

A New 7-Day Spore Sampler

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Contribution No. 1246, Division of Biology, Kansas Agricultural Experiment Station and Contribution No. 628, Department of Plant Pathology. Cooperative investigations of the Kansas Agricultural Experiment Station, ARS, USDA, and the Department of Health, Education and Welfare, National Center for Air Pollution Control (Grant No. 5R01 AP00080).

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Accepted for publication 3 July 1975.

ABSTRACT

A new volumetric, suction-type drum sampler (the 7-Day Drum Spore Sampler) has been developed. Fungal spores, pollen grains, and other airborne particles are impinged on double-coated cellophane tape applied to a 15.24-cm (6-inch) diameter drum. The sampling surface of the drum rotates past the orifice at 60 mm in 24 hours so collections can be time

related. The sampler body rotates, keeping the intake orifice facing into the wind. Flow rates may be adjusted by air-flow meter from 0.5 to 28.3 liters per minute. Operation is continuous with either 115 V or 230 V AC vacuum pumps.

Phytopathology 66:60-61

Additional key words: air spora, sampling techniques, epidemiology.

Many recent studies involving volumetric spore collecting have been done with a Hirst (2), Burkard (Burkard Manufacturing Co.), or Kramer-Collins (K-C)

spore trap (3). All are suction-type traps that impinge particles collected on adhesive-coated slides or drums. The Hirst and K-C traps use glass microscope slides that

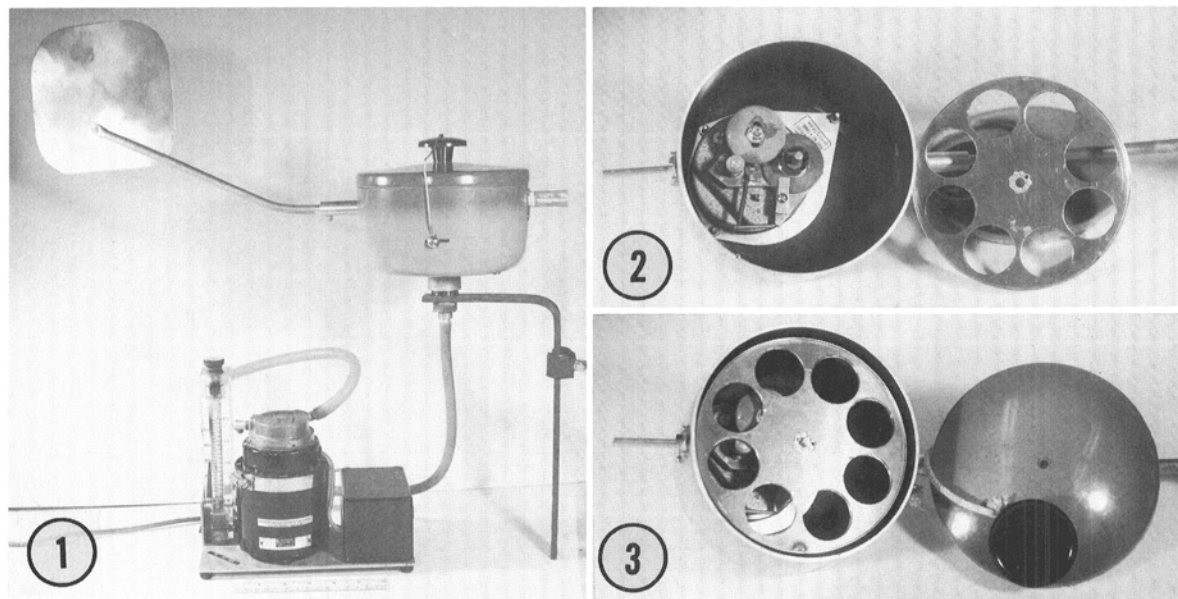


Fig. 1-3. Construction of new 7-day vacuum-type spore sampler. 1) Sampler complete with vacuum pump assembly consisting of an air-flow meter to adjust rate of air flow, 115 V AC carbon-vane vacuum pump and electrical relay (in black plastic box). An air-tight exit port on the underside of the sampler body is used to connect to the air-flow meter by means of 6.4-mm diameter rubber tubing. Constructed with the exit port is a ball bearing which allows for 360-degree directional rotation of the sampler. The wind vane can be seen to the left of the sampler and the intake orifice to the right. 2) Sampler with lid and collection drum removed (placed to the right). An 8-day, spring-driven clock motor equipped with gears can be seen inside the sampler body. The drum has a 2.54-cm (1-inch) rim to which double-sided cellophane tape is applied to form the trapping surface. 3) Sampler with collection drum in place. There is a 2-mm space between the sampling surface of the rotating drum and the inside edge of the intake orifice seen at the left of the sampler body.

accommodate 24-hour collections. Burkard modified the Hirst trap so a rotating drum collects spores over a 7-day period without servicing. Both the Hirst and Burkard traps operate continuously. The K-C sampler deposits particles in discrete hourly bands on adhesive-coated slides. A cam-microswitch mechanism provides for intermittent, rather than continuous, operation and, thus, efficient operation under battery power where other electricity is unavailable. Eversmeyer et al. (1) compared operating efficiencies and uses of the Hirst and K-C samplers with that of the new 7-Day Drum Sampler described here.

A study involving long-distance dispersal of urediospores of *Puccinia graminis* and *P. recondita* throughout the Great Plains region of the USA required a lightweight, compact, inexpensive sampler to be raised by pulleys on a 12-meter sampling tower to operate with minimal maintenance and servicing. We believe that the 7-Day Drum Sampler described here meets those qualifications and that it may be of interest to plant pathologists and aerobiologists in the collection of airborne fungal spores, pollen grains, and other organic particles. It is available from the G. R. Manufacturing Company, 1317 Collins Lane, Manhattan, Kansas 66502.

Description of the sampler.—The 7-Day Drum Spore Sampler (Fig. 1) is a suction-type sampler that impinges airborne particles on an adhesive surface consisting of a strip of 1.9 cm wide, double-coated cellophane tape applied to the outside of a 15.24-cm diameter drum (Fig. 2). The tape is coated with a thin layer of silicone grease to increase adhesiveness. The drum is mounted on the hour-hand shaft of an 8-day, spring-driven clock motor (Fig. 2 and 3), which is geared to rotate the drum surface past the intake orifice at 60 mm in 24 hours. At that rate, collections for 7 days can be obtained on a single drum tape with no servicing. Interchangeable drums are mounted on the clock shaft by a press friction fit.

The sampling chamber or sampler body (Fig. 1), equipped with a wind vane, rotates on an air-tight bearing to keep the intake orifice facing into the wind. The intake orifice extends 5 cm from the sampler. Its inside dimensions are 2 × 14 mm throughout its length. A space of 2 mm separates the end of the intake tube and the trapping surface on the drum. The inside dimensions of the intake orifice are the same as those of the Hirst trap.

The air-exit port of the sampling chamber is contained by an airtight bearing on which the sampler rotates (Fig. 1). Rubber tubing (6.4-mm diameter) is used to connect the exit port to an air-flow meter (Fig. 1) which, in turn, is connected to the vacuum pump (Fig. 1). The sampler is designed to operate continuously at flow rates of 0.5 to 28.3 liters per minute. Continuous operation necessitates use of the vacuum pump where line electricity is available.

Exposed tapes may be examined by cutting the tape into 60 mm (24-hour) lengths, removing them from the drum, and placing them on separate glass microscope slides. Mounting media and a cover glass may be added before examining them with a microscope. Some spores, such as urediospores of the wheat rust fungi, may be counted without using a mounting medium. We have found that with that type of spore it is preferable to transfer the entire length of exposed tape from the drum to a 4 × 45-cm length of 1-mm-thick Plexiglas, using 5 × 35-cm length of 2-mm-thick Plexiglas as a platform on the microscope stage to support the thinner Plexiglas. If notches are cut in the Plexiglas platform so slide clamps of the mechanical stage on the microscope can hold the platform in place, the entire strip can be moved, then one can count the spores on an area (60 mm) covering a 24-hour period simply by moving the mechanical stage. If a 60-mm portion in the center of the Plexiglas platform is ruled at 2.5-mm intervals, collections can be time related to within one hour. The first 24-hour period (60 mm) on the exposed tape is overlaid on the ruled portion of the Plexiglas platform and held in place by small clips. When the first 24-hour period has been counted, the Plexiglas with the exposed tape is moved across the platform so that the next 24-hour period overlays the ruled portion of the Plexiglas platform.

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