MATE SELECTION BEHAVIOUR IN MULBERRY SILKWORM BOMBYX MORI L.

ABSTRACT

The intersexual selection (female choice) is a widely observed phenomenon between mating partners in animal kingdom. Further, minority male mating advantage is a phenomenon, whereby genetic variability can be maintained in a population without genetic load at equilibrium. Though such type of mating is observed in almost all species of Drosophila, no such reports are available in lepidopteran insects. So, in order to detect the rare-male effect in silkworm Bombyx mori L, present investigations were carried out to study the mating success of Kalimpong-A and NB18 races of silkworm B. mori. In all the experiments, female choice was employed. Experiments were conducted at nine different ratios. The results show that though both types of males are equally successful in mating when present in equal ratio, they are more successful in mating, when they are in minority. This advantage disappears when males become common. Thus, the present results provide evidence for the existence of minority male mating advantage in silkworms B.mori.

Key words: Silkworm Bombyx mori L.,Kalimpong-A, NB18, rare-male mating advantage.

INTRODUCTION

Frequency dependent selection may be positive in favour of a common or negative in favour of the rare type. Rare-male mating advantage is one of the widely studied frequency dependent sexual selection. When two races of same species are present together, the rare type is more successful in mating than the common. the first report of behavioral pleotropism was demonstrated by Sturtevant in the year 1915 by using Drosophila (McFarland, 1985). The reasons for sexual selection is said to have attractive sons, provided the attractive characters are inherited. These sons inturn will be successful in attracting females and in reproducing themselves (Fisher, 1930). The first report of the occurrence of rare-male mating advantage in multiple choice was shown by Petit (1951). Later, it was demonstrated that, this phenomenon helps to maintain polymorphism and was influenced by genetic background, temperature, age, nutrition etc.,(Petit,1954,1958). Subsequent to this, a number of rare-male mating advantage reports have been documented, which suggests that the phenomenon is common in Drosophila (Ehrman and Probber,1978., Ehrman and Parsons,1981., Soiess, 1982., Singh and Chatterjee, 1985).

The rare-male mating phenomenon is of evolutionary ignificance, because it is a way of maintaining high level of enetic variability in a natural population,without genetic load : equilibrium. The phenomenon of rare-male mating promotes the it-breeding and exchange of genes amoung different populations .ewontine, 1974). There are reports of having such phenomenon ı flour beetles Tribolium castanoum (Sinnock,1970), parasite ıso mormoniella vitripennis (Grant et al, 1974, 1980). Several xplanations have been proposed to account for minority male ating advantage (Spiess, 1982., Knoppien,1985).

Silkworm Bombyx mori L. a popular insect of economic nportance is known to have more than 500 races and many of them re evolved through conventional breeding techniques. In these nsects, to study the rare-male mating advantage , two bivoltine aces viz., Kalimpong-A and NB18 stock maintained at Sericulture esearch Project, Department of Studies in Zoology, University of ysore,Manasagangotri, Mysore were used.

MATERIALS AND METHODS

Two races of silkworm B.mori used in the present nvestigations were Kalimoong-A, a bivoltine races of Indian rigin and the other, New Bivoltine-18 (NB18)- a bivoltine race btained from the hybridization between Kokko x Shunko and N124 C124 of Japanese origin. Both the races are well acclimatized o local agroclimatic conditions and are in the field for the ast ten years and have crossed more than 100 generations.

To test minority-male mating advantage with Kalimpong-A(KA) nd New Bivoltine-18 (NB18) moths, the following procedure was mployed. 1) Cocoons were cut open on 5th day of their spinning nd male and females were separated and preserved separately. 1) On the day of their emergence, a single female of required ace was introduced into a glass trough of 1.5 feet diameter, ollowed by the male moths of both the races in desired ratio. he pairing was recorded at 5 minutes interval for 30 minutes. 00 replicates were run with each of the nine ratios with KA and B18 females separately.

All the experiments were conducted from 0500-0900 Hr. in a ontrolled room temperature of approximately 24 degree entigrade, under normal room light conditions.

RESULTS

Table-1 depicts the data on the number of mating of KA and NB18 males with both types of females at different ratios. The data was obtained by pooling the data of the results of 100 replicates. It can be well observed that, when both KA and NB18 males are present in equal number (ratio), the mating frequency of either KA or NB18 do not vary much from the expected frequency of mating. While, both the races show a high frequency of mating when they are in a minority number. For example, when KA males are in 3,2 and 1 number resoectively, against 7,8 and 9 numbers of KA males will succeed at large in mating, though they are in minority number (X2 VALUE 5.76, 6.25 and 5.44 respectively, which is statistically significant at 0.05 level). Similarly, when NB18 males are in 1 and 2 numbers against 9 and 8 KA males, they too succeed in mating to a larger extent and have a statistically significant deviation from expected chi-square value. However, both the races lost this advantage, when they are in higher number. Thus, providing evidence for rare-male mating advantage phenomenon.

DISCUSSION

Darwin maintained that the advantage of behavior evolved through sexual selection lies primarily in the satisfaction of female choice (McFarland, 1985) and the females try to court and mate with males with special features, though many a times such features may be disadvantageous in the face of natural selection. Zahavi (1975) suggested that females prefer such males precisely because they carry a handicap and therefore must be robust individuals. Similarly, rare-male mating is an important phenomenon with evolutionary implications. According to Ehrman and Spiess (1969), the nature of cue is different for different male types. The females becomes conditioned against mating with the males that first court these during their unreceptive period. As these males are of common type, the rare males are successful in mating as they are able to break the habituation, when the females become sexually active. However, such frequency depends on several forces such as age of the female, previous experience etc., (Pruzan and Ehrman, 1974). There are reports of rare-female mating advantage (Spiess and Spiess, 1969), rare-male mating advantage (Singh and Chatterjee, 1989). However, though the exact cause of minority mating and mechanism of such incidence is not fully understood, it is believed that the process is controlled by a combination of several specific mechanisms and vary widely.

able 1: NUMBER OF MATINGS OF KALIMPONG-A AND NB18 MALES WITH THE TYPES OF FEMALES AT DIFFERENT RATIOS (Data based on 100 replicates)

EMALE TYPE	MALE RATIO		EXPECTED FREQUENCY		OBSERVED FREQUENCY		X2 VALUE
	KA	NB18	KA	NB18	KA	NB18	
:A	9	1	90	10	85	15	2.78
:A	8	2	80	20	75	25	1.53
:A	7	3	70	30	65	35	1.19
:A	6	4	60	40	58	42	1.07
:A	5	5	50	50	55	45	1.00
:A	4	6	40	60	48	52	2.73
:A	3	7	30	70	41	59	5.76*
:A	2	8	20	80	30	70	6.25*
(A	1	9	10	90	17	83	5.44*
NB18	9	1	90	10	82	18	7.11*
NB18	8	2	80	20	71	29	5.06*
NB18	7	3	70	30	61	39	3.86
NB18	6	4	60	40	58	42	1.67
NB18	5	5	50	50	47	53	0.36
NB18	4	6	40	60	45	55	1.04
NB18	3	7	30	70	34	66	1.71
NB18	2	8	20	80	27	73	3.30
NB18	1	9	10	90	12	88	0.44

*- Statistically significant (P 0.05 level).

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