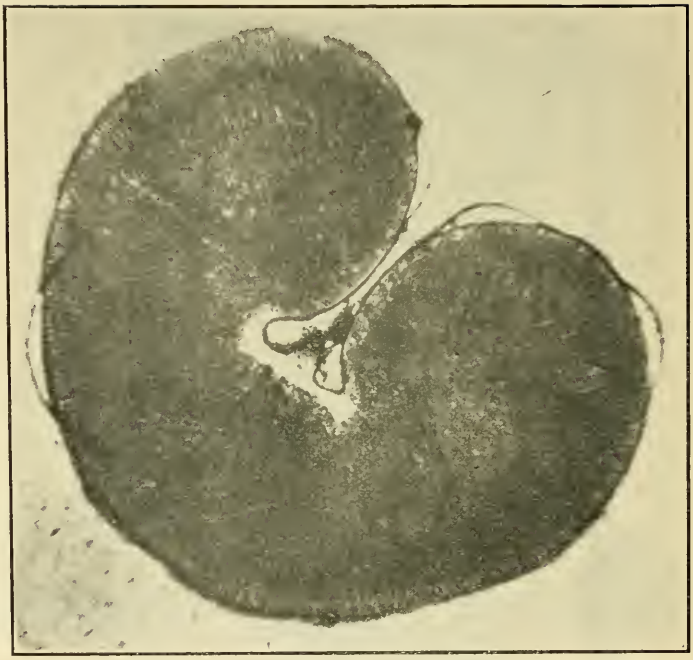
Seeds which had germinated for varying numbers of days were sectioned. In these, action was not so far advanced as in the sections placed in the extracts. For instance, seeds germinated for six days, when embedded in paraffin, and cut on the microtome, parts of the endosperm still remained as a granular mass.



Collenchyma treated with Cytase.

1. Normal.
2. Three days action.
3. Five days action.

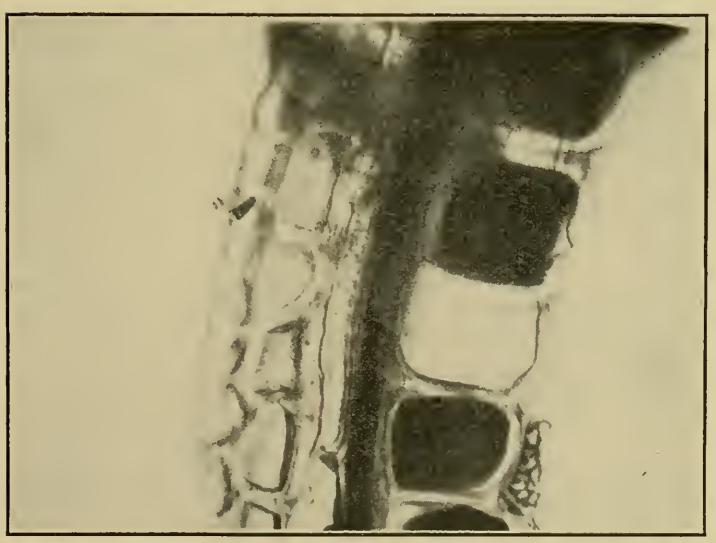
Sections of wheat grain treated with cytase.



1. Section before treatment.

2. Section after treatment.

3. Section before treatment, showing outer coats and aleurone layer.



4. Section after treatment, showing outer coats and aleurone layer.