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Photo phase impact on tasar seed cocoon preservation and period of silk moth, *Antheraea mylitta* (Drury) emergence

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Abstract

Tropical tasar silkworm, *Antheraea mylitta* Drury (Lepidoptera: Saturniidae), pupae undergo diapause to escape unfavourable climatic conditions. During the termination of diapause stage, due to altered climatic conditions pupal mortality and erratic moth emergence is noticed in tasar seed sector. In the present study, just before diapause termination stage (about one month prior to the normal emergence period tasar) seed cocoons were exposed to photoperiod (16h Light: 8h Dark) at room temperature 25 °C with 65 ± 5% RH. Results indicated that, altered light regimes reduced the moth emergence period 27 days in DTV and 11 days in DBV Seed cocoons than the control batch duration. It is clearly evident in treatment batches, moth emergence completed earlier than the control without affecting the moth's health and subsequently the egg laying behaviour.

Keywords: Tropical tasar silkworm, seed cocoons, preservation, pupal diapause, photoperiod, moth emergence

Introduction

Two ecoraces of tropical tasar silkworm, *Antheraea mylitta* Drury (Lepidoptera: Saturniidae), Daba Bivoltine (DBV) and Daba Trivoltine (DTV) are commercially exploited in Indian tropical regions. The pupae of these ecoraces, soon after completion of Nucleus crop rearing tasar pupae enters into the facultative diapause to escape from harsh climatic conditions. The pupae remain in diapause period, from November to mid-June (Daba Trivoltine) and from January to May (Daba Bivoltine) respectively. Mishra *et al.*, (2011) [5], Dinesh Kumar *et al.*, (2012) [2] and Rahile *et al.*, (2015) [6] studies revealed that during this long diapause period vigilant preservation of Tasar seed cocoons is most essential to acquire all qualitative grainage parameters. Mishra *et al.* (2011) [5] have reported 10-30% of loss of moths during tasar seed cocoon preservation, majorly by pupal mortality during the termination of diapause period due to erratic and unseasonal moth emergence. Singh *et al.* (2003) [8] studies also revealed that, long term preservation of Oak tasar seed cocoons leads to low fecundity and low hatchability. In *Antheraea mylitta* D. exposure to varied climatic conditions during prolonged diapause period, is responsible for percent of seed cocoon loss (Kapila *et al.* 1992) [3]. But in insects Rasenick *et al.*, (1978) [7], Mc Nell and Fields, (1985) [4] and Debaraj *et al.*, (2013) [1] studies established that photoperiod plays prominent role in diapause management. Hence, in the present study considering photoperiod as an important cue, attempt was made to reduce the erratic moth emergence and the duration of grainage activities by advancing the moth emergence period during termination of diapause.

Materials and Methods

At SSTL the seed cocoons of Daba Trivoltine (DTV) and Daba Bivoltine (DBV) received from Basic Tasar silkworm seed organization (BTSSO), Bilaspur were preserved at room temperature (25 °C; 65 ± 5% RH) from February to April and exposed to the light regime of 16 h Light (4 PM- 8 AM) and 8 h Dark (8 AM-4 PM) during May (one month prior to the normal emergence). The preservation at said photoperiod was maintained up to 40 days for DTV and 50 days for DBV after which the cocoons were shifted to normal light dark condition and the moth emergence pattern was recorded till the completion of grainage operation.

Results and Discussion

Studies related to effect of photoperiod (16h L: 8h D) revealed that, altered light regime in DTV Seed cocoons advanced the moth emergence pattern / rhythm and entire emergence was observed in 22 days than 49 days in control.

The percentage of moth emergence was 97 under 16h L: 8h D condition and 95 in control. In case of DBV, 88% of moth emergence completed within 29 days under altered light regime as against 80% within 40 days in control (Table 1).

Table 1: Percentage of moth emergence advanced (days) in tasar seed cocoons (DTV & DBV) kept at 16h L: 8h D regime condition

Particulars	DTV Moth emergence % (Days)	DBV Moth emergence % (Days)
Photoperiod (16h L:8h D)	97±2.054 (22 Days)	88±0.816 (29 Days)
Control	95±0.816 (49 Days)	80±0.816 (40 Days)
p value (t stat)	0.1998	0.0213

Earlier researchers observed that long photoperiod / long days altered regular rhythms in Oak Tasar, *Antheraea pernyi*. Williams and Adkisson (1964) [9] demonstrated that *Antheraea pernyi* diapausing pupae maintained at 12 Light: 12 Dark for 16 weeks did not break diapause but those maintained at 16 Light: 8 Dark for 1 week and at 16 Light: 8 Dark for 4 weeks showed 50% and 90% of reactivation, respectively. Rasenick *et al.* (1978) [7] observed that exposure of diapausing pupae of *Antheraea pernyi* to long days (LD 17:7) enhanced the brain cAMP levels than the short days (LD 10:4). They opined that transduction of the photoperiodic signal played crucial role in increasing cAMP levels in the brain, indicating the role of the intracellular second messenger cAMP in the brain in sending numerous extracellular signals in the nervous system leading to advancing or delaying the circadian rhythms. In the present study observed that, where the long photoperiod (LD 16:8) might have served as an important circadian cue in activating the circadian clock responsible for advancing the moth emergence.

Conclusion

The study indicated the feasibility of advancing the moth emergence period on Tasar silkworm (both Tri and Bi voltine ecoraces), thereby reducing the grainage operation period. For utilization of identified technology in Tasar culture and also to make grainage activities successful, by reducing the duration of moth emergence and erratic moth emergence for more seed recovery, further studies are required in this line in large scale.

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