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Bionomics of Mealybug, *Coccidohystrix insolita* (Green) on Pigeonpea*

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ABSTRACT

The life cycle of *Coccidohystrix insolita* (Green) was studied in laboratory and field conditions in Junagadh. The eggs were dirty white, oval and found within the protective cottony ovisac. The male and female bugs passed through four and three nymphal instars, respectively. The total life span for male and female was 25.92 ± 1.38 and 42.89 ± 2.88 days, respectively, at an average laboratory temperature of 29.42 ± 1.20°C and 82.64 ± 5.48 per cent relative humidity and 42.14 ± 1.46 and 59.49 ± 2.14 days for male and female at the field temperature of 24.94 ± 2.27°C with 70.11 ± 13.10 per cent relative humidity, respectively. The sex ratio of male to female was 2.07 in field conditions.

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INTRODUCTION

Pigeonpea, *Cajanus cajan* (L.) Millsp. is an important legume crop and various insect-pests reduced the yield by 33.47 per cent in Saurashtra region of Gujarat State (Bhalani and Parsana, 1991). Among the 200 insect-pests (Lateef and Reed, 1990), the mealybug, *Coccidodohystrix insolita* (Green) has been observed recently and severely infesting pigeonpea in South Gujarat and in Saurashtra region (Patel *et al.*, 1985; Bhalani, 1990). Considering the importance of the pest and no information of its bionomics, attempts were made to investigate the same.

MATERIALS AND METHODS

Bionomics of the pest was studied under laboratory and field conditions, during 1991 and 1992, respectively. Initial culture was maintained on the pigeonpea (variety BDN 2) seedlings grown in the plastic pots and on plants raised in the fields. The newly emerged nymph was transferred on to a leaf of 21 days aged potted plant. In this way 100 nymph was transferred on a leaf of 100 different potted plants. The plants were covered with glass chimneys having top end covered with muslin cloth and secured in position with the rubber bend. The seedlings were observed daily till the completion of life cycle. The duration of various stages, fecundity, etc. were noted. Observations were also made under microscope for colour, shape and morphological characters of various stages of the pest. The measurements of each stage were taken under microscope. During the study period, the temperature and relative

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humidity was 29.42 ± 1.20°C and 82.64 ± 5.48 per cent, respectively in laboratory, while it was 24.94 ± 2.27°C and 70.11 ± 13.10 per cent respectively, under field condition.

RESULTS AND DISCUSSION

Ovisac : The female laid eggs within the protective cottony ovisac on lower surface of the leaf. Similar observations were also reported by Patel (1990). The length and width of ovisac were 6.51 ± 0.99 and 1.95 ± 0.09 mm, respectively.

Egg : The newly laid eggs were smooth, transluscent, bright, dirty white which became creamy to light yellow before hatching. It was oval with tapering ends, kidney or round shaped. The length and breadth were 0.30 ± 0.02 and 0.16 ± 0.01 mm, respectively. The present observations are in agreement with Patel (1990). The incubation period was 6.08 ± 0.78 days and hatching percentage was 90.02 in laboratory. It was 10.26 ± 0.99 days and 87.79 per cent in field condition (Table 1). Rawat and Modi (1969), however reported 4.4 days incubation period from Madhya Pradesh. Patel (1990) reported 7.03 ± 0.27 days as egg period and 89.37 ± 4.23 per cent hatching in laboratory at 29.65 ± 1°C temperature and 84.93% R. H.

Nymph : The male and female nymphs moulted 3 and 4 times, respectively before attaining adult stage.

First instar : Freshly emerged nymphs were oval in shape, light yellow in colour having a pair of 6-segmented short filiform antinnae and bright red eyes. The colour changed to pale white within two days after hatching. A pair of long filaments was observed at posterior end of the body. The length and breadth were 0.35 ± 0.02 and 0.17 ± 0.01 mm, respectively. Ghosh and Ghose (1988) reported 0.59 and 0.27 mm of body length and width, respectively. The slight differences in body size from the present findings might be due to variation in host plant.

Second instar : The morphology of the second instar nymphs was same as that of first instar. Within one day of the first moult, nymphs secreted white waxy powder and fibres on dorsal as well as on lateral sides of the body. Length and breadth were 0.64 ± 0.03 and 0.32 ± 0.02 mm, respectively. Similar observations were recorded by Ghosh and Ghose (1988) and Patel (1990).

Third instar : Sexual dimorphism was evident from this stage. The male nymph formed a white silken cocoon before one of two days of second moult, whereas it was absent in female. After formation of cocoon male passed through two moults before reaching adult stage. Similar observations were also reported by Rawat and Modi (1969). Mean length and breadth was 1.75 ± 0.15 and 0.61 ± 0.07 mm, respectively.

Male : The nymphs were elongated and pale yellow in colour. It possesses well developed legs and a pair of wing buds on the dorso-laternal margin of the meta-thorasic region. A pair of 9-segmented filiform antennae was directed backward from the first apical end.

Female : The nymphs were smaller in size than male and oval in shape with light

TABLE 1

Incubation period, hatching percentage, duration of nymphal instars and growth index of *C. insolita* under laboratory and field conditions.

Condition	Incubation period (days)	Percentage egg hatching	Sex	Duration of nymphal instars (days)					Nymphs survived (%)	Growth index value
				1st	2nd	3rd	4th	Total		
Laboratory	6.08 ± 0.78	90.02	Male	5.8 ± 0.9	5.1 ± 0.7	3.5 ± 0.7	2.8 ± 0.6	17.2 ± 1.1	92.68	5.39
			Female	5.7 ± 0.7	5.1 ± 0.9	5.4 ± 0.9	—	16.2 ± 1.5	96.49	5.96
Field	10.26 ± 0.99	87.79	Male	10.5 ± 1.1	9.1 ± 1.1	5.6 ± 0.9	3.9 ± 0.8	28.9 ± 1.4	69.70	2.41
			Female	10.5 ± 1.2	8.8 ± 1.2	8.1 ± 1.4	—	27.5 ± 2.0	74.13	2.70

yellow colour. Two pairs of dark brown spots were evident on dorsal side of the body. It possesses a pair of 7-segmented filiform antennae. Number of clusters having 4 to 6 glossy waxy short hairs were also present on the dorsal and lateral sides of each thorasic and abdomenal segments.

Length and breadth of third instar nymphs of male were 1.12 ± 0.03 and 0.43 ± 0.02 mm, whereas in case of female, it was 0.90 ± 0.03 and 0.42 ± 0.02 mm, respectively. Ghosh and Ghose (1988) and Patel (1990) recorded similar measurements.

Fourth instar : The male was pale yellow in colour having wing pads on dorso-lateral margins of the metathorax. It possesses a pair of 10-segmented antennae. Length and breadth were 1.17 ± 0.04 and 0.43 ± 0.02 mm, respectively. The reports of Ghosh and Ghose (1988) and Patel (1990) regarding measurements of fourth instar strongly supported the present findings.

The durations of first, second, third and fourth instars of male (Table 1) were 5.8 ± 0.9, 5.1 ± 0.7, 3.5 ± 0.7 and 2.8 ± 0.6 days, respectively, whereas the first, second and third instar of female took 5.7 ± 0.7, 5.1 ± 0.9 and 5.4 ± 0.9 days, respectively. The total nymphal period of male and female was 17.2 ± 1.1 and 16.2 ± 1.5 days, respectively in laboratory. Patel (1990) reported total nymphal duration of male and female as 17.02 ± 1.08 and 15.50 ± 1.83 days, respectively on pigeonpea. Under field conditions, the mean duration of first, second, third and fourth instar of male (Table 1) was 10.5 ± 1.1, 9.1 ± 1.1, 5.6 ± 0.9 and 3.9 ± 0.8 days, respectively, whereas in case of female, the first, second and third instar duration was 10.5 ± 1.2, 8.8 ± 1.2 and 8.1 ± 1.4 days, respectively. The total nymphal period of male and female was 28.9 ± 1.4 and 27.5 ± 2.0 days, respectively. Thus, the duration of nymphal instar increased with decreased in temperature.

Growth index : Growth index values of male and female nymphal instars were 5.39 and 5.96 in laboratory, while it was 2.41 and 2.70 under field conditions, respectively (Table 1). Thus, an average temperature of 29.42 ± 1.20°C with 82.64

TABLE 2

Pre-oviposition, oviposition, post-oviposition period and fecundity of *C. insolita* under laboratory and field conditions.

Condition	*Duration (days)*			*No. of eggs laid per female*
	Pre-oviposition	*Oviposition*	*Post-oviposition*	
Laboratory	13.09 ± 2.55	3.09 ± 0.62	4.58 ± 1.58	163.04 ± 43.90
Field	14.21 ± 2.23	4.04 ± 0.81	3.79 ± 1.08	147.93 ± 38.37

± 5.48 per cent relative humidity were found to be more suitable for pest multiplication.

Adult

Male : It was slender, delicate and elongate in shape. Head, thorax, legs and antennae were yellowish, whereas abdomen was pale yellow in colour. They possessed a pair of well developed meta-thorasic milky white wings and three pairs of legs. The antennae was 10-segmented and much longer than the female. Two pairs of tail-like waxy filaments were present at the anal end of the body. The mean length and breadth with expanded wing was 1.18 ± 0.04 and 2.35 ± 0.09 mm, respectively. Almost similar measurements were recorded by Patel (1990). The male survived for 2.95 ± 0.84 and 2.70 ± 0.76 days under laboratory and field conditions, respectively (Table 2). Patel (1990) reported 1.44 ± 0.65 days longevity of male.

Female : Female was light yellow in colour having a greenish strip on the dorsal side and a yellowish green strip with two small greenish spots plural sides of the body. It was apterous, elongated oval in shape, soft bodies insects and having clusters of glossy waxy hairs over the body. Each cluster of waxy hair consists of 4 to 6 and 6 to 10 hairs on dorsal and lateral surfaces of the body, respectively. They possessed a pair of brownish short filiform 9-segmented antennae. Length and breadth were 1.41 ± 0.04 and 0.67 ± 0.05 mm, respectively, while the body measured 2.74 ± 0.16 mm in length and 1.46 ± 0.08 mm in breadth at the time of egg laying. Similar observations were also reported by Patel (1990).

Under the laboratory conditions, pre-oviposition, oviposition and post-oviposition periods were 13.09 , ± 2.55, 3.09 ± 0.62 and 4.58 ± 1.58 days, respectively. These periods were 14.21 ± 2.23, 4.04 ± 0.81 and 3.79 ± 1.08 days in the field studies. Patel (1990) reported 6.68 ± 1.22, 3.12 ± 0.73 and 3.32 ± 1.03 days, respectively as preoviposition, oviposition and post-oviposition periods on pigeonpea. A single female laid 163.04 ± 43.90 and 147.93 ± 38.37 eggs in the laboratory and field, respectively (Table 2). Rawat and Modi (1969) observed 199 eggs/female on brinjal and Patel (1990) reported 142.28 ± 46.85 eggs/female on pigeonpea.

TABLE 3

Longevity of adult and entire life span of *C. insolita* under laboratory and field conditions.

Conditions	*Sex*	*Longevity of adult (days)*	*Entire life period (days)*
Laboratory	Male	2.95 ± 0.84	25.92 ± 1.38
	Female	20.76 ± 2.78	42.89 ± 2.88
Field	Male	2.70 ± 0.76	42.14 ± 1.46
	Female	22.06 ± 2.51	59.49 ± 2.14

The female survived for 20.76 ± 2.78 and 22.06 ± 2.51 days in the laboratory and field, respectively (Table 3). Patel (1990) reported female longevity of 15.12 ± 1.88 days in laboratory.

Entire life span : The mean entire life period of male and female was 25.92 ± 1.38 and 42.89 ± 2.88 days in laboratory and 42.14 ± 1.46 and 59.49 ± 2.14 days in the field, respectively (Table 3).

Sex ratio : The average sex retio of male to female was 1:2.07. However, it ranged from 1:1.49 to 1:2.63 in naturally infested fields. Only relative humidity exhibited significant negative association with sex ratio. This results clearly showed that the increased level of relative humidity resulted in relatively decreased in female population as compared to the male mealybugs.

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