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<th>Title</th>
<th>Mating Vigour and Sexual Competitiveness of Chemosterilized Males of Culex fatigans</th>
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<td>Author(s)</td>
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Kyoto University
A number of workers have studied the effects of radiation and chemosterilization on the mating vigour and sexual competitiveness of male mosquitoes. Davis et al. (1959) observed a significant deficiency in the mating vigour of irradiated males of Anopheles quadrimaculatus. Normal females when allowed to mate with irradiated and normal males in 1:1:1 ratios laid eggs having a hatch rate of 74.0% as compared to the normal hatch rate of 96.0%. Both the irradiated and chemosterilized males of Musca domestica were found to be equally competitive to normal males, but males of A. quadrimaculatus irradiated at 12,000 r or fed on 1.0% apholate suffered a reduction of about 26% (Schmidt et al. 1964). The same workers observed that irradiation of males at 10,000 r or exposure to 7 mg/l tepa residues for two hours had practically no effect on their mating behaviour. LaBrecque et al. (1962) observed that male houseflies got sterilized when fed on 1.0% apholate and were equally or even more aggressive than the normal males in their mating power. On the other hand a loss in the mating vigour of the males of Aedes aegypti when treated with chemosterilants has been observed by Dame et al. (1964).

The findings reported above suggest that the effects of sterilizing agents on the mating vigour of males are rather specific and vary with the mode of treatment. As no attempt has been made to study the effects of apholate on the mating vigour and sexual competitiveness of C. fatigans, the phenomenon was studied by making treatments in the larval stage.

Materials and Methods

Test insect and chemical

The mosquitoes used in the present studies were drawn from the normal laboratory strain initially developed from larvae collected from a tank in Aligarh. The larval food consisted of dried yeast and blood albumen and the adults were reared on 10% glucose solution. The females were also fed on chicken blood.

Apholate was obtained through the courtesy of Dr. C. N. Smith of United States Department of Agriculture.

Experimental procedure

Five-day old larvae were released in water treated with 30 ppm apholate and were allowed to pupate. The pupae were sexed and the ones destined to become males were placed for emergence in wire frame cages covered over with muslin cloth and mosquito netting. The emerging males, when three-day old were released in cages
measuring 6” x 6” x 6” in size along with the
desired number of normal males and females of
the same age. Egg rafts were obtained after
the females had taken a blood meal and the rate
of hatching for individual rafts was determined.
In another test normal females were caged with
treated males to determine the maximum and
minimum sterility induced by the males.

Results and Discussion
Assuming that the sterilized and normal males
were equally aggressive, the expected number of
sterile rafts was calculated from the total number
of rafts obtained on the basis of the proportion
of sterilized males to the normal males. The
expected number of sterile egg rafts when
compared to the number of egg rafts actually
obtained shows that the latter exceeded in all
but two cases where the difference was almost
negligible. This shows that the sterile males
were no less vigorous and competitive in mating
than the normal ones. In other words the
females received the sterilized and normal males
with equal preference.

The sterilized males, obtained from larvae
exposed to 30 ppm apholate induced 95% or more
sterility as against less than 10% unhatchable
eggs obtained from crosses between normal males
and females. Thus all rafts with a hatch rate
of 5% or less can be grouped as sterile rafts
and those with 90% or more hatch as the normal
ones. The hatch rate obtained in the individual
rafts was either less than 5% or nearer to the
normal hatch so that it can be said that no
instance of intermediate hatch occurred during
the present studies. Dame et al. (1964), however,
found the males of Aedes aegypti treated with
apholate in the larval stage to be comparatively
less vigorous in mating with the females. Those
workers also observed that mixing of sperms in
the normal females, mated first to treated males
and then to untreated males, greatly reduced the
sterilizing effects of the treated males. The
present author, however, could not observe any
such effect. Infact as observed earlier by La-
Brecque et al. (1962) in the case of Musca
domestica, a higher sterility level in the eggs
obtained from the normal females caged with
sterilized and normal males was found by the
present author. This may be due to the fact
that the sterilized males or for that purpose the
sterile sperms are more vigorous than the normal
males or sperms. In a cross where 180 sterilized
and normal males in a ratio of 1:2 were caged
with 180 females, 150 egg rafts were obtained.
Of these 57 were sterilized rafts as against an
expected number of 50 such rafts (Table 1). It
is possible that, inspite of their being double in
number the normal males either could not co­
mpete with the sterilized ones in mating with
the females or that the sterilized males on mating
with the normal females nullified the effects of
normal matings. In yet another experiment
where the number of sterilized males was double
than the normal ones, the number of actually
obtained sterile rafts was still higher; 107 as
against the expected number of 95.3. These
observations therefore, clearly show that the
chemosterilization of C. fatigans in the larval
stage does not effect the mating potentialities
of the males.

Table 1. Sexual competency of male C. fatigans
treated with apholate.

<table>
<thead>
<tr>
<th>Type of mating</th>
<th>Egg rafts obtained</th>
<th>Egg rafts with 5.0% hatch or less</th>
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<tr>
<td>50: 50: 50*</td>
<td>36</td>
<td>18</td>
</tr>
<tr>
<td>60:120: 60</td>
<td>51</td>
<td>17</td>
</tr>
<tr>
<td>50:100:100</td>
<td>82</td>
<td>27.3</td>
</tr>
<tr>
<td>60:120:180</td>
<td>150</td>
<td>50</td>
</tr>
<tr>
<td>120: 60: 60</td>
<td>52</td>
<td>34.7</td>
</tr>
<tr>
<td>100: 50:100</td>
<td>90</td>
<td>60</td>
</tr>
<tr>
<td>120: 60:180</td>
<td>143</td>
<td>95.3</td>
</tr>
<tr>
<td>60: 60:120</td>
<td>100</td>
<td>50</td>
</tr>
<tr>
<td>50: 00: 50</td>
<td>41</td>
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* The figures indicate the number of sterilized
males, normal males and normal females in
each mating.

Summary
Effect of apholate on the mating vigour and
sexual competency of male Culex fatigans was
studied. Chemosterilized males were allowed to
mate with normal females in presence of normal
males in various ratios and rate of hatching was
determined in individual egg rafts. It was
observed that chemosterilization had an effect
on the mating competitiveness of male *C. fatigans*.
In a cross where 180 sterilized and normal males in a ratio of 1:2 were caged with 180 females, 150 egg rafts were obtained. Of these 57 were sterilized rafts as against an expected number of 50 such rafts.

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References


18. ピエリアシジンに関する研究 I. ピエリアシジンAおよびBのミトコンドリアの電子伝達系に及ぼす影響 清井 辰*，深見順一*，福永一夫**，佐川隆夫**，高橋信孝***，田村三郎*** (*理化学研究所 **中日製薬株式会社 **綜合研究所 ***東京大学農学部) 44. 6. 23 受理

Piericidin A and B have been isolated from *Streptomyces mobaraensis* and their chemical structures were elucidated by Tamura, Takahashi et al.*1,*2* These compounds were found to have insecticidal activity to certain insects.

Hall *et al.* (1966)*3* found that Piericidin A was a powerful inhibitor of mitochondrial electron transport in beef heart mitochondria and they concluded that insecticidal activity of Piericidin A might be based on its inhibition of mitochondrial function.

The effect of Piericidin A to the aerobic oxidation of substrates linked to pyridine nucleotides was as sensitive as previously described with rotenone.*4* In contrast with rotenone, however, Piericidin also inhibited succinoxidation system at considerably higher concentration. The fact that Piericidin resemble Co Q in the chemical structure and respiration was restored in succinoxidation system inhibited by Piericidin A by adding Co Q in this inhibited system suggested Piericidin A act as a competitive inhibitor of Co Q.

More recently, Miji *et al.* (1968)*5,*6* further