

Florida Department of Agriculture and Consumer Services

Progress Report: Characterization of the Optimal Field Droplet Size for Aerial Applications of Permethrin.

Progress

Discussions with Dr Alfonso Ganan Calvo have revealed that there is still a significant wait on the mono-disperse sprayer. As section leader and Principle Investigator on this project I have done all that I can to encourage a more timely arrival. This whole process has taken longer than either I or Dr Ganan Calvo expected they have had difficulty finding reliable and timely suppliers. Moreover the conditions for mono-dispersity and the logistics of the build are colossal, 18,000 flow focusing cells must be made. The first build proposal was to laser drill these cells into stainless steel although Dr Ganan Calvo is still following this plan he is investigating other options in the attempt to get our sprayer to us as soon as possible

Dr Ganan Calvo has designed a flow focusing micro-nozzle, and has built a micro-mould (price is about \$30,000 USD). Via a plastic micro-injection machine they have started micro-injecting these moulds. The first series of working flow focusing nozzles, made with an exit orifice of 260 microns. They now need to get down to an orifice diameter of 130-150 microns for our application. This is too small, even for micro-injection moulding, so they must make blind nozzles and to drill them by laser. The micro-injection machine (\$50,000 USD, not too expensive for its quality) has cost Dr Ganan Calvo.

The new idea is to make 20,000 small plastic nozzles and mount them in the Nozzle Array Wings using a special distribution system. Dr Ganan Calvo will build 100 disk-like manifolds of 80mm in diameter with about 200 nozzles each, and will distribute them in the NAWs in a very similar way as photovoltaic cells in a rectangular collector. This is considered a faster and more reliable technique. It will be more expensive than the first method (stainless steel drilled tubes) that was in their previous report. However Dr Ganan

Calvo is committed to this project we are unique and if we can prove this method for commercialisation he will hopefully make back his losses. They have already invested money exceeding \$100.000 USD.

So as in the previous report we are simply waiting for the arrival of our mono-disperse sprayer. I would ask that the department of Agriculture have faith and consider our exceptional circumstances. This research project is my main focus. I believe we will be able to return fundamental information for mosquito control. My failure to complete this project for your program is not due to lethargy or misappropriation in funds. I want nothing more than to start and complete this research.

Dr Jane A.S. Barber

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Project Brief

This project was funded to characterize aerial flux and deposition of permethrin applications over a range of conditions. What makes this project exceptional is that a unique device is being built to achieve the previously impossible, and that is the application of mono-sized droplets at field application rates. The ability to isolate the parameter of droplet size means that we can precisely calculate the optimum droplet size distribution for permethrin over a range of meteorological conditions. Once we know how the spray will behave we can advise settings that will provide minimum ground contamination and maximum mosquito mortality.

Progress

Money became available the last week in April 2005 the sprayer was immediately commissioned. Please find attached the interim progress report from Dr Alfonso Ganan-Calvo.

To date the prototype has been built and is being tested; once the Spanish scientists are sure they have the correct conditions for permethrin mono-sized atomization, the build will begin. Once the conditions have been confirmed the actual build should only take one month.

In Panama City we have been putting into place all the meteorological equipment. To scale each experiment by meteorological stability we have two three dimensional sonic anemometers these will measure wind speed and direction at 10hz at 4ft and 40ft. Four two dimensional sonic anemometers will take comparative meteorological measures between the control and treatment sites. A Sonic Doppler Ranging device will vertically profile wind speed direction and vertical flux from 20-200m. Our droplet sizing and

volumetric samplers are all prepared and ready. Our Daphnia colony is stable, we are presently conducting temperature tolerance and dose response bioassays against permethrin. We have shown that permethrin preferentially binds to all cheap plastic. Glass mesocosms will be required in the field for daphnia. We have established LC50 and LC 90 for Daphnia magna and pulex. Daphnia pulex has a wider temperature range compared to Daphnia magna making it more robust for field research. The approximate LC50 and LC90 is 0.00515 μ l/ml and 0.00959 μ l/ml respectively. We shall continue running these dose response bioassays over a range of temperatures.

Close

In short we are all in place just waiting on the completion of the Flow focussing nozzle array wing. It should arrive this year to be retrofitted on to one of the Manatee Hughes 500 helicopters. Once we have the machine calibration trials will be conducted; then as soon as we have appropriate weather conditions the experimentation will begin.

Progress in this research has been presented at the American Society of Agricultural Engineers in July 2005. I have attached that presentation and again please read the attached report from Dr Alfonso Ganan Calvo, there is a certain level of confidentiality associated with this report. This report is only to be viewed by concerned parties within DACS it is not for dispersal.

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