

spermatids and sperms tend towards normalcy in terms of cell counts per 100 Sertoli cells (Table I).

Moore<sup>1</sup> and Nelson<sup>2</sup> attribute the atrophic changes in seminiferous epithelium to be due to cryptorchidism, to increased abdominal temperature as compared to that of the scrotum. Chowdhury and Steinberger<sup>5</sup> have shown that spermatids and sperms are most susceptible to heat. It is seen in this experiment that sperms and spermatids degenerated while spermatogonia and pachytene spermatocyte persist after cryptorchidism. On orchidopexy, the cell types recuperate to normalcy, with the cell counts similar to that of controls (Table I). No significant change is discernible in the weights of seminal vesicle and ventral prostate, indicating that the androgenic production is not hampered. However, the epididymal weight is significantly reduced in cryptorchid animals ( $P < 0.001$ ). According to Amatayakul *et al.*<sup>6</sup>, the serum levels of testosterone are reduced considerably after cryptorchidism which may cause degeneration of epididymis, as its physiological integrity depends on testosterone as stated by Rajalakshmi and Prasad<sup>7</sup>. The reduction in epididymal weight is alluded to the reduced biosynthesis of testosterone, possibly due to partial defect in enzyme system, resulting in the increased production of androstenedione and dehydroepiandrosterone which maintains the accessory organs as hypothesized by Amatayakul *et al.*<sup>6</sup>. Further experiments are in progress to hasten the rate of recuperation of degenerated testis.

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## IRRADIATION-INDUCED STERILITY IN THE MALES AND FEMALES OF *CALLOSOBRUCHUS ANALIS* (F.) (BRUCHIDAE: COLEOPTERA)

THE standardization of the doses of radiation required for sterilizing a few pests of stored grains has already been worked out<sup>1,2</sup>. Such information in respect of a few others is still wanted. The present report deals with the production of sterile males and females of *Callosobruchus analis* by irradiating its pupae of different ages under a cobalt<sup>60</sup> source fitted in the Irradiation Laboratory, P.G.I., Chandigarh.

The immature stages of *C. analis* required for these investigations were bred on the seeds of *Phaseolus aureus* (Moong) at 30° C and R.H. 70%. The pupal stage under these conditions lasts for five days. Different batches of pupae (one, two, three and four-day old) were irradiated separately with four doses of 1,000, 1,500, 2,000 and 2,500 rads. The adult males and the females that emerged from the treated pupae were allowed to copulate with the normal adults of the opposite sex. The fate of the eggs laid by the copulated females in each combination was watched. The mortality of treated pupae under different conditions was also recorded. The particular set of treatment, which showed the minimum mortality of pupae and produced eggs which failed to hatch, was considered to be the best.

The irradiation of one-day old pupae with all the four doses did not produce useful results, because the mortality of eggs was rather low in all the cases, with the maximum of 71.5% recorded with a dose of 1,000 rads. The two-day old pupae, when irradiated with 1,500 2,000 and 2,500 rads, showed more than 50% pupal mortality and the resulting adults were greatly damaged, almost incapable of copulation. With a dose of 1,000 rads, on the other hand, the mortality in the treated pupae is low, i.e., 12.5% and the sterile males retain the normal vigour for copulation and the eggs produced by the females mated by them showed 100% mortality. Apparently, the desired type of mortality in males can be produced by irradiating two-day old pupae with a dose of 1,000 rads. Under the same conditions, the sterility induced in females is, however, very low as only 44.4% of the eggs failed to hatch. In the three-day old pupae, higher doses of 2,000 and 2,500 rads produced a very high mortality in the pupae. With the two lower doses, the sterility in the males is only 72% in both the cases while a 100% sterility is induced in females with a dose of 1,500 rads although the mortality of pupae in this treatment is also slightly high at 39%. The four-day old pupae behave in a manner similar to the three-day old pupae as they also

undergo a very high mortality with higher doses of 2,000 and 2,500 rads. The lower two doses give fairly good results, with low pupal mortality, but fail to give 100% sterility in either sex.

It is thus evident from the above that the desired type of sterile males and sterile females of *C. analis*, suitable for control operations, can be produced by irradiating two-day old pupae by 1,000 rads and three-day old pupae by 1,500 rads respectively. In the allied bruchid, *C. chinensis*<sup>3</sup>, the adult insects were exposed to a high dose of 42,000 rads to produce sterile males and females. In a few other pests of stored grains the adults were exposed to doses varying from 6,000 to 16,000 rads for this purpose<sup>4,5</sup>.

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## A NOTE ON THE OCCURRENCE OF PROTEIN COMPLEXES IN THE HAEMOLYMPH OF CRABS

HAEMOCYANIN multiplicity is well known in many crustaceans<sup>1-6</sup>, but previous works do not record the occurrence of complexes of haemocyanin fractions with other proteins. Only in *Carcinus maenas* a single glycolipoprotein complex is reported<sup>7</sup>, but the present study on two crabs shows that a number of haemolymph proteins are possibly linked.

The haemolymph proteins in intermoult males of *Scylla serrata* (aquatic) and *Cardisoma carnifex* (terrestrial) were fractionated by 7% polyacrylamide gel electrophoresis. The gels were stained for haemocyanins, lipoproteins and glycoproteins using O-dianisidine-peroxidase<sup>1</sup>, oil red O and periodic acid Schiff (PAS) reaction respectively.

The haemolymph of *Scylla serrata* (Fig. 1) showed five fast moving haemocyanin fractions of which all excepting the fastest one were positive to oil red O and PAS. This seems to indicate that possibly the haemocyanin fractions are linked with lipo and glycoproteins. Out of the total of 11 lipo and 8 glycoprotein fractions, evident in the haemolymph of *S. serrata*, eight glycoprotein fractions are identical in mobility with lipoprotein fractions which is indicative of their close bondage. Three of the lipoprotein fractions are however free. It appears, therefore, that there are four haemocyanin lipo-glycoprotein complexes and eight lipo-glycoprotein complexes in this crab.

In *Cardisoma carnifex* (Fig. 1), only two haemocyanin fractions, one fast and another slow moving, could be discerned. There are 8 glycoprotein fractions and 5 lipoprotein fractions in the haemolymph of this crab. The two haemocyanin fractions are

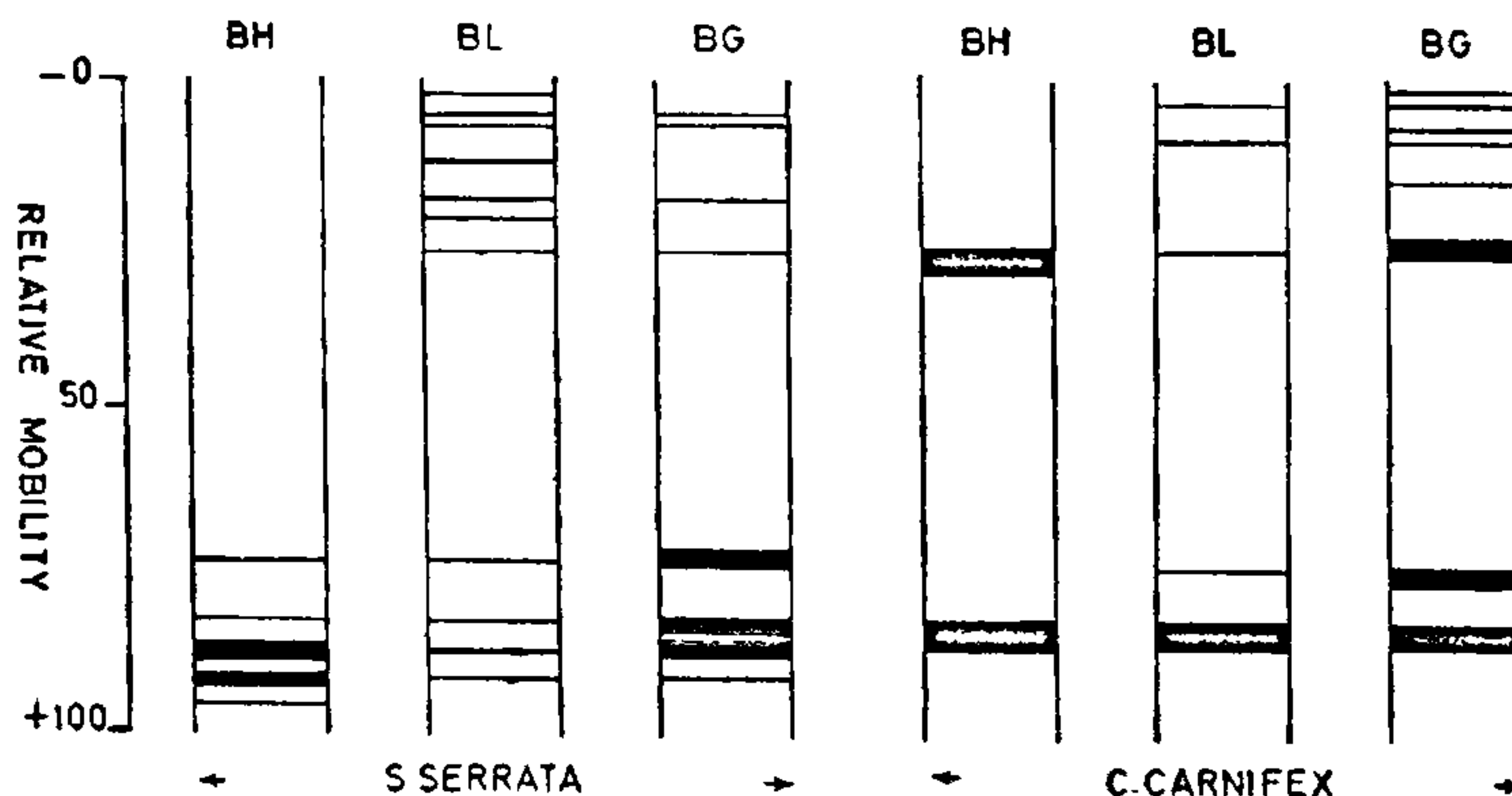


FIG. 1. Diagrammatic representation of haemolymph proteins of *Scylla serrata* and *Cardisoma carnifex*. BH, Haemocyanin. BL, Lipoprotein. BG, Glycoprotein.