NOTE

A Vacuum-Assisted Apparatus for Collection of Live German Cockroaches (Dictyoptera: Blattellidae) from the Field[1]

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German cockroaches, *Blattella germanica* (L.), are captured in the field and subsequently colonized in the laboratory for research purposes. However, since the German cockroach has a long developmental period (Willis et al., 1958, Ann. Entomol. Soc. Am. 51: 53-69), the process of colonization may take months to years before sufficient numbers of cockroaches are available for experimentation. Moreover, the domesticated strain may not accurately resemble cockroaches in the field. For example, attenuation of insecticide resistance occurs in the absence of insecticide selection pressure during the domestication process (Cochran, 1993, J. Econ. Entomol. 86: 1639-1644). In these instances, experiments conducted on cockroaches collected directly from the field would yield more informative results concerning the resistance level *in situ*. For these and other situations where live field-collected German cockroaches are desired, a vacuum-assisted collection apparatus was constructed.

The **v**acuum-**a**ssisted cock**r**oach **c**ollector (VARC) was constructed from materials available in a home-center or hardware store for approximately $24. After construction, the VARC attaches to a common shop-type vacuum cleaner. The majority of the components were polyvinyl chloride (PVC) pipe and related fittings (Fig. 1). The following parts were required: 20.3 cm of 2.7 cm OD PVC pipe (A,M); one 4.8 cm OD × 2.7 cm ID PVC bushing (B); two 5.7 cm OD × 10.2 cm OD PVC reduction couplings (C,H); one 2.7 cm ID PVC coupling (D); one 6.9

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cm OD PVC coupling (G); one 4.8 cm OD × 3.4 cm ID PVC bushing (I); 16 cm of 3.4 cm OD PVC pipe (J,O); one 3.4 cm ID tee (K); one 3.4 cm OD × 2.7 cm ID busing (L); one 2.7 cm ID PVC ball valve (N); 32 cm^2 of 6 mesh (per cm) fiberglass screening (F); 25.4 cm plexiglass cylinder, 8.9 cm OD, 0.32 cm wall thickness (E); 1.8 meters of lightweight bilge hose with a relatively smooth interior (2.9 cm ID).

Assembly began with modification of the 4.8 cm OD × 2.7 cm ID bushing (Fig. 1 [B]). The internal diameter of the bushing was increased to accept the PVC pipe (A) with a small sanding drum attached to a drill. The pipe (15.3 cm length) was cemented into the bushing with PVC cement; 5 cm of the pipe was left exposed on the polygonal side of the bushing. The busing/pipe combination (A/B) was then cemented to a 5.7 cm OD × 10.2 cm OD PVC reduction coupling (C).

The 4.8 cm OD × 3.4 cm ID PVC bushing (I) was cemented to the other 5.7 cm OD × 10.2 cm OD reduction coupling (H). The 3.4 cm ID tee (K) was joined to the bushing (I) via a 5 cm piece of 3.4 cm OD pipe (J). To one side of the tee (K) a 3.4 cm OD × 2.7 cm ID bushing (L), a 5 cm section of 2.7 cm ID pipe (M), and a 2.7 cm ID ball valve (N) were attached. The other side of the tee received an 11.5 cm section of 3.4 cm OD pipe (O). The plexiglass cylinder (E) was then cemented to the coupling (H).

The screen cone (F) used to contain the cockroaches was fabricated with 6 mesh fiberglass screening. The screening was wrapped around a Styrofoam cone used as a template (7 cm diameter base × 15 cm length) and sewn together along the edge. The bottom of the screen cone was glued using a hot glue gun to a ring of PVC (1 cm depth) cut from the 6.9 cm OD coupling. Screen also was glued to the face of the PVC ring. The small end of the cone was attached to a 2.7 cm ID PVC coupling (D) with a hose clamp. The coupling (D) was slipped onto the inlet pipe (A) extending into the plexiglass tube.

The ball valve (N) was used to regulate the vacuum force at the inlet hose by diverting air flow. Shop-type canister vacuum sources provide adequate suction force for the VARC. The VARC pictured in Fig. 2 is attached to a li'l Hummer® (Miracle Marketing Corp., Salt Lake City, UT) vacuum. When using the lil' Hummer® as the vacuum source the ball valve was not necessary; sufficient vacuum force was generated with the diverter completely open. Obviously, if the vacuum force is too great the cockroaches will be killed. Care must be taken to correctly regulate the air flow at the vacuum diverter (N). Bilge hose was used to connect the VARC to a vacuum source and as an extension of the suction inlet.

Cockroaches were sucked into the screen bag (F) via the inlet hose. Once captured, the vacuum was stopped and the screen bag was removed from the inlet pipe by simply slipping coupling D off of the inlet pipe (A). The bag can be replaced and vacuuming can be resumed immediately. Cockroaches in the screen bag can be dumped into a suitable container or temporarily held in the screen bag.

Field collections of German cockroaches are typically accomplished with passive trapping systems. One of the most common is a glass jar coated around the interior rim with petroleum jelly and baited with a small portion of beer and bread (Owens and Bennett, 1983, Environ. Entomol. 12: 1040-1046). The baited jars are placed in the infested structure and retrieved some time later (usually

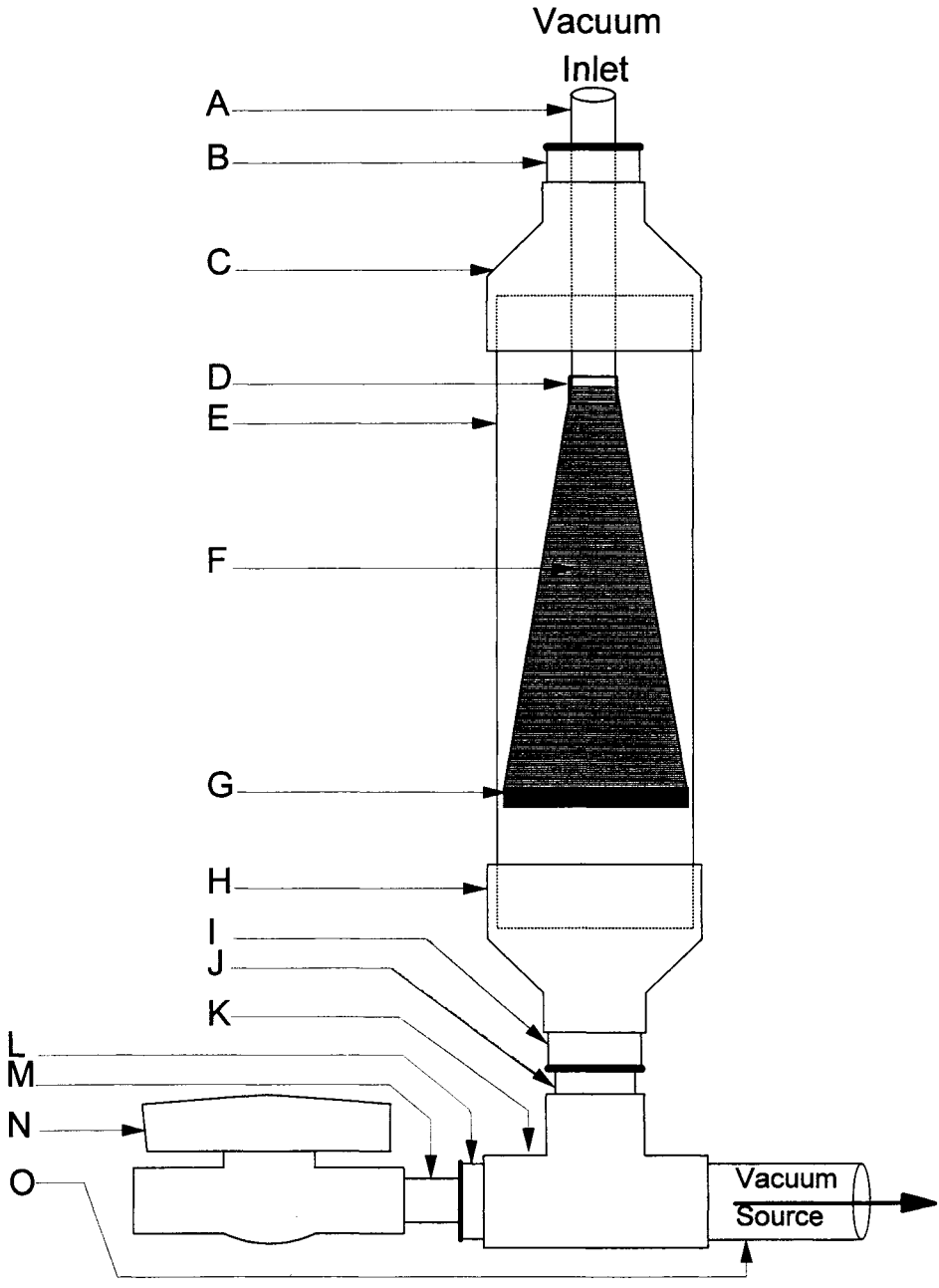

Fig. 1. Diagrammatic sketch of the vacuum-assisted cockroach collector.

Fig. 2. Photograph of the vacuum-assisted cockroach collector attached to a lil' Hummer® vacuum.

12 to 24 h). Unfortunately, this method yields low numbers of cockroaches and, because it only captures foraging stages, results in a biased population sample. Furthermore, it requires two or more visits to the infested building. These factors may limit the type of experimentation than can be conducted. Conversely, the VARC is an active collection method providing the ability to catch all developmental stages and in higher quantity compared with passive trapping methods. Beer and bread baited glass jar traps (6 per kitchen) yielded 35.5 ± 18.5 cockroaches in a 24 h period in a kitchen artificially infested with approximately 500 cockroaches. Under the same conditions, the VARC caught 175.5 ± 28.5 cockroaches in 5 min.

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