The Determination of Mating Speeds in *Drosophila melanogaster* for Various Combinations of Inbred Lines

Observations on 6 inbred lines, the 15 hybrids between them and their reciprocals, have shown that the time taken by previously unmated flies to mate (the mating speed) is controlled by the genotype[1,2]. It is also possible to investigate the mating speeds of the various combinations of inbred lines before breeding the hybrids, and this should provide, among other things, an overall estimate of the relative importance of the genotypes of the males and females in determining mating speed. In this paper, such an array of all possible combinations between 5 inbred lines will be considered. Thus there will be 5 inbred lines, the 10 possible combinations between them and the 10 reciprocal combinations. The inbred lines had been sibmated by pair matings for at least 100 generations. The lines used were similar, but not entirely the same as those used previously[1,2], because of difficulties in maintaining some of them.

The experimental procedure was the same as reported previously[1,2], except that flies were stored separately for 3 rather than 6 days before a single male was shaken in with a single female. The time (in min) pairs of flies were together before copulation commenced is the mating speed, and those not mating in 40 min were recorded as unmated. For each of the combinations between the inbred lines, and the inbred lines themselves, 16 trials were carried out split into 2 replicates of 8.

In Table I the means for the combinations between inbred lines are given expressed as $X_{i.}$ representing the means for the females of a given line with the 4 other lines, and $X_{.i}$ representing the means for the males of a given line with the 4 other lines. The means for the inbred lines themselves X_{ii} are also given. Means are given for those mating in $\leqq 10$ and $\leqq 40$ min. For a given time interval there is little difference between $X_{i.}$ and $X_{.i}$ on the one hand and X_{ii} on the other as might be expected, since hybrids are not being considered as in experiments reported previously[1,2].

Inspection of Table I reveals that the $X_{.i}$ values are perhaps more variable than the $X_{i.}$ values. To look at this further, analyses of variance were carried out for those mating in $\leqq 10$ and $\leqq 40$ min, with the aim of separating variation due to sexes (Table II). There is a highly significant component for male lines but not for female lines for those mating in $\leqq 10$ min, showing that the males are much more important in determining the number mating in 10 min than the females. For pairs mating in $\leqq 40$ min the component for male lines is still significant, but the component for female lines is subsignificant ($P < 0.10$). Analysis of the data for those mating in $\leqq 20$ min reveals an intermediate situation. Possibly, therefore, when mating is rapid it is determined entirely by the genotype of the male, but at a later stage the female's reaction to the male's courtship behaviour assumes more importance.

Table I. Mean numbers of successful matings

Line	Combinations between inbred lines		Inbred lines
	$X_{i.}$	$X_{.i}$	X_{ii}
	≤ 10 min		
N1	2.75	0.875	0.5
N2	2.375	1.75	3.0
Y2	2.125	2.125	3.0
G5	2.125	3.875	2.5
D5	2.875	3.625	2.0
Overall mean	2.45	2.45	2.2
Line	≤ 40 min		
N1	4.625	3.375	4.5
N2	5.25	4.5	7.0
Y2	4.375	5.875	3.0
G5	6.0	6.625	5.5
D5	6.375	6.25	3.5
Overall mean	5.325	5.325	4.7

Table II. Analysis of variance of the numbers of successful matings out of 8 after applying the angular transformation[a]

Source of variation	d.f.	≤ 10 min		≤ 40 min	
		m.s.	F	m.s.	F
Female lines	4	52	0.22	556	2.15[b]
Male lines	4	1531	6.57[d]	867	3.35[c]
Error	41	233		259	

[a] Observations for the inbred lines themselves are included in this analysis. [b] $P < 0.10$. [c] $P < 0.05$. [d] $P < 0.001$.

The data were analysed for a model incorporating a component for maternal (or paternal) effects as presented by WEARDEN[3] in a paper summarizing various methods of analysing diallel crosses. The main result of relevance to the present discussion is that the component for interactions between lines is insignificant throughout, even so it does increase from the $\leqq 10$ to the $\leqq 40$ min group of data. Thus although there are no significant interactions between inbred lines for the behaviour pattern determining mating speed, there is the possibility of significant interactions developing after a long period of time. This presumably is when the female's reaction to the male's courtship behaviour may become more important

These results have their parallel in a paper by KAUL and PARSONS[4], who studied the mating speed and duration of copulation for all possible combinations between the three karyotypes ST/ST, ST/CH, and CH/CH (ST = Standard and CH = Chiracahua gene arrangements) of *D. pseudoobscura*. They found that both the mating speed and duration of copulation were determined almost entirely by the male karyotype, and that there were no appreciable behavioural interactions between karyotypes[5].

Résumé. Il ressort de nos expériences portant sur cinq souches pures de *Drosophila melanogaster* que la souche d'origine du mâle influe sur la durée de l'accouplement (jusqu'à 40 min) de l'une de ces souches avec d'autres. Toutefois, il n'y a pas d'interactions significatives, de ce point de vue, entre les souches.

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[1] P. A. PARSONS, Exper. *20*, 569 (1964).

[2] P. A. PARSONS, Genetica *35*, 141 (1964).

[3] S. WEARDEN, Heredity *19*, 669 (1964).

[4] D. KAUL and P. A. PARSONS, Heredity *20*, in press (1965).

[5] The competent technical assistance of Miss H. GIDLEY is gratefully acknowledged.