Journal Homepage: - www.journalijar.com

INTERNATIONAL JOURNAL OF ADVANCED RESEARCH (IJAR)

Article DOI: 10.21474/IJAR01/10569
DOI URL: http://dx.doi.org/10.21474/IJAR01/10569

RESEARCH ARTICLE

COLOUR POLYMORPHISM IN COCOON POPULATION OF WILD TASAR SILK INSECT ANTHERAEA PAPHIA LINN

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Manuscript Info

Manuscript History
Received: 22 December 2019
Final Accepted: 25 January 2020
Published: February 2020

Key words:-
Altitude, Variation, Population, Cocoon, Colour, Percentage, Antherae Paphia

Abstract

Percentage of coloured cocoons in the population of Antherae paphia Linn. was studied in three different altitudinal ranges in Mayurbhanj districts of Odisha. It was observed that the percentage of population of black cocoons was highest in the lower altitude in the range 100-300mASL.The percentage of population of grey black cocoons was found to be highest in medium altitude in the range of 301-600mASL as well as in higher altitude in the range 601-1000 mASL. The percentage of population of grey cocoons was recorded to be second highest and similarly the percentage of population of yellow black cocoons indicated second highest value in medium altitude.The percentage of population of black cocoons occupied second position in higher altitude and the population of yellowblack cocoons was found to be lowest in percentage.The occurrence of yellowgrey cocoons in medium altitude was not observed.Incase of higher altitude the existence of population of yellowgrey cocoon,brown cocoon and grey cocoon was not detected.The variation in percentage of population of different coloured cocoons studied in different altitudes indicated significance difference as based on t-test and Anova test.The probable reason of marked variation of population of different coloured cocoons based on altitudinal gradient might be due to the effect of variation in prevailing annual temperature,relative humidity,photoperiod etc. which needs to be studied in depth for future conformation.

Introduction:-

The wild population of Antheraea paphia Linnaeus is endemic in high altitude Sal (Shorea robusta Gaertn) forests of Odisha, India. The insect multiplies in nature and feeds only on Sal leaf which is its common host plant. Depending on altitude, the voltinism of A. paphia L. varies from univoltine to multivoltine (Nayak etal, 1992). For commercial rearing the wild cocoons of A. paphia are also collected from the Sal forests located in high attitude. The collected cocoons are subjected to grainage operation for production of egg (seed). These eggs are subsequently utilised for rearing on Asan(Terminalia alata W.&A.) or Arjun (Termnalia arjuna W.&A.) food plants during autumn season at low altitude. Literature on A.paphia are already available on taxonomic position (Arora and Gupta, 1979), abnormal cocoons (Dash and Nayak, 1990), conservation strategy (Dash and Nayak, 1991), oviposition behaviour (Dash and Nayak, 1992), mortality of larvae (Dash and Nayak, 1998), biodiversity (Nayak et al 1998), food plants (Nayak et al,1998), life table (Nayak and Dash, 1999), effect of egg chamber on fecundity (Dash et al, 2000), technology of

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commercial rearing (Nayak et al, 1994) and cocoon morphology (Panda, 1972). But no literature is available on percentage of different coloured cocoons in the populations of A. paphia in different altitudes. So the study was conducted to establish the relationship of availability of different coloured cocoons in an altitudinal gradient basis.

Materials And Methods:-

During the summer months (March-May) a thorough search operation was carried out at different altitudes (100-300,301-600,601-1000 mASL) in the Sal forest of Mayurbhanj district of Odisha. The nature grown cocoons of A. paphia were collected from different altitudinal zones and were preserved separately. Then the cocoons collected from different altitudes were subjected to segregation on the basis of their different colours. Later mathematical calculations were carried out to determine the percentage of population of different coloured cocoons available in different altitudinal zones. Subsequently statistical analysis were done to obtain mean values ($\bar{X}$) with standard deviations ($\pm$SD) of different samples of coloured cocoons.

Results And Discussions:-

Table 1 presents data on percentage of different coloured cocoons in the three altitudinal zones from where the nature grown cocoons of different colours were collected. The different coloured cocoons obtained from altitudinal zones located within 100-300mASL were mainly black, grey, grey black, yellow black, yellow grey and brown. In this zone the occurrence of percentage of black cocoon was highest(80.79 ± 0.53) followed by grey cocoons (9.31± 0.23), yellow black (3.16 ± 0.39), brown (2.63 ± 0.17), black (1.93 ± 0.12) and yellow grey (1.19 ± 0.24) cocoons.The t-test showed significant($p<0.05$) difference in percentage of various coloured cocoon population available in this altitudinal zone. The ANOVA test also indicated significant ($p<0.01$) interaction between the altitude and percentage of coloured cocoons endemic in this altitudinal zones.

In the second altitudinal zone (301-600 m ASL), the different population of coloured cocoons noticed were black, grey, grey black, yellow black and brown. The population of yellow grey coloured cocoons was not available at all in this medium altitudinal zone. The percentage of grey black cocoons were highest (71.26 ± 0.41) followed by yellow black cocoon (13.52 ± 0.26), black(10.13±0.32),grey(2.91±0..22)and brown (1.03±0.12) cocoon. Conducting 't' test, it was established that the percentage of population of different cocoons were significantly ($p< 0.05$) different. Further the ANOVA test also expressed significant ($p < 0.01$) interaction between the two considered parameters.

The extensive survey carried out in the third altitudinal (601-1000 mASL) zone indicated availability of only three types of population of coloured cocoons i.e.grey black, yellow black and black. It was observed that the percentage of population of grey black cocoons was highest (53.78 ± 0.62) .The occurrence of percentage of population of black coloured cocoon was second highest (23.87 ± 0.42) followed by yellow black cocoon (19.8 ± 0.48). The 't' test revealed significant ($P < 0.5$) difference in percentage of different coloured cocoons in this zone. Also significant ($P< 0.01$) interaction was observed from the ANOVA test.

The percentage of population of different coloured cocoons in different altitudinal zones was quite different. The probable reason might be the variation of photoperiod and temperature in the three chosen altitudinal zones. Musolin and Numata (2003) observed significant effect of temperature and photoperiod on colour change of body of southern green stink bug Nezera virudela(L.). They stated that change of colour was significantly higher under short day (19:8h) than under long day(19:8h) and colour change is strongly associated with diapause induction. They further mentioned that dark colour morphs did not vary genetically but it is the effect of photoperiod and temperature. Kobayashi and Numata(1995) reported that long day conditions produced light coloured adults and also high temperature(30^0c) increased the proportion of light coloured adults. Long day condition produced brown colour in case of green stink bug Nezera viridula L. Volkovich and Saulichi (1994) as well as Tanzawa (1994) also reported the effect of photoperiod and temperature on body colouration of predatory bug Arma custos. Besides the environmental factors were found to affect colouration especially among insects (Kingsolver and Huey,1998 and Harris et al., 2013).

Table 1:- Percentage of different coloured cocoons of A.paphia endemic in different altitudinal zones.

Altitude (mASL)	Black	Grey	Brown	Yellow Black	Grey Black	Yellow Grey
100-300	80.29	9.31	2.63	3.16	1.93	1.19

	±0.53	±0.23	±0.17	±0.39	±0.12	±0.24
301-600	10.13 ±0.32	2.91 ±0.22	1.03 ±0.12	13.52 ±0.26	71.26 ±0.41	NA
601-1000	23.87 ±0.42	NA	NA	19.80 ±0.48	53.78 ±0.62	NA
***NA-NOT AVAILABLE**						

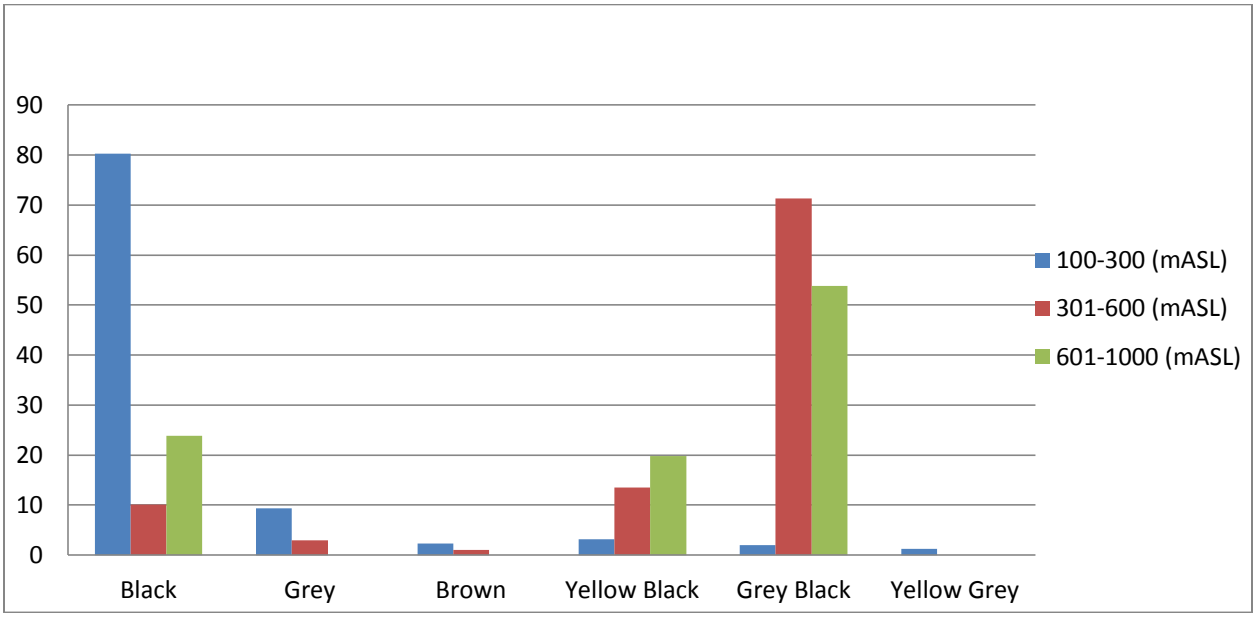

Fig. 1:- Percentage of population of different coloured cocoons of A.paphia endemic in different altitudinal zones.

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