Table 1. Percentage pupation and emergence and number of pupae and adults from first instar larvae of *Mansonia* set up in different culture media with 250 larvae in each culture.

Type of culture	Species of *Mansonia*	No. of tests	No. of I stage larvae set up	Pupation			Emergence			
				Average percentage pupated	Range	Total number pupated	Average percentage emerged	Range	Total number ♂♂	Total number ♀♀
Guinea pig dung infusion	*uniformis*	24	6000	26.8	0–80.0	1608	18.7	0–55	561	563
+ yeast	*bonneae*	10	2500	17.5	0–35.2	438	12.2	0–26	162	144
+ paper	*indiana*	7	1750	29.1	18.8–46.8	510	11.4	0–27.6	110	90
Liver/ yeast + paper	*uniformis*	25	6250	39.0	1.2–80.0	2440	27.2	0–54	883	820
	bonneae	11	2750	38.7	22.4–61.6	1064	25.9	13.2–53.6	365	348
	indiana	3	750	27.2	10.4–40.4	204	16.3	6.8–25.6	62	60
Liver/ yeast + *J. repens*	*uniformis*	9	2250	36.3	7.6–74.4	816	27.6	6.0–59.2	280	341
	bonneae	6	1500	25.3	8.0–48.0	380	19.3	4.8–37.2	136	154
	indiana	8	2000	26.5	2.8–55.6	529	17.0	0–40.0	175	164

pupation and emergence among the three species.

The conditions provided in the insectary tend to prolong the life cycle with a consequent increase in the mortality of immature stages. Recently, parallel cultures have been set up in an outdoor insectary with the temperature ranging from 28–30°C. In a preliminary set of outdoor cultures of *Ma. uniformis* the average pupation was 49% and the average emergence 37%. Adequate numbers of robust adults are being obtained from both indoor and outdoor cultures and experimental transmission studies have commenced. Complete accounts of detail colonization experiments of the five species will be presented later.

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A BASIC PROGRAM FOR THE ANALYSIS OF ULV INSECTICIDE DROPLETS[1]

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In order to satisfy labeling requirements, improve application efficiency, and develop a legal historical record of applied droplet sizes, the New Jersey State Airspray Program regularly collects sprayed (airborne) insecticide droplets for microscopic measurement, and

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determination of the number median diameter (NMD) and volume median diameter (VMD) (Kent and Sutherland 1978).

Such an evaluation of ULV droplet size has become an essential, but often tedious chore in mosquito control work. Using a programmable calculator, West and Cashman (1980) reduced the time and effort necessary for performing the calculations. In New Jersey, a FORTRAN program was developed and run on the Rutgers University mainframe computer. This minimized the time and effort needed for calculating the NMD and VMD. Presently, a microcomputer with a BASIC program is used in our program, with advantages over all previous systems.

Figure 1 is a BASIC computer program, written for an IBM personal computer with an Epson MX80 printer. The program defines the dimensions of the variables in lines 120–140. The preliminary data are entered with lines 150–190. The number of divisions (NUM; line 180, 200, 360, 720) corresponds to the largest eyepiece division that contains a droplet. The NMD is calculated at line 520 by interpolating between the first division with accumulative percentage (SA) greater than 50 (line 450) and the previous division (line 420). The VMD is likewise calculated at line 530 using corresponding data (SV) from lines 500 and 470. The results are displayed on the monitor (lines 550–560) and can be printed with lines 640–800. Remarks are entered with lines 590–630 and printed with lines 810–830.

To run the program, the number of divisions and the conversion factor are entered. The conversion factor includes the spread factor of the collecting surface (Anderson and Schulte 1971), multiplied by the size of each eyepiece division (in microns). The number of droplets for each eyepiece division is then entered. The NMD used in this program and in Rathburn (1970) is the same as the length median diameter calculated by Carroll and Bourg (1979).

The advantages of this program are numerous. The microcomputer is more readily available for calculations than the Rutgers University computer and the results are available immediately. The format of the program minimizes the chance of error and allows the program to be run by personnel with a brief orientation. The printed output is listed on standard 8½ × 11 in (21.5 × 28 cm) paper, which may be easily stored in conventional file systems. As microcomputers become increasingly available to county mosquito control agencies, this program can be used to evaluate ULV droplets. With the advantages listed above, agencies may increase the monitoring of their ULV equipment and thus increase the effectiveness of their program.

```
100 WIDTH "LPT1:",132
110 W1=0: W2=0: SV=0: SA=0 TDROPS=0
120 DIM A(50):DIM PA(50):DIM PV(50)
130 DIM SV(50):DIM V(50):DIM VN(50)
140 DIM SA(50):DIM S(50)
150 INPUT "SITE";SITE$
160 INPUT "DATE";DAT$
170 INPUT "INSECTICIDE";IN$
180 INPUT "NUMBER OF DIVISIONS";NUM
190 INPUT "CONVERSION FACTOR"; CONV
200 FOR T=1 TO NUM
210 PRINT "Droplets in division"; T
220 INPUT S(T)
230 TDROPS =TDROPS+S(T)
240 V(T)=(T*T*T)
250 VN(T)=V(T)*S(T)
260 SV=SV+VN(T)
270 A(T)=T*S(T)
280 SA=SA+A(T)
290 NEXT T
300 B=100/SA
310 C=100/SV
320 PV(1)=VN(1)*C
330 SV(1)=PV(1)
340 PA(1)=A(1)*B
350 SA(1)=PA(1)
360 FOR R=2 TO NUM
370 PA(R)=A(R)*B
380 PV(R)=VN(R)*C
390 SA(R)=SA(R-1)+PA(R)
400 SV(R)=SV(R-1)+PV(R)
410 IF SA(R) >= 50 THEN GOTO  440
420 Y=SA(R): J=R
430 GOTO 460
440 IF W1=1 THEN GOTO 460
450 X=SA(R): K=R: W1=1
460 IF SV(R)>= 50 GOTO 490
470 Y3=SV(R):J3=R
480 GOTO 510
490 IF W2=1 THEN GOTO 510
500 X3=SV(R): K3=R: W2=1
510 NEXT R
520 NM=(K+((50-X)/(Y-X))*(J-K))*CONV
530 VM=(K3+((50-X3)/(Y3-X3))*(J3-K3))*CONV
540 PRINT
550 PRINT "Number Median Diameter =" NM "microns"
560 PRINT "Volume Median Diameter =" VM "microns"
570 INPUT "Would you like a printout (Y/N)";RE$
580 IF RE$="Y" OR RE$="y" GOTO 590 ELSE 840
590 INPUT "Remarks (Y/N, no. of lines)";R2$,N
600 IF R2$ = "Y" OR RE$="y" GOTO 610 ELSE 640
610 FOR I=1 TO N
620 INPUT "REMARK";Q$(I)
630 NEXT I
640 LPRINT CHR$(27)"w"CHR$(1) "     U.L.V. Droplet Analysis";CHR$(27)"
W"CHR$(0)
650 LPRINT:LPRINT CHR$(15) "Site: " SITE$
660 LPRINT "Date: " DAT$
670 LPRINT "Insecticide: " IN$
680 LPRINT "Conversion factor =" CONV:LPRINT
690 LPRINT "EYEPIECE    # OF"
700 LPRINT "DIVISIONS  DROPLETS     D*N      % OF TOTAL   ACCUMULATIVE
   DIVISIONS   D3*N    % OF TOTAL    ACCUMULATIVE"
710 LPRINT CHR$(27)"U" CHR$(1) "   (D)       (N)                  D*N/E
(D*N)     PERCENTAGE       CUBED          D3*N/E(D3*N)    PERCENTAGE"
720 FOR U=1 TO NUM
730 LPRINT USING "  ###       ####       #####          ###.##          ###
.##       #####    ######       ##.##          ###.##";U,S(U),A(U),PA(U),
SA(U), V(U),VN(U),PV(U),SV(U)
740 NEXT U
750 LPRINT "                -----       -----
     -----"
760 LPRINT USING "                ####       #####
                ######";TDROPS,SA,SV
770 LPRINT CHR$(18)
780 LPRINT CHR$(27) CHR$(69) "NUMBER MEDIAN DIAMETER =" NM "MICRONS"
790 LPRINT "VOLUME MEDIAN DIAMETER =" VM "MICRONS"
800 LPRINT CHR$(27) CHR$(70):LPRINT CHR$(27)"U" CHR$(0)
810 FOR I=1 TO N
820 LPRINT Q$(I)
830 NEXT I
840 END
```

Fig. 1. BASIC program to compute NMD and VMD for ULV droplet data.

U.L.V. Droplet Analysis

Site: Port Norris, Cumberland Co.
Date: Septeaber 8, 1982
Insecticide: Malathion U.L.V. @ 3 oz/acre
Conversion factor = 11.06

Eyepiece DIVISIONS (D)	# of DROPLETS (N)	D*N	% OF TOTAL D*N/E(D*N)	ACCUMULATIVE PERCENTAGE	DIVISIONS CUBED	D3*N	% OF TOTAL D3*N/E(D3*N)	ACCUMULATIVE PERCENTAGE
1	4	4	0.83	0.83	1	4	0.02	0.02
2	33	66	13.66	14.49	8	264	1.55	1.57
3	38	114	23.60	38.10	27	1026	6.02	7.59
4	18	72	14.91	53.00	64	1152	6.76	14.35
5	15	75	15.53	68.53	125	1875	11.00	25.34
6	6	36	7.45	75.98	216	1296	7.60	32.95
7	5	35	7.25	83.23	343	1715	10.06	43.01
8	4	32	6.63	89.86	512	2048	12.01	55.02
9	0	0	0.00	89.86	729	0	0.00	55.02
10	1	10	2.07	91.93	1000	1000	5.87	60.88
11	0	0	0.00	91.93	1331	0	0.00	60.88
12	1	12	2.48	94.41	1728	1728	10.14	71.02
13	1	13	2.69	97.10	2197	2197	12.89	83.91
14	1	14	2.90	100.00	2744	2744	16.09	100.00
	127	483				17049		

NUMBER MEDIAN DIAMETER = 42.01264 MICRONS
VOLUME MEDIAN DIAMETER = 83.85996 MICRONS

Collector: Slavin
Reader: Kent
Temperature: 69 F
80015 nozzles

Fig. 2. Sample output of the BASIC program.

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