

and mandibles of the III and subsequent instars (Muralirangan and Ananthakrishnan<sup>8</sup>).

Cannibalism was observed both in the adult as well as in the early instars. This behaviour was linked with the shortage of water and the lack of sufficient food or the innate craving for animal food as stated by earlier workers (Gangwere<sup>2</sup>) but the present study indicates that even when sufficient food and water were provided, cannibalistic behaviour was evident.

As regards the mandibular changes, the grinding surface of the molars develops only after III instar onwards, which explains the inability of the first two instars to feed on the older leaves of *Panicum maximum*. When the insect becomes old, the molars become smooth, possibly due to the high silica content of the grasses on which they feed.

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Entomology Research Unit, M. C. MURALIRANGAN.\*  
Loyola College,  
Madras, August 13, 1977.

\* Permanent address: Dept. of Natural Science, Guru Nanak College, Madras 600.032.

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#### DEVELOPMENTAL BEHAVIOUR OF *DIACRISIA OBLIQUA* (WALKER) (LEPIDOPTERA: ARCTIIDAE) ON SOME COMMON WEEDS

THE hairy caterpillar, *Diacrisia obliqua* (Walker) is a polyphagous pest of several cultivated crops in India and neighbouring countries. A detailed information is available on its growth and development on several cultivated crops (Djou<sup>2</sup>; Pandey *et al.*<sup>5</sup>; Kabir and Khan<sup>4</sup>, and Deshmukh *et al.*<sup>1</sup>). The developmental pattern of *D. obliqua* on few common weeds is presented in this note.

##### Materials and Methods

Development of *D. obliqua* was studied on 8 plant species, *viz.*, *Chenopodium album* L., *Ageratum cony-*

*zoides* L., *Blumea glomerata* DC., *Cirsium arvense* (L.) Scop., *Argemone mexicana* L., *Monarda viridis* L., *Brassica rugosa* (Roxb.) and *Glycine max* (L.) Merrill belonging to 6 different families. First five are common weeds of Tarai. Eggs of *D. obliqua* were obtained from a pair collected from the light source. Newly hatched larvae (0–12 h old) were transferred to various test plants in groups of 10 in plastic petri dish. Each replication had 10 larvae and each treatment was replicated five times. After one week larvae were separated and kept individually in petri dishes. Fresh food was supplied at 24 h interval. In order to avoid drying of leaves a wet piece of cotton was placed at the tip of petiole or midrib. Experiment was conducted at  $27.5 \pm 1^\circ \text{C}$ , 65–70% r.h. and 12 h photophase and 12 h scotophase. Observations were recorded on larval survival, per cent pupation, adult formation, larval and pupal duration, pupal weight and sex ratio. Sexing was done by following the method of Rathore and Verma<sup>8</sup>. Various growth indices were also computed to evaluate the suitability of plant species. Data were subjected to statistical analysis in a completely randomized design. Due to lack of sufficient information part of the analysis of the data on *A. mexicana* was deleted.

##### Results and Discussion

Perusal of Table I reveals that significantly higher larval survival was recorded on *G. max* and *C. arvense* and significantly lower on *A. mexicana* followed by *B. rugosa*. No survival was recorded on *A. conyzoides*. Poor feeding was observed on this plant and larvae survived from 17 to 25 days but did not develop beyond 2nd–3rd instar. This indicates, perhaps, the presence of deterrent in leaves which did not permit required consumption of food material and ultimately death occurred or it might be due to the presence of toxic chemicals which inhibited the growth and development of larvae. On *A. mexicana*, only 1 larva survived. The survival on *G. max* was not as high as reported by Deshmukh *et al.*<sup>1</sup> because some larvae died due to disease in the later stage of development. Larval period also varied significantly from 19.9 to 32.1 days; the longer being on *B. rugosa* followed by *B. glomerata* and *C. arvense*. There was no significant difference in larval duration on *C. album*, *M. viridis* and *G. max*. The data obtained in the present investigation are in accordance with that of Deshmukh *et al.*<sup>1</sup>. Prepupal and pupal period varied from 1.5 to 1.8 days and from 8.8 to 9.6 days respectively on various plant species but did not differ significantly. Per cent pupation differed greatly and followed the same trend as per cent larval survival. Significantly heavier pupae were obtained when larvae fed on *C. album* followed



TABLE I

Per cent survival, larval and pupal period, pupal weight and sex ratio of *D. obliqua* on various plant species

Test plants	% Larval survival*	Larval period (days)	Pre-pupal period (days)	% pupation	Pupal wt. (mg)	Pupal period (days)	% Adult formation*	Sex ratio	
								F	M
<i>C. album</i>	64 (53.82)	19.9	1.7	60 (51.04)	497.63	9.5	56 (48.51)	1	1.33
<i>A. conyzoides</i>	00 (0.00)	..	..	..	..	..	..	..	..
<i>M. viridis</i>	74 (60.04)	21.4	1.8	72 (58.41)	403.40	8.8	70 (57.21)	1	1.18
<i>B. glomerata</i>	68 (59.01)	25.7	1.5	68 (59.01)	361.74	9.5	68 (59.01)	1	0.36
<i>B. rugosa</i>	30 (32.96)	32.1	1.6	26 (30.55)	317.69	9.6	22 (33.64)	1	1.75
<i>C. arvense</i>	80 (66.21)	22.5	1.8	76 (61.37)	328.09	9.3	76 (61.37)	1	1.53
<i>A. mexicana</i>	2 (3.68)	..	..	2 (3.68)	..	..	2 (3.68)	..	..
<i>G. max</i>	80 (66.98)	21.7	1.8	80 (66.98)	434.97	9.2	76 (64.20)	1	0.90
C.D. at 5%	30.5 (24.32)	2.0	..	31.5 (24.02)	79.21	..	37.5 (27.30)	..	..

\* Calculated on the basis of number of larvae released initially.

by *G. max* and *M. viridis*. Statistically there was no difference in pupal weight when larvae fed on *B. rugosa*, *C. arvense* and *B. glomerata*. Less number of adults formed when *A. mexicana* and *B. rugosa* were provided as larval food and there was no significant difference in adult formation on other plants which varied from 56 to 76%. It is interesting to observe that food plants greatly affected the sex ratio of the insect. On all plants except *G. max* and *B. glomerata* more males were produced than females. Maximum males were obtained when larvae fed on *B. rugosa* followed by *C. arvense*. on *G. max* the sex ratio was close to unity. But 2.5 times more females were produced when larvae fed on *B. glomerata*.

To assess the suitability of various plant species in supporting the growth and development different indices were calculated (Table II). Growth index

TABLE II

Growth indices of *D. obliqua* on various plant species

Test plants	Growth index	Howe's growth index	Larval-pupal index	Pupal index	Survival index
<i>C. album</i>	3.01	0.209	1.05	1.14	0.73
<i>A. conyzoides</i>	..	..	..	..	..
<i>M. viridis</i>	3.36	0.201	1.02	0.92	0.92
<i>B. glomerata</i>	2.64	0.164	0.87	0.83	0.89
<i>B. rugosa</i>	0.80	0.106	0.74	0.73	0.28
<i>C. arvense</i>	3.37	0.195	0.97	0.75	1.00
<i>A. mexicana</i>	..	..	..	..	..
<i>G. max</i>	3.68	0.202	1.00	1.00	1.00

(Pant and Dang<sup>6</sup>) indicated higher values 3.68, 3.37, 3.36 and 2.01 on *G. max*, *C. arvense*, *M. viridis* and *C. album*, respectively. The lowest growth index value was 0.80 on *B. rugosa*. Modified growth index as suggested by Howe<sup>3</sup> was also computed which exhibited higher value on *C. album* followed by *G. max* and *M. viridis* and lowest on *B. rugosa*. A positive relationship existed between larval period

and Howe's growth index. Other indices such as larval-pupal index, pupal index and survival index were also calculated following the method of Prasad and Bhattacharya<sup>7</sup>. To calculate these indices a value of 1 was given to *G. max* which was considered a standard host. If the calculated value exceeded 1, the test plant was categorized superior over standard and if less than 1 the test plant was considered inferior for the development of *D. obliqua*. Larval-pupal index showed higher value on *C. album* and *M. viridis* and slightly lower on *C. arvense* than *G. max*. Values obtained for pupal index indicated superiority of *C. album* over *G. max*. The values of this index were lower on other plant species than on the standard. Survival index on *C. arvense* was equal to *G. max* and other plant species were inferior than *G. max*. Different values for different indices precisely indicate that some plants were nutritionally superior for larval survival and development while others for pupal development and adult formation. *B. rugosa*, which belongs to oilseed group, proved to be inferior host. Weeds like *C. album*, *B. glomerata* and *C. arvense* and a kitchen garden crop *M. viridis* were found suitable for the growth and development of *D. obliqua* and these plant species can, therefore, serve as potential hosts of this insect in nature.

Department of Entomology, Y. S. RATHORE,  
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Pantnagar, Nainital (U.P.),  
December 2, 1977.

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**CHROMOSOME NUMBER IN  
POLYSTOMOIDES KACHUGAE  
(TREMATODA : MONOGENEA)**

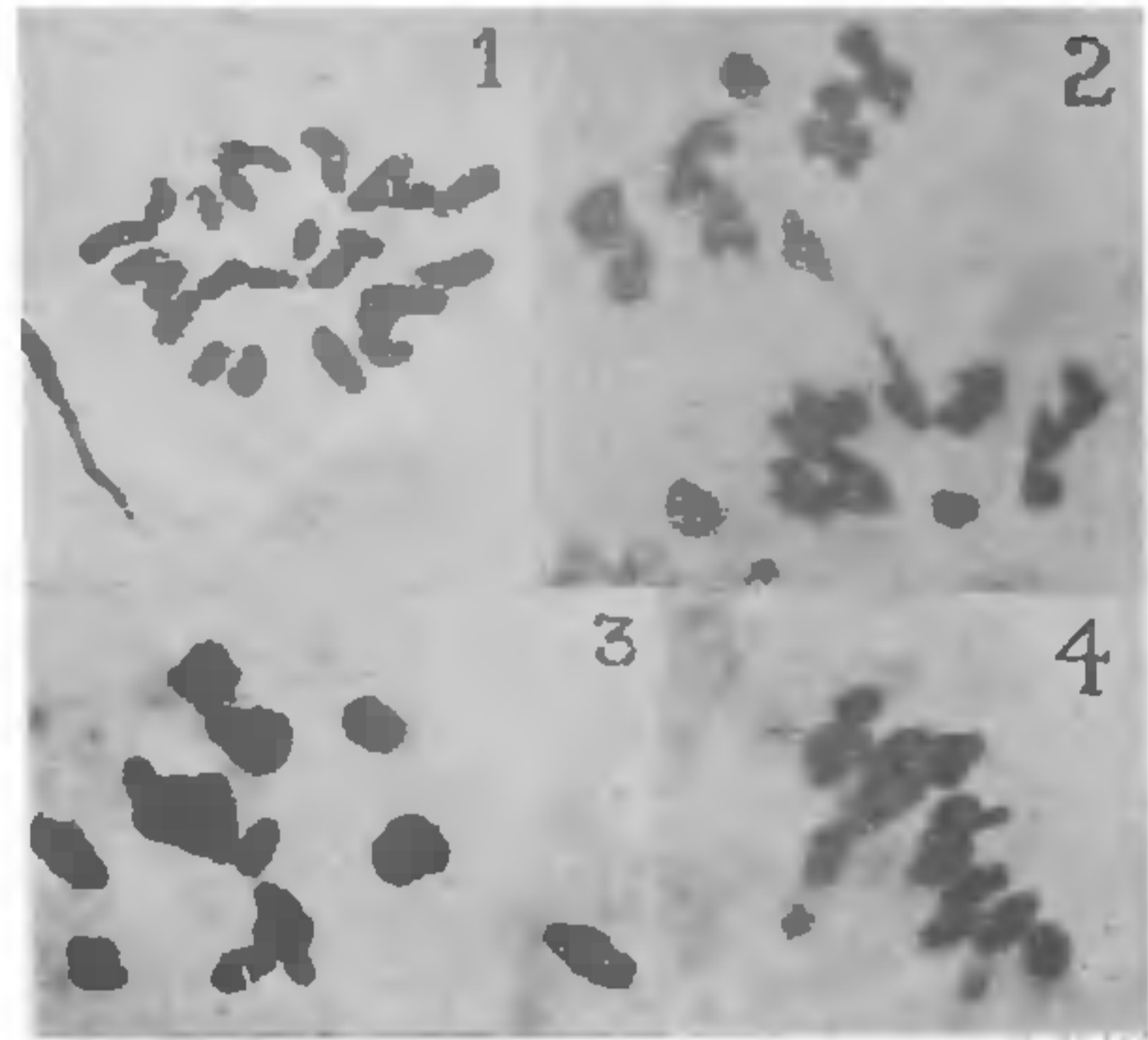
A GOOD deal of information is available on the chromosome numbers of digenetic trematodes<sup>1-7</sup>. As regards monogenetic species, the chromosome numbers are known for two species, *Gyrodactylus elegans* and *Polystoma integerrimum*. In the present communication, the chromosome number for a monogenetic trematode, *Polystomoides kachugae*, parasitic in the urinary bladder and cloacal bursae of a fresh water turtle, *Kachuga smithi* from Jammu (J. & K. State) is presented. Perhaps, this is the first chromosome count for any polyopisthocotylean genus from a reptilian host.

Live parasites, collected from the host, were washed in physiological saline for about 10 minutes and were fixed in acetic-alcohol (1:3) for two hours. The fixed material was partially macerated and put in 1% aceto-orcein for an hour for staining. Testes from pretreated parasites were then teased out on a slide and were squashed under a cover glass in aceto-orcein. Good metaphase and anaphase spreads from temporary preparations of both mitotic and meiotic figures were photographed. The mitotic chromosomes were studied from spermatogonial metaphases and meiotic chromosomes from diakinesis, metaphase I and anaphase I from spermatocytes.

In all 62 cell spreads (both mitotic and meiotic) from the testes of 8 parasites collected from 3 host specimens were scanned for chromosome counts. In 80% of cells scored, a diploid count of  $2n = 24$  (Fig. 1) was obtained. Four pairs of chromosomes appeared to be consistently larger elements of the entire set and constituted approximately 43.3% of the total complement length. The remaining pairs were of nearly equal size. The centromeric position, however, could not be ascertained for any chromosome of the set, though a majority of them appeared to be metacentric (Fig. 2).

The meiotic cells at diakinesis (Fig. 3) and metaphase I (Fig. 4) regularly formed 12 bivalents. The mean chiasma frequency at diakinesis was around 15 per cell and 1.25 per bivalent. The meiotic configurations confirm the diploid count of  $2n = 24$  for this species.

Morphologically, *Polystomoides kachugae* shows a strong similarity with *Polystoma integerrimum*, notwithstanding the fact that the latter form is exclusively an amphibian parasite and is known to exist in two cytotypes, with  $n = 4$  and  $n = 10^{1,2}$ . A haploid count of  $n = 12$  in *Polystomoides kachugae*, thus, appears to be a new count for any polyopisthocotylean trematode.



FIGS. 1-4. Fig. 1. Chromosomes of *Polystomoides kachugae* at spermatogonial metaphase showing  $2n = 24$  (Approximately,  $\times 1,000$ ); Fig. 2. Primary spermatocyte anaphase chromosomes with 12 at each pole (ca.,  $\times 1,000$ ). Fig. 3. Chromosomes in diakinesis of meiosis I from primary spermatocytes showing  $n = 12$  (ca.,  $\times 1,000$ ). Fig. 4. Meiotic metaphase I chromosomes with 12 II inside view (ca.,  $\times 1,000$ ).

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Department of Bio-Sciences,  
University of Jammu,  
Jammu 180 001, India,  
October 7, 1977.

P. L. DUDA.  
VIJAY GUPTA.

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