Study the biology of common castor butterfly,*Ariadne merionemerione*Cramer

Abstract

A laboratory experiment was conducted at the PC Unit Sesame & Niger, Department of Entomology, JNKVV, Jabalpur on biology of spiny castor caterpillar,*Ariadne merionemerione*(Cramer) on castor. Considerable variation in larval period on castor plants was observed, with the shortest of 27.41(max.) and 25.80 (min.) days being when reared on castor leaves. Generally, females length longer than males on all the castor plants.The average developmental period of 1st, 2nd, 3rd, 4thand 5thlarvae were 70.92±4.89, 109.22±1.81, 134.37±1.87, 147.87±4.12 and 176.82±5.67hours, respectively.The length and breadth of pupa varied from 18.79±0.74mm and 5.62±0.11mm, respectively.The Pre-oviposition, oviposition and post oviposition periods in hourssequencely,59.62±6.17, 121.42±2.42 and 61.69±3.20, respectively.

Keywords: Eclosion, revealed,leaves,developmental,departure andimitation.

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1. Introduction

The spurge (Euphorbiaceae) family non-edible oilseed crop castor (*Ricinus communis* L.) is thought to have originated in Abyssinia. Due to its minimal demand on soil fertility, moderate rainfall requirements and lack of competition with food crops and food grade oils, it is extensively dispersed throughout the tropics and sub-tropics. Castor is farmed on an industrial scale in around 30 nations, with India leading the pack in terms of both acreage and production. Its fruits are attractive but often are removed before they mature because the poison ricin gets concentrated in their beanlike seeds. It is also the host plant of Eri-silkmoth (*Samia cynthiaricini*).The common castor butterfly is a specific pest of the castor seed plant, *Ricinus communis* (Nayar *et al*., 1976)and the larvae also feed on the hurtful nettles, *Tragia involucrate* and *T. plukenetti*(Kunte, 2000).Castor butterfly is a brownish orange butterfly with black curvy lines. In females, these curvy lines are broader in the form of distinct bands. The larvae of this butterfly feed exclusively on leaves of castor plant. They are fond of resting on leaves at the top canopy, keeping the wings slowly moving sideways and are always nearer to host plants.

2. Material and Methods

After pupation, pupae were collected and placedin another cages. The male and female adults emergingwere collected in plastic bottles and released in separaterearing cage for mating and egg laying. Fresh castor leaves were supplied daily as food to larvae.The adults were fed with 10% honey soakedin cotton swabs. Longevity of lifestageswere observed with the larval instars, formation of pupaand adult emergence and until death. After death, adultswere stretched and preserved for measuring their wingexpanse and length.Observations were recorded on their colour, shape and incubation period. Newly hatched larvae released singly in glass vials to study the duration of each instar. The pre-oviposition, oviposition and post-oviposition periods, fecundity and longevity were also recorded by keeping the paired adult moths in glass jars. Different lifestages examined under lab condition of stages weredone with digital vernier caliper.

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3. Results and Discussions

Female moths laid eggs singly on the lower surface of the leaves between the midrib and veins, in between the floral buds, inside the flowers and in stem and capsules. Females spread their wings during egg laying, either singly, in pairs and in clusters(12-15/ cluster). Similar egg laying pattern of *Ariadne merionemerione(*Cramer)was observedby Bala *et al.*, (2014).The 1stinstar immediately after emergence started feeding on empty egg shells and then epidermis of leaflets. 2ndinstar larvae also fed on the leaf epidermis, tender and apical portion of the shoots. 3rdinstar larvae, after initial feeding on the epidermis of leaves and tender parts of the plants. 4th instar larvae fed on the leaf epidermis, tender parts of the branches by scrapping. 5th instar larvae fed mainly on leaves and tender parts of castor plants by scrapping.More or less similar damage pattern was observed byBala *et al.*, (2014).

The freshly hatched larva was cream colored, later turning brownish green with three brown colored horizontal bands on dorsal side. Body was somewhat rectangular in shape, but slightly narrowing posteriorly. Head very minute and brown.Second instars larvae whitish green spines with branched ends appeared over the entire body. Head was brown with a pair of brown horns. Third instars larvae dorsally they had a yellowish green broad stripe with brown edge longitudinal to the body. The body spines present on the three brown horizontal bands were also brown. Head was 1mm in size, blackish brown with white markings.Fourth instars larval body became green in color. The dorsal stripe turned brown with yellowish cream edges. The three black horizontal bands began to disappear. Head was blackish brown in color, square shape. There were three triangular white markings on the head. The head horns were reddish brown in

color and measured 2 mm in length. Segmentation was clear. Body spines were green, arranged in four lines on each side of the body on all the segments.The fifth instars when fully mature turned green with clear segmentations and dorsal stripe orange with black edges showing numerous small white to cream colored spots. The dorsal three horizontal bands and white triangular markings with black borders present two above and one below. The horns became orange, with black tips and light and dark green crossed lines both lateral sides of the body. The color of spines changed to brown with black tips and with yellow to orange colored spots at their base.The larva became lethargic and slightly shrinked before entering into the pupal stage. This stage called as prepupal stage.The body contracted and the larva attached itself to the substratum with its posterior end hanging downwards. The brown color changed to black with pupal maturation until adult eclosion.Adults male and female adults were nearly identical, characterized by their brownish orange wings bearing black wavy lines. It has been observed in the field. Mating took place end to end and lasted for 80 minutes. Mating of butterflies was observed to take place during flight mostly in the late morning hours (11 am to 2 pm).

The length and breadth of first instar caterpillar varied from 2.90 to 2.33 mm with an average of 2.52 mm and 0.057 to 0.054 mm with an average of 0.05 mm, respectively.Developmental period of first instar caterpillar varied from 75.10 to 65.70 hours with an average of 70.92hours.Bala *et al.*, (2014) reported average length of the larva measured between 2-4 mm. The duration of the first instar varied from 2 to 3 days duringPre Monsoon (May-June) to 3 to 4 days during Post Monsoon(Oct-Nov).

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The length of the second instar ranged from 6.50 to 7.11 mm with an average of 6.93 mm, while breadth varied from 0.087 to 0.083 mm with an average of 0.085mm.Bala *et al.*, (2014) reported average length of the larva measured 6-8 mm and the duration of instar period was 2 to 3 days during PreMonsoon (May-June) and 3 to 4 days during Post Monsoon (Oct-Nov).

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Therewere no changes in other characters from previous instar.The length of the third instar caterpillar ranged from 15.49 to 11.78 mm with an average of 12.94 mm, while breadth varied from 0.15 to 0.16 mm with an average of 0.16 mm. Developmental period of third instar caterpillar varied from 136.90 to 132.60 hours with an average of 034.37hours.Bala *et al.*, (2014) reported average length of the larva measured between 8-16 mm. The duration of the third instar

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varied from 3 to 4 daysduring Pre Monsoon (May-June) to 2 to 4 days during Post Monsoon (Oct-Nov).

Legs were green. Length of the fourth instar caterpillar varied from 19.99 to 19.20 mm with an average of 19.59 mm and breadth 0.21 to 0.22 mm with an average of 0.21 mm. Bala *et al.*, (2014) reported average length of larva measured between 17 to 26 mm. Duration of larval period was 2 to 4 days during Pre Monsoon (May-June) to 2 to 3 days during Post Monsoon (Oct-Nov).

Length of the caterpillar varied from 34.40 to 30.76 mm with an average of 3.08 mm. Breadth ranged from 0.50 to 0.46 mm with an average of 0.48 mm. The duration of fifth instar caterpillar was 181.60 to 169.10 hours with an average of 176.82hours.Bala *et al.*, (2014) reported average length of larvae measured between 27 to 40 mm. Duration of larval period was 2 to 3 days during Pre Monsoon (May-June) to 3 to 5 days during Post Monsoon (Oct-Nov).

The length of the pre-pupa ranged from 19.03 to 18.13 mm with an average of 18.54 mm. Breadth varied from 5.03 to 4.20 mm with an average of 4.57mm. The fifth instar when fully grown stopped feeding, turned brown and its lateral crossed lines changed to brown and white. The larva became lethargic and slightly shrinked before entering into the pupal stage. This stage called as prepupal stage lasted for 8 to 10 hours and finally formed pupa.Bala *et al.*, (2014) reported average length of the pupa measured between 28 to 29 mm in length and 3mm in width. The duration of the pupal stage varied from 6 to 7days during Pre Monsoon (May-June) to 7 to 11 days during PostMonsoon (Oct-Nov).

The length and breadth of pupa varied from 19.66 to 18.03 mm with an average of 18.79 mm and 5.75 to 5.50 mm with an average of 5.62 mm, respectively.The anterior end was narrow. At thebroadest point both lateral sides were curled inwards, betweenwhich two pointed projections appeared on dorsal side.The three early stagesand adults could be found under natural conditions throughoutthe year. Rainfall appears to be the most importantfactor promoting higher reproduction rates in *A. merionemerione*Cramer as is the case for both *Catopsiliacrocale*(Chirstopher and Mathavan, 1986) and *Catopsiliapyranthe*(Atluri *et al.*, 2004). Precipitation during the North–Westmonsoon likely had its influence on reproduction via the hostplant. During this season, the host plant had its greatest freshgrowth, a resource needed by the larvae for better performancedue to the likely higher levels of nitrogen and water content.Although the host plant was available throughout the year, leafquality in terms of

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nitrogen and water content might havevaried through the year. For most of India,Wynter - Blyth (1957)[8]rated spring as the most favorableperiod, followed by post monsoon and South – West monsoon.In the Northern Western Ghats, Kunte (1997) observedhighest flight activity during late monsoon (Aug-Sept) and early winter (Oct-Nov). Thesedifferences in the phenology of butterflies suggest thatdifferent species respond differently to the prevailingenvironmental seasonality and exhibit different life historypatterns. Even different species of a genus may behavedifferently as observed by Jones and Rienks (1987) in the threespecies of the tropical *Eurema*they studied.

Adult females lay eggs singly or in small groups of 2 to 5 one at a time on the under surface of leaves. Adults were found feeding on spoiled flowers of *Lantana camara*, overripe, fallen and damaged fruits of *Annona squamosa, Syzygiumcumini* and *Artocarpus heterophyllus*, and the sap oozing from wounds in the tree trunks of *Citrus aurantifolia*(Bala *et al.*, 2014).

Length of the males varied from 61.52 to 56.89 mm with an average of 59.70 mm, while the breadth with wing expanded form varied from 5.52 to 4.75 mm with an average of 5.08 mm.Length of the female moths varied from 14.23 to 13.68 mm with an average of 13.97 mm and breadth with wing expanded form varied from 6.15 to 5.90 mm with an average of 6.03 mm.

The pre-oviposition period of female moth varied from 67.69 to 54.29 hours with an average of 59.62 hours.The oviposition period of females ranged from 123.00 to 117.82hours with an average of 121.42hours.

The total life cycle of *Ariadne merionemerione*Cramer varied from 70 - 66 days. The total development time from egg laying to adult eclosionwas determined as 22-32 days, thus permitting a maximum of8 to 9 overlapping broods per year (Bala *et al.*,2014).

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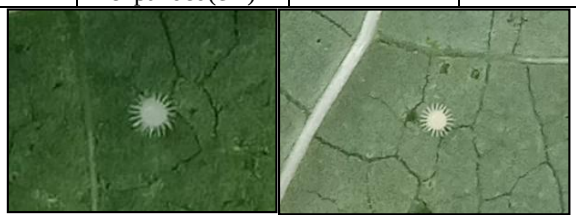
Table 1. Duration of different life stages of spiny castor caterpillar on castor.

S. No.	Life stages	Period		
		Maximum	**Minimum**	**Mean±SD**
1.	**Egg (days)**	3.30	2.80	3.05±0.24
2.	**Larvae**			
	1st instar (Hrs.)	75.10	65.70	70.92±4.89
	2nd instar (Hrs.)	111.80	107.90	109.22±1.81
	3rd instar (Hrs.)	136.90	132.60	134.37±1.87
	4th instar (Hrs.)	152.50	144.10	147.87±4.12
	5th instar (Hrs.)	181.60	169.10	176.82±5.67
	Total larval period (Days)	27.41	25.80	-
3.	Pre-pupa (Hrs.)	141.01	123.30	133.05±7.68
4.	Pupa (Hrs.)	85.99	78.15	83.31±3.67
5.	**Adults**			
	Pre-oviposition (Hrs.)	67.69	54.29	59.62±6.17
	Oviposition (Hrs.)	123.00	117.82	121.42±2.42
	Post oviposition (Hrs.)	64.45	57.11	61.69±3.20
6.	**Longevity**			
	Female (Days)	39.46	38.17	38.77±0.53

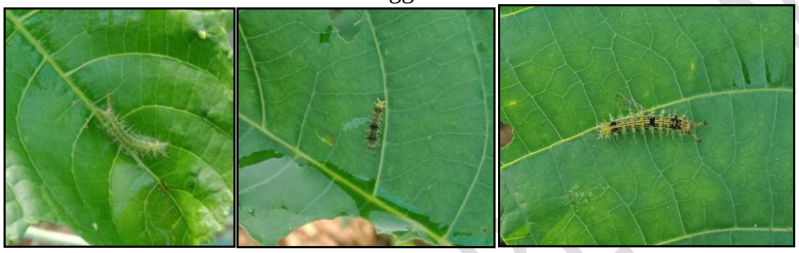
Table 2.Biometrical parameters of different stages of spiny castor caterpillar on castor.

S. No.	Stage	Particulars	Measurement (mm)		
			Maximum	**Minimum**	**Mean±SD**
1.	**Larvae**				
	1st instar	Length	2.90	2.33	2.52±0.25
		Width	0.057	0.054	0.05±0.01
	2nd instar	Length	7.11	6.50	6.93±0.29
		Width	0.087	0.083	0.085±0.01
	3rd instar	Length	15.49	11.78	12.94±1.73
		Width	0.16	0.15	0.16±0.02
	4th instar	Length	19.99	19.20	19.59±0.32
		Width	0.22	0.21	0.21±0.05
	5th instar	Length	34.40	30.76	32.08±1.62
		Width	0.50	0.46	0.48±0.01
2.	Pre-pupa	Length	19.03	18.13	18.54±0.37
		Width	5.03	4.20	4.57±0.34
3.	Pupa	Length	19.66	18.03	18.79±0.74
		Width	5.75	5.50	5.62±0.11
4.	**Adults**				
	Male	Length(mm)	61.57	56.89	59.70±2.05
		Wing expanded(cm)	5.52	4.75	5.08±0.33
	Female	Length(mm)	14.23	13.68	13.97±0.23

		Wing expanded(cm)	6.15	5.90	6.03±0.13



Eggs



First instar larva Second instar larvaThird instar larva

Fourth instar larvaFifth instar larvaPre-pupa

PupaAdultDamaged leaf

Host PlantAdult measurement

Plate 1.

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4. Conclusion

The incubation period of eggs with an average of 3.05 days.The length and breadthof 1st, 2nd, 3rd, 4th and 5thinstars caterpillar varied from 2.52, 6.93, 12.94, 19.59, 3.08 mm and 0.05, 0.085, 0.16, 0.21, 0.48 mm, respectively.The length of pre-pupa and pupa with an average of 18.54 and 5.62 mm, respectively.The length and breadth of males and female moth with an average of 59.70, 13.97 mm and 5.08 and 6.03 mm, respectively.The pre-oviposition and oviposition period of female moth with an average of 59.62 and 121.42 hours, respectively.Thetotal life cycle of *Ariadne merionemerione*Cramer varied from 70-66 days.

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6. References

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