were removed, fixed in Bouin's fluid, dehydrated in an alcohol series, cleared in xylene, and embedded in paraffin wax. Sections (6 μm) were processed and stained in Ehrlich's haematoxylin and alcoholic eosin.

Topical application of the essential oil of the gum oleoresin from *B. serrata* on freshly moulted fifth instar nymphs resulted in production of super-nymphs and adult-nymphs. In the resultant forms, both spermatogenesis and spermiogenesis were seriously affected. This was evident from the various abnormalities observed in the testis, vas deferens and accessory glands.

Sagittal sections of testis showed degeneration of testicular tissue. The spermatogonia lost their cysts and the nuclei became pycnotic and large gaps appeared between them (figure 1). The spermatogonial cells and remnants of the necrotic tissue were found in the apical region of the testis. The heads of the spermatozoa were not prominent and the sperm did not form bundles. In the controls the spermatozoa moved in bundles. The entire testis of treated insects appeared less compact. Distal elongation of testicular follicle and proximal bulging of testes lobes (figure 2) were due to the proliferation of spermatogonia and excessive release of sperm respectively. The swelling of the proximal part of the testis, which was often observed, could be due to the inability of the spermatozoa to enter the thin vas deferens. These effects may be due to the effects of the essential oil on neurosecretory processes. Similar abnormalities were reported by Revathy *et al*[4]. The accessory glands were globular, each lobe surrounded by a thin layer of cells having pycnotic nuclei. The lumen was sparsely filled with secretory material (figure 3). The gland showed inhibition of secretory activity, as shown by the decrease in the amount of secretion[5].

The results show that the essential oil from the gum oleoresin of *B. serrata* Roxb. affects spermiogenesis in *D. similis* F., thereby acting as an effective insect growth regulator.

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SIB-MATING AND REPRODUCTIVE STRATEGY OF *GRYON* SP. (HYMENOPTERA: SCELIONIDAE)

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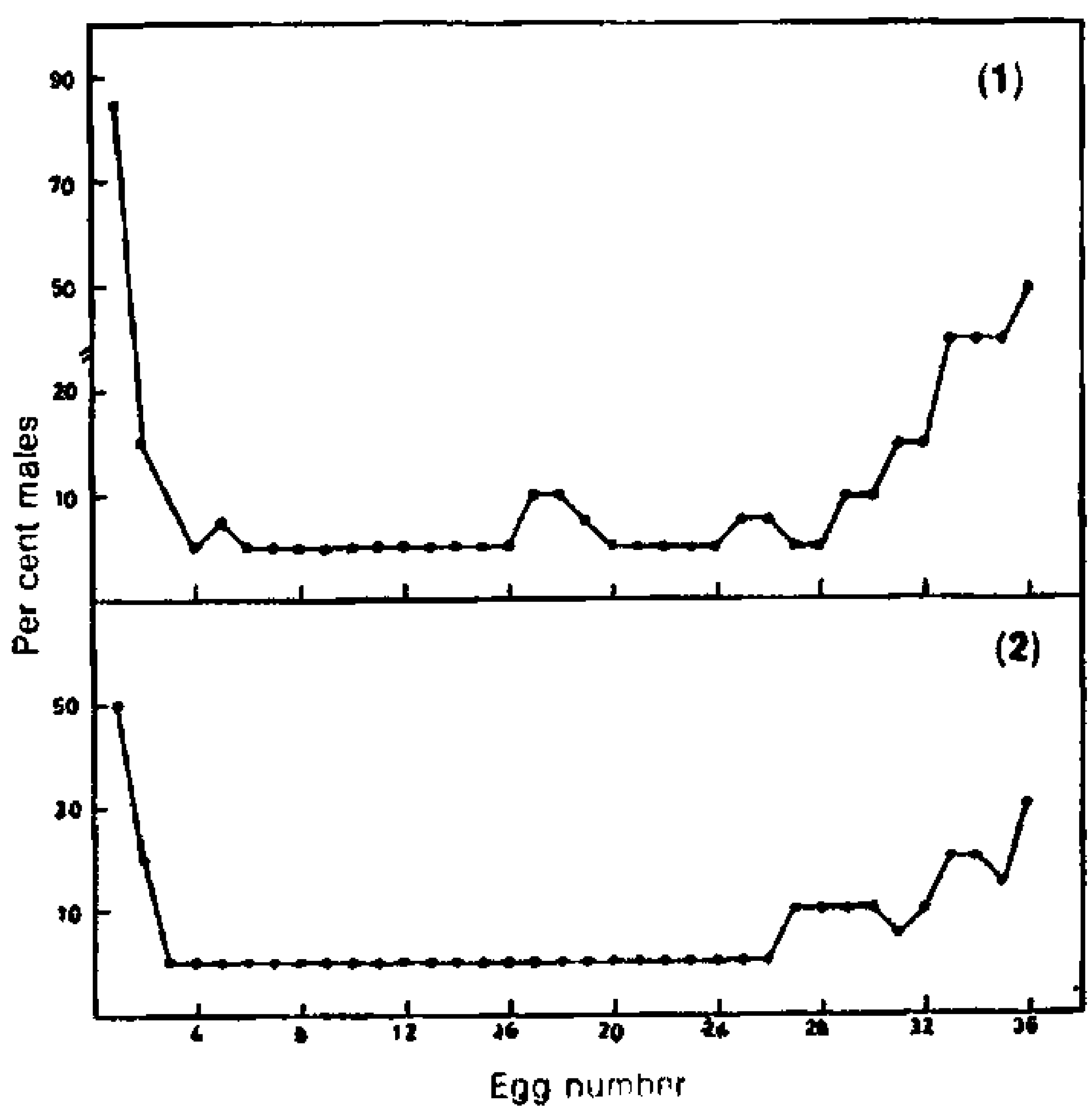
THE search for an effective biocontrol agent against heteropteran insects has often focused on predators and parasitoids and much importance is laid on the egg parasitoids of the family Scelionidae[1–3]. *Gryon* sp. was recorded in India as an effective egg parasitoid of the turpod bug *Clavigralla gibbosa* Spinola[4] and also on the eggs of *Nezara viridula* (Linn)[5]. Apart from *Nezara*, the present study has also recorded this parasitoid from the eggs of *Acrosternum graminea* (Fabricius), a weed-infesting pentatomid. Parasitization by this parasitoid on the eggs of *N. viridula* was 23.24% on an average, while and 35% on *A. graminea*. A comparison of the sex ratios of *Gryon* sp. on these two host eggs, which vary in their number and size, confirms the hypothesis that the sex ratio will decrease with increasing levels of sib-mating[6]. Scelionids appear capable of recognizing eggs parasitized by conspecifics and alter their sex ratio in response to the presence of other wasps.

The present investigation highlights the strategy adopted by the parasitoid in producing a precise sex ratio. A good understanding of these aspects would aid biological control programmes using these scelionids, since the main objective is to maximize the production of mated females and release through laboratory rearing often leads to an increase in the production of males. Eggs of the two hosts were provided in varying numbers and the sequence in which the female parasitoid laid male and female eggs was observed. In all the egg masses, a haploid egg, leading to a male is laid first. By this strategy, every mass, independent of its size, is ensured of a male. In larger masses of eggs (>25 eggs) a second male is sometimes produced towards the end of the sequence, probably to balance the ratio between males and females, which might be kept track of by the ovipositing parasitoid.

When eggs of varying sizes were offered to the females, the strategy of sequential egg laying was slightly altered. In the case of the smaller eggs of *A. graminea* (diameter 0.75 mm), in 85% of the cases the first egg laid was a male and in about 20% of the cases the second and third eggs were also male. Ten per cent of the fourth and fifth eggs were also males. Thereafter, till the sixteenth egg, 95% of the eggs were female, and then till the 30th egg, 90% were female though a certain amount of variation was observed. From the 31st egg onwards, a higher percentage of male eggs was noticed. The average number of eggs laid by an adult female parasitoid after mating was 33 ± 2 (range 26 to 40) (figure 1). In the case of the larger eggs of *N. viridula* (diameter 1 mm), the observations were similar except that the frequency of female eggs was higher from the third egg onwards. The percentage of males increased from the 26th egg onwards (figure 2). The percentages of male and female eggs were almost equal when an assortment of eggs of the two hosts was offered to the ovipositing female, confirming the fact that under stress a female parasitoid would lay more haploid eggs rather than produce more reproductives (figure 3).

It has been observed that courtship strategies are affected by life-history constraints. In the case of *Gryon* sp., the biological backdrop against which courtship is acted out is that of an 'island' breeding structure, with occasional random mating within almost isolated subpopulations[7]. In scelionids generally, only one female usually parasitizes a host egg mass, but in *Gryon* sp. several females may simultaneously parasitize a group of eggs. Two additional facts are of significance: first, the sex ratio is usually female-biased, and secondly, neither sex tends to disperse until after mating. The females fly away in search of suitable host eggs, whereas the males, which emerge earlier, remain at the place of emergence to mate with subsequently emerging females. Thus these are usually brother–sister matings and the resultant matings for the whole population are actually a mixture of many sib-matings and some occasional outcrosses. Hence, as far as the ability of a male is concerned, the reproductive success of the species depends on the male's capacity to inseminate a large number of females. On the other hand the reproductive success of the species is directly related to the female's capability to locate a suitable host habitat and then the host eggs. It was also observed that within this



Figures 1 and 2. Allocation of male progeny (eggs) in egg sequence of *Gryon* sp. in host eggs of (1) *A. graminea*, and (2) *N. viridula*. Each point represents frequency of male parasitoid eggs in five runs.

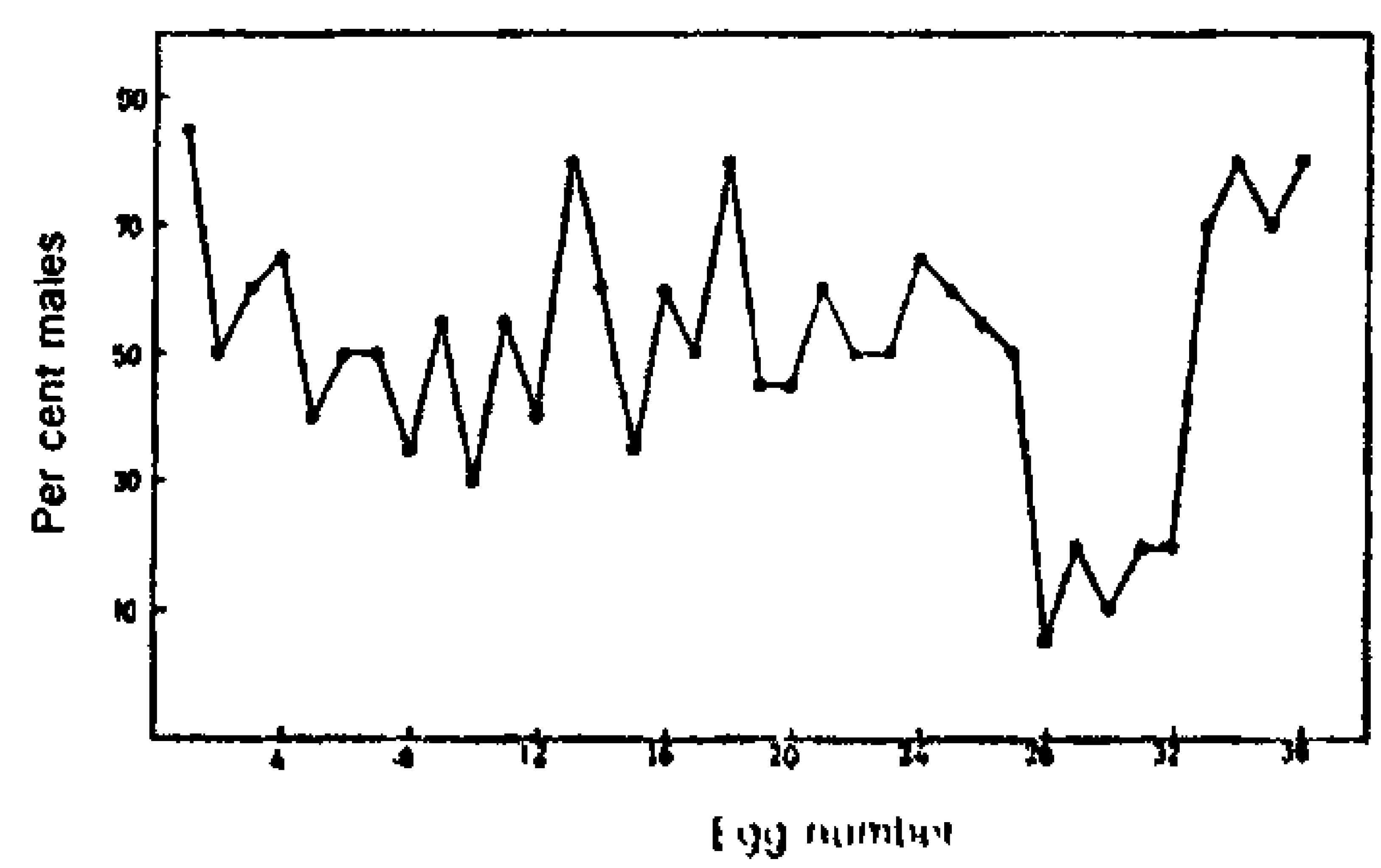


Figure 3. Allocation of male progeny (eggs) in egg sequence of *Gryon* sp. in assorted egg masses of *A. graminea* and *N. viridula*. Each point represents frequency of male parasitoid eggs in five runs.

species the females are more dispersal-oriented and associated changes in behaviour occur soon after mating. This constitutes an important part of the behavioural repertoire by which monandry is maintained. This in turn would be beneficial to the species since it would restrict insemination by the polygynous males to virgin females, thereby maximizing successful reproduction by both sexes within the population. The results indicate the unique reproductive behaviour of *Gryon* sp. that ensures the production of maximum reproductives in the context of the limited reproductive potential of the species. *Gryon* is thus an efficient egg parasitoid of several pests.

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ERRATUM

S. Ramaseshan writes ...

In the printed version of the talk I delivered in Calcutta entitled 'The portrait of a scientist—C. V. Raman' (*Current Science*, **57**, 1207, 1988) there is an error. The sentence reads:

When the mathematicians of the world presented a copy of Ramanujan's bust to the Indian Academy of Sciences at Bangalore, the astrophysicist S. Chandrasekhar wrote....

The sentence should be replaced by:

The mathematicians of the world desired to present Mrs Ramanujan with a bronze bust of Ramanujan. The US mathematician Richard Askey persuaded the sculptor Paul Granlund to undertake the making of this bust. Prof. S. Chandrasekhar and his wife Lalitha graciously offered to present one of the copies to the Indian Academy of Sciences. At that time the Chicago astrophysicist wrote....

As reported in the April 1985 issue of *Patrika* (the newsletter of the Indian Academy of Sciences), the unveiling and formal presentation of the bust was done by Mrs Lalitha Chandrasekhar on 6 February 1985 during the Golden Jubilee celebration of the Indian Academy of Sciences. Mrs Lalitha Chandrasekhar then related the story of how the bust came into being—how the sculptor transformed a photograph of Ramanujan (discovered by her husband in India in 1936) into a three-dimensional work of art.