

XXV. THE GRAND PERIOD OF GROWTH OF ROOT-HAIRS

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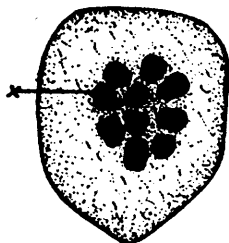
Seedlings of pop corn and radish were used in this work. These were germinated on filter paper and when the roots were from one and a half to two centimeters long the seedlings were placed in glass germinators. These germinators could be mounted on the microscope and growth studied in this way.

The work was carried on in a constant temperature room (temperature from 22°-23° C) and in darkness except for a dim red light used in reading the micrometer scale. The moisture conditions were kept as nearly constant as possible, the atmosphere of the germinator being in a constant state of saturation.

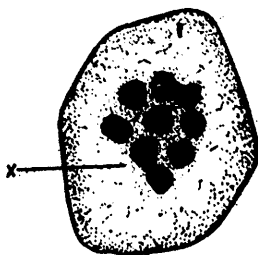
The following information regarding root hair growth was obtained.

EXPLANATION OF PLATE IV.

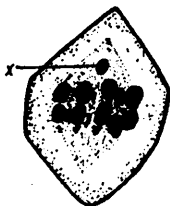
- FIG. 1.** The usual arrangement of the chromosomes in the equatorial plate of spermatocytes of *Bruchus*.
- FIG. 2.** An equatorial plate showing but nine chromosomes.
- FIG. 3.** A lateral view of the mitotic figure. (Metaphase).
- FIG. 4.** An unusual arrangement of the chromosomes in the equatorial plate.
- FIG. 5.** Division of the tetrads to diads. (Anaphase).
- FIG. 6.** Division of the tetrads to diads. (Late anaphase).



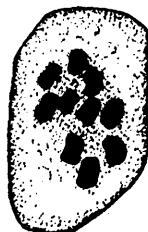
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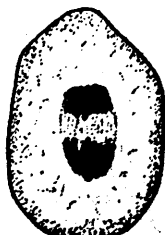
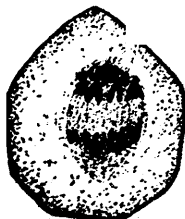
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(1.) Root hairs spring from the upper region of root elongation and the root continues to elongate for an average of one and a half to three hours, in the region in which new root hairs are starting.

(2.) The rate of root elongation in the region of newly forming root hairs decreases rapidly. The average of five corn roots showed an initial rate of 112 microns per fifteen minute interval. This decreased to 58.4 microns the last fifteen minute interval of the first hour, and to 1.5 microns the third fifteen minute interval of the third hour. This retardation in root elongation, was gradual and uniform in rate. By the end of the third hour no further growth was noted.

(3.) Root hairs grow slowly at first, gradually increasing their rate of growth up to the time root elongation ceases and there is a definite relation between root and root hair elongation. At the time, or shortly after root elongation ceases, the rate of growth of the root hairs in that region becomes stabilized and they continue to grow with only slight variations up to about two hours before root hair growth ceases.

An average, taken from the above five corn roots showed an initial rate for five root hairs (one from each root) of 6.5 microns per fifteen minute interval. This increased to 16.1 microns per interval at the end of the first hour and to 33.6 microns at the end of the third hour. After this there was no further root elongation in this region and the root hairs grew at an average rate of 35 microns per fifteen minute interval for the next three hours, which was as long as they were studied. However, several root hairs were studied for a period of eight to ten hours after root elongation ceased, and their variation in rate of growth in all cases was slight.

(4.) As a root hair matures it slows up in its growth rate very rapidly. The average taken from five root hairs of radish (from five different roots) gave the following results:

Approximate length two hours before growth ceased 1824 microns. They were then elongating at an average rate of 44.5 microns per fifteen minute interval. One hour before growth ceased they were growing 36 microns per interval, and fifteen minutes before growth ceased, they were growing 15 microns per fifteen minute period. Growth ceased on an average of two hours after retardation in rate was noticeable.