Inheritance of Dieldrin-Resistance in *Musca domestica nebulo*. S. Jamilur RAHMAN and Nawab H. KHAN (Department of Zoology, Muslim University, Aligarh, India). Received April 30, 1964. *Botyu-Kagaku*, **29**, 19, 1964.

4. イエバエの一亜種 *Musca domestica nebulo* の dieldrin 抵抗性の遺伝

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dieldrin に抵抗性を示す *Musca domestica nebulo* の一系統を抵抗性を示さぬ系統と交雑実験を行つてその遺伝性をしらべた．実験は雌雄一対の相反交雑と集団についての交雑によつて行つたが，dieldrin 抵抗性が一つの同義因子によつていることが判つた．F_2 で分離は見られず，また F_1 のヘテロ接合体と親世代の感受性個体との戻し交雑でも単因子性は証明されなかつた．

There have been several independent investigations on the inheritance of dieldrin-resistance in the housefly, *Musca domestica domestica*. Abdullah (1961) studied the F_1 and F_2 progenies of crosses between a dieldrin-resistant and a susceptible strain of *domestica* and concluded that dieldrin-resistance in this form of housefly was polyfactorial in nature. Later in 1962 two independent group of workers, Guneidy and Busvine in England and Georghiou *et al.* in U.S.A. found evidence to show that dieldrin-resistance in *M.d. domestica* was due to a single pair of alleles or to a number of closely linked alleles which were transmitted as a single unit.

The investigations cited above relate to *M. d. domestica* and the authors are unaware of any studies concerning the inheritance of dieldrin-resistance in the predominant Indian housefly, *M. d. nebulo*. An attempt was, therefore, made to find out the genetic nature of dieldrin-resistance in this form of housefly.

Methods

Pupae of the normal and resistant strains were kept individually in small glass vials and the flies sexed on emergence. Reciprocal crosses were made between the two strains. Two sets of experiments were performed ; in the first set individual flies of the two strains were crossed while in the other mass crosses were made between the resistant and the normal strains.

The flies were reared on cotton pads soaked in diluted milk and sugar and the adults when 4-day-old were tested with topical applications of dieldrin solutions in acetone on the dorsum of thorax of each fly with a microsyringe (Busvine 1951). The size of the drop applied was kept constant but the concentration varied.

Results

The percentage mortalities of the parents with different concentrations of dieldrin were shown

Table 1.

Concentration	Normal			Resistant		
	Males	Females	Average	Males	Females	Average
0.03125	20.0	12.9	15.8	—	—	—
0.0625	28.2	21.1	24.4	—	—	—
0.125	61.0	36.1	48.2	0.0	0.0	0.0
0.25	70.1	54.1	63.3	13.04	11.7	12.5
0.5	94.5	88.0	91.09	50.0	21.8	35.0
1.0	100.0	100.0	100.0	62.7	46.1	54.5
2.0	—	—	—	80.0	68.7	73.6
4.0	—	—	—	92.8	54.1	75.0
6.0	—	—	—	100.0	75.0	87.5

in Table 1.

The LC_{50} values of the resistant and normal parents were 1.05 and 0.125 per cent respectively; the resistance ratio being 8.4.

The results of tests on F_1 and F_2 progenies obtained from single-pair matings and mass crosses between the normal and resistant flies are presented in Tables 2 and 3.

Table 2. Results of tests on groups of flies in the progenies of various normal × resistant single-cross matings.

Generation	Original cross Type	Pair No.	Percentage of flies killed by different concentrations of dieldrin 0.125	0.25	0.5	1.0	2.0	4.0	6.0
F_1	♂N × ♀R	1	10.5	27.7	46.6	62.5	85.0	82.2	100.0
		2	12.0	18.7	50.0	72.2	88.2	80.9	95.2
		3	16.6	23.07	47.4	70.5	85.7	91.3	93.3
		4	16.6	29.6	36.3	62.5	75.0	83.3	96.0
		5	20.0	22.7	36.8	69.2	77.7	91.6	100.0
	Average		15.0	24.7	43.3	67.4	82.2	87.5	96.7
	♂R × ♀N	6	—	13.3	50.0	68.7	76.9	86.3	95.2
		7	—	17.3	41.6	61.8	83.3	88.2	91.3
		8	20.0	28.5	29.1	56.0	78.2	91.6	96.8
		9	14.2	19.3	52.9	65.3	76.1	85.0	91.6
		10	17.2	23.8	45.1	64.5	73.07	84.6	92.5
	Average		17.7	21.1	44.7	63.05	77.1	87.1	91.6
F_2	♂N × ♀R	4	40.0	46.6	60.08	90.4	92.5	100.0	—
		5	39.02	47.7	68.0	85.1	100.0	100.0	—
	Average		39.8	47.1	64.5	88.03	96.4	100.0	—
	♂R × ♀N	8	31.2	43.3	75.0	86.2	95.9	100.0	—
		10	32.0	43.9	84.8	90.3	95.1	100.0	—
	Average		31.6	43.6	80.09	88.3	95.4	100.0	—
F_1	All data		15.9 (29/182)	22.9 (52/227)	44.1 (101/229)	65.3 (160/245)	79.5 (167/210)	87.3 (200/229)	95.1 (237/249)
F_2	All data		35.8 (72/201)	45.2 (101/223)	73.8 (164/222)	88.1 (209/237)	96.0 (216/225)	100.0 (219/219)	— —

Table 3. Results of tests on groups of flies in the progenies of various normal × resistant mass-cross matings.

Generation	Type of cross	Percentage of flies killed by different concentrations of dieldrin 0.125	0.25	0.5	1.0	2.0	4.0	6.0
F_1	♂N × ♀R	13.1	25.0	34.3	63.2	71.4	73.5	93.2
	♂R × ♀N	16.1	25.4	46.1	66.6	74.5	83.3	96.2
F_2	♂N × ♀R	40.8	42.1	66.6	85.07	96.2	100.0	
	♂R × ♀N	30.1	50.0	65.3	83.9	94.03	100.0	
F_1	All data	14.6 (18/123)	25.2 (27/107)	39.4 (47/119)	65.2 (79/121)	72.8 (78/107)	82.4 (127/154)	95.0 (133/140)
F_2	All data	34.2 (39/114)	46.3 (57/123)	66.1 (88/133)	85.7 (150/175)	95.0 (114/120)	100.0 (120/120)	

The F_1 hybrids of the reciprocal crosses between the two parents were back-crossed with susceptible parents and the offsprings when tested for their susceptibility to 1.0% dieldrin gave the following mortalities, given in Table 4.

Table 4.

Back-cross	Percentage mortality with 1.0% dieldrin		
	Males	Females	Average
♂F_1(♂N×♀R)×♀N	80.0	40.0	58.4
♂F_1(♂R×♀N)×♀N	66.6	35.4	52.5
All data	72.4	37.8	54.7
♀F_1(♂N×♀R)×♂N	69.6	38.4	55.9
♀F_1(♂R×♀N)×♂N	57.5	47.5	52.1
All data	63.4	43.7	53.8

The back-cross (F_1) offspring was slightly less resistant than the resistant parents and far more resistant than the susceptible ones and though the degree of resistance decreased in the F_2 generation, it was still nearer to the resistant parents. The F_2 flies did not segregate into 1:3 ratio expected in simple Mendelian inheritance and the results of crosses between F_1 heterozygotes and susceptible parents failed to provide any evidence of monofactoriality. It can, therefore, be concluded that dieldrin-resistance in *M. d. nebulo* is a phenomenon of multifactorial inheritance, a conclusion substantiated by the earlier findings of Abdullah (1961) who obtained evidence to show that dieldrin-resistance in *M. d. domestica* is governed by a multiple-gene factor.

Conclusions

The results of reciprocal single-pair as well as mass-cross matings between a dieldrin-resistant and a susceptible strain of *M. d. nebulo* showed that dieldrin-resistance in this form of housefly is governed by a multiple-gene factor. The F_2 generation did not show any segregation and the results of back-crosses between F_1 heterozygotes and susceptible parents failed to provide any evidence of monofactoriality.

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5. ブユ駆除のため河川に殺虫剤を投入した場合における薬剤の分散状況について

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ブユ幼虫駆除の目的で，流水量が毎秒21～22トンの河川に，DDT 水和剤を 1 分間流水量に対し，1 ppm の割合で10分間投入した場合，その薬剤がどの程度に希釈されるか，その濃度分布状態を生物的方法により測定した．その結果，流心の上層部における濃度は，薬剤投入点より下流 10，25m 地点では 1.5～2.0 ppm でかなり高い値を示したが，50，100m 地点では 0.7～1.3 ppm となり，これより下流域では極度に減少し，1000 m 地点では，今回の生物的方法では測定不可能な低濃度であった．

ブユ成虫は蚊やアブなどと共に人畜を刺咬吸血する衛生害虫の一つで，その幼虫，蛹は清冷な小川や渓流の流水中に発生し，その付近の農村，山村においては人畜の受ける被害は甚大である．これらのブユの駆除は成虫よりも幼虫に重点がおかれ，現在本邦では東京都をはじめ，京都その他の諸地において，河川に殺虫