On the Influence of Ultra-violet Rays upon the Protoplasmic Viscosity

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Some experiments were made to see whether or not a change in the viscosity of cytoplasm can be caused by irradiation by ultra-violet rays. The centrifuging method was employed to determine the occurrence of this change, the determination being made by comparing the number of replaced nuclei in the irradiated material with that of those in the control.

Root-tips of *Vicia Faba*, L. was used as material. The root-tips were exposed to the rays for 10m., 30m., 1h., 2h., 3h. and 4h, using the same method as that mentioned in my other paper.¹⁾ In the case of 3h. and 4h. exposures. the material was not exposed to the rays continuously, but intermittently with certain intervals of time as shown in Table 1.

Table 1

Time of exposure in total	Time of first exposure	Time of first interval	Time of second exposure	Time of second interval	Time of third exposure
3 h.	1h.	3 h.	1h.	3h.	1h.
4 h.	2h.	2h.	2h.		

In each experiment only 10 sections from each root-tip were observed. The results obtained are given in Table 2. In this table the actual number and percentage of nuclei closely in contact with the cell membrane, and of nuclei clearly apart from it (a certain number of nuclei displaced from their original position being included in this latter counting) are given.

1) TAKAMINE, N., On the Influence of Ultra-violet Rays upon the Frequency of Nuclear Division in Plants. (in the Press).

Table 2

Experi- ment series	Time of exposure	Total number of nuclei counted in 10 sections		The same in %	
		in contact	apart	in contact	apart
I	10m.	851	60	93.4	6.6
	control	861	63	93.2	6.8
II	30m.	1161	98	92.3	7.7
	control	877	65	93.1	6.9
III	1h.	1100	125	89.8	10.2
	control	1069	80	93.0	7.0
IV	2h.	1002	136	88.0	12.0
	control	1361	99	93.1	6.9
V	3h.	688	170	80.2	19.8
	control	845	113	88.1	11.9
VI	4h.	727	146	83.3	16.7
	control	795	72	91.7	8.3

Fig. 1

In Table 2, in the case of those nuclei which were apart from the cell membrane, the difference between the exposed material and the control is also given on the right of the figures denoting the percentage. These differences in per cent obtained in the six series of experiments I(-VI) are graphically shown in Fig. 1.

Result. As is seen from Table 2 and Fig. 1, the experiments show that when the material is exposed to ultra-violet rays, the viscosity of the cytoplasm first decreases slightly, but then increases rapidly. This result agrees with that obtained by HEILBRUNN and YOUNG in *Arbacia* (HEILBRUNN, L. V. and YOUNG, R. A., The action of ultra-violet rays on *Arbacia* egg protoplasm. *Physiol. Zool.* Vol. 3, No. 3, 330-341. 1930).