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Bio–ecology of *Acrotylus humbertianus*

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The grasshopper, *Acrotylus humbertianus* (Sauss.) is an important species in the Rajasthan desert. It damages grasslands, cowpea and seedlings of bajra crop. Very scanty information is available on its life history hence the present paper deals with it.

In the monsoon season, many nymphs of the 2nd to 3rd stages were collected from the CR Farm of the CAZRI Jodhpur. They were bred in the cages (45x45x45cm). In a few days the nymphs became adults. Females laid egg-pods in cages. The pods were transferred individually in glass tubes and buried in 8% moist sandy soil kept at 34 ± 1°C. The hatched nymphs were reared individually in small wooden cages. They were fed daily with fresh leaves of the grass *Cenchrus ciliaris*. Just after the final moult, the individual pairs of both the sexes were placed in a wooden cage having 15 cm thick layer of moist soil at the bottom. Life history in the field was studied during 1977-78 to record the durations of various stages and the total number of generations in a year.

Habits

Adults and hoppers always remained segregated and fed on green vegetation individually. This habit is the opposite of that on Aak grass hopper *Poekilocerus pictus* which assembles in masses on bush tops to bask in the sun (Parihar, 1974). They did not eat anything on the day previous to moulting. On the dry seasonal grasses, nymphs not only failed to develop but sustained a high mortality in the successively first to four instars. However, it was comparatively low in the fifth/six instars. Both annual and perennial green grasses like *Lasiurus sindicus, Cenchrus ciliaris, Eleusine compressa, Aristida* sp. were preferred by the hoppers and adults.

Sites and generation

It was studied at four ecologically divergent localities in western Rajasthan, viz., Jodhpur (sandy loam, 336 mm annual rainfall), Bikaner (sandy soil, 330 mm rain), Chandan (sandy soil, 200 mm rain) and Palsana (sandy soil, 800 mm rain). At Jodhpur there are two generations : the first generation commenced from eggs hatched in July, and the second from those hatched in November (Fig. 1).

Biological stages

The following stages were studied in detail : Egg-pods and eggs : Egg pods were generally elongated, soft,fragile and dark brown in colour. They varied from 4.2–5.0 cm in length and 2.0–2.6 mm in width. Eggs are subcylindrical, usually curved in the middle, the anterior pole is rounded, and the posterior pole some what tapering. Eggs vary in length from 4.1–4.5 mm and 1.1–1.45 mm in maximum width.

Hatching : The average incubation period varied from 7-28 (mean 12.2 ± 1.0) days and the percentage of hatching was 66.6-100 (mean 89.6±2.2). At the time of hatching, the chorion splits longitudinally releasing the vermiform larvae which became the first instar hopper by passing through the intermediate moult. The time taken in the hatching of all the eggs from an egg-pod ranged from 4-8h.

Hoppers and adults stages : There are five to six hopper stages, the sixth or seventh being the adult. Isolated hoppers when fed upon *Cenchrus ciliaris* showed variation in the number of nymphal instars, e.g., 5 or 6 (Table 1). A similar variation was observed in *Poekilocerus pictus* (Parihar 1974) and in *Pyrgomorpha bispinosa deserti* (Parihar 1979). However, *Acrotylus angulates*, an allied species did

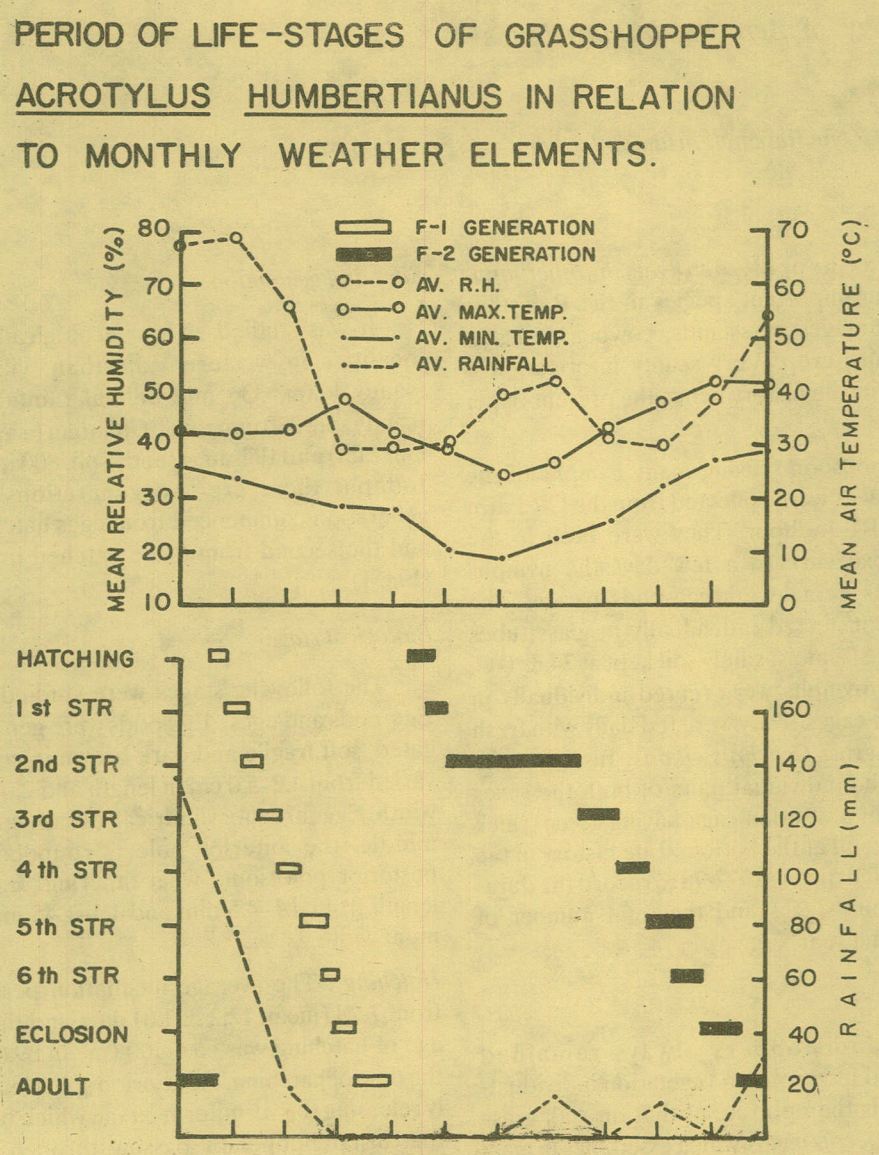

Fig. 1 Duration of life-stages of grasshopper *in relation to monthly weather parameters*

not show variation in nymphal instars where both sex and an equal number of nymphal instars (Chesler 1938). The total nymphal duration of hoppers of A. *humbertianus* was 57.1 ± 1.2 days and 71.1 ± 2.1 respectively for five instar and sixth instar males, while it was higher in female hoppers (Table 1).

Copulation : Mating in the first generation was observed from 24th September to 10th October, and in the second from 14th to 20th April. Males matured earlier than females. The average prematuration period in males was 6.0 ± 1.5 days and in females 12.7 ± 1.5. Copulation is both, the riding type (Uarov 1966) and hanging type (Katiyar 1956) and was completed in 2-5 h. The excited male clasps the female from the back. Only one male rides a female, head to head, and the terminal ends of abdomen of both get interlocked with each other. The male abdomen bends down, either to the left

Table 1 *Life history, sex-ratio and period taken for development of Acrotylus humbertianus*

Characters	Time taken in days	
	Male	Female
1) Life history		–
a. Egg hatching	7-28 (12.2 ± 1)	
b. Hatching to enclosion	50-79 (61.1±2.0)	50-85 (69.2±2.2)
c. Pre copulation	2-17 (6.0 ± 2.5)	7-22 (12 ± 1.5)
d. Pre-oviposition	–	10-18 (13.9±0.8)
e. Oviposition	–	2-18 (6.5±0.9)
f. Post-oviposition	–	2-13 (8.0 + 1.3)
g. Eclosion to death	15-32 (25.4±2.5)	30-75 (41.1±4.27)
h. Total life span	96-135 (111.1± 3.8)	109-142 (129.2 ± 5.5)
2) Sex-ratio		
a) Hoppers III-IV instars	45.5 ± 2.1	58.7 ± 2.1
b) Adults	45.7 ± 1.3	54.3 ± 1.6
3) Development period		
(a) Adults with 5 instar race		
Ist instar	7-12 (9.0 ± 0.6)	7-12 (9.0 ± 0.6)
IInd instar	9-17 (12.4 ± 0.9)	9-17 (12.4 ± 0.9)
IIIrd instar	8-13 (10.9 ± 0.5)	8-13 (10.0 ± 0.5)
IV instar	8-12 (10.0 ± 0.5)	8-12 (10.0 ± 0.5)
Vth instar	12-19 (14.7 ± 0.8)	12-19 (14.7 ± 0.8)
Total nymphal duration in days	50-62 (57.1 ± 1)	50-71 (60.6 ± 2.3)
b) Adults with 6 instar race		
Ist instar	6-10 (7.7 ± 0.4)	7-13 (10.6 ± 0.5)
IInd instar	8-16 (11.4 ± 0.8)	10-16 (11.9 ± 0.7)
III instar	8-13 (10.3 ± 0.6)	10-17 (14.7 ± 0.8)
IV instar	7-12 (9.3 ± 0.6)	10-13 (12.5 ± 0.6)
V instar	12-19 (15.2 ± 1.3)	7-20 (13.0 ± 1.2)
VI instar	10-20 (15.9 ± 1.1)	10-17 (12.5 ± 0.9)
Total nymphal duration in days	57.78 (71.1 ± 2.1)	67-85 (75.2 ± 2.1)

*Figures in parentheses are average values with standard error.

or to the right of female abdomen to achieve the coitus.

Oviposition : This was observed from 30th September to 22nd October for the first generation and from 18th to 31st May for the second. Egg-pods were generally laid at a depth of 4-6 cm below the surface and they generally contained about 5-15 (mean 9.5 ± 0.8) eggs. When females were ready for oviposition, they were observed digging sand, a female makes a final hole by extending its abdomen to a depth of 2.5-3.2 cm. when the eggs are laid, a frothy secretion is ejected which is later absorbed by the sand particles making them hard, this subsequently forms the wall of the egg-pod. After oviposition, the females appeared to be exhausted and started feeding very quickly. Females may lay eggs for as many as 2 to 5 times in their lifetime. The process of oviposition was completed within 30 minutes to five hours. The average duration of pre-oviposition, oviposition and post-oviposition are 13.9 ± 0.8, 6.5 ± 0.9 and 8.8 ± 1.3 days, respectively.

Sex ratio : Both hoppers (Third to sixth stage) and adults in laboratory rearings, have preponderance of females (Table 1).

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References

Chesler J 1938 Observations on the biology of some south African Acrididae (Orthoptera). *Transaction of Royal Entomological Society London* **87** 313-335

Katiyar KN 1956 The life history and ecology of the short horned grasshopper, *Parahieroglyphus bilineatus* Bilivar (Orthoptera : Acrididae). *Agra University Journal of Research (Science)* **5** 179- 192

Parihar DR 1974 Some observations on the life history of Aak grasshopper, *Pockilocerus pictus* (Acridoidea : Pyrgomorphidae) at Jodhpur. *Indian Journal of Zoological Society* **26** 99-129

Parihar DR 1979 Life history of *Pyrgomorpha bispinosa deserti* (Bei Bienko) (Acridoidea : Pyrgomorphidae) *Zeitschrift fur angewandie Zollogie* **27** 417–422

Roonwal ML 1976 Ecology and biology of the grasshopper, *Hieroglyphus nigrorepletus* Bolivar (Acrididae) 2. Distribution, economic importance, life-history, colour forms and problem of control. *Zeitschrift fur angewancte Zoologie* **63** 307-332

Uarov BP 1966 Grasshoppers and locusts. In *Hand Book of General Acridology*, Cambridge University Press, P 481

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