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Variation in Mating Propensity And Mating Speed in Three Drosophila Species of Ananassae Species Subgroup

KEYWORDS: Mating propensity, mating speed, Drosophila ananassae etc.

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ABSTRACT *Sexual behavior must have evolved as an efficient mechanism to propagate the species. As a property contributing to Darwinian fitness it must be one of the most critical in the life cycle, because throughout the preadult stages numbers of individuals succumb to the exigencies of their environment so that at the mature stage when reproduction takes place the minimum for the life cycle is attained. Mating propensity and mating speed were studied in three species of Drosophila ananassae species subgroup. Which were collected from same locality. The results show statistically significant variation among different species with respect to mating propensity and mating speed. Thus, there is a negative correlation between mating propensity and mating speed in three species.*

INTRODUCTION

Sexual selection is one of the phenomenon which has evolved to increase the efficiency of sexual process. It is well known that sexual behaviour is under genetic control in *Drosophila* species (Spiess, 1970; Spieth and Ringo, 1983). A number of investigations on mating propensity have been carried out in different *Drosophila* species by utilizing mutant and wild type strains. In *D.melanogaster*, different mutant genes like white, yellow, ebony, cut and Bar have been found to diminish the sexual activity of males. Similarly, the white eye gene reduces sexual activity of males in *D.ananassae* (Singh *et.al.,* 1985). Singh and Pandey (1993) also found that purple eye color mutation affects mating propensity in *D.biarmipes*.

In addition to the effects of various mutations on sexual behaviour in *Drosophila*, evidence for polygenic control of this phenomenon has also been obtained. The results of selection experiments for fast and slow mating speed were conducted in *D.melanogaster* (Manning, 2001), and *D.ananassae* (Singh and Chatterjee, 1988) which provide evidence for polygenic control of the phenomenon. Maynard Smith (1956) studied mating and fertility in *D.subobscura* and found that outbred males (mate more frequently than inbred males) leave more progeny, which suggested that differences in vigour due to genetic differences must exist in natural populations, enabling selection to operate.

It is known that male activity and female receptivity are the main factors responsible for successful mating in *Drosophila* (Bastock, 1956). The males which inseminate more females in a limited time contribute more progeny. Thus, male mating propensity is an important component of fitness. The aim of the present study was to investigate the relation between mating behaviour and fitness in three *Drosophila* species of same subgroup.

MATERIALS AND METHODS

In the present study, three *Drosophila* species of same sub group were collected from Rohtak and maintained under laboratory conditions for several generations before the tests were carried out. These species were reared by transferring nearly 50 flies (females and males in equal numbers) to fresh culture bottles in each generation. From mass-bred populations, virgin males and females were collected and aged for seven days.

Mating ability was tested by putting twenty males and twenty females for each replicate in mating chamber and in total five replicates were carried out. When a pair commenced mating, it was taken out from mating chamber by aspirator and the number of mated pairs were scored. The fertility of all four populations was measured by counting the number of offsprings produced by a single females and male. For testing the fertility, one female and one male were left in food vial for a period of 3 days and were then transferred to a fresh food vial every third day. Nine successive changes were made and the total number of flies emerged in each vial were counted. All the experiments were carried out by direct observation in mating chamber for 60 minutes at 25±1°C during morning hours of the day (700 hrs to 1100 hrs) under normal laboratory light conditions. Body weight (mg x 100) were measured in groups of ten pairs involved in each set of experiments in order to avoid experimental errors, ten replicate were employed for each experiment.

RESULTS AND DISCUSSIONS

The mean number of matings out of ten pair tested in sixty minutes are given in (Table 1). The mean number of mating vary from 5.8 to 9.2 for different species. Among three species the highest activity has been observed for *D.bipectinata* while the *D.malerkotliana* showed lowest activity. The average number of offsprings of mated pair produced in various species ranged from 1148 to 1990 (Table 2). The average number of progeny of mated pairs is lowest for *D.ananassae* (1147) while *D.malerkotliana* shows highest number of progeny (1992). Data on mating propensity among three species clearly shows that mating propensity of *D.ananassae* is lowest (3.31) while that of *D.bipectinata* is highest (7.9) which is clearly opposite to data on mating speed which is highest for *D.ananassae* and lowest for *D.bipectinata* (3.18). In other words there is a significance negative correction between mating propensity and mating speed (Table 3).

Mating propensity is a complex trait based on the interaction of both the sexes. It is well known that male activity and female receptivity are the main responsible factors for successful mating in *Drosophila* (Spieth, 1952; Bastock, 1956). The males which inseminate more females in a limited time contribute more progeny (Spiess and Langer, 1961). In *D.robusta* males, a positive correlation among fast mating, repeat mating and fertility was observed by

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Prakash (1967). Fulker (2006) conducted experiments to ascertain the relation among mating speed, time of copulation, number of copulations resulting in fertilization and number of progeny produced in *D.melanogaster* and all the four measures appeared to be general characteristics of the male mating behaviour. In *D.subobscura* the outbred males mate more frequently than inbred males, and a female mated by an outbred male leaves more progeny than a female mated by an inbred male. Therefore, male mating activity is an important component of fitness.

Mating propensity is a complex trait with evidence of a large magnitude of a variation with local populations as well as between geographical populations. In *D. melanogaster* larger males had faster matings speeds than smaller males. It may be that larger males court more than smaller males, either because they have more energy or because they are better able to locate females and to track them during courtship. These results show that male size is an important component of fitness, because of its effect on mating success. (Linda Partridge and Marion Farquhar, 1983). This is further supported by our observation in three species. There is a limited data only on mating propensity in a few *Drosophila* species but detailed analyses on several correlated aspect is lacking and need to be extended to more species population on different continents.

TABLE 1 : Data on body weight (females, males and total), number of matings and offsprings produced from ten pairs for three species from Rohtak.

Species	Data on ten pairs				
	Body weight (mg)			Matings	Offsprings
	F	M	T	m±SE	m±SE
D.ananassae	106.78±2.01	78.00±2.03	184.78	7.80±0.20	1147.80±17.27
D.malerkotliana	82.00±2.90	59.00±3.10	141.00	5.80±0.37	1991.40±10.45
D.bipectinata	76.24±2.80	51.30±1.91	127.54	9.20±0.37	1415.80±14.74

TABLE 2 : Data on mean number of matings per ten pairs and their resultant offsprings at 25°C for five species from Rohtak. Values are shown as m±SE, standard deviation and coefficient of variation.

Species	Number of matings/ten pairs			Number of offsprings of mated pairs		
	m±SE	se	CV	m±SE	se	CV
D.ananassae	7.80±0.20	0.44	5.73	1147.80±17.27	48.31	10.43
D.malerkotliana	5.80±0.37	0.83	14.42	1991.40±10.45	45.44	6.46
D.bipectinata	9.20±0.25	0.53	6.07	1415.80±14.74	34.49	13.56

TABLE 3 : Data on mean number of mating propensity and mating speed in three Drosophila species. Values are shown as m±SE, standard deviation and coefficient of variations.

Species	Mating propensity			Mating speed		
	m±SE	se	CV	m±SE	se	CV
D.ananassae	3.30±0.67	0.60	18.32	17.45±0.92	2.07	11.91
D.malerkotliana	6.20±0.17	0.40	6.45	10.34±2.20	4.90	18.31
D.bipectinata	7.98±0.13	0.30	3.80	3.18±0.45	1.00	26.71

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