III, adultoids with adult wings and ovipositor but with smaller body and pale colouration and IV, giant adults, moulted from the supernumerary larvae, with body size 1·6 times larger than control adults.

Time of JHA application influenced the degree of metamorphosis. Application, prior to 72 h after moulting, resulted in supernumerary larvae and thus completely inhibited metamorphosis. While percentages of surviving forms attaining stages I, II and III were 7, 40 and 53 for the nymphs treated between 72–96 h after the moult, they were 0, 13 and 87 for those treated between 96–120 h. JHA treatment after 120 h produced stage III only. All supernumerary larvae moulted to giant adults. Thus JHA action was critical and time dependent during the first one-third period of last nymphal instar. Later application led to decreasing juvenilisation with appearance of intermediate adults and adultoids. This observation conforms to the findings for *T. molitor*[4] and *R. prolixus*[6].

Further, JHA application influenced the duration of 7th nymphal instar. While these last instar nymphs took $8 \cdot 16 \pm 0 \cdot 39$ days to moult to 8th instar (supernumerary), control nymphs showed $9 \cdot 15 \pm 0 \cdot 09$ days to moult to normal adults. The difference was found to be statistically significant ($P < 0 \cdot 05$). Such accelerated moulting cycle because of JH action has also been recorded for *R. prolixus*[6] and *T. molitor*[10].

Intermediate adults failed to mate, nor did they deposit or produce any eggs. But adultoids mated normally and even produced and deposited eggs. Giant females, though mated with normal males, deposited only a few eggs. But they had retained many developed eggs in their body. Giant males, on the contrary, failed to mate as they could not produce any spermatophores. Their accessory glands were found to lack well developed tubules which might be the cause for their inability to produce spermatophores. Malformation of male genitalia and thereby failure to mate as a result of JHA treatment has been recorded for *D. fasciatus*[3].

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ON THE SYNONYMY OF *GANEO KORKEI* BHALERAO, 1936 AND *GANEO PUNJABENSIS* GUPTA, 1954 WITH *GANEO TIGRINUM* MEHRA AND NEGI, 1928

THE genus *Ganeo* was erected by Klein, 1905, for the worms he collected from the intestine of *Rana hexadactyla* and designated as *Ganeo glottoides*. Subsequently a number of species were added to this genus, but in the present communication the authors are concerned with three species, *viz.*, *G. tigrinum* Mehra and Negi, 1928; *G. korkei* Bhalerao, 1936, parasitizing the intestine of *Rana tigrina* and *G. punjabensis* parasitizing the intestine of *Rana cyanophlyctis*.

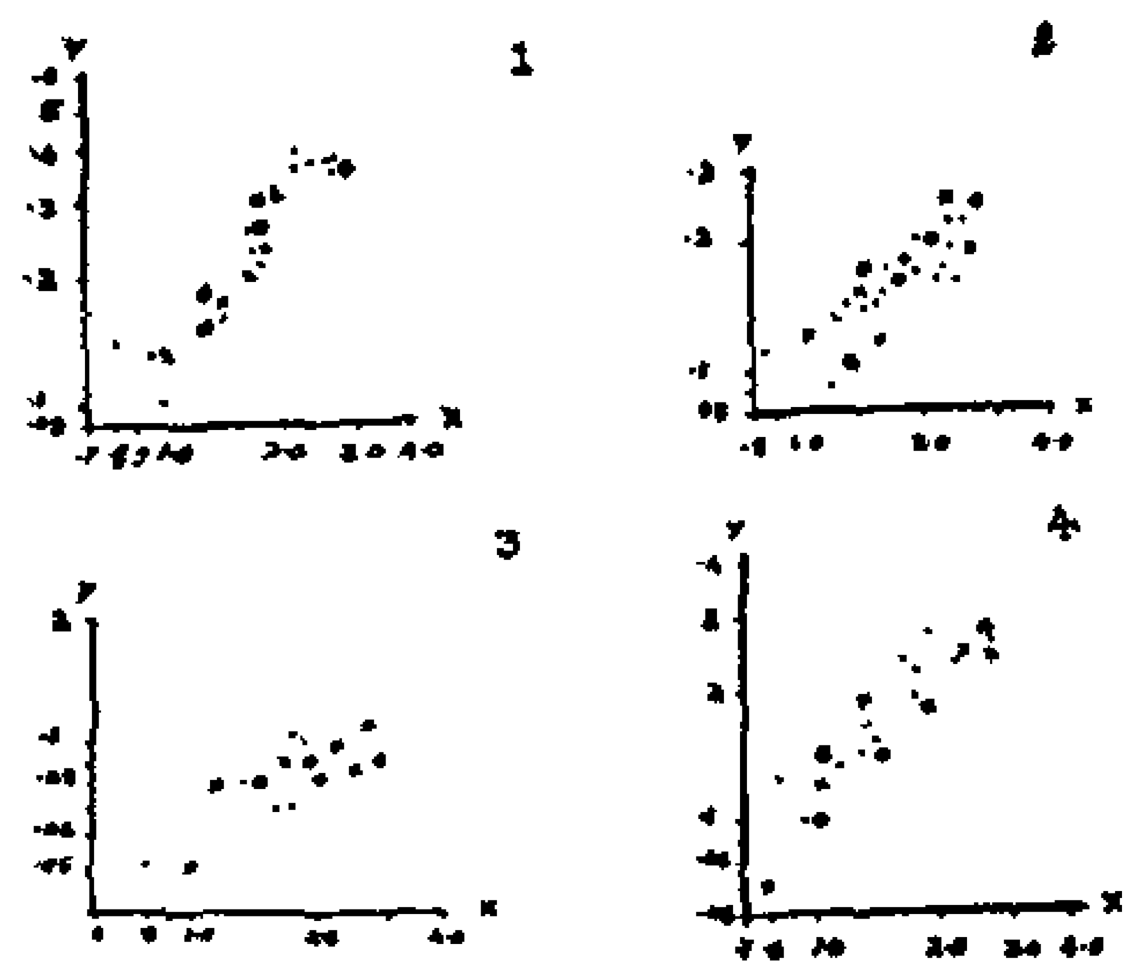
G. korkei and *G. punjabensis* differ from *G. glottoides* in the absence of pseudocirrus sac and in possessing a 'U'-shaped excretory bladder with a median stem, but in these respects they closely resemble *G. tigrinum*: however they differ from *G. tigrinum* in having the grouping of vitellaria. Further they are distinguishable from each other on the size of the gonads. In *G. korkei* ovary is larger than testes and in *G. punjabensis* ovary is smaller than testes.

The distinction between these two species does not hold good for tht fact that the size of the gonads is variable in *G. tigrinum*. An examination of a number of ten species of *G. tigrinum* showed that in various specimens of the same species ovary may be larger, equal or smaller than the testes.

When these variations between gonad sizes occur within one species they become intraspecific variations and all the species erected on this basis lose their identity. Hence, *G. punjabensis* becomes synonym of *G. korkei*. But the distinction of *G. punjabensis* from *G. tigrinum* also does not exist for the fact that in the *genus ganeo* the position and arrangement of vitellaria presents many variations, specially in those in which the pseudocirrus sac is absent. Hence this particular parameter is not of much taxonomic importance as discussed elsewhere (Rao, 1974) and as such *G. korkei* and *G. punjabensis* become synonym to *G. tigrinum*.

The synonymity of these two species with *G. tigrinum* is further supported by a study of allometric growth developed by Rohde (1966). According to him growth rate of an organ is much slower compared to the whole body and is expressed by the formula $\log y = \log b + a. \log x$, where y = organ size, x = body size, b = allometric constant and a = allometric exponent.

In the present study the data obtained on oral and ventral suckers, pharynx and gonads in *G. tigrinum*, *G. korkei* and *G. punjabensis* were plotted against the body size and shown in Figs. 1–4. It is clear from these that sizes of similar organs of all species are falling in a linear line indicating the synonymity of *G. korkei* Bhalerao, 1936 and *G. punjabensis* Gupta, 1954 with *G. tigrinum* Mehra and Negi, 1928.



FIGS. 1–4. Fig. 1. Body size *vs.* oral sucker. Fig. 2. Body size *vs.* ventral sucker. Fig. 3. Body size *vs.* testes. Fig. 4. Body size *vs.* ovary. (· *G. tigrinum* ; o, *G. korkei* ; x, *G. punjabensis*.)

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BIOLOGICAL CONTROL FOR THE PERNICIOUS WEED *PARTHENIUM HYSTEROPHORUS* LINN.

THE 'congress grass' *Parthenium hysterophorus*, whose seeds reached India with the wheat imported from Canada and U.S.A. has become naturalized in many parts of our country[1-4]. The weed is also harmful to human beings[5]. It causes eczema and affects lungs, eyes and nose[6]. The pollen grains of the weed floats in the air and cause several allergic diseases like dermatitis, fever and asthma[7]. Parthenin, one of the constituent principles characterized, is said to produce depressant effect on the nervous system[1]. Therefore it is high time that effective control measures are launched for the eradication of this pernicious weed.

Several herbicides have been tried to check the growth of this weed[2]. Ansar 529 is a chemical based on arsenic that can prove fatal to human beings and cattle. The Indian tea board has banned the use of this chemical in tea gardens. Therefore it is not desirable to employ this in *Parthenium* control. The other herbicides, however, can cause less harm to animals, but these are expensive. In this context it may be of interest to note that a biological control has been successfully evolved to check this harmful weed by employing bugs of the species *Aphis fabae* (Fig. 1).

These hemipterans are well known for their quick fecundity; the life cycle is completed in a few days and the females are parthenogenetic in most stages[8]. Kennedy and Booth[9] and Kennedy *et al.*[10] have already reported the remarkable ability of adaptation of these pests to new plant hosts.

These plant bugs are commonly present in *Ipomioea purga* growing in the environs of Coimbatore. When transferred to *Parthenium* they adapted well to the weed and produced desirable effects. Figure 2, presents photographs of two *Parthenium* plants grown under identical conditions in a green-house out of seeds planted at the same time. When they grew about 25 cm tall, the bugs were released on one of the plants. The infected plant grew only about 6 cm more in 4 months while the other plant reached 134 cm and started flowering profusely and in the normal way the fruits and seeds were also produced. In the infected plant, on the other hand, only a few flowers appeared and they never yielded fruits and seeds. This can be an ideal and most desirable effect. Experiments conducted in the field has also