(3) One week after being prepared.
(4) Plate dipped in hot paraffin and cooled.
(5) Carbon ground in agate mortar and passed through 100 mesh screen.
(6) Collected at base of arc and brushed on the plate with rice paper.
(7) 40–60 is carbon passed through a 40 mesh screen upon a 60 mesh screen.
60–80 is carbon through a 60 mesh screen upon an 80 mesh screen.
80–100 is carbon through an 80 mesh screen upon a 100 mesh screen.
100 is carbon through a 100 mesh screen upon the pan below.
(8) Ground in a porcelain mortar.

Carbon obtained from cypress, poplar, redwood, southern pine and northern pine is soft, having a flaky or needle-like structure as shown by photomicrographs. Table I shows that these are not as active as carbon obtained from paraffin, arc carbons, chestnut, red oak, black walnut and gum-wood, which is hard, having a distinctive granular structure. Because of the fact that soft carbon adheres to the test-plates much better than harder grades, more particles remain on the plate per square centimeter. Thus a greater photoelectric effect was expected; however, the reverse proved to be true. Therefore, the photoelectric effect increases with hardness of the particles.

Our results indicate that the photoelectric effect varies with the size of the carbon particles. Redwood (8) (Table I) was ground in a porcelain mortar, and it was coarse and flaky. It was quite inactive. Redwood (100) was more than twice as active as Redwood (40–60). Paraffin (1) having been brushed with rice paper was more active than paraffin (2), the coarser particles having been removed by brushing. Therefore we have some reason for believing that the photoelectric effect is modified by the fineness of the particles. However, it is possible that the apparent increase in the photoelectric effect with the decrease in the size of the particles is, at least in part, due to the fact that the effective area (the area normal to the direction of the incident light) increases with the fineness.

TABLE II

Substance	Condition	Time in sec.
Graphite as manufactured	Rough and uneven	13.4
Graphite plate cut out	Rough	9.3
Same plate	Polished on buffing wheel	4.7
Same plate	Roughened with No. 00 sand paper	8.5
Hard carbon	Very hard. Cut out with hacksaw and tested (surface covered with dust)	10.8
Same plate	Polished	8.6
Hard carbon plate held in flame from asbestos wick in liquid paraffin	Completely covered finely divided carbon	4.2
Zinc plate Av. of 25 readings	Polished	5.1+
Hard carbon plate	Covered with fine carborundum dust	not active

Further results obtained more recently appear in Table II.

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THE EFFECT UPON DIGITALIS PURPUREA OF RADIATION THROUGH SOLARIZED ULTRA-VIOLET-TRANSMITTING GLASS[1]

DURING the Nashville meeting in 1927, a report[2] was made by the writer concerning *Digitalis purpurea* plants which were started under glass that transmits ultra-violet light, and later grown in the open field. Such plants, when tested physiologically, proved to be considerably more potent medicinally than were the controls which had been exposed under ordinary glass.

The question at once arose as to whether such effects would continue to be obtainable after the glass had been solarized for several months; and the purpose of this brief paper is to give a report of work done upon this point.

During the season just passed, 1928, similar experiments were made, therefore, to serve as check tests on the previous findings. All methods closely paralleled those used in 1927, except that not so many plants were used as before. Each outdoor bed this year consisted of four rows of six plants each; and each group of twenty-four plants provided a composite sample.

While the plants were under greenhouse conditions, the difference between the treated plants and the controls was much less marked than in those of last year. Whatever advantage was observable, in size or color, lay constantly with the treated plants; but, when the plants were put out-of-doors, the two groups were practically identical to the eye. It was felt at

[1] Paper read before the Botanical Society of America, December 28, 1928, New York, N. Y.
[2] A. McCrea, SCIENCE, 67, No. 1732, 277–278, 1928.

that time that there would probably be a corresponding agreement in their activity.

Digitalis drug is harvested twice each season, the first cutting being in late July and early August, the second in September. These experimental samples were gathered at the same time and in the same manner as the field crop except that the writer personally picked and mixed the leaves rather than have the farm men do it.

After the leaves were carefully dried and milled, U. S. P. tinctures were prepared. These were then tested physiologically, by the M. L. D. frog-heart method.[3] Results are given in the table below, in reading which it should be borne in mind that U. S. P. standard tincture represents 100 per cent.

First Crop

Treated group	225 per cent. of Standard.
Control group	185 per cent. of Standard.

Increase of Potency, 21.62 per cent.

Second Crop

Treated group	350 per cent. of Standard.
Control group	250 per cent. of Standard.

Increase of Potency, 40 per cent.

It should be noted here that in Michigan we had a severe hailstorm last August 8, which rather badly injured the plants of the first crop. This probably explains the relatively low potency of that cutting. Spread out in its first-year, rosette form of growth, digitalis offers a fair mark for damage by hail. Many leaves were badly beaten and perforated in as many as ten places; so it is surprising that they gave as high activity as they did. Several of the plants died; but most of them revived, and showed no effects at the time of the second cutting.

Judged by the results of the past two summers, it appears quite conclusive (a) that digitalis develops a higher potency under the influence of ultra-violet-transmitting glass, and (b) that solarization for one year does not appreciably affect the transmission of the particular portion of such rays as are responsible for such effect in digitalis.

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CHROMOSOME MORPHOLOGY IN ZEA MAYS

THE haploid number of chromosomes in *Zea mays* is ten. Several 2n + 1 individuals (with twenty-one chromosomes) have arisen as the result of crosses between diploid and triploid individuals.[1] Since there are ten known linkage groups, it is desirable to determine what linkage group is represented by the extra chromosome in the several 2n + 1 individuals. Because of the desirability of associating each linkage group with a specific chromosome of the complement, a study has been undertaken to determine to what extent the different members of the complement are identifiable cytologically. Studies have been made of the first division in the microspore where only the haploid complement is present.

A semi-diagrammatic representation of the haploid set is given in Fig. 1. One chromosome possesses a satellite.[2] During the prophase the satellite remains attached to the nucleolus until the latter disappears. The thread joining the satellite to the major part of the chromosome does not possess a constant relative length but varies in different figures. In the fourth from the smallest chromosome there is a deeply staining body which becomes very conspicuous during late prophase. Other chromosomes have less conspicuous bodies of this kind, but their exact position requires further study.

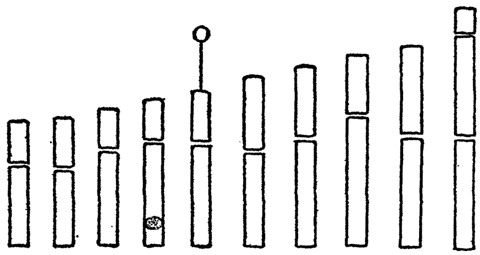

FIG. 1

Besides the primary constrictions, with which spindle fiber attachment seems to be associated, there are secondary constrictions. Such a constriction is indicated near the end of the longest chromosome. The secondary constrictions, although always appearing in the same place in certain chromosomes, are not always evident in the observed figures.

Although only a preliminary study has been made, the author is convinced that every chromosome of the set is morphologically identifiable, differing from the others essentially as shown in the figure. It should be possible, therefore, after the extra chromosome in any 2n + 1 individual has been associated with a certain linkage group, to determine from an examination of the eleven-chromosome microspores which chromosome of the haploid set carries this group of genes.

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[3] Houghton, E. M., *Jour. A. M. A.*, 31: 959, 1898.

[1] B. McClintock, *Genetics*, 14: 180–222.

[2] The satellite in *Zea* was first observed by L. F. Randolph.