<table>
<thead>
<tr>
<th>Title</th>
<th>Inheritance of Dieldrin-Resistance in Musca domestica nebulo</th>
</tr>
</thead>
<tbody>
<tr>
<td>Author(s)</td>
<td>RAHMAN, S. Jamilur; KHAN, Nawab H.</td>
</tr>
<tr>
<td>Citation</td>
<td>防虫科学 (1964), 29(2): 19-21</td>
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<tr>
<td>Issue Date</td>
<td>1964-05</td>
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<td>URL</td>
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<tr>
<td>Type</td>
<td>Departmental Bulletin Paper</td>
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<td>Textversion</td>
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Kyoto University

There have been several independent investigations on the inheritance of dieldrin-resistance in the housefly, *Musca domestica domestica*. Abdullah (1961) studied the F₁ and F₂ 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.**

<table>
<thead>
<tr>
<th>Concentration</th>
<th>Normal</th>
<th></th>
<th></th>
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<th></th>
</tr>
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<td></td>
<td>Males</td>
<td>Females</td>
<td>Average</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.03125</td>
<td>20.0</td>
<td>12.9</td>
<td>15.8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.0625</td>
<td>28.2</td>
<td>21.1</td>
<td>24.4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.125</td>
<td>61.0</td>
<td>36.1</td>
<td>48.2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.25</td>
<td>70.1</td>
<td>54.1</td>
<td>63.3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.5</td>
<td>94.5</td>
<td>88.0</td>
<td>91.09</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.0</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.0</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.0</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.0</td>
<td>—</td>
<td>—</td>
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<td></td>
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</table>

<table>
<thead>
<tr>
<th></th>
<th>Resistant</th>
<th></th>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Males</td>
<td>Females</td>
<td>Average</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.03125</td>
<td>13.04</td>
<td>11.7</td>
<td>12.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.0625</td>
<td>50.0</td>
<td>21.8</td>
<td>35.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.125</td>
<td>62.7</td>
<td>46.1</td>
<td>54.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.25</td>
<td>80.0</td>
<td>68.7</td>
<td>73.6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.5</td>
<td>92.8</td>
<td>54.1</td>
<td>75.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.0</td>
<td>100.0</td>
<td>75.0</td>
<td>87.5</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
The LC50 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 F1 and F2 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.

<table>
<thead>
<tr>
<th>Generation</th>
<th>Type of cross</th>
<th>Percentage of flies killed by different concentrations of dieldrin</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Type (No.)</td>
<td>0.125 0.25 0.5 1.0 2.0 4.0 6.0</td>
</tr>
<tr>
<td>F1</td>
<td>♀N × 1</td>
<td>10.5 27.7 46.6 62.5 85.0 82.2 100.0</td>
</tr>
<tr>
<td></td>
<td>♀R 2</td>
<td>12.0 18.7 50.0 72.2 88.2 80.9 95.2</td>
</tr>
<tr>
<td></td>
<td>♀R 3</td>
<td>16.6 23.0 47.4 70.5 85.7 91.3 93.3</td>
</tr>
<tr>
<td></td>
<td>♀R 4</td>
<td>16.6 29.6 36.3 62.5 75.0 83.3 96.0</td>
</tr>
<tr>
<td></td>
<td>♀N 5</td>
<td>20.0 22.7 36.8 69.2 77.7 91.6 100.0</td>
</tr>
<tr>
<td></td>
<td>Average</td>
<td>15.0 24.7 43.3 67.4 82.2 87.5 96.7</td>
</tr>
<tr>
<td>F1</td>
<td>♀R × 6</td>
<td></td>
</tr>
<tr>
<td></td>
<td>♀N 7</td>
<td>- 13.3 50.0 68.7 76.9 86.3 95.2</td>
</tr>
<tr>
<td></td>
<td>♀N 8</td>
<td>20.0 28.5 29.1 56.0 78.2 91.6 96.8</td>
</tr>
<tr>
<td></td>
<td>♀N 9</td>
<td>14.2 19.3 52.9 70.5 76.1 85.0 91.6</td>
</tr>
<tr>
<td></td>
<td>♀N 10</td>
<td>17.2 23.8 45.1 64.5 73.0 84.6 92.5</td>
</tr>
<tr>
<td></td>
<td>Average</td>
<td>17.7 21.1 44.7 63.0 77.1 87.1 91.6</td>
</tr>
<tr>
<td>F2</td>
<td>♀N × 4</td>
<td>40.0 46.6 60.08 90.4 92.5 100.0 -</td>
</tr>
<tr>
<td></td>
<td>♀R 5</td>
<td>39.02 47.7 68.0 85.1 100.0 100.0 -</td>
</tr>
<tr>
<td></td>
<td>Average</td>
<td>39.8 47.1 64.5 88.03 96.4 100.0 -</td>
</tr>
<tr>
<td>F2</td>
<td>♀R × 8</td>
<td>31.2 43.3 75.0 86.2 95.9 100.0 -</td>
</tr>
<tr>
<td></td>
<td>♀N 10</td>
<td>32.0 43.9 84.8 90.3 95.1 100.0 -</td>
</tr>
<tr>
<td></td>
<td>Average</td>
<td>31.6 43.6 80.09 88.3 95.4 100.0 -</td>
</tr>
<tr>
<td>F1</td>
<td>All data</td>
<td>15.9 22.9 44.1 65.3 79.5 87.3 95.1</td>
</tr>
<tr>
<td>F2</td>
<td>All data</td>
<td>35.8 45.2 73.8 88.1 96.0 100.0 -</td>
</tr>
<tr>
<td></td>
<td>(72/201) (101/223) (164/222) (209/237) (216/225) (219/219) -</td>
<td></td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Generation</th>
<th>Type of cross</th>
<th>Percentage of flies killed by different concentrations of dieldrin</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Type (No.)</td>
<td>0.125 0.25 0.5 1.0 2.0 4.0 6.0</td>
</tr>
<tr>
<td>F1</td>
<td>♀N × ♀♀R</td>
<td>13.1 25.0 34.3 63.2 71.4 73.5 93.2</td>
</tr>
<tr>
<td></td>
<td>♀R × ♀♀N</td>
<td>16.1 25.4 46.1 66.6 74.5 83.3 96.2</td>
</tr>
<tr>
<td>F2</td>
<td>♀N × ♀♀R</td>
<td>40.8 42.1 66.6 85.07 96.2 100.0</td>
</tr>
<tr>
<td></td>
<td>♀R × ♀♀N</td>
<td>30.1 50.0 65.3 83.9 94.03 100.0</td>
</tr>
<tr>
<td>F1</td>
<td>All data</td>
<td>14.6 25.2 39.4 65.2 72.8 82.4 95.0</td>
</tr>
<tr>
<td></td>
<td>(18/123) (27/107) (47/119) (79/121) (78/107) (127/154) (133/140)</td>
<td></td>
</tr>
<tr>
<td>F2</td>
<td>All data</td>
<td>34.2 46.3 66.1 85.7 95.0 100.0</td>
</tr>
<tr>
<td></td>
<td>(39/114) (57/123) (88/133) (150/175) (114/120) (120/120) -</td>
<td></td>
</tr>
</tbody>
</table>
The F₁ 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.

<table>
<thead>
<tr>
<th>Back-cross</th>
<th>Percentage mortality with 1.0% dieldrin</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Males</td>
</tr>
<tr>
<td>♀F₁(♀N×♂R)×♀N</td>
<td>80.0</td>
</tr>
<tr>
<td>♀F₁(♀R×♀N)×♀N</td>
<td>66.6</td>
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<td>All data</td>
<td>72.4</td>
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<tr>
<td>♀F₂(♀N×♂R)×♀N</td>
<td>69.6</td>
</tr>
<tr>
<td>♀F₁(♂N×♀R)×♀N</td>
<td>57.5</td>
</tr>
<tr>
<td>All data</td>
<td>63.4</td>
</tr>
</tbody>
</table>

The back-cross (F₁) 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 F₂ generation, it was still nearer to the resistant parents. The F₂ flies did not segregate into 1:3 ratio expected in simple Mendelian inheritance and the results of crosses between F₁ heterozygotes and susceptible parents failed to provide any evidence of monofactoriality. It can, therefore, be concluded 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. nebula* showed that dieldrin-resistance in this form of housefly is governed by a multiple-gene factor. The F₂ generation did not show any segregation and the results of back-crosses between F₁ heterozygotes and susceptible parents failed to provide any evidence of monofactoriality.

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References


5. プ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 松尾常久男・田村昭夫（京都府立医科大学 医動物学教室） 39. 4. 30 受理

プ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分間流下水に対し、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、その薬剤散布状態を生物的 Faith の方法により測定した。その結果、流氷の上層部における薬剤濃度は、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、これより下流成績は極端に減少し、1000 m 地点では、今回の生物的 Faith の方法では測定不可の低濃度であった。

プユ成虫は蚊やアブなどと共に人畜を刺吸血する雑生害虫の一つで、その幼虫、卵は清流な小川や散布された流水中に発生し、その付近の農村、山村においては人畜の刺創の被害は甚大である。これからのプ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、京都その他の諸都市において、河川に殺虫