and 24-hour light-day treatments yielded significantly higher titers in salivary secretions than 0-hour light day treatments.

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STUDIES WITH THE POWER-DRIVEN BACK-PACK SPRAYER-DUSTER [1]

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Of all the insecticide dispersal equipment, none seems to be as controversial as the motor-driven back-pack. Our experience with these machines shows there are basically two schools of thought concerning this tool; those that like it and those that don't.

The motor-driven back-pack is a tool that has a specific capability and place in insect control, and when anyone using this machine loses sight of this fact, there are unpleasant results. The value of this device varies quite considerably with the different situation and circumstances and this should be kept in mind at all times.

We have successfully used these machines for dispersal of liquids, dusts and granules in various entomological problem areas. Perhaps the greatest advantage we have experienced with this machine is the omipresent opportunity for selective application of insecticide. It can be assumed that wherever a man can go on foot, by boat or wheeled-vehicle, this machine can go also. Much of our work has had to do with controlling mosquitoes utilizing the "source reduction" concept and here the back-pack has proved especially useful. Instead of making blanket aerial applications of insecticide to several acres of suspected mosquito breeding and resting sites, we have typically been able to get to the actual sites and exert prompt selective and efficient control at a fraction of the cost and time otherwise required.

Many times operators of this machine have suggested that these machines cannot disperse the insecticide materials very far. Using a "Day-Glo" dye as a marker mixed with dust and granules, we have consistenly found that granules are distributed in a very even pattern up to 35–60 feet from the nozzle of the machine; and dust as much as 500 feet when assisted by a 2–3 m.p.h. tail wind. Liquids are typically dispersed 40–50 feet from the nozzle in still air.

[1] The opinions and assertions contained herein are the private ones of the authors and are not to be construed as official or reflecting the views of the Navy Department or the naval service at large.

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Maximum distance for dispersal of any of the materials, regardless of whether dust, liquid or granule, is affected by the angle at which the nozzle is held during application. Greatest distances seem to be achieved when holding the nozzle at an angle of 15° with respect to the ground.

The most consistent problem concerned with dispersal of dust from a power-driven back-pack is the complaint that the dust "packs" in the hopper and does not feed into the flow outlet. We have found that adding a small amount of coarse material such as dry sand, fine vermiculite or granules at a ratio of 1 part coarse material to 4 parts dust, completely eliminates this problem. Especially noteworthy is the fact that in areas where heavy populations of mosquitoes such as salt marsh mosquitoes are a problem, as in parts of Florida, the Bahamas and Puerto Rico, application of 5 percent malathion dust mixed with the above-mentioned proportion of 1 percent Baytex granules gives a two-fold effect. The dust kills off or reduces the critical mass of adults and emerging adults, and the granules control the larvae. This combination has produced many outstanding examples of source reduction through selective application in areas where access by motor vehicles is impossible.

Many back-pack flow-rate controls have failed to function properly following their use for liquid dispersal. In all such nonfunctional back-packs examined to date, it has been found that they were returned to storage with some liquid in the hopper or not given any post-dispersal care. We have found that when the liquid tank is for all practical purposes empty, opening the flow valve all the way and letting the machine run for about 1 minute removes the residual liquids and dries the tank and valve.

Perhaps one of the most frustrating jobs related to the back-pack is loading of dust and granules. Loading of liquids is no problem since it is easy to pour liquids through the 4-inch opening in the top of the hopper. However, to pour dust from a 50-pound bag or 25-pound can has resulted in difficulties such as waste, spillage (with contamination of the exterior of the machine) where it contacts operator, and wasted time. Since the back-packs that we have used so far have been equipped with 4-inch diameter openings on the hopper, we have solved the dust and granule loading problem by making a funnel adapter to attach to the hopper opening as seen in figure 1. The funnel is a 4-inch screw top cover from a food jar with the center cut out. To this cover we soldered 26-gauge galvanized tin. The resultant funnel is 4 inches in diameter at the bottom, 12 inches at the top and has an overall height of 7¼ inches. The volume of the funnel is 381 cubic inches and holds approximately 12 pounds of dust or 6 pounds of granules. By using this

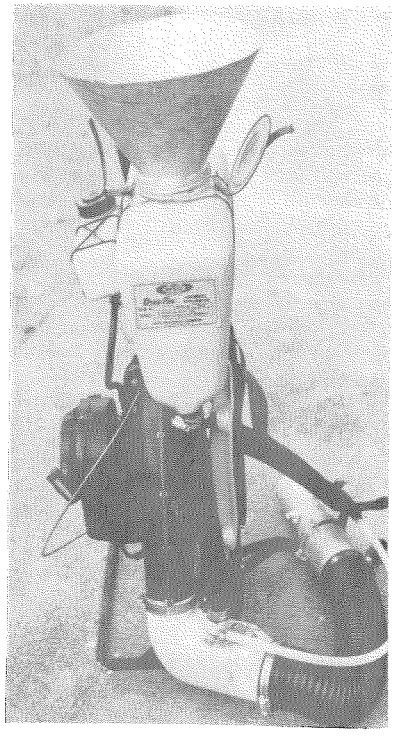

FIG. 1.—Funnel adaptation for loading back-pack.

funnel, not only can granules and dust be easily loaded into the hopper, but granules and dust can be added simultaneously where this combination is required to help avoid the dust packing problem.

One of the greatest objections to the power-driven back-pack is that it is very heavy to carry after about 15 to 20 minutes. This may be true if the hopper is filled with granules and carried for a long distance before dispersal begins or if the required dispersal rate is very slow. However, by and large, the complaints that the back-pack is very heavy are completely unfounded. Typically, an entire hopper full of insecticide is selectively dispersed in 15–20 minutes, again depending on the problem area being treated. Minimum cleanout for a full dust load is approximately 5 minutes.

Although the motor-driven back-pack can be operated by one man, we have found that two-man teams greatly increase their efficiency. Usually one man carries the back-pack and disperses a load; the second man starts the machine (when required) for the one carrying the back-pack, in addition to bringing along gasoline and insecticide to be used as needed. Teams working in this manner seldom have the difficulty of becoming tired even after working for several hours with the back-pack.

Again it must be emphasized that the motor-driven back-pack is a specific tool that is most useful in small, isolated locations that are accessible only on foot.

Although source reduction techniques may be more difficult and laborious than those used for adulticiding, they are typically less expensive and far more effective in the long run. Since the motor-driven back-pack does not offer the glamour of an airplane nor the convenience and comfort of a seat on a Buffalo Turbine or a cold-fogger, it is only natural that there is considerable reluctance to use this device. Our work has shown that any extra effort required to operate and maintain this device is more than justified.