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PREFERENCE OF *MANSONIA UNIFORMIS* (THEOB.) FOR SPECIFIC WATER HYACINTH PLANTS [1]

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The search for a more rapid means of surveying for immature *Mansonia uniformis* (Theob.) mosquitoes continues to be one of the most challenging activities in mosquito control work. With increasing emphasis on selective application of insecticides, source reduction, and avoidance of ecological contamination, we are concerned with determining the exact locations of the mosquito breeding sites. A more rapid detection of *Mansonia* breeding sites would be more efficient and far more economical in control programs concerned with this mosquito.

Due to the unconventional means of respiration of the larvae of *Mansonia*, it is difficult to detect their breeding sites. Instead of rising to the surface of the water to exchange gases, *Mansonia* immatures insert their syphons or trumpets into hollow roots and stems of aquatic plants, such as water hyacinths, to obtain air. As a result, the ordinary mosquito survey technique of dipping at the surface of the water fails to detect the presence of such immatures.

Although investigators Hodgkin (1939) and Chow (1949) collected *Mansonia* larvae from the roots of plants such as water hyacinth, *Eichornia*, for several years, finding plants with immatures was left to chance. Laurence (1960) noted that *Mansonia* larvae were firmly attached to their host plant; thus, when the plant was removed from the water the tiny larvae blended in with the myriad of roots. This problem of detecting *Mansonia* immatures is compounded by mud clinging to the roots.

One technique used by investigators is to put suspect plants in a bowl or pail of water and shake the plant vigorously to dislodge mosquito immatures that may be attached to the roots. Not only does the presence of mud on the roots make the water opaque and impossible to observe immatures but when larvae detach from the host plant they go to the bottom of the pond (in this case the container) and burrow into the sediment. Bidlingmayer (1954) developed a technique for surveying for immature *M. perturbans* (Wlk.) using a sheet metal cylinder, but this technique is slow and only a small area can be surveyed within a given period of time. McDonald (1970) showed that when water hyacinth plants were hosts for *M. uniformis* immatures, the larvae and pupae detach from the roots and rise to the surface of the solution immediately when the host plant is placed in either a 5 percent sodium hydroxide or a 15 percent sodium chloride solution.

However, the major problem is still present: Which plants will be examined to detect the presence of mosquito immatures? Van den Assem and Metselaar (1958) were unable to demonstrate that plants actually attracted *Mansonia* larvae. Laurence and Smith (1958), however, implied that *M. africana* (Theob.) and *M. uniformis* larvae preferentially attach to various species of healthy plants rather than brown paper and further suggested that when *Mansonia* larvae are attached to a grass that dies, the larvae die also. These results would indicate that live plants should be more attractive than dead plants. The present study was carried out to determine whether certain water hyacinth plants are more attractive to the *M. uniformis* immatures than others, and whether there are physical characteristics of the plant associated with this attractiveness.

It has been suggested that live healthy plants are more attractive than dead ones and we tested this hypothesis. Water hyacinth plants were taken from a nearby pond where they were growing. All plants were alive and healthy and judged to be of the same age due to selection based on uniform size. First, ten plants were removed from the pond and placed in an incu-

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bator, set at 45° C., for 24 hours to allow them to die and dry completely. After the 24 hours had passed, the dead and dried plants were introduced into aquariums along with 10 fresh plants that had just been taken from the pond. One hundred *M. uniformis* fourth instar larvae were then introduced into the water with the plants. The aquariums were undisturbed for 48 hours to permit selection and attachment by the larvae. At the end of that period the roots of each plant were submerged in a 5 percent sodium hydroxide solution to determine numbers of larvae attached to the respective plants.

An average of 87 percent of the immatures attached to the live plants whereas only 9 percent attached to the dead and dried plants. Four percent were missing due to either natural mortality or failure to attach. Since the mosquito immatures preferred the live plants to the dead plants we then attempted to see if certain live plants were preferred over others. Since hyacinth produces a flower, we investigated to determine whether the presence or absence of flowers on the plants had any influence on preference by the immatures.

Ten flowering and 10 nonflowering plants were placed side by side in the aquariums. Again 100 *M. uniformis* fourth instar larvae were introduced into the aquariums and they were treated as in the previous test.

An average of 67 percent of the larvae attached to the flowering plants, whereas only 28 percent attached to the nonflowering plants and 5 percent were missing due to either natural mortality or failure to attach.

SUMMARY. *M. uniformis* 4th instar larvae demonstrate a preference for attaching to live water hyacinth rather than dead ones and flowering rather than nonflowering plants. It is not clear whether the specific plants attract the mosquito immatures or the mosquito immatures move randomly though the water and preferentially attach to one type of plant rather than another. This is not to say that all the various species of plants which are hosts to *M. uniformis* would have a similar relationship. These answers can be obtained only when different species of *Mansonia* and their reaction to various host plants can be observed. However, due to the abundance of *M. uniformis* and water hyacinth in Southeast Asia, the information presented may aid in simplifying our search for *M. uniformis* breeding sites.

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AUTOGENY IN *ANOPHELES AMICTUS HILLI*

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During January 1971, attempts were made to establish a laboratory colony of the mosquito *Anopheles amictus hilli* Woodhill & Lee 1944 from larvae collected at Gove, Northern Territory, Australia. Larvae collected in the field were sent by air to Sydney and reared in the laboratory in 6″ x 4″ x 2″ plastic trays containing 200 ml of river water and were fed on powdered fish food. Pupae were placed in 50 ml beakers of water inside gauze-covered 24 oz paper cups, and cotton wool pads soaked in sugar solution were provided for the emerging adults. Two to four days after emergence it was noticed that the females had laid eggs in the pupal beakers without first receiving a blood meal. This phenomenon of autogeny has been recorded widely in many mosquito genera but is rare in *Anopheles*, being first observed in *A. claviger* (Markovitch, 1941) and later in *A. crucians* (Chapman, 1962). This is the first recorded instance of autogeny in an Australasian *Anopheles*.

The ability to mate in small paper cups and lay eggs without a blood meal was a great ad-