FURTHER NOTES ON DRYING PLANT SPECIMENS BETWEEN SHEETS OF MOISTURE-PERMEABLE PLASTIC FILMS

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Since the brief note on the subject of drying plant specimens between sheets of moisture-permeable plastic films was published (Traub, 1950, April), additional experience with the method has been gained. This is the reason for the present report.

Thicker films. It has been found that the use of thicker moisture-permeable films represents an improvement. Thus cellulose acetate 200-CA-43 (Du Pont) and cellophane 600 PT (Du Pont), particularly the former, give better results. These thicker films give more rigid preparations which make for ease in handling, and apparently tend to reduce any later tendency to wrinkling, particularly when cellulose acetate 200-CA-43 (Du Pont) is used. This latter is indicated as first choice for the purpose.

Drying temperature. It was found that in case of the *Amaryllidaceae*, as delimited by Hutchinson (1934), the drying can be completed over a period of 24 hours or more in the mechanical convection type (forced draft) drying oven at 60° C., without causing any brittleness in the specimens. However, this is not the case with some plants, such as *Alstroemeria*, *Phaseolus*, and *Ulmus* species. Plants in this drying class should be dried between films in a drying box with electric light bulbs as the source of heat (Archer, 1945; Traub, 1950)or under similar conditions. If the mechanical convection type oven is used at all, the specimens should be left in the oven for only a minimum period at 55° C. or lower, and should then be transferred to the drying box with electric light bulbs for completion of drying.

Thus, it would seem important to recognize that different types of plants may require somewhat different treatment for drying as indicated above. Such requirements could of course be determined only by actual experiments.

Fleshy parts. Some fleshy parts, such as the peduncle of large amaryllids like *Hymenocallis*, *Amaryllis* L., and *Crinum*, which are difficult to dry in the usual manner or between films, because of the excessive moisture to be removed and the efficient epidermal covering of the parts, even with heat killing, may be easily dried if they are split lengthwise and the halves are dried between films. As a record of the part in cross-section, thin cross-sectional slices, made before the longitudinal splitting, are dried separately between small pieces of film. This must be done under moderate, but sufficient pressure; otherwise there is shrinkage of the thin sections. For this purpose a small press may be improvised by placing the slices, with the film on either side, between several thicknesses of blotting paper and weighting them down with books or other convenient heavy objects. As indicated, the pressure should not be so great as to crush the slices.

Delicate parts. Similarly, with delicate parts such as sepals, petals and stamens which do not have a relatively large amount of total moisture to be removed, the operation may be performed just as indicated, or it may be carried out in the conventional press in the drying cabinet provided with electric light bulbs, or even without them.

Restoration of dried material. When floral or other plant parts from poorly prepared herbarium specimens are to be restored, or parts of them are to be restored for detailed study, they are soaked in hot water in a shallow rectangular tray, which can be placed under a lens illuminated with flourescent light (Stocker & Yale unit) for convenient inspection and dissection. A piece of cellulose acetate film is then placed under the specimen in the water, the straightening out, or dissection if desired, can be carried out, and the water is then gradually removed by means of a large dropping pipette so that the specimen remains spread out on the wet film. Another sheet of cellulose acetate film which has been previously moistened is then carefully placed over it. Care is necessary since there is a tendency for the two sheets to repel each other, apparently because they have similar electric charges. The preparation is then placed between blotters in the usual botanical press and dried as recommended by Traub (1950). The dried preparations are then stapled to the herbarium sheet to which they belong.

Types of drying ovens. Since the note by Traub (1950, April) appeared, Gates (1950, June) has published a stimulating paper on the advantages of oven drying herbarium specimens. He used the gravity convection type oven, but stated in a footnote that an electric fan might be installed to advantage, in order to obtain speedier movement of the vapor -laden air. This suggestion for the use of the mechanical convection type oven is in harmony with the recommendation of Traub (1950), who had previously used an available model (Model 1202 Hotpack mechanical convection oven) for the same purpose. Dr. Gates illuminated the subject by pointing out that a vast volume of water vapor has to be removed in the drying process, and this should be a point in favor of the mechanical convection type oven since this removes the vapor laden air more rapidly than the gravity convection type oven.

The temperature range, 60°--65° C. (140° F.--149° F) for drying herbarium specimens in the mechanical type oven was originally chosen by Traub (1950) as a starting point because this is the temperature range he uses for the preparation of plant tissues for chemical analyses. The objective of using a relatively low temperature range is to reduce possible changes in the tissues. In this range it was recommended that the herbarium specimens were to be dried in the mechanical convection type oven for a few hours. Since the drying of plant tissues involves also a cooling process due to the evaporation of moisture, the actual temperature of the tissues would be somewhat below the range indicated. With longer drying under the conditions, it is possible that a somewhat lower temperature range might prove optimal, a point that has not as yet been established. As stated above, Traub has recently used 60° C. (140° F.) for drying amaryllid specimens over 24 hours or more with success, but no experiments have been made to determine the optimal temperature. With the less efficient gravity convection type oven, Dr. Gates (1950,June) indicated 140° F. (60° C.) as the probable beginning of "over high" temperature for drying specimens and 120° F. (48.9° C.) as the probable optimal temperature; and he actually used 110° F. (43.3° C.) in his herbarium practice. These statements are in essential harmony with those of Traub. The greater evaporation rate per unit time would tend to keep the actual temperature of the plant material somewhat lower than that indicated by the thermometer of the mechanical convection type oven used, as contrasted with a relatively higher temperature of the specimens when the gravity convection type oven is used. Further experiments are needed in order to establish the optimal temperature ranges for each type of oven.

Literature cited

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