A DILATOMETER FOR PLANT MATERIALS

(WITH ONE FIGURE)

Several types of dilatometers have been developed to study the changes in volume accompanying imbibition and to measure the rate and amount of hydration in colloidal systems (1, 2, 3, 4, 5). The dilatometer which has been used in the plant physiology laboratory at the University of Maryland possesses certain advantages that facilitate its use and increase its accuracy. The details are shown in figure 1. It is an all pyrex glass system, and can be evacuated and filled without disturbing the material used as a sample. The apparatus has proved particularly valuable for accurately measuring changes in volume accompanying imbibition in whole and ground corn kernels, and in demonstrating the condensation of water by plant colloids.

The dilatometer consists of a 250-ml. heavy pyrex Erlenmeyer flask with a ground glass joint between it and a calibrated capillary tube that contains a three-way stopcock. To the bottom of this Erlenmeyer flask is fused a

1 Constructed by Mr. Clark, of the Smithsonian Institution, Washington, D. C., under specifications furnished by the writers.
Fig. 1. Dilatometer for plant materials: A, mercury well; B, weight; C, reaction chamber; D, three-way stopcock; E, capillary tube.

50-ml. pyrex Erlenmeyer flask, which forms the mercury well for the material while being evacuated and thermostated. A pyrex glass bulb filled with mercury acts as a weight to hold the material beneath the mercury. The dimensions given in the preceding description may be modified as the materials or aims of the investigator require.

To operate the instrument, the lower compartment (A) is partially filled with mercury. The material being studied is placed on top of the mercury and covered with the weight (B). After the apparatus is assembled in place, the entire system is evacuated under a pressure of 0.05 mm. to displace the gases in or on the sample. The time period of evacuation will vary, and must be determined experimentally for each kind of material used. Sufficient mercury to cover the sample is then introduced through the capillary and allowed to trickle around the loosely fitting weight into the lower compartment. The system is evacuated a second time, and distilled water, boiled and cooled to the correct temperature, is admitted through the capillary by adjustment of the three-way stopcock, until the
system is completely filled. The apparatus is now ready to be placed in an accurately controlled thermostat. Observations and readings of the height of the meniscus in the capillary will enable the operator to determine when the system has reached thermal equilibrium. The apparatus is tilted sufficiently to permit the weight to fall away from the mouth of the lower chamber, thus allowing the sample to come into contact with the water. Volume changes can now be recorded.—G. A. GREATHOUSE and M. W. PARKER, University of Maryland.

LITERATURE CITED


CHLOROPHYLLOMETRY

As is well known, chlorophyll is in many respects the analogue of the haemoglobin of the blood of animals. Indeed, it is more than probable that haemoglobin is derived from chlorophyll by the substitution of iron for magnesium. Medical men have long estimated the relative haemoglobin content of the blood by various color matching methods, and haemoglobinometers of several types have been in common use for many years. Haemoglobinometry has been of great value both in clinical pathology and in pure research.

The same principles and simple methods used in haemoglobinometry may readily be applied to the measurement of differences in chlorophyll content in plants. The following is an outline of the adaptation of the methods of haemoglobinometry to chlorophyll estimation. The first step required is the establishment of a color standard. The leaf of the common hard maple, Acer saccharinum, was selected as readily available. One third of 1 gm. of the fresh leaf from the blade, but rejecting the midrib, was taken. This was cut up into fine pieces (3 or 4 mm. square) with an ordinary scissors, and immersed for 24 hours in 10 cc. of pure alcohol. At the end of that time the green alcohol was decanted from the leaf sections, the pieces of which now resembled pieces of white paper. The alcoholic extract of the chlorophyll was then placed in an ordinary Duboseq colorim-