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John R. Weber
Citrus Experiment Station, Riverside

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The literature concerning the preparation of fresh and dried plant material for embedding in methacrylate resins is vuluminous. The excellent reviews of Fessenden and Fessenden and Sando adequately cover the work (3, 4). More recently, however, methods for the preservation of the natural pigments in plant material have been outlined (7).

One of the problems encountered in embedding rigid botanical specimens is their size. Almost all the material embedded previously has been small, and a finished plastic block of 3 inches square is considered large. A block measuring 5 in. x 5 in. x 3 in. is difficult to prepare, for larger specimens necessitate the polymerization of larger blocks. The greater the bulk of plastic the more difficult it is to dissipate the heat released by the polymerization of the monomer. Sometimes the heat produced in the polymerization is enough to destroy the natural pigments of the material, and usually cracks the block, ruining the specimen.

To eliminate this overheating during polymerization another technique was used. Our problem was to devise a method of preserving large ears of hybrid field corn, since it is desirable to protect the corn kernels from insects and prevent loss of and damage to the kernels during classroom handling and study. Insect specimens had previously been protected from rough handling by repeated dipping into a solution of isobutyl methacrylate and toluene (9). Butterflies and leaves had been treated in the same manner by this investigator. From this data it seemed feasible to try the same technique on the corn.

Two plastics were employed, ethyl methacrylate monomer and a commercial product, Ward's Bio-Plastic. The physical and chemical characteristics of the methacrylate resins are well known (2, 5,6,8). The methacrylate was prepared according to the general directions obtained from the E. I. Du Pont De Nemours Company (1). The ethyl methacrylate monomer was washed free of its inhibitor. Benzoyl peroxide was added to the monomer as a catalyst (0.02% by weight). The ethyl methacrylate was then partially polymerized by heating on a water bath under a reflux condensor at a temperature of from 90°C. to 100°C. until the polymerization reached a point where the monomer was slightly viscous, but poured readily. The dry ears which previously had been treated with an insecticide were either dipped into the monomer or painted with the resin. A combination of both procedures will insure full coverage of all cracks between kernels and the exposed ends of the cob. The ear was allowed to drain and then hung in an oven for complete polymerization to a solid polymer. The temperature was kept at 40°C. If a lower temperature is used the polymerization will take longer. Faster polymerization can be obtained by increasing the temperature or by the addition of more catalyst, but this tends to produce bubble formation.

Ward's Bio-Plastic and ethyl methacrylate gave equally good results. The Bio-Plastic tended to have a greenish color where the polymer was thicker, but the difference in transparency between the two was negligible when a thin coat was used. Ward's monomer was prepared according to the directions (10). With our sample the material was so viscous that dipping and draining off the excess monomer from the ears was time consuming, while brushing the monomer on the ear took even more time to get complete coverage.

Another technique was employed using discarded cracked blocks of Ward's Bio-Plastic. These broken chips were placed in a number of chlorinated organic solvents in hopes of finding a suitable solvent for the plastic. Chloroform seemed to serve the purpose after several attempts were made to rescue valuable specimens. This solution of chloroform and plastic was used to dip ears of hybrid seed corn just as was previously done with ethyl methacrylate. The specimens were dipped several times. After each immersion they were allowed to drain and the chloroform was carefully evaporated off at room temperature before another coat was applied.

Excellent results were obtained with both plastics. The ears have remained insect free for over two years and have stood up well under rough and frequent handling. The thin plastic coating is highly recommended for protecting rigid botanical specimens for classroom use and research studies and would afford more permanent protection for valuable displays.

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Bibliography

1. Du Pont, E. I. De Nemours & Co. Technical Bul. Polymerization of methyl methacrylate monomer.
2. Du Pont, E. I. De Nemours & Co. 1936. Methacrylate resins. Indus. and Engin. Chem. 28:1160-1163.
3. Fessenden, G. R. 1949. Preservation of agricultural specimens in plastics. U. S. Dept. Agr. Misc. Pub. 679.
4. Fessenden, G. R. and Sando, C. E. 1942. Embedding specimens in methacrylate resins: A selected list of reference with annotations. U. S. Bur. Agr. Chem. & Engin. Cir. ACE-174, 9 pp.
5. Klein, L. and Pearce, W. T. 1936. Polymerized acrylic acid derivatives. Indus. and Engin. Chem. 28:635-639.
6. Neher, H. T. 1936. Acrylic resins. Indus. and Engin. Chem. 28:267-271.
7. Specht, Randolph C. 1950. Preservation of the color and shape of flowers. Florida Engin. and Indus. Exp. Sta. Bul. 40.
8. Strain, D. E., Kennelly, R. G., and Dittmer, H. R. 1939. Methacrylate resins. Indus. and Engin. Chem. 31:382-387.
9. Wheatley, M. D. 1941. Preservation of biological specimens with isobutyl methacrylate polymer. Sci. 94:49-50.
10. Ward's Natural Science Establishment, Inc. 1947. Ward's Service Bul. 6.

Citrus Experiment Station
Riverside, California