The Effect of Aeration on the Roots of Zea Mays.—I.

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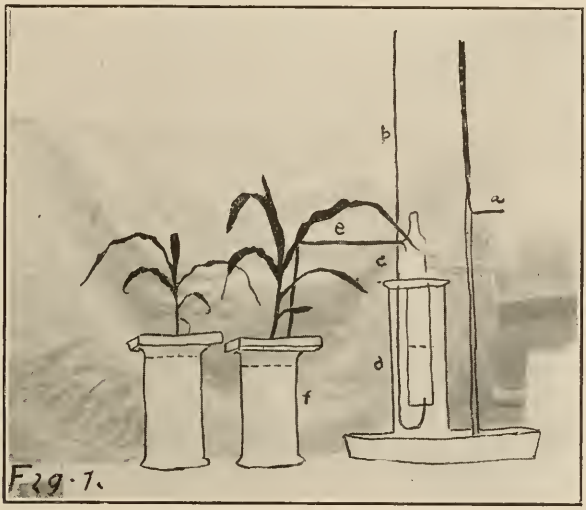
This experiment was conducted for the purpose of learning the effect of aeration on the roots of Zea Mays. In water cultures as commonly conducted, the only aeration that the growing plants receive comes from the surface of the water.



Effect of aeration on roots of Zea Mays.

The plants were grown as water cultures in normal solutions minus the sodium chloride. The cylinders used had a capacity of one and one-half liters and the solution was changed at frequent intervals. One cylinder was aerated by means of letting a stream of water flow through a glass tube (a) from a hydrant. The tube protruded slightly through a rubber cork fitting tightly in the larger end of condensing tube that was cut in two pieces. The cork should have an opening for a tube to admit air. The lower end of the tube was connected to a second one (b) leading to a cylinder (d) filled with water resting in a drain pan. The

larger end of a cutoff condensing tube (c) was suspended over the open end of the small bent tube. The upper end was connected to the cylinder of solution by a glass tube (e) which extended almost to the bottom of f. All connections between the glass tubes were made by tight-fitting rubber tubing. The flow of air was regulated by varying the amount of water that passed through the hydrant. A drain tube carried away the excess of water from the pan. The apparatus stood about four feet high and was held in an upright position by a ring-stand.

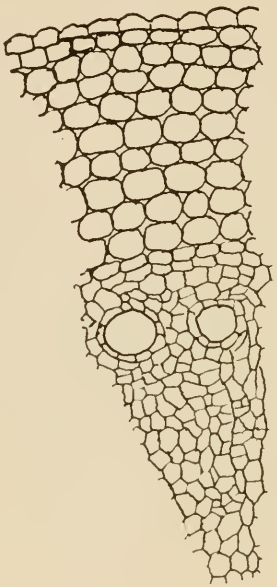


Fig. 2

Effect of aeration on roots of Zea Mays

This apparatus was after W. Ostwald as given in his *Chemico-physical Measurements*. Aeration of plants is mentioned, however, by Julius Sachs in his *Vorlesunger über Pflanzen-physiologie*, 1887, pages 268-269.

The glass tube fed a constant supply of air into the cylinder of normal solution. The two plants were started at the same time and received like treatment except the aeration of the solution.

The following table gives the height of the plants at different stages of growth:

	Aerated.	Nonaerated.
2 days	2.8 cm.	1.9 cm.
3 days	5.9 cm.	4.7 cm.
6 days	14.50 cm.	12.00 cm.
8 days	25.00 cm.	23.00 cm.
11 days	28.00 cm.	24.00 cm.
15 days	37.00 cm.	33.00 cm.
20 days	47.00 cm.	37.00 cm.
26 days	65.00 cm.	46.00 cm.

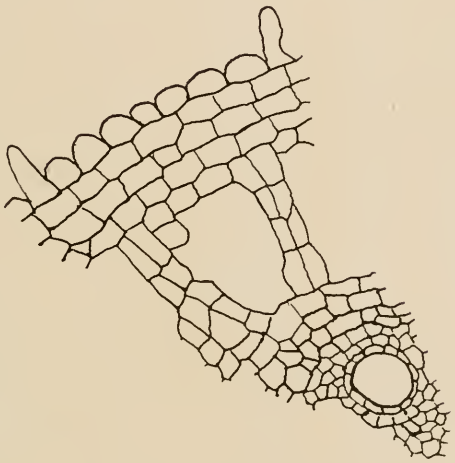


Fig. 3.

Effect of nonaeration on roots of Zea Mays.

After three months' growth in the greenhouse under as nearly normal growing conditions as possible, the plants were removed and burned. The ash of the aerated plant including the roots weighed 2.182 grams, while the ash of the nonaerated amounted to 1.303 grams.

A cross-section of a root when magnified showed that the cortex cells of the aerated plant (Fig. 2) were uniform in size with no con-

spicuous air cavities, while the cortex of the nonaerated root (Fig. 3) contained large air cavities separated by narrow strands of tissue.

This experiment shows the great importance of the presence of air not only for the normal growth of plant tissue but also the obtaining of the maximum plant growth.

The work of which this study is the result was taken up at the suggestion of Prof. Andrews of the Department of Plant Physiology of Indiana University, and his constant interest and help have contributed to its completion.