



Solid State Chemistry For The Production Of Carbon Dioxide: Laboratory And Field Evaluations

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Because carbon dioxide (CO₂) attracts most mosquito species and other haematophagous flies it has been commonly used with various surveillance traps to increase collection size. CO₂ is traditionally supplied to these traps either from compressed gas cylinders, which requires a regulator, or as dry ice. Both methods can be inconvenient and often unavailable in remote locations. Therefore, alternative methods of generating/supplying CO₂ to these traps are being investigated. One such method is the Insect Bait (CO₂) Gas Sachet, manufactured by ICA, Tri Nova, Atlanta, GA, which uses a patented method for slow release of CO₂ from dry chemicals. This poster presents our investigations to answer the following questions: Does the product attract mosquitoes of any species under any circumstances? Will the product attract colonized *Aedes aegypti* in our olfactometer? If so, how long is it effective? If effective in the olfactometer, will it attract wild mosquitoes? If so, what species? Can it be used for routine mosquito surveillance.

Materials and Methods

To begin answering these questions, preliminary studies were conducted in the laboratory utilizing an airflow apparatus designed for selecting female mosquitoes for use in repellent and attraction studies (Posey & Schreck 1981). In operation, a stock cage (37.5 x 38.5 x 46.4 cm) of the desired mosquito species of a known is placed in the airflow apparatus. A trap is attached to the front of the apparatus. A CO₂ gas sachet is placed at the front end of the trap and a blower fan turned on. The odor emanating from the sachet then drifts through the trap into the stock cage. Females fly upwind following the attractant odor and get trapped. Collection periods of 3 and 30 minutes were used. Trapped mosquitoes were killed in the freezer and counted. Further studies were conducted in a dual port, triple cage olfactometer (Posey et. al., 1998). Female *Aedes aegypti* were used in these studies. Mosquitoes were allowed 3 minutes to respond to the presence of the sachets. Ageing studies, i.e sachets activated and tested at various time intervals after activation, were conducted to determine for how long the sachets were effective. These studies were followed by two field studies. In the first study MM-X traps baited with either the sachets or 500 cc/min metered from a cylinder (with/without octenol) were operated near a freshwater swamp. Four sachets were taped to the bottom of the MM-X trap. To determine whether these sachets might prove useful for routine mosquito surveillance, studies were conducted with Anastasia Mosquito Control District, St. Augustine, FL. CDC traps were baited with either 1 sachet, dry ice or 1-octen-3-ol (octenol)..



Airflow Apparatus



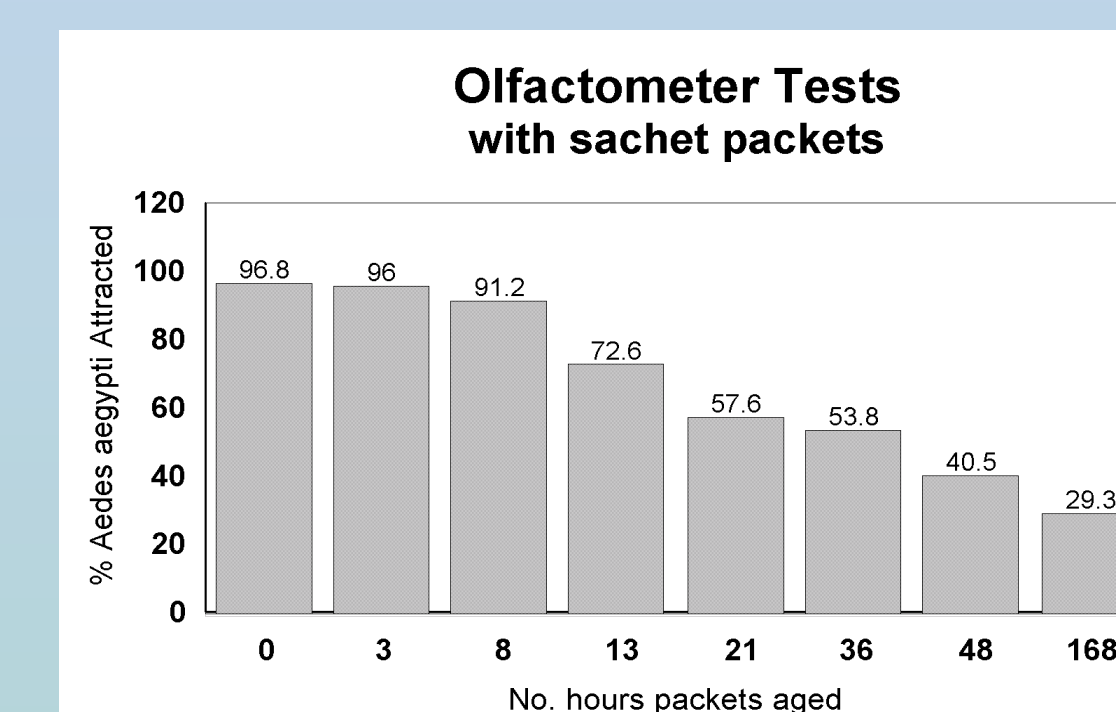
Triple Cage Olfactometer



MM-X Trap With CO₂ Sachets

Results

Mosquito Trapping With Airflow Device			
Trial	Sachet Size	Exposure Time (Min)	Females Captured
<i>Aedes aegypti</i>			
1	M	3	90
2	H	3	115
3	L	3	45
4	M	30	784
5	H	30	287
6	L	30	495
<i>Ochlerotatus taeniorhynchus</i>			
7	M	3	69
8	H	3	100
9	L	3	87
10	M	30	320
11	L	30	74



Treatment	7/15/03	7/16/03	7/17/03	Mean (SE)
CO ₂ Packets	23	19	11	18 (5)
Octenol	14	26	27	22 (6)
Dry Ice	175	22	197	131(78)

Anastasia Mosquito Control District's CDC Surveillance Trap Comparison Study With Three Different Baits

Comparison of MM-X traps baited with sachets and CO₂ from a cylinder (with/without octenol) against natural populations of mosquitoes.

Species	4 Sachets	4 sachets + octenol	500 cc/min CO ₂	500 cc/min CO ₂ + octenol
AeV	0	0	17	20
AnCr	7	11	230	1005
CsM	33	15	267	14
CxE	0	0	1	0
CxQ	12	15	90	13
CxS	13	17	144	117
OcA	4	18	33	45
OcC	5	11	144	368
OcD	0	0	1	1
OcI	19	78	595	1061
OcMi	0	0	0	1
PsF	1	1	23	88
TOTALS	94	166	1545	2733

Discussion and Conclusions

The studies reported here are just the beginnings of part of our investigation of the usefulness of this product for mosquito surveillance. They demonstrate that the product can attract mosquitoes both colonized and wild. Not all species are equally attracted. The trends are very similar when used with/without octenol to those obtained with CO₂ from a cylinder. The product will generate CO₂ over an extended period of time. Studies conducted by Anastasia Mosquito Control District indicate some promise that these sachets can be used for routine surveillance, but some changes will probably need to be made. The company says that sachets can be made which generate more CO₂ faster and it can be combined with some chemicals which can produce more CO₂ over an extended period of time. There is some speculation that it can be developed as a sticky trap to monitor or control natural populations of *Aedes aegypti* in houses in countries where dengue is a problem. Further research is planned to investigate this possibility.

Literature Cited

- Posey, K.H. and C.E. Schreck. 1981. An airflow apparatus for selecting female mosquitoes for use in repellent and attraction studies. *Mosquito News* 41: 566-568.
- Posey, K.H., D.R. Barnard and C.E. Schreck. 1998. Triple cage olfactometer for evaluating mosquito (Diptera: Culicidae) attraction responses. *J. Med. Entomol.* 35: 330-334.