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RESEARCH ARTICLE

STUDY ON THE RELATIVE COUPLING BEHAVIOUR OF DIFFERENT TASAR SILKWORMS UNDER VARIOUS ARTIFICIAL CONDITIONS

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ABSTRACT

Owing to different chromosomal number and physiogenetic make up of various species of genus *Antheraea* (tasar silk insects) creates vital ground for variations in their behavioural breeding manifestations in both seed crop and commercial crop season. Various biological performances of these species were investigated which depended on environmental condition like climatic factors, habitat differentiation alongwith dietary variations in artificial laboratory conditions. The results showed coupling behaviour in four different *Antheraea* species (*Antheraea mylitta, Antheraea proylei*, *Antheraea pernyi*, *Antheraea roylei*) in such conditions on different mating media. Highest coupling breeding percentage in isolated condition of 72% and 78% while higher group coupling percentage of 77% and 82% in *A. mylitta* in seed crop and commercial crop season, respectively have been observed. Further *A. mylitta* shows its supremacy of coupling percentage under different mating media over *A. proylei*, *A. pernyi* and *A. roylei* in both seed and commercial crop season. Following relative order of coupling percentage for given tasar silk insects in maintaining the order of coupling manifestations observed from our investigation is: *Antheraea mylitta* < *Antheraea proylei* < *Antheraea pernyi* < *Antheraea roylei*

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INTRODUCTION

Silk is one of the most beautiful gifts of nature. It is known as queen of textiles which is produced by sericigenous insects belonging to family Sturniidae and Bombycidae which are famous for producing mulberry, tasar, eri and muga silk of great commercial importance. Among the silk producing insects *Antheraea* is purely local Asiatic genus. About thirty six species of *Antheraea* are known of which four species namely *Antheraea mylitta, Antheraea proylei*, *Antheraea pernyi* and *Antheraea roylei* are reared in the tropical and temperate belts of India. These species grow on various primary (Asan, Arjun, Sal plants) and secondary host plants in outdoor conditions in the forest areas during the seed crop (July-August) and commercial crop (September-October) season (Jolly *et al.* 1975). Economical viability and sustainability of tasar silk industry in India has made it inevitable to focus on the species diversities and biological performances of tasar silk producing insects. The information related to tasar culture has been accumulated over the years by serious works by scientists like Akai (1998), Alam, *et al.* (2000), Basker (2006), Choudhary (2008) etc.

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However, the investigations regarding species diversity has not yet been fully carried out. Further Jolly, et al. (1985) has reported species differentiation in the genus *Antheraea* which survive in the temperate and tropical regions of India. The experimental animal classification of the silkwork is given as following- Phylum - Arthropoda, Class - Insecta, Sub class - pteridogota, Division - Endopterygota, Family - Saturniidae, Genus - *Antheraea,* Species -*mylitta, pernyi, roylei, proylei.* The species of *Antheraea* owing to different physiogenetic makeup are supposed to differ among themselves in their behaviour manifestations. Thus rate of coupling in *Antheraea* need to be investigated in different artificial conditions during the seed crop and commercial crop seasons to formulate appropriate strategy for successful survival in indoor condition for commercial rearing of tasar silkworm species.

MATERIALS AND METHODS

Four different *Antheraea* species (*A. mylitta*, *A. proylei*, *A. pernyi* and *A. roylei*) were selected for this study on their coupling behaviour in different media. In the course of experiments related to this topic, cocoons of these four species were collected from field and carefully transported to Bodh-Gaya and acclimatised under the laboratory conditions prior to

experimentations. The experiments related were carried out under optimized conditions of the sericulture laboratory. Healthy tasar cocoons of these four species were reared and put into ventilated cage separately in hanging position in the form of garlands to provide natural disposition. After the emergence of moths all the four species of *Antheraea* were assorted carefully for the purpose of coupling according to the demand of the experiment. The selected species were further taken for the evaluation of their relative coupling performances during the seed crop and commercial crop seasons. The seed crop season selected extended from July to August while commercial crop season selected was from September to August. All experiments were carried out according to the protocol established by Krishnamurthy (1973). Four different mating media used in the experiment included wooden cabinet, basket, paper box and glass chamber. Finally evaluation of coupling percentage of different species of *Antheraea* was made under different laboratory conditions and calculated statistically.

RESULTS AND DISCUSSION

The relative variations in relation to coupling behaviour of four different species of *Antheraea* namely *Antheraea mylitta*, *Antheraea proylei*, *Antheraea pernyi* and *Antheraea roylei* under different indoor condition was recorded and tabulated as such.

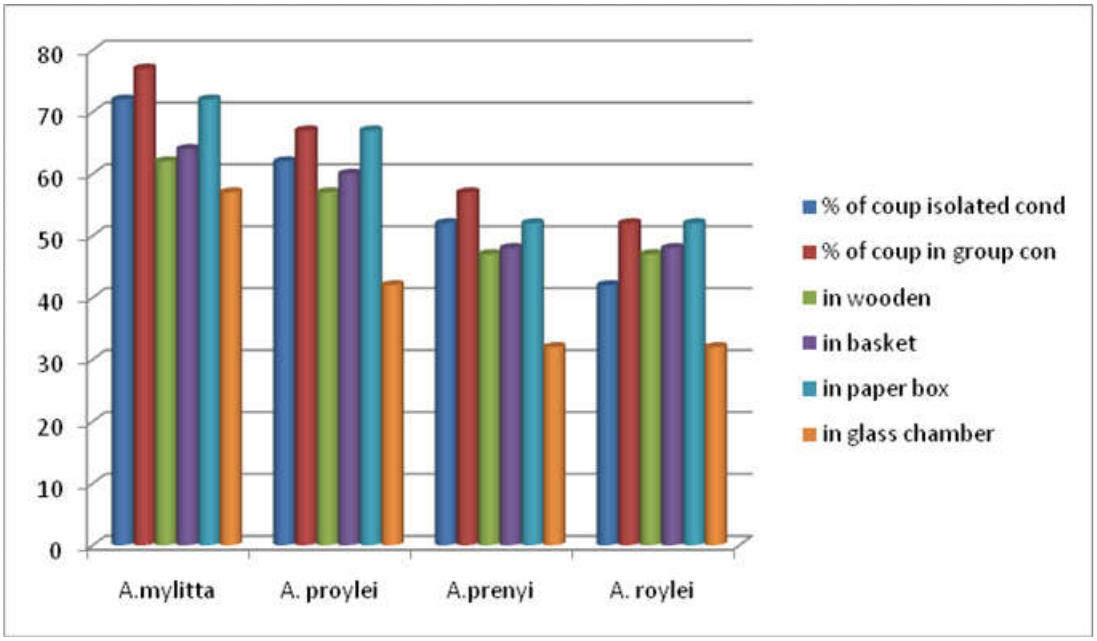
Table 1 accounts for the coupling behaviour of four different types of tasar silk insects under isolated condition (one male X one female), group mating condition and on different media viz: wooden cabinet, basket, paper box and glass chamber during the seed crop (July-August) and commercial crop (September-October) seasons. Under isolated condition where one male X one female was tabulated reveals percentage of coupling for seed crop and commercial crop season for *A. mylitta* (seed crop 72% & commercial crop 78%), *A. proylei* (seed crop 62% & commercial crop 68%), *A. pernyi* (seed crop 52% & commercial crop 58%) and *A. roylei* (seed crop 42% & commercial crop 52%). From the following observation it is evident that the variation during seed crop and commercial crop seasons has highest percentage of coupling recorded under isolated condition for *A. mylitta* and lowest for *A. roylei*. Likewise, the coupling percentage behaviour of these four different types of tasar silk insects under group mating condition also shows variations in table 1 which reveals that the percentage of coupling in *A. mylitta* during seed crop and commercial crop season (77% & 82%, respectively) which is comparatively greater than *A. proylei* (67% & 72%, respectively), *A. pernyi* (57% & 62%), and *A. roylei* (52% & 57%). Therefore, the group mating condition of all the four variety of tasar insects has registered its supremacy over the isolated condition of mating in both the respective seasons.

The relative effect of four mating media namely wooden chamber, basket, paper box and glass chamber has been

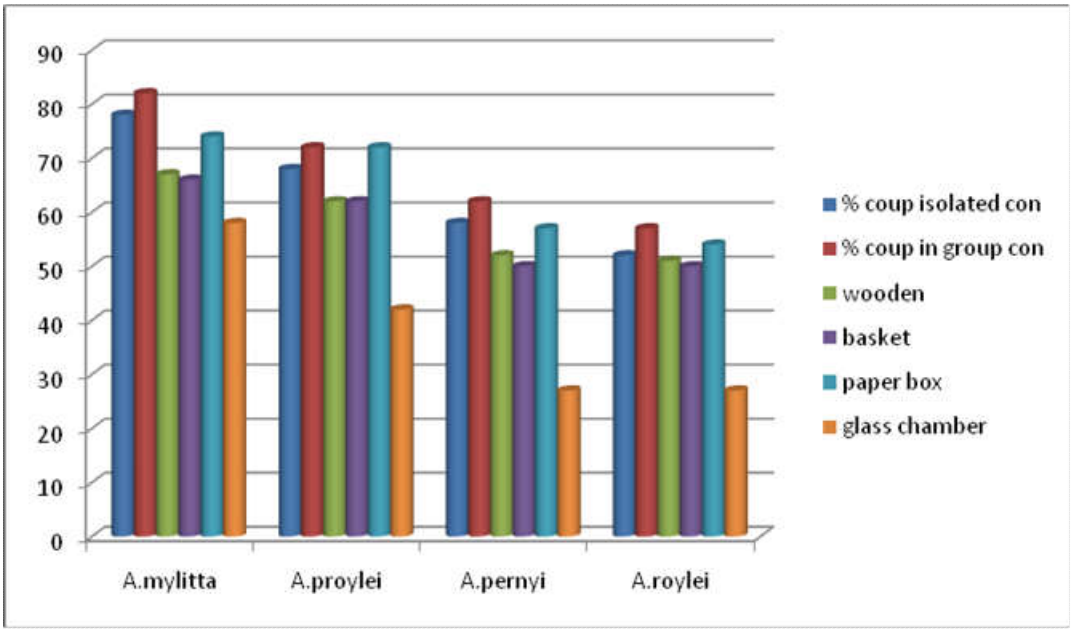
Table 1. Relative coupling behaviour of different tasar producing insects under various artificial conditions

Species		% coupling isolated condition	% coupling group condition	% coupling under different media				CD level at 0.5%
				Wooden	Basket	Paper box	Glass chamber	
A. Mylitta	Seed crop	72	77	62	64	72	57	**
	Comm. Crop	78	82	67	66	74	58	**
A. Proylei	Seed crop	62	67	57	60	67	42	*
	Comm. Crop	68	72	62	62	72	42	*
A. pernyi	Seed crop	52	57	47	48	52	32	*
	Comm. Crop	58	62	52	50	57	27	*
A. roylei	Seed crop	42	52	47	48	52	32	-
	Comm. Crop	52	57	51	50	54	27	-

* significant, ** highly significant



Histogram 1 shows % of coupling of four *Antheraea* species under different condition during the seed crop season



Histogram 2 shows % of coupling of four *Antheraea* species under different condition during the commercial crop season

observed during the experimentations where the percentage of coupling among tasar insects during seed crop and commercial crop season has been observed and recorded in table 1. Among all four mating media it has been observed that the percentage of coupling in paper box mating chamber during both crop and commercial season for *A. mylitta* (72% & 74%), *A. proylei* (67% & 72%), *A. pernyi* (52% & 57%) and *A. roylei* (52% & 54%), has its superiority among all other media (wooden chamber, basket and glass chamber) used for mating. The following observation (histogram 1 & 2) has been made which reveals the percentage of coupling for *A. mylitta*, *A. proylei*, *A. pernyi* and *A. roylei* in wooden chamber (62% and 67%, 57% and 62%, 47% and 52%, 47% and 51%), basket (64% and 66%, 60 % and 62%, 48% and 50%, 48% and 50%) and in glass chamber (57% and 58 %, 42% and 42%, 32% and 27%, 32% and 27%) respectively. The lowest coupling percentage is recorded for glass chamber mating media while highest is found for the paper made coupling chamber among all the mating media. The following observations of the given tested indoor artificial conditions have selective coupling performances in different *Antheraea* species of tasar insects which is indicative of the fact that all the four tasar insects differ among themselves in respect of their mode, rate and frequency of coupling. The percentage of coupling is highest in *Antheraea myllitta* while the lowest percentage of coupling has been recorded with *Antheraea royeli* of tasar silk insects. The relative order of coupling percentage for four different species of tasar silk insects from our investigation is found to be:

Antheraea mylitta < *Antheraea proylei* < *Antheraea pernyi* < *Antheraea roylei*

Summary and Conclusion

Generally the *Antheraea* species are wild in nature and our study reveals that among the four Indian varieties of *Antheraea* species namely *Antheraea mylitta*, *Antheraea proylei*, *Antheraea pernyi* and *Antheraea roylei* could be domesticated which vary for different media condition in relation to their coupling performances.

The overall observation shows that *A. mylitta* has the highest percentage of coupling under isolated mating condition, group mating conditions and under different mating media in both seed crop and commercial crop season over other *Antheraea* species in the study. In all the four species, lowest coupling percentage is recorded for glass chamber mating media while highest is found for the paper made coupling chamber among all the mating media. Group mating condition shows its supremacy over the isolated mating condition in both seed crop and commercial crop seasons in all the varieties under investigation. The following work could be beneficial in successful domestication and commercial productivity of *Antheraea* species especially *A. mylitta* in artificial condition over different media.

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