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METRICAL MORPHOLOGY AND GROWTH TREND OF THE LARVAL INSTARS OF *PERICALLIA RICINI* FABRICIUS (LEPIDOPTERA : ARCTIIDAE)

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Studies on the larval instars of *Pericallia ricini* show that a particular instar can reasonably be ascertained with the help of morphometric measurements.

INTRODUCTION

Various workers from time to time have established a number of criteria for the determination of the lepidopteran larval instars (CATSUMATA, 1931; NISHIKAWA, 1931; YAGI & KATSUMATA, 1935: KANNO, 1955; LIN *et. al.*, 1964; MURTHY & PERRAJU, 1969; ALLEN & GRIMBLE, 1970). The observations on the growth trend of the cuticular part of insects have been varied (DYER, 1890; GAINES & CAMPBELL, 1935; LUDWIG & ABERCROMBIE, 1940). In the present communication the metrical data and observations on the growth trend of different characters of the larval instars of the castor (*Ricinus communis* L.) leaf eating pest *Pericallia ricini* FAB. are presented.

MATERIAL AND METHODS

The larvae were reared in the laboratory (temperature 28°–32° C and relative humidity 74–90 per cent) on castor leaves. The different parts of the larvae of the different instars were dissected out for taking the measurements. For each larval instar and for each of the variables, there were ten replications. The significance of difference between the mean values was tested by analysis of variance. To ascertain the nature of the growth curve of all the variables, log Y (where Y was the observed mean values of the variables) was calculated against x (where x was the stages of instars) and the relations were linear and nonlinear. The appropriate degree was determined by fitting orthogonal polynomial to the logarithms of the observed mean values of the variables (y), assuming the stages of instars (x) to be equidistant. The appropriate degree of the polynomial was determined by the analysis of variance test.

RESULTS AND DISCUSSION

The morphometric data are presented in Table 1 and the results of the growth trend analysis in Table 2. The linear component in all cases (except antenna length) is significant at 1%, whereas the quadratic component is insignificant. The growth trend of all these variables is thus linear in the logarithms of the variables [$y = \log Y = b_0 + b_1 (x - \bar{x}) = a_0 + b_1 x$] i.e. the relation is exponential in the observed values ($Y = ab^x$ where $a_0 = \log a$ and $b_1 = \log b$). In the equation $Y = ab^x$, b is the progression factor. In the case of antenna length the quadratic component is significant at 5% whereas the cubic component is insignificant. The growth trend of this variable is hence quadratic in logarithms of the variable [$y = \log Y = (y - 5b_1 + 5.001\ b_2) + 2b_1 - 7.5\ b_2)\ x + 1.5\ b_2\ x^2$]. The growth rate, where the trend is quadratic, is negative [$\frac{dy}{dx} < 0$, when $y = f(x)$].

The high significance in the differences of measurements indicates that the particular stage of the instar can reasonably be ascertained with the help of morphometric

TABLE 1. Morphometric data of different larval instars of *Pericallia ricini*.

	Mean values of measurements on different instars						C. D. at 5%	Remarks
	I	II	III	IV	V	VI		
Body weight mg	0.600	0.750	5.300	26.600	97.190	325.050	4.321	**
Body length mm	3.000	4.000	6.000	11.600	17.000	27.700	1.246	**
Body width mm	0.500	0.500	1.160	2.000	3.150	5.040	0.305	**
Head capsule length mm	0.270	0.360	0.690	1.103	1.730	2.440	0.011	**
Head capsule width mm	0.324	0.439	0.801	1.250	1.920	2.718	0.055	**
Labrum length (Antero-posteriorly) mm	0.054	0.072	0.140	0.237	0.330	0.471	0.028	**
Labrum width (Laterally) mm	0.090	0.141	0.225	0.375	0.585	0.834	0.055	**
Mandible length mm	0.090	0.125	0.250	0.380	0.594	0.858	0.028	**
Mandible width mm	0.072	0.100	0.170	0.302	0.474	0.708	0.028	**
Maxilla length mm	0.162	0.248	0.454	0.711	1.083	1.480	0.028	**
Maxillo-labial hypopharyngeal complex width mm	0.198	0.239	0.455	0.729	1.180	1.545	0.055	**
Antenna length mm	0.036	0.072	0.139	0.218	0.339	0.447	0.011	**

** 1% larvel of significance in the differences of mean.

TABLE 2. Growth trend analysis of different morphological characters in larvae of *P. ricini*.

Morphological feature	Values of F			Growth Equation
	Observed F at 1, 3 d. f.			
	Linear	Quadratic		
Body weight	103	0.197		$\log Y = 3.3108 + 0.2958x$
Body length	408	1.080		$\log Y = 3.6825 + 0.1000x$
Body width	98	0.162		$\log Y = 2.8876 + 0.1092x$
Head capsule length	391	0.322		$\log Y = 2.6643 + 0.1004x$
Head capsule width	586	0.553		$\log Y = 2.7367 + 0.0965x$
Labrum length	144	0.049		$\log Y = 1.9623 + 0.0993x$
Labrum width	1888	3.350		$\log Y = 2.2083 + 0.0988x$
Mandible length	80	0.128		$\log Y = 2.1970 + 0.1023x$
Mandible width	671	0.004		$\log Y = 2.0855 + 0.1041x$
Maxilla length	378	2.030		$\log Y = 2.4706 + 0.0992x$
Maxillo-labial hypopharyngeal complex width	235	0.202		$\log Y = 2.4973 + 0.0975x$
	Observed F at 1, 2 d.f.			
	Linear	Quadratic	Cubic	
Antenna length	2646	59.700	9.196	$\log Y = 1.5500 - 0.3352x - 0.0228x^2$

measurements. Moreover, the linear relationship in the growth of some characters indicate that the data has a trend to agree with the DYAR's law (DYAR, 1890). The non-linear growth trend of the antenna length, however, supports the view of METCALF & FLINT (1962) which postulates that for some insects the relationship in the growth of different parts of insects is parabolic rather than linear.

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