zygous for certain of the complementary factors involved.

A preliminary study of the seed-like structures in the mature fruits of these new seedless grapes shows several degrees of development. In a few cases there are only tiny rudiments of seeds, quite as exist in the fruits of the Sultanina grape. But in most cases there is some development of the tissues of the seed coats, but the structures, even when their size approaches that of a seed, are either without embryo and endosperm or with only traces of them and are so soft and pulpy that they are not noticed when the fruits are masticated in eating. It appears that the type of seedlessness in these plants corresponds to that of the pollen parent, but that the inhibition in the development of the seeds which results in their abortion is less complete in most of them.

The seedless plants already obtained are being utilized as pollen parents in crosses with sister plants that have seeds. The latter are being selfed and crossed to obtain a second generation and they are being used in back crosses with the seedless parents. The results should give further data on hereditary behavior, and, it is hoped, provide more of the seedless grapes.

Several of the seedlings which bear seedless or near-seedless fruits possess considerable merit. For these the clusters are well filled and of good size or even large. In size the berries range from larger than Delaware fruits to nearly the size of Concord. The colors include green, amber, red, mottled red and shades of black. In quality there is considerable variation, but the best are vinous, sweet and meaty. Several ripen early. The most promising of these grapes are being propagated for trial under cultural conditions.

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THE OCCURRENCE OF ROTENONE AND RELATED COMPOUNDS IN THE ROOTS OF CRACCA VIRGINIANA[1]

CRACCA VIRGINIANA, the most abundant species of the genus Cracca indigenous to the United States, has recently been reported as possessing insecticidal properties.[2] This, together with the fact that other species of Cracca, namely, *C. toxicaria* from South America and *C. vogelii* from Africa, have yielded substances related to the rotenone group of fish poisons,[3] has made a chemical study of the American species interesting and desirable. Such an investigation has been in progress and to date the following results have been obtained:

Ether extraction of the roots of the plant yielded from 4 to 6 per cent. of resinous materials having a pleasant characteristic odor. The extract, when tested as a fish poison, showed essentially the same toxicity as pure rotenone. It contained 9 per cent. methoxyl[4] and in many ways resembled the non-crystallizable extractives from derris and cubé roots.[5] Attempts to obtain individual major constituents by distillation, crystallization or the formation of derivatives were for the most part unsuccessful, although four substances were obtained in small quantities. These were rotenone, dehydrorotenone, tephrosin and a colorless crystalline material, $C_{22}H_{24}O_4$, whose M.P. is 131°.

The rotenone was obtained by dissolving one part of the resin in an equal part of *n*-butyl ether and allowing the solution to crystallize for from two to three weeks. The yield was usually about 5 per cent. of the weight of the resin, but apparently much more rotenone was present which did not crystallize because of the complex nature of the mixture. This was shown by the fact that a slightly more dilute solution failed entirely to crystallize or at most gave only traces of crystals, and also by the fact that solutions of the resin in other solvents, from which rotenone readily crystallizes from very dilute solutions, would not crystallize.

Dehydrorotenone was obtained from the resin in approximately 2 per cent. yield by treating the material in a methanolic solution with alkali (50 gm. resin, 200 cc. methanol and 0.5 gm. potassium hydroxide). Sometimes crystallization occurred in a short time, and again a month or more was required for the process to take place. The dehydrorotenone was frequently contaminated with material which appeared to be a dehydro derivative of a somewhat higher molecular weight. The first specimen obtained, for example, melted sharply at 217°. It gave analytical values approximately half-way between that required for dehydrorotenone and dehydrotoxicarol and could not be further purified. Hydrolysis with alcoholic alkali, however, gave a fair yield of derrisic acid, and examination by the optical immersion method[6] showed that much of the material was dehydrorotenone. This particular phenomenon is the same as was recently reported for certain naturally occurring mixtures of dehydrodeguelin and dehydrotoxicarol.[7] Other specimens of the dehydro

[1] From the Insecticide Division of the Bureau of Chemistry and Soils, United States Department of Agriculture, Washington, D. C.

[2] Little, SCIENCE, 73, 315 (1931); *Jour. Econ. Ent.*, 24: 743 (1931).

[3] Clark, *Jour. Am. Chem. Soc.*, 52, 2461 (1930); 53, 729 (1931).

[4] A ligroin (B.P. 40–60°) extract was employed for this purpose.

[5] Clark, SCIENCE, 71: 396. 1930.

[6] The optical identifications involved in this communication were performed by George L. Keenan, of the Food and Drug Administration, U. S. Department of Agriculture.

[7] Clark and Keenan, *Jour. Am. Chem. Soc.*, 55, 422, 1933.

derivative from the same or other samples of resin were easily purified and identified by melting-point, mixed melting-point and optical properties.

Tephrosin was obtained by removing the methanol from the dehydrorotenone mother liquors, dissolving the residue in approximately an equal volume of *n*-butanol and allowing the solution to crystallize over a period of several weeks. The material was purified and identified by melting-point, mixed melting-point and optical properties.

The fourth substance, $C_{22}H_{24}O_4$, sometimes crystallized in small amounts from the alkaline methanolic solutions upon standing. A small quantity could always be obtained by adding approximately 5 per cent. of water to the alkaline alcoholic solution and allowing the turbid liquid to stand until it cleared. Crystallization usually occurred. If this did not take place, the oily insoluble layer in the bottom of the flask was dissolved in boiling petroleum ether and concentrated to about one fifth of its volume. Upon standing the solution crystallized. The material was purified by recrystallization from petroleum ether. It consisted of colorless rods which melted at 131° and gave in alcoholic solution a greenish purple color with ferric chloride, but it did not dissolve in aqueous alkali. Analysis for carbon and hydrogen and molecular weight determinations showed it to have the formula $C_{22}H_{24}O_4$. The material reacted with hydriodic acid in a Zeisel apparatus, giving an alkyl iodide, but the results were of such a character as to show that probably neither methoxyl nor ethoxyl groups were present. The material in a concentration of 1–100,000 when tested for toxicity, employing goldfish as test animals, was inert.

The yields of tephrosin and the C_{22} compound were small and variable, but, as with rotenone, there were ample indications that much more material than was obtained was present in the resin. In all probability the complex character of the extractives inhibited the crystallization of the individual constituents.

While the results here recorded account for only a small portion of the extractives of *Cracca virginiana*, it is interesting that this is the first native plant of the United States in which members of the rotenone group of fish poisons have been found.

E. P. CLARK

EFFECT OF TEMPERATURE ON EVERSPORTING EYE COLOR IN DROSOPHILA MELANOGASTER[1]

OUR x-ray experiments have produced three mottled-eyed stocks.[2] All are caused by some change in the normal allelomorph at the white locus of the x-rayed wild type sex chromosome. Regular males receiving a treated X-chromosome, and regular females heterozygous for a treated X and for white eye color, have mottled eyes.

Since the mutation rate varies directly with temperature in *Drosophila melanogaster*,[3] it might be expected that temperature would influence such conditions of genetic instability. Similar cases of eversporting in other forms have been tested for effect of temperature. Eyster[4] found that strains of maize with variegated pericarp color raised in Arizona showed less extreme variegation patterns than the same strains raised in a cooler climate in California. Demerec,[5] on the other hand, found that a difference of 10° C did not affect mutable miniature in *Drosophila virilis*.

Preliminary tests at 29°, 24° and 18° C show that the cooler the temperature at which the flies are raised the larger the light areas of mottled eyes in our stocks. Temperature affects viability as well as eye color. Mottled-2 is almost completely lethal to males at 18° and 24°, but at 29° a fair proportion of the expected males survive, demonstrating that genetic constitution may be a factor in determining the survival value of an organism in an unfavorable environment.

This temperature effect offers a means of determining the larval stage at which mottling occurs, which may furnish a clue as to the mechanism involved. Eyster's work and ours both indicate that the incidence of eversporting varies inversely with temperature, which seems to imply that something other than regular gene mutation is responsible for these cases of unstable genetic constitution.

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