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THE EFFECTS OF 8-QUINOLINOL ON HORDEUM VULGARE AND SECALI CEREALI

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We had tried the effects of various mitotic poisons on barley and rye when the promising preliminary results obtained by Tjio and Levan with 8-quinolinol led us to investigate more thoroughly the use of this reagent with these plants.

The plants were grown in terralite in 6-inch pots and were watered with Hoagland's complete nutrient solution. Thirty plants per pot were available for use. The plants were most easily handled and yielded the best results when treated 4 to 7 days after planting. The roots were treated with aqueous solutions of various concentrations. A concentration of 0.002 moles proved to be most effective.

The solution was prepared by adding the 8-quinolinol to the water and heating to 60°C until the material was dissolved. This usually required 10 to 15 minutes. The solution should not be heated over 60°C.

The time of treatment varies with the concentration. When using 0.002 *M* concentration, a period of 4 hours is recommended. The roots were treated while still on the plants. While being treated, the temperature should not exceed 20°C.

After treatment, each root was cut off about a quarter of an inch from the meristem. The short ends were placed in a fermentation tube, into which had first been placed 18 drops of aceto-orceine stain and 2 drops of 1 *N* HCl, to dissolve the intercellular cement and facilitate crushing. The tube with the root ends was placed upright in a petri dish. Water at 50°C was poured into the dish and kept at 50°C for 5 minutes. After 2 minutes, 2-to-3 drops of 1 *N* HCl was added to the tube. Then the meristem of one root was placed on a slide in a drop of the stain.

A cover glass was placed over the meristem and the usual squash technique employed. It was then necessary to tap the cover glass vigorously to separate the cells into one layer.

Fresh roots produced the best results, but material kept in a solution of 3 absolute-1 acetic acid was often just as satisfactory.

Photomicrographs were taken of representative slides, and permanent slides for classroom use were made by McClintock's method.

An alternate method was used in some cases. One hundred milliliters of solution was poured over the plants while still growing in the pot. After 12 hours the plants were removed from their pots and placed in water, where a partial recovery occurred.

Results

Generally the treatments yielded C-mitosis, and it was possible to study the individual differences in

chromosomes with considerable clarity.

There was a definite clarification and constriction of the chromosomes at the prophase and metaphase. A corresponding clarification of the centromeric apparatus and an increase in plasma viscosity were also observed. A differentiation between the euchromatin and the heterochromatin was effected, especially observable at prophase.

Among the more striking phenomena observed in our investigation were the radiomimetic of 8-quinolinol, illustrated by the lag of one chromosome in one anaphase. Vaculated chromosomes and satellited chromosomes were clearly seen. The contraction of the chromosomes induced by the action of 8-quinolinol enabled us to make an accurate count of the species number.

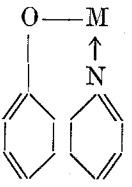
The use of 8-quinolinol is distinguished by the fact that the mitotic division is occasionally completed. Other mitotic poisons immediately inhibit mitotic activity beyond metaphase.

A 6-n polyploid condition was observed in a few nuclei, caused by the disruption of the spindle mechanism. The chromosomes failed to separate properly, remained in close application, and underwent subsequent divisions.

8-quinolinol can also be of valuable assistance in idiogram analysis.

Appendix

8-quinolinol (8-hydroxyquinoline) form chelate rings with many metallic ions, in which a coordinate linkage exists between the nitrogen and the metal:



Some of these chelates are soluble, some insoluble.

Preparation of the aceto-orceine stain.—A stain of 2 percent orceine in 45 percent acetic acid was used. The stain was refluxed for 3-to-4 hours, after which it was left in the refrigerator overnight. The stain was then filtered through double-thickness paper to remove sediment. In some cases additional filtering is recommended.