Steiner, W.W.M. University of Hawaii, Honolulu, Hawaii. A simple and effective desiccating system.

Because the study of genotype-environmental relationships may offer a positive approach to problems of current evolutional interest, it seems appropriate to offer for use an inexpensive system to control relative humidity (R.H.) in the laboratory. It has been specifically designed for the study of individual reaction to the stress offered by low humidity environments.

Figure 1 illustrates the overall design of the system. The arrows indicate the direction of air flow. The air pump (Hush II, Metaframe Corp., Maywood, N.J.) has a double outlet. The

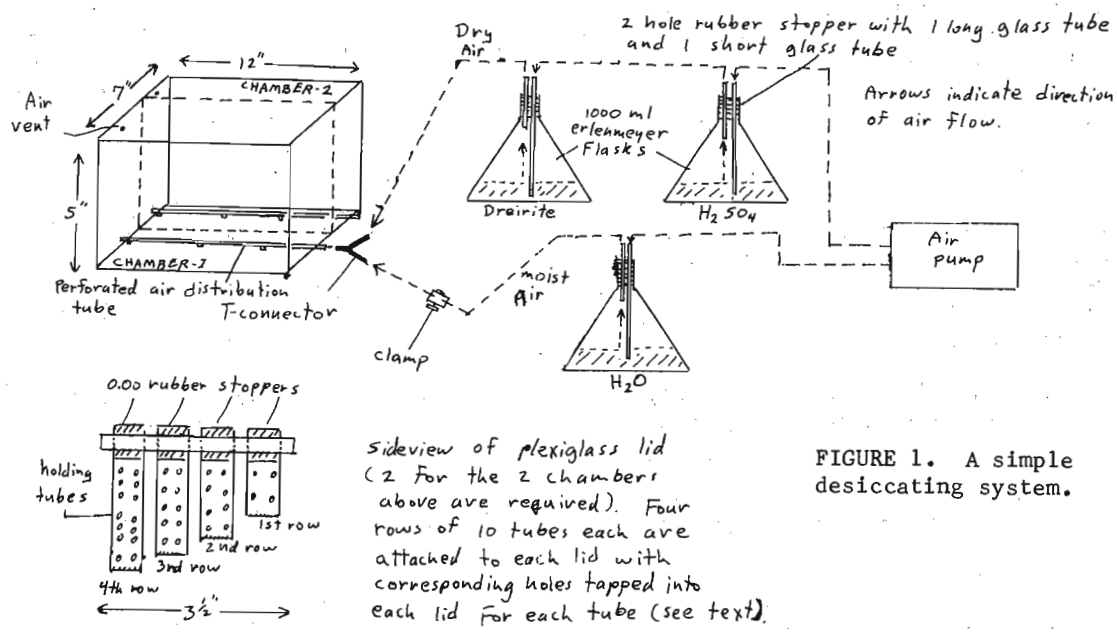

FIGURE 1. A simple desiccating system.

first outlet pumps air through two 1000 ml erlenmeyer flasks containing 300 ml of concentrated sulfuric acid (H_2SO_4) in the first and 300 grams of Drierite in the second. (In addition, a sodium bicarbonate sump may be attached to the line between these flasks to assure neutralization of H_2SO_4 byproducts.) These serve to remove all moisture from the air; the Drierite providing, in addition, a warning when the H_2SO_4 has reached it's saturation point (this usually occurs in 3-4 days, depending on the relative humidity of the ambient air). When this happens, another flask containing fresh H_2SO_4 may be quickly substituted for the first.

Where humidities above 0% R.H. are desired, the second outlet to the air pump may be used to pump air through a 1000 ml erlenmeyer flask containing 300 ml of distilled H_2O. This procedure enables saturation of the air with moisture. The clamp attached to the inlet line from the H_2O reservoir can then be manipulated such that the correct ratio of dry to wet air can be obtained which will yield the desired relative humidity. A hygrometer-temperature indicator (Doral #118, Airguide Instr. Co., Chicago) can be placed within the chamber receiving the the conditioned air to record internal temperature and humidity. Two-hole rubber stoppers (no. 9) containing one 8 cm glass tube for the outlet hose and one 30 cm glass tube for the inlet hose are used to cap the erlenmeyer flasks. These should be carefully attached and taped down since pressure on the system can force these loose. The long glass tube should extend into the flasks contents.

The desiccation box consists of 2 narrow chambers holding approximately 2800 cc of air each. It and the cover plates for each chamber are constructed of 1/4 inch clear plexiglass. Air enters via a 1/4 inch plexiglass tube which runs the length of each chamber. This "distribution tube" has unequal numbers of perforations on the bottom with more located on the terminal end than near the entrance. It is designed to equalize air delivery throughout the chamber. Over all dimensions of the 2-chambered box with the lid on are 6.75 inches (wide) x 5.5 inches x 12.5 inches.

Attached to half of the lid (cover plate) of each chamber are four rows of 1/2 inch

plexiglass tubes (10 tubes to a row) with corresponding holes tapped through the lid for each tube. These tubes, which have an inside diameter of 3/8 inches, are designed to hold 1 to 5 flies each. These may have 1/16 inch perforations and have a fine mesh cloth screening glued to their bottom. The perforations and screening enable the tubes to equilibrate evenly with the rest of the chamber to the desired relative humidity and maximizes exposure of the organisms placed in them to the chambers internal environment.

These "holding" tubes are staggered in length. The rearmost (4th) row of tubes should be 3 1/2 inches in length, the next row of 10 tubes 3 inches in length, the next row 2.75 inches and the firstmost row 2.5 inches. This order enhances visual observation of the tubes since the flies, when they reach a state of exhaustive dehydration, will fall to the bottom. When this occurs, the rubber stopper (no. 0.00) plugging the aperture of the tube may be removed and an aspirator inserted through the corresponding hole in the cover plate to remove the organism. Stopcock grease can be used to seal the chamber lids, with a small vent located at the rear of the chambers serving to equalize air pressure on the sealed system. A second air system must be installed to operate the second chamber, which can also be used to house an undesiccated control.

I have found it takes 6-8 hours to equilibrate the chamber at 0% R.H. Somewhat longer time intervals may be required where equilibration is desired at higher humidities.

Table 1 lists the component parts necessary to build a 2-chambered desiccation box. Ethylene dichloride is used as a plexiglass cement and all line connections are made with 1/4 inch amber rubber tubing. All plexiglass components can usually be ordered precut from local distributors, but specifications must usually be in inches. Total cost of the system (Hawaii) is less than $30.00.

Table 1. Components necessary to build a 2-chambered desiccating system. A fine mesh screen of durable quality should be used to cover the bottom of each holding tube. Plexiglass components are of 1/4" thickness.

ITEM	NO. PER SET	DIMENSIONS
base	1	6 3/4" x 12"
endpieces	2	6 3/4" x 5 1/4"
sidepieces + middlepiece	3	5" x 12"
bars (for lid support)	2	1/2" x 12"
blocks (for distrib. tube support)	6	1/2" x 1/2"
lid (coverplate)	2	3 1/4" x 12 1/2"
distribution tube	2	1/4" x 13"
holding tubes: 1st row	20	1/2" x 2 1/2"
2nd row	20	1/2" x 2 3/4"
3rd row	20	1/2" x 3
4th row	20	1/2" x 3 1/2"
rubber stoppers	80	no. 0.00
rubber stoppers	6	no. 9.0 (2-hole)
glass connecting-Y	2	1/4"
amber rubber tubing	-	1/4" x 144"
rubber tubing clamps	2	---------
erlenmeyer flasks	6	1000 ml capacity
glass tubing, short	3	1/4" x 3"
glass tubing, long	3	1/4" x 10-12"

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