

A STUDY OF VARIATIONS IN THE E.R.R. AND OTHER REARING PERFORMANCES OF MUTANT STRAINS OF INDIAN TASAR SILKWORM

ANAMIKA MISHRA^{1*}

¹University Department of Zoology, Magadh University, Bodhgaya 824234, India.

AUTHOR'S CONTRIBUTION

The sole author designed, analysed, interpreted and prepared the manuscript.

Received: 05 June 2020

Accepted: 10 August 2020

Published: 17 August 2020

Original Research Article

ABSTRACT

This Research Article is an effort to study the relative variations in respect of rearing performances and to study the impacts of zonal differences on the productivity and qualities of tasar cocoons of three mutant strains viz; Daba–blue, Daba–yellow and Daba–almond of tasar silk worm, *A. mylitta* D. Results obtained are indicative of the fact that the three mutant strains of Tasar Silk Worm differ among themselves in respect of their rearing performances. The performances of Daba–blue in respect of rearing performances have been found evidently better than the Daba–yellow and Daba–almond. Further, zonal differences influence the relative performances of mutant strains of *Antheraea mylitta* D in respect of productivity and quality of tasar cocoons. The results have clearly shown that the productivity and quality of tasar cocoons of Jharkhand and Madhya Pradesh zones are relatively better and superior to Orissa, West Bengal and Bihar Zones of tasar producing states. The performances of Daba–blue in respect of productivity and qualities of tasar cocoons have been found evidently better than the Daba–yellow and Daba–almond. The results obtained appear to be the outcome of genetic variability among the three mutant strains of *A. mylitta* D. on account of relative differences in their physio–genetic makeup. Results obtained are indicative of the fact all the three mutant strains of *A. mylitta* D. in spite of relative differences have registered their supremacy over the control (Daba–green) on account of desired beneficial mutation in relation to their breeding activities. Thus the evolution of three distinct mutant strains of tropical tasar silkworm is in the larger interest of tasar culture.

Keywords: Ecotype; cocoon weight; shell weight; shell ratio; filament length.

1. INTRODUCTION

Antheraea mylitta is an indigenous traditional tasar producing insect, which exists in the forms of nearly 20 ecotypes distributed all over the ecological zones of tropical tasar belts in our Country. The different ecotypes of *Antheraea mylitta*. In spite of having the same chromosomal number differ among themselves in their quantitative and qualitative characters. These ecotypes are uni, bi and trivoltine. Different local names have been assigned to each

group by the tribals of this area eg. Daba, Raily, Model, Naila, Bogari etc. Among these, the Daba ecotypes of *Antheraea mylitta* D. is distributed to the different localities of tasar belts particularly in the states of Bihar, Jharkhand and Madhya Pradesh. The tribals usually reared this ecotype by preparing the eggs in captivity and rear the larvae outdoor on foliage of *Terminalia arjuna*, *Terminalia tomentosa* and *Shorea robusta* during Seed Crop (July–August) and Commercial Crop Seasons (September–October).

*Corresponding author: Email: anamikamishra2004@gmail.com;

As a matter of reality, the emergence of three mutant strains from a locally adapted Daba ecotypes of *Antheraea mylitta* in the forms of Am-blue, Am-yellow and Am-almond based on different larval color appears to be significant development in the field of tasar culture as it raises great prospect and desired opportunity for better quality of tasar yarn as well as for the productivity of the tasar silk to a desired extent. It is logical to assume that the three mutant strains so evolved as result of spontaneous mutation appear to be different in their biological manifestations than the normal daba green on account of relative variations in their genetic makeup.

Jolly *et al.* [1] observed that the mutant strains of tropical silkworm in spite of having the same chromosomal number differ among themselves in their behavioral manifestations. Further Jolly *et al.* [2] presented details of species variations in the genus *Antheraea* producing vanaya silks. Fristrom [3] found variation in morphological characters of mutant strains of *Drosophila melanogaster*. Krishnaswamy *et al.* [4] developed desired methods of silkworm culture under different conditions. Sharma *et al.* [5] reported significant variations in quantitative and qualitative characters among different ecotypes of *Antheraea mylitta* D. Genetic variability among the Eco races of tropical tasar silkworm has been reported by Renuka *et al.* [6].



Image 1. An Adult Indian tropical tasar silkworm



Image 2. Larval Indian tropical tasar silkworm

2. MATERIALS AND METHODS

Healthy and disease free tasar cocoons of three mutant strains of five different tasar producing zones of India namely the states of Bihar, Jharkhand, Madhya Pradesh, Orissa and West Bengal were collected from their respective sites of rearing areas. The cocoons were analyzed and assorted and put under normal laboratory conditions for proper acclimatization for 15 days. The uniform tasar cocoons of three mutant strains of *A. mylitta* namely Am-Blue, Am-yellow and Am-almond along with its Control Am-Green were properly processed under grainage operations as suggested by Krishnaswamy [4].

100 tasar larvae divide in five replications (20X5) for each mutant strain along with its control were mounted on the foliage of Arjuna Plant till cocoon formation. The rearing of different mutant strains with their control was carried out for both the seasons. The data in respect of E.R.R. (Effective Rate of Rearing), Cocoon weight, Shell Weight, Shell Ratio, length of fibre and size of fiber were recorded carefully for each set of mutant strain and control during both the season

in respect of productivity and relative qualities of tasar cocoons of all the three mutant strains of *Antheraea mylitta* of five different zones of tasar culture. The data were further statistically analyzed, correlated and finally presented in the tables.

3. RESULTS AND DISCUSSION

The rearing performances of three mutant strains of *Antheraea mylitta* D. namely Am-blue, Am-yellow and Am-almond with different body colors along with its control in respect of Effective Rate of Rearing (E.R.R%), Cocoon weight, Shell weight, Shell ratio, Peduncle length and total period of cocoon formation during the seed crop (July-August) and commercial crop (September- October) seasons have been evaluated and results so obtained in respect of relative rearing performances of three different mutant strains of *Antheraea mylitta* are recorded in Tables 1 and 2. Graphical representation of relative rearing performances of 3 mutant strains of *Antheraea mylitta* during both the season of three different mutant strains of *Antheraea mylitta* has been recorded in Figs. 1 to 6.

Table 1. Table showing relative rearing performances of 3 mutant strains of *Antheraea mylitta* during seed crop season

Sl. No.	Parameters of rearing	Am-Blue	Am-yellow	Am-almond	Control	C.D. at 0.5% level for Characters
1	E.R.R (%)	40.0	37.0	33.0	29.0	**
2	Cocoon weight (gm)	11.83	11.21	11.15	10.93	*
3	Shell weight (gm)	1.53	1.32	1.25	1.20	*
4	Shell ratio (%)	11.90	11.21	10.95	10.48	*
5	Peduncle length of Cocoon (cm)	2.0	1.6	1.2	1.0	N.S.
6	Total period of Cocoon formation (days)	28	32	34	40	*

E.R.R. = Effective Rate of Rearing Am = *Antheraea mylitta*
N.S. = Not significant * = Significant ** = Highly Significant

Table 2. Table showing relative rearing performances of 3 mutant strains of *Antheraea mylitta* during Commercial crop season

Sl. no.	Parameters of rearing	Am-Blue	Am-yellow	Am-almond	Control	C.D. at 0.5% level for Characters
1	E.R.R (%)	42.0	39.0	35.0	31.0	**
2	Cocoon weight (gm)	11.89	11.28	11.25	11.10	*
3	Shell weight (gm)	1.60	1.38	1.35	1.29	*
4	Shell ratio (%)	12.10	11.61	11.10	10.98	*
5	Peduncle length of Cocoon (cm)	2.4	1.8	1.4	1.1	N.S.
6	Total period of Cocoon formation (days)	26	30	32	38	**

E.R.R. = Effective Rate of Rearing Am = *Antheraea mylitta*
N.S. = Not significant * = Significant ** = Highly Significant

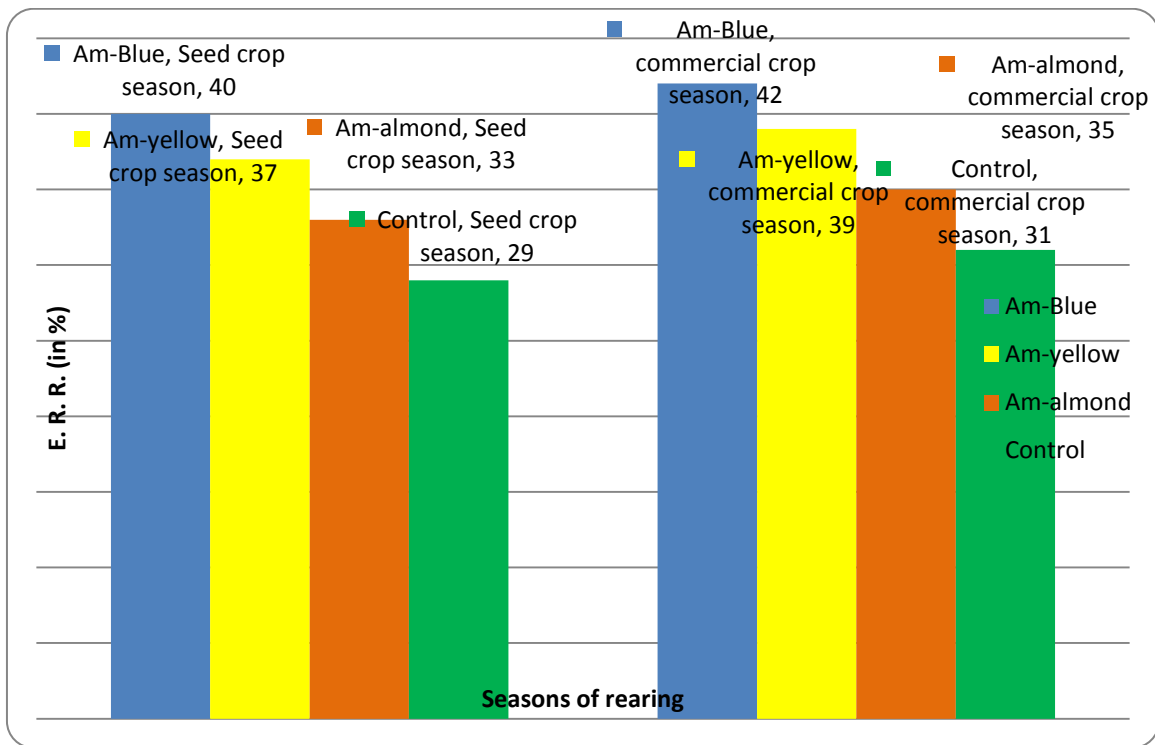


Fig. 1. Graph showing relative performances in E.R.R. (in %)

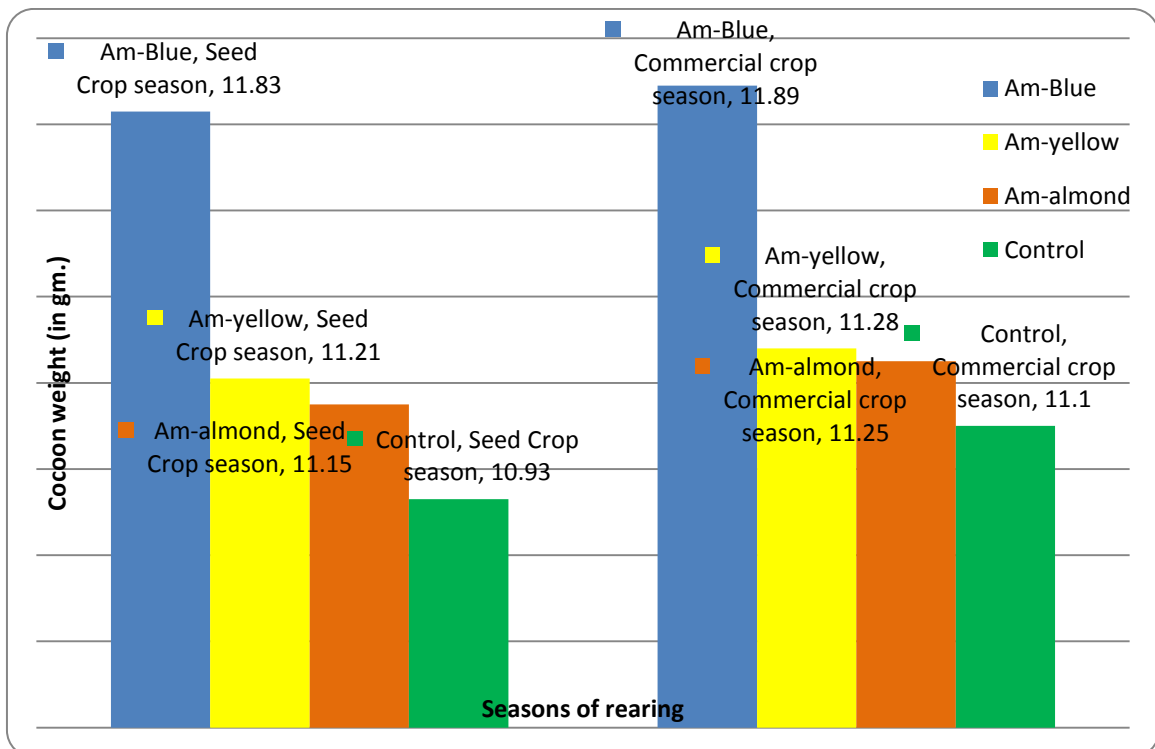


Fig. 2. Graph showing relative performances in cocoon weight (in gm)

The relative impacts of five different tropical tassar producing zones namely Jharkhand, Bihar, Orissa, Madhya Pradesh and West Bengal on the

productivities and qualities of tassar cocoons of three mutant strains of *Antheraea mylitta* D. namely Am-blue, Am-yellow and Am-almond along with its

control have been evaluated in respect of Effective Rate of Rearing (E.R.R%), Cocoon weight, Shell weight, Shell ratio, Filament length and size of fabrics and results so obtained in respect of relative impacts of zonal differences on the productivity and qualities of tasar cocoons of three different mutant strains of

Antheraea mylitta are recorded in Tables 3 to 5. Graphical representation of zonal differences on the productivity and qualities of tasar cocoons in respect of E.R. R. of three different mutant strains of *Antheraea mylitta* has been recorded in Fig. 7.

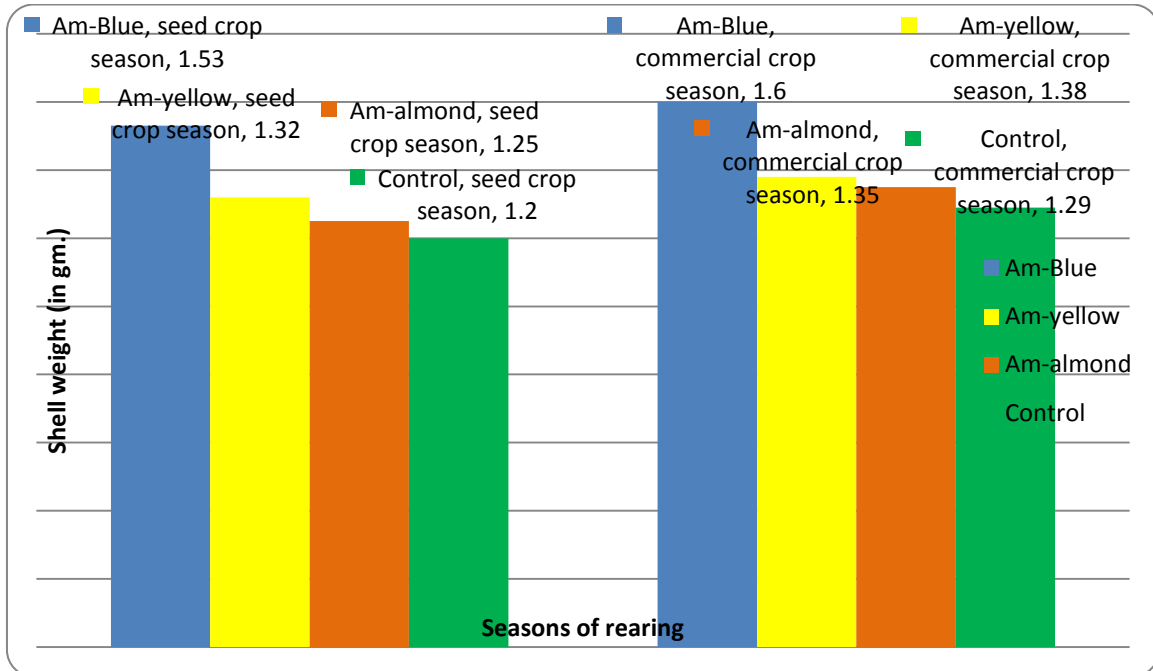


Fig. 3. Graph showing relative performances in shell weight (in gm)

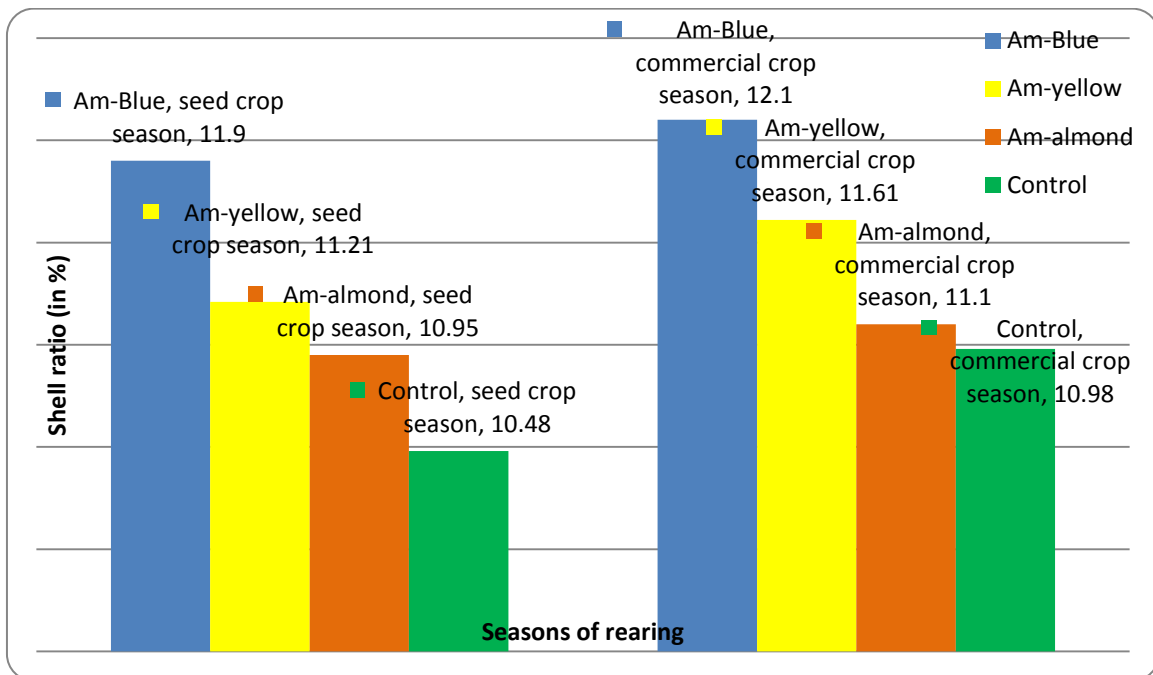


Fig. 4. Graph showing relative performances in shell ratio (in %)

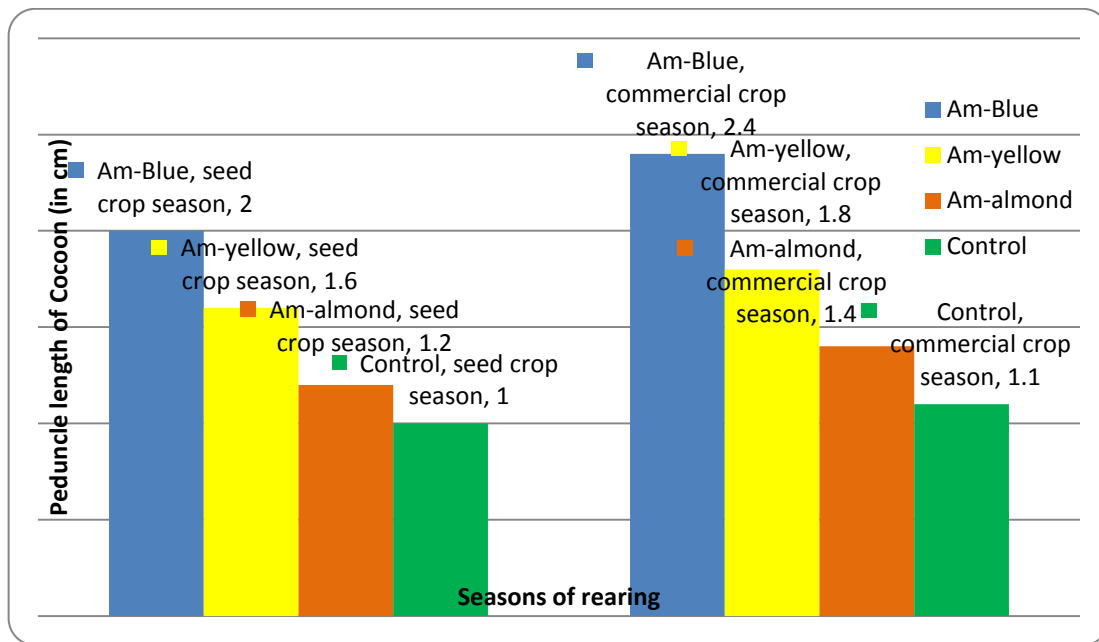


Fig. 5. Graph showing relative performances in peduncle length of cocoon (in cm)

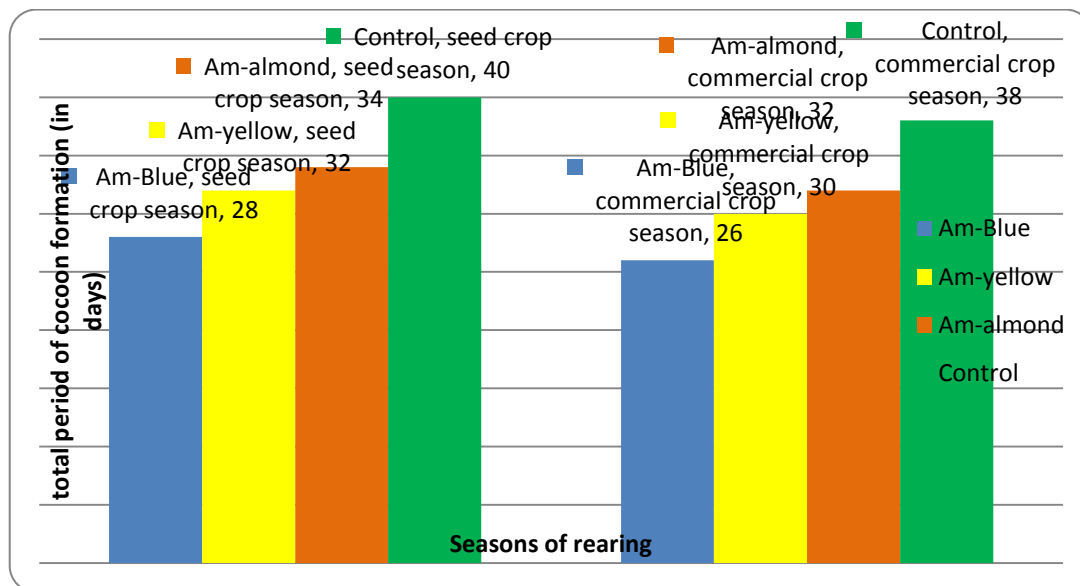


Fig. 6. Graph showing relative performances in total period of cocoon formation (in days)

Table 3. Table showing relative impacts of zonal differences on the productivity and quality of cocoons of Am-Blue strain of *Antheraea mylitta*

Sl. no.	Parameters of rearing	Jharkhand	Bihar	Orissa	Madhya Pradesh	West Bengal
1	E.R.R (%)	45	32	39	40	35
2	Cocoon weight (gm)	11.92	10.83	11.12	11.80	10.51
3	Shell weight (gm)	1.54	1.31	1.40	1.48	1.28
4	Shell ratio (%)	12.10	11.32	11.70	11.98	11.10
5	Filament length (cm)	6629	6521	6590	6610	6510
6	Size of fibre (m)	2.5	1.5	1.8	2.0	1.2

E.R.R. = Effective Rate of Rearing; Am = *Antheraea mylitta*

Table 4. Table showing relative impacts of zonal differences on the productivity and quality of cocoons of Am-Yellow strain of *Antheraea mylitta*

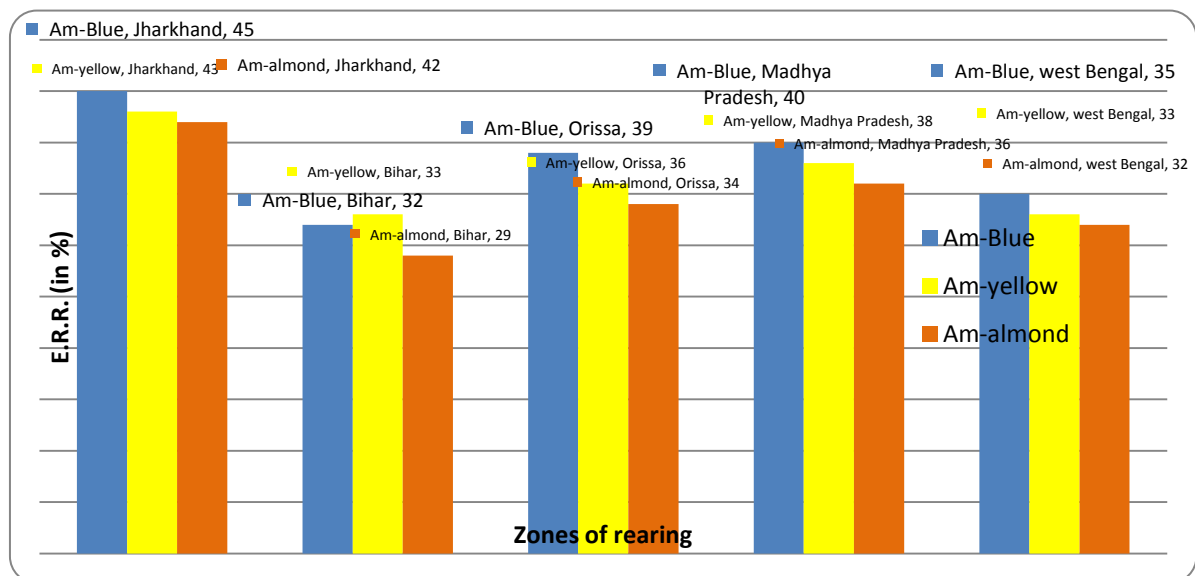
Sl. no.	Parameters of rearing	Jharkhand	Bihar	Orissa	Madhya Pradesh	West Bengal
1	E.R.R (%)	43	33	36	38	33
2	Cocoon weight (gm)	11.89	10.73	11.02	11.78	10.45
3	Shell weight (gm)	1.45	1.28	1.35	1.40	1.21
4	Shell ratio (%)	11.95	10.75	11.58	11.90	10.89
5	Filament length (cm)	6600	6420	6485	6510	6393
6	Size of fibre (m)	2.0	1.2	1.5	1.8	1.1

E.R.R. = Effective Rate of Rearing; Am = *Anthearea mylitta*

Table 5. Table showing relative impacts of zonal differences on the productivity and quality of cocoons of Am-Almond strain of *Antheraea mylitta*

Sl. no.	Parameters of rearing	Jharkhand	Bihar	Orissa	Madhya Pradesh	West Bengal
1	E.R.R (%)	42	29	34	36	32
2	Cocoon weight (gm)	11.80	10.69	10.92	11.52	10.12
3	Shell weight (gm)	1.35	1.20	1.30	1.32	1.10
4	Shell ratio (%)	11.85	10.81	11.35	11.75	10.72
5	Filament length (m)	6590	6352	6382	6398	6371
6	Size of fibre (m)	1.5	1.3	1.7	1.8	1.4

E.R.R. = Effective Rate of Rearing; Am = *Anthearea mylitta*

**Fig. 7.** Graphical representation of zonal differences on the productivity and qualities of tasar cocoons in respect of E.R. R. of three different mutant strains of *Antheraea mylitta*

4. DISCUSSION

A comparative analysis in relation to rearing performances of three mutant strains of *Antheraea mylitta* along with its control during the seed crop and commercial crop seasons reveals the under given facts:

- Results obtained are indicative of the fact that all the three mutant strains of *antheraea mylitta* differ among themselves in their relative rearing performances during the seed crop and commercial crop season.
- Among the three mutant strains of *Antheraea mylitta* the rearing performances of Am-blue mutant strain is relatively better than Am-yellow

and Am-almond mutant strain. It follows the given preferential order:

Am-blue > Am-yellow > Am-almond

- The rearing performances of all the three mutant strains in spite of their differences have been evidently found superior than the control during both the seasons of rearing.
- The relative productivity and quality of tasar cocoons are significantly superior to control.
- The relative rearing performances of all the three mutant strains of *Antheraea mylitta* along with its control are by and large better during the commercial crop season than the seed crop season which reveals the significant impacts of seasonal differences on the rearing performances of mutant strains along with its control.
- Results obtained are indicative of the fact that the zonal differences influence the relative performances of mutant strains of *Antheraea mylitta* D in respect of productivity and quality of tasar cocoons.
- The results have clearly shown that the productivity and quality of tasar cocoons of Jharkhand and Madhya Pradesh zones are relatively better and superior to Orissa, West Bengal and Bihar Zones of tasar producing states.
- The performances of Daba–blue in respect of productivity and qualities of tasar cocoons have been found evidently better than the Daba–yellow and Daba–almond.

5. CONCLUSION

The results obtained appear to be the outcome of genetic variabilities among the three mutant strains of *A. mylitta* D. on account of relative differences in their physio–genetic makeup. It further appears that the Am–blue mutant strain as compared to Am–

yellow and thereafter Am–almond is more robust in its genetic architecture as such it has shown relatively better performances in various rearing parameters. Results obtained are indicative of the fact all the three mutant strains of *A. mylitta* D. in spite of relative differences have registered their supremacy over the control (Daba–green) on account of desired beneficial mutation in relation to their rearing performances. Thus the evolution of three distinct mutant strains of tropical tasar silkworm is in the larger interest of tasar culture.

COMPETING INTERESTS

Author has declared that no competing interests exist.

REFERENCES

1. Jolly MS, Narasimhanna MN, Bardaiyar VN. Almond body mutant in *Antheraea mylitta* D., its origin and pattern of inheritance. *Genetica* .1969;40:425-428.
2. Jolly MS. Species differentiation in the genus *Antheraea*. *Sericologia*. 1985;25(1):84-94.
3. Fristrom JW. Development of morphological mutant strains of *Drosophila melanogaster*. *Genetics*. 1965;52: 297-318.
4. Krishnaswamy S, Narsimhanna MN, Suryanarayan SK, Kumar R. *Sericulture Manual – 2, Silkworm rearing*, F.A.O. Agri. Services Bull. 15/2 Rome. 1973;51-53.
5. Sharma KB, Pandey V. A comparative study on the laboratory culture of *Antheraea mylitta* D. *Mendel*. 1990;57-60.
6. Renuka G, Shamitha G. Genetic variation in the eco races of tropical tasar silkworm, *Antheraea mylitta* D. *Journal of Genetics*. 2016;95(4):777-785.