HUMIDITY CONTROL IN LARGE CHAMBERS BY MEANS OF SULFURIC ACID SOLUTIONS

FRANK J. ZINK AND C. O. GRANDFIELD

THE need of controlling humidity along with temperature control in relation to two problems under investigation, viz., the influence of atmospheric humidity on the rate of drying of alfalfa and the effect of humidity on the seed setting of alfalfa plants, resulted in the construction of a simple and accurate method which is described herein as a guide to other investigators confronted with a similar need.

As the necessary equipment was not available, search of the literature on humidity control was made to find some reference to an inexpensive method to meet the requirements. Most of the methods of obtaining variable humidity control with spray jets for humidifying and refrigerating systems for dehumidifying are commercial units built largely for air conditioning of buildings and do not permit a sufficiently accurate control within the range suitable for research work.

Satisfactory humidity control by means of supersaturated salt solutions is reported by Spencer (1) and a number of other investigators. Each salt used provides for only one condition of humidity, rather than a range of conditions. In other investigations humidity control has been obtained by aqueous solutions of sulfuric acid (2). By varying the concentration of the acid, any desired degree of humidity may be obtained. The majority of these studies used sulfuric acid with desiccators or other small enclosed chambers (3). Zink (4) used sulfuric acid in desiccators for this purpose in studies of equilibrium moistures of hays.

From the experience of using acid in desiccators and information on the specific limit of size of enclosed space found in the literature, it seemed possible to enlarge the space conditioned and to increase the quantity of acid in a ratio similar to that used in desiccators to a point where large cabinets might be used. The basic method has been reported on by Wilson (5) who gives a graph and states the thermodynamic theory of the calculation.

In the studies reported in this paper the first efforts were confined to bubbling air through acid solutions of different specific gravity and directing the conditioned air into an enclosed space of approximately 5 cubic feet. This means has served for small bulbous glass chambers and possibly would serve for a chamber of larger size if a good diffusion of air and acid could be obtained, or if large volumes of acid could be used in a closed chamber. The variable results obtained

1 Contribution No. 69 from the Department of Agricultural Engineering and No. 258 from the Department of Agronomy, Kansas Agricultural Experiment Station, Manhattan, Kan. Received for publication April 1, 1936.
2 Associate Professor of Agricultural Engineering, Kansas Agricultural Experiment Station and Assistant Agronomist, Division of Forage Crops and Diseases, Bureau of Plant Industry, U. S. Dept. of Agriculture, respectively.
3 Figures in parenthesis refer to “Literature Cited,” p. 466.