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Research Article

SEASONAL IMPACT ON PRODUCTIVITY OF BIVOLTINE, DABA ECORACE OF TROPICAL TASAR SILKWORM, *ANTHERAEA MYLITTA* D. AT THREE ECO-POCKETS OF MAYURBHANJ DISTRICT IN ODISHA

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ABSTRACT
Daba ecorace of *Antheraea mylitta* D is widely reared in Mayurbhanj district by the tribals. The primary food plants are *Shorea robusta*, *Terminalia arjuna* and *Terminalia tomentosa* which naturally found forest of this region. The present study was carried out upon Bivoltine Daba ecorace at three different ecopockets such as Durgapur of Morada block, Rangamatia of Baripada block and Badtilau of Kuliana block. Comparative study has been made upon productivity parameters like percentage of larval hatching, cocoon harvested, ERR%, Cocoon weight, Shell weight and Shell ratio percentage of rainy and autumn season. Statistical analysis with student's t-test was performed to know the significant level if any. The corelation between ERR% with temperature and relative humidity and rearing site were made. The result shows a significant difference cocoon harvested and ERR%. The autumn season has more productivity than rainy season.

Keywords: *Antherea mylitta, Daba Ecorace, Bivoltine, Rearing Performance, Eco-pockets*

INTRODUCTION
Tasar culture is an age-old traditional practice in the Eastern part of India. The tropical deciduous forest of this region predominantly contains the host plants like *Shorea robusta, Tarminalia arjuna and Tarminalia tamantosa*, which favours rearing of tasar silkworm. It is commonly called as wild silk and considered as Indian richest tribal culture (Allam *et al.,* 2018) because mostly the tribal people of this region are involved in such tasar rearing. Odisha has a rich heritage of tasar culture. It was first started by the Bhanja dynasty in princely of state of Mayurbhanj (Sahu, 2015). At present, Odisha is the third highest tasar producing state in India (Gowrisankar *et al.,* 2024) contributing more than 107mt of tasar in every year. The north west districts namely Mayurbhanj, Keonjhar and Sundargarh are mainly practising tasar culture as these three are the tribal dominated district. The tropical tasar silkworm, *Antheraea mylitta*, Drury has 44 ecoraces comprising wild and semi domesticated varieties. Among them Daba ecorace is mostly reared in Mayurbhanj and Kenojhar district of Odisha because the ecoclimatic condition favours such ecorace to survive better. It is reared as Bivoltine (two crops per annum) and Trivoltine (three crops per annum) forms.

It is considered as the most appropriate labour intensive agro based cottage industry, which best suits for the economic development of tribal people, more specifically contributing a major role in women empowerment (Ray and Mohapatra, 2012). In Odisha, Tasar culture practised in 9 districts out of which Mayurbhanj has placed as highest Tasar producing district. In early periods, Tasar silk worm was traditionally reared in the forest by the tribals. But with the implementation of scientific rearing technology by Central Tasar Research and Training Institutes, Ranchi (CTR&TI) and State Sericulture Board of the state government, the tasar production has been increased in last couple of years i.e., from 2015-2020, (Kar *et al.,* 2019). Then after the tasar productivity became stagnant and the involvement of tribals in this field shows a gradual decline. The present research is focussed on making a comparative study of tasar productivity in rainy and autumn seasons and to corelate the variation of productivity if any with the ecoclimatic condition of such region.

MATERIALS AND METHODS

The present study is made in three ecopockets of Mayurbhanj district of Odisha i.e., Durgapur of Morada block, Rangamatia of Baripada block, and Badtilau of Kuliana block. Bivoltine Daba ecorace has been selected for this purpose. Three experienced rearers are choosen in three ecopockets and each one is supplied with 3000 eggs. Each rearer is asked to assort the eggs into three groups (one thousand number of eggs in each group). The hatching percentage was counted in each group. The freshly hatching 1st instar larvae were brushed at nearly Adapahi (Rearing field). The larval mortality was counted at each stage. The cocoon harvested per 1000 eggs were counted and recorded. The package and practice of tasar rearing were followed as per recommendation of CTR&TI. The effective rearing rate (ERR) of each ecopocket in every season was calculated as follows:

$$ERR = \frac{\text{No.of cocoon harvested}}{\text{No.of larva brushed}} \times 100$$

The quantitative traits of cocoons were assessed by adapting standard statistical procedure. The qualitative assessment of cocoons was done by randomly selected 25 cocoons at each Eco pockets of every season. The cocoon weight and shell weight were measured. The mean and standard deviations were calculated. The shell ratio percentage was calculated as follows:

$$\text{Shell ratio percentage} = \frac{\text{Shell weight}}{\text{Cocoon weight}} \times 100$$

Comparison of productivity of two rearing seasons were made through student t-test and significance level was ascertained with tabulated value. The climatological datas such as maximum temperature, minimum temperature, Relative humidity month wise rainfall and photo periods were obtained from nearby TRCS. Correlation of productivity with climatological conditions were analysed.

RESULTS

Table 01: Rearing of tasar silkworm at three eco-pockets of Mayurbhanj district

Rearing Sites	Cropping season	Hatching percentage Mean±SD	t-test	Cocoons harvested Mean±SD	t-test	ERR % Mean±SD	t-test
Durgapur, Muruda Block	Rainy season	71.16 ±1.18	0.06	148.33 ±5.31	5.34**	20.84 ±0.75	3.50*
	Autumn season	71.03 ±2.53		170.33 ±2.49		24.01 ±1.04	
Rangamatia, Baripada Block.	Rainy season	72.93 ±0.66	0.17	155 ±2.16	8.49**	21.08 ±0.29	5.85**
	Autumn season	72.63 ±2.33		174.66 ±2.49		24.06 ±0.65	
Badtilau, Kuliana Block	Rainy season	75.43 ±0.32	0.25	159.33 ±4.18	5.89**	21.12 ±0.63	4.73**
	Autumn season	75.86 ±2.44		180.33 ±2.86		23.78 ±0.48	

*(*P≤0.05, **P≤0.01, ***P≤0.001)*

The rearing data of tasar silkworm are presented in table-01. It reveals that there is no significant difference in hatching percentage of larvae in all Eco pockets of both the rearing seasons. The calculation of t-test shows the acceptance of null hypothesis but the productivity in terms of cocoon harvested is highly significant in two rearing seasons at every Eco pockets. At Durgapur it was 148.33(±5.31) in rainy season while 170.33(±2.49) in autumn season. Similarly, at Rangamatia it was

155(±2.16) in rainy season and 174.66(±2.49) in autumn season. Similar trend was also seen at Badtilau having 159.33(±4.18) and 180.33(±2.86) in rainy and autumn season respectively.

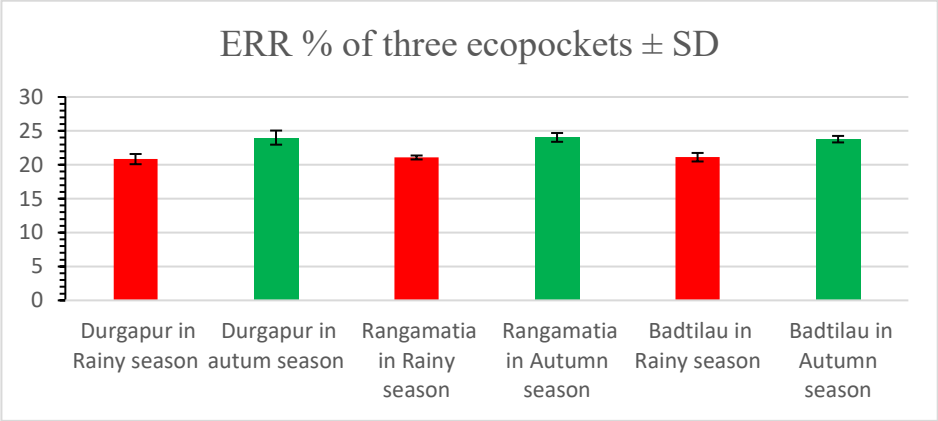
Table 2: Cocoon biometry of two rearing seasons

Rearing Sites	Cropping season	Cocoon weight (in gm.) Mean±SD	t-test	Shell weight (in gm.) Mean±SD	t-test	Shell Ratio (%)	t-test
Durgapur, Muruda Block	Rainy season	8.96 ±0.30	6.67**	1.34 ±0.13	0.96	15.03 ±1.87	1.11
	Autumn season	10.76 ±0.22		1.44 ±0.06		13.42 ±0.80	
Rangamatia, Baripada Block.	Rainy season	10.42 ±0.48	4.46*	1.47 ±0.27	0.35	14.18 ±2.61	0.77
	Autumn season	12.39 ±0.39		1.55 ±0.16		12.57 ±1.40	
Badtilau, Kuliana Block	Rainy season	9.81 ±0.63	3.05*	1.42 ±0.21	0.70	14.59 ±2.65	0.58
	Autumn season	11.58 ±0.52		1.55 ±0.16		13.41 ±1.06	

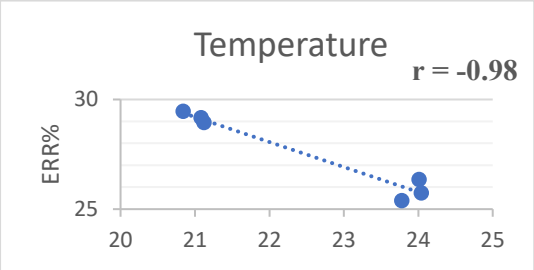
Table 3: Climatological data of study site

Sl. No	Season	Month	Max. Temp (^{0}C)	Min temp. (^{0}C)	Ave. Temp. (^{0}C)	Relative Humidity (%)	Rainfall (mm.)	Photo period (hrs)
01	Rainy	June	37.60 ±5.23	23.70 ±4.09	30.60 ±3.53	85.80 ±5.28	142.20 ±40.65	179.20 ±22.51
02		July	35.40 ±2.84	22.80 ±2.12	29.10 ±1.67	92.20 ±1.42	218.40 ±83.89	122.40 ±27.38
03		Aug.	34.80 ±2.48	22.50 ±2.47	28.70 ±2.23	91.10 ±3.38	298.60 ±64.26	147.80 ±7.91
04	Autumn	Sep.	34.30 ±0.58	20.65 ±1.38	28.10 ±0.63	93.40 ±0.63	215.80 ±38.72	172.30 ±21.44
05		Oct.	33.80 ±1.89	19.70 ±1.24	26.35 ±0.75	93.30 ±1.11	108.80 ±32.40	266.50 ±17.90
06		Nov.	31.60 ±1.10	17.35 ±1.35	24.60 ±0.63	87.20 ±3.68	30.60 ±10.69	286.20 ±23.47

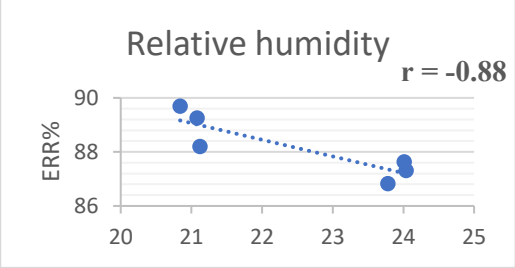
Considering the Effective Rearing Rate (ERR) percentage, every Eco pockets have a significant difference in rainy and autumn seasons which justified through t-test. At Durgapur the ERR% has 20.84(±0.75) and 24.01(±1.04) in rainy and autumn season, at Rangamatia, the ERR% is 21.08(±0.29) and 24.06(±0.66) respectively and at Badtilau the ERR% of rainy season is 21.12(±0.63) and autumn season is 23.78(±0.48). the Cocoon weight, every Eco pockets have a significant difference in rainy and autumn seasons which justified through t-test. At Durgapur the Cocoon weight has 8.96 (±0.30) and 10.76 (±0.22) in rainy and autumn season, at Rangamatia, the cocoon weight is 10.42(±0.48) and 12.39(±0.39) respectively and at Badtilau the cocoon weight of rainy season is 9.81(±0.63) and autumn season is 11.58(±0.52). Analysis upon cocoon biometry of two rearing season reveals that are no significant differences of shell weight, and shell ratio percentage between two rearing seasons in any of the mentioned Eco pockets.



Graph-01: Comparison of ERR % in three eco-pockets of Two rearing seasons



Graph-02: Correlation of ERR vs temperature



Graph-03: Correlation of ERR vs Relative humidity

Photo 01: Rearing field (Adapahi)

Photo 02: 5th instar larva Forming cocoon

Photo 03: Field study along with a tribal women rearer

DISCUSSION

From the field study, it is observed that the Tasar productivity in terms of cocoon harvested and ERR%, there is significant difference in two rearing seasons. The biometrical analysis shows a significant difference in cocoon weight while other parameters like shell weight and shell ratio percentage didn't show any difference among two rearing seasons. When the ERR% of two rearing seasons are corelated with the ecoclimatic conditions like temperature and relative humidity, it was observed that the variation of maximum and minimum temperature during rainy season was more which has adverse effect upon cocoon productivity (Barsagade *et al.,* 2023). It is observed that, the correlation between temperature and relative humidity with ERR percentage are analysed, both the parameters have shown negatively corelated i.e., temperature vs ERR has r = - 0.98 and Relative humidity vs ERR% has r= - 0.88.

CONCLUSION

From the present study it is concluded that the productivity in autumn season is more favourable than rainy season that's why the tribals of these localities prefer autumn season for tasar culture as rainy season has irregular climatic condition with high fluctuation of maximum and minimum temperature. The fungal and viral infection during rainy season is very high causing lot of larval mortality for which the net productivity of cocoon has been declined. Proper scientific approach is required to overcome such problem so that the productivity can be increased in rainy season. The role of Tasar Rearing Co-operative Society (TRCS) is very significant providing helping hand to the rearers. The CTR&TI has developed a number of technologies for tasar culture but there is the need for large scale adoption at farmer level which can boost the tasar productivity (Kar *et al.,* 2019).

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