Modified Sampler Accurately Measures Heavy Spore Production of *Fomes marmoratus*

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The Kramer-Collins (K-C) spore sampler, which is designed to take samples for periods of 1 to 10 min, 1 to 4 times/hr, is generally well suited to measuring spore production of wood-decay fungi (2). Its major drawback is that it does not accurately measure very heavy spore loads. At the min sample time of 1 min, heavy concn often cause clogging of the slit orifice and no sample lines are deposited; when there is no clogging, so many spores may be deposited on the slide that counting is difficult and time-consuming (1). This note describes a device for reducing the sampling time to as little as 4 sec. A K-C sampler with the device attached recorded heavy spore production of *Fomes marmoratus* (Berk. & Curt.) Cooke on water oak (*Quercus nigra* L.) far better than an unmodified sampler.

Apparatus.—A 12-v timer was wired to the relay of the K-C sampler. It was constructed from six items: a pushbutton switch; a toggle switch; a 6.3-v, normally closed 10-sec thermal delay relay; a tube socket; a 5-w, 0-25 ohm, wire-wound potentiometer; and a 2¾- × 2⅛- × ⅝-inch, two-piece aluminum box. The parts were obtained from an electronics supplier for ca. $8.00. Sampling times from 4 to 25 sec can be set by adjusting the potentiometer. They could be increased or further decreased with additional relays. Figure 1 shows the timer attached to a K-C sampler, and Fig. 2 shows the wiring diagram. Switches were placed in the timer to bypass the delay relay for manual operation; they are unnecessary for automatic operation.

The effect on accuracy caused by changes in ambient temp from 0-35 C was determined by testing the device in an incubator. Operating time ranged from 4.0 to 4.5 sec at the min timer setting and from 23 to 26 sec at the max setting. When temp was increased from 0 to 35 C, operating time increased 0.5 sec at the min setting and 3 sec at the max. At individual settings and temp, there was no detectable variation in operating time.

Field trial.—The timer was tested for measuring basidiospore production of *F. marmoratus* sporophores on water oaks growing in an open area at the edge of a

Fig. 1. New timer attached to K-C sampler relay case.

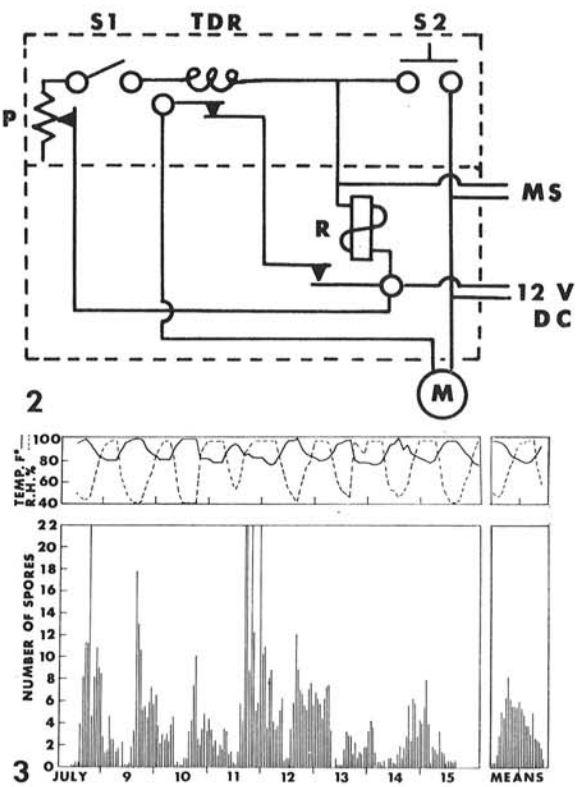

Fig. 2-3. **2)** Wiring diagram of 12-v timer and standard sampler components; S1 = toggle switch; S2 = pushbutton switch; TDR = thermal delay relay; P = potentiometer; R = relay; MS = microswitch in sampler; and M = electric motor. **3)** Spore discharge, 8-15 July 1969, from a sporophore of *Fomes marmoratus* on a water oak. Number of spores × 8,000 approximates number of spores per liter of air. Temperature and relative humidity are from hygrothermograph placed near the sporophore.

mixed hardwood stand near Stoneville, Miss., in 1968-69. Two K-C samplers, with 1-cm × 1-m plastic tubes attached to each sampler intake orifice, were used. The tube openings were placed 5 cm below the pore openings of the same sporophore. Both devices were operated at an airflow rate of 22 liters/min. Samples were taken at 1-hr intervals, and the silicone-coated slides were changed daily at 9 AM. The unmodified K-C sampler was adjusted to the shortest possible operating time (60-75 sec). With the modified machine, 5-sec samples were taken. The two samplers were set to operate at approx the same time, but not simultaneously. Temperature and relative humidity (RH) were monitored with a hygrothermograph placed near the sporophores. The production of three individual sporophores was measured for a total of 40 days.

The number of spores per sample was estimated by counting the spores in 0.027-m^2 areas delineated by a microscope eyepiece reticule. For each sample, the numbers in 30 such areas were averaged.

The unmodified sampler frequently became clogged with spores, and a uniform line was not deposited on the slides or the large quantity of spores collected resulted in stacking and overlapping, making counting difficult. The max production recorded in a 5-sec sample was 175,000 spores/liter of air; the number that would have been estimated from a 60-sec sample taken at approx the same time from the same sporophore was 16,000 spores/liter of air. Differences among max production figures were clarified by taking samples with the slide moving at 9.0 mm/min for 1 min. Spores were evenly distributed from start to finish, and the numbers of spores per liter were nearly equal to 5-sec samples. These results indicate an error in total production figures derived from long (60 sec +) sampling periods. Apparently some spores fail to stick to the slide after the first few sec of sampling.

The modified sampler indicated a daily pattern of spore production with a peak near midnight in all sporophores (Fig. 3). Temperature ranged from 15-38 C, and relative humidity (RH) from 30-100% during the tests. Cessation of production due to extremes in temp or RH was not observed. The longest individual sporophore production recorded was 24 days. In individual sporophores, production was high for an average of 13 hr/day between 8 PM and 1 PM. This typical daily pattern was observed on 3 days in 1968 when relatively constant RH (95-100%) and temp (21-25 C) were recorded. The same daily pattern was observed with the unmodified sampler when production was moderate to low, but when production was high, data were discontinuous and production peaks were not always discovered.

In addition to satisfactory operation in the test just described, the timer has performed well in studies of spore production of six wood-decay fungi (3).

LITERATURE CITED

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