enteric cells in late pupal stages remains unchanged. The adult mid-gut epithelial cells show weak β-glucosidase activity in the apical region bordering the lumen of the gut (figure 2). The cells of the spinning gland in larval period reveal no β-glucosidase activity. In prepupal period also, when the cells are actively engaged in silk secretion, β-glucosidase activity is undetectable. With the onset of pupation when the gland begins to degenerate, the enzymatic reaction product is formed in appreciable amounts in all the gland cells (figure 3). The activity is scattered throughout the cytoplasm and not restricted to specific areas. β-glucosidase activity, although weak, persists up to the final phase of degeneration (3-day-old pupa).

β-glucosidase is one of the carbohydrases, which hydrolyses specific (β) bond in the sugar residues of cellobiose, gentiobiose, phenylglucosides, methyl-β-glucosides, salicin, arbutin etc, the specificity depending on the nature of the bond and the form of linkage. Like acid phosphatase and β-glucuronidase, β-glucosidase is also lysosome attached hydrolase involved in tissue breakdown[8–11]. The present investigations on the β-glucosidase activity in the mid-gut epithelial cells of growing instars of *D. obliqua* have revealed that in the functional phase it is low and confined to the basal cytoplasm only.

In degenerating cells the activity increases considerably and is found in the entire cytoplasm. In the regenerative cells the activity is low and remains as such in the mid-gut epithelium of the adult. It is thus seen that the greater β-glucosidase activity in the degenerating cells coincides with increased acid phosphatase activity during early pupal stages[13]. There is reason to believe that β-glucosidase reaction as obtained in the mid-gut cells of the prepupa and pupa of *D. obliqua* is associated with the process of cellular degradation, which occurs with the increased lysosomal activity in the cells. It is also in agreement with Young's[10] observation that enzymatic activity varies during development of *Spodoptera eridania*. The presence of carbohydrase activity in functional cells, although weak, has nothing to do with lytic events, as in histolytic phenomena, but is possibly concerned with the breakdown of sugar substrate received from the food of the animal. As during larval instars, no significant variation in activity and localization of the enzyme under reference is noticed, there appears little involvement of the enzyme in differentiation and growth. Absence of β-glucosidase activity in the silk gland cells in sequential instars of *D.obliqua* further confirms the above viewpoint.

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1. Bongers, J., *Z. Vergl. Physiologie.*, 1970, **70,** 382.
2. Hori, K., *Comp. Biochem. Physiol.*, 1975, **50,** 145.
3. Khan, M. R., *Pak. J. Zool.*, 1976, **6,** 13.
4. Morgan, M. R. J., *J. Insect Physiol.*, 1975, **21,** 1045.
5. Morgan, M. R. J., *Acrida*, 1976, **5,** 45.
6. Khan, M. R. and Bhatti, A. H., *Pak. J. Zool.*, 1975, **5,** 131.
7. Terra, W. R., Ferreira, C. and Bianchi, A. G. de, *J. Insect Physiol.*, 1979, **25,** 487.
8. Varute, A. T. and Sawant, V. A., *Comp. Biochem. Physiol.*, 1971, **38,** 211.
9. Varute, A. T. and Sawant, V. A., *Indian J. Exp. Biol.*, 1971, **9,** 333.
10. Young, R. G., *Ann. Ent. Soc. Am.*, 1978, **71,** 95.
11. Young, R. G., *Ann. Ent. Soc. Am.*, 1979, **72,** 193.
12. Pearse, A. G. E., *Histochemistry*, 1968, **2,** 507.
13. Vishnoi, D. N. and Srivastava, U. C., *Zool. Jb. Anat.*, 1976, **95,** 511.

KARYOLOGY OF THE PIGMY SHREW, *SUNCUS ETRUSCUS PERROTTETI* (SAVI) (SORICIDAE: INSECTIVORA)

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THE pigmy shrew, *Suncus etruscus*, is perhaps the smallest extant eutherian mammal with an average length of 6 cm. In India it is distributed in peninsular India and northwards to Punjab, Orissa and Assam[1]. Meylan[2] reported in this species a chromosome number of 42 in a specimen collected from S. France. Later the preliminary study by Satya-Prakash[3] confirmed the chromosome number but with some architectural differences. Since other details of the chromosomes are lacking, a greater number of animals of both sexes were analysed. The present communication describes the details of the

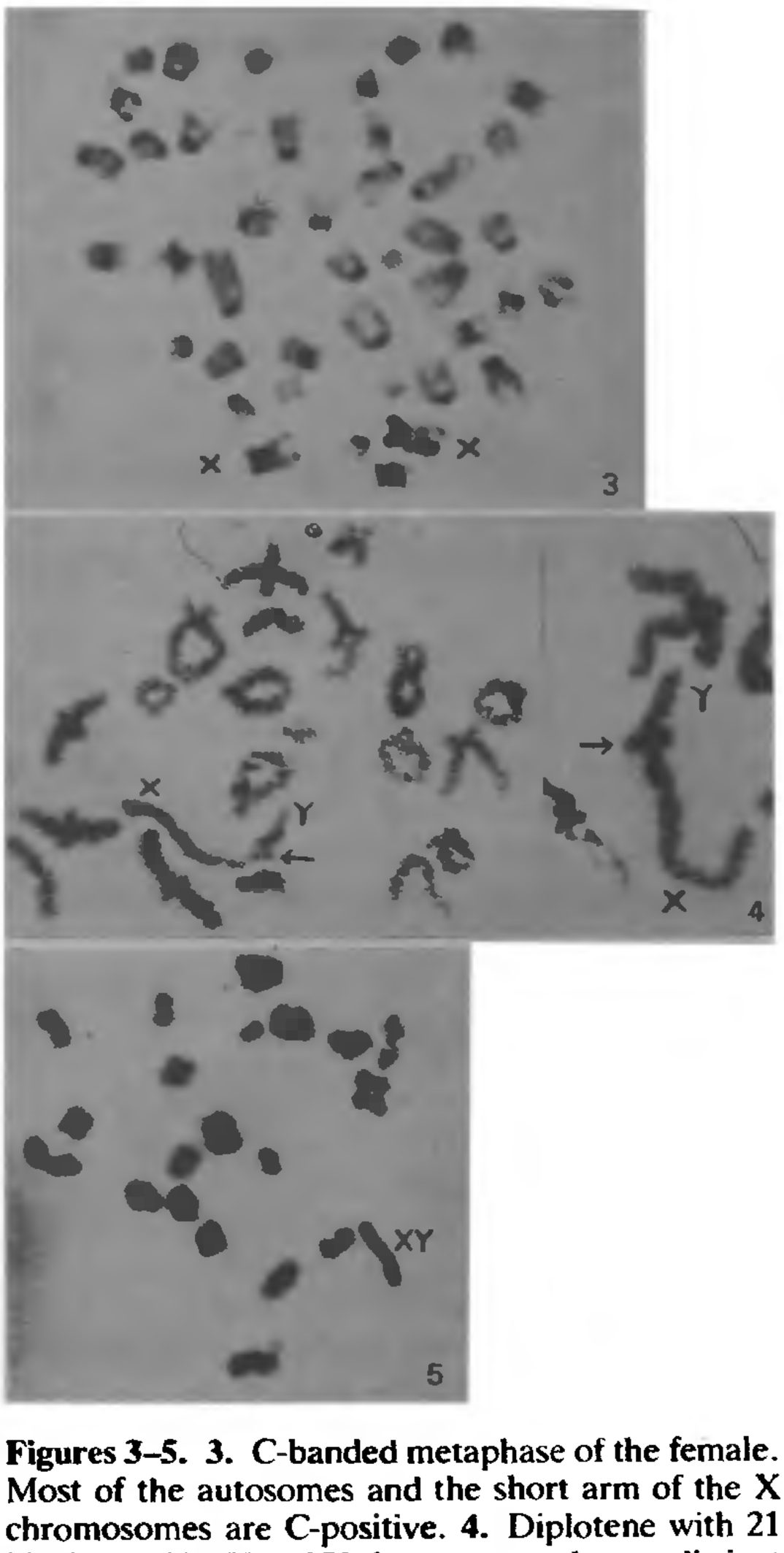
karyotype, localization of constitutive heterochromatin and meiosis of *S. etruscus*.

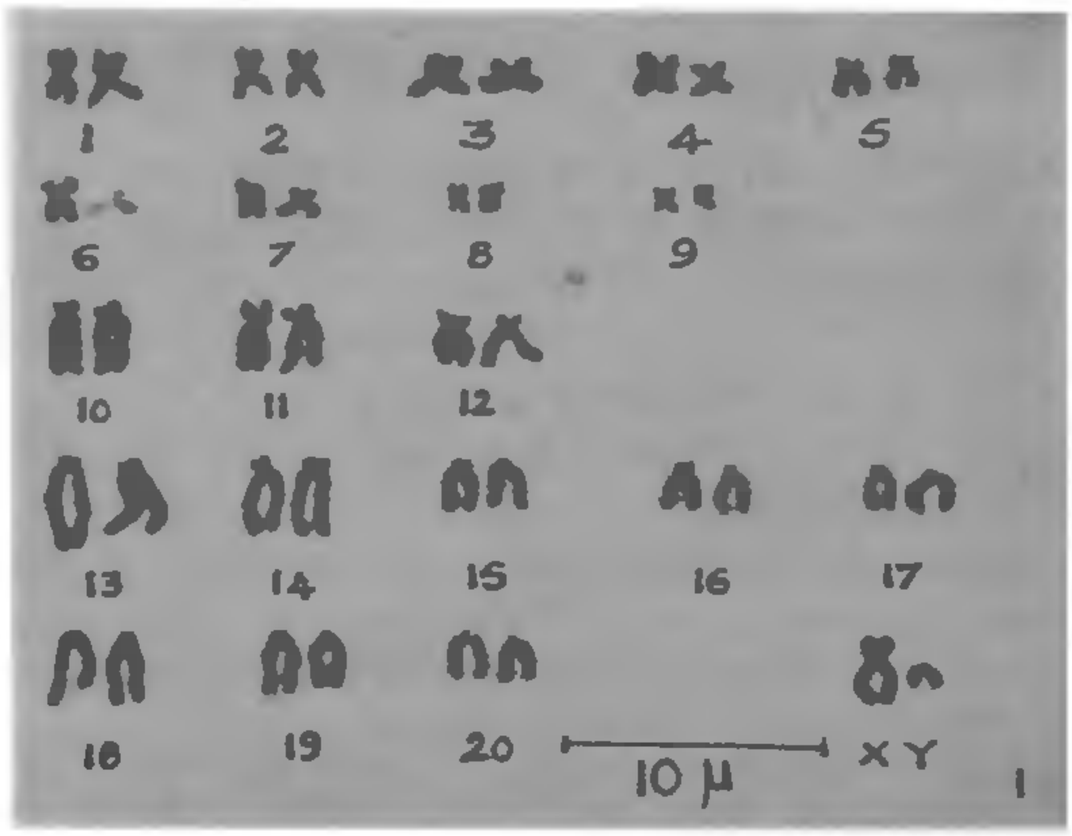
The specimens were collected from different spots of this University campus under litter, grass heaps and other waste materials. The specimens were identified and the type specimens are deposited in the British Museum, (Natural History) London.

Chromosome preparations were made by the routine airdry technique using bone marrow, spleen and testes. As the animals were too small the marrow was removed by crushing the delicate skeletal structures in warm hypotonic solution. Sumner's[4] method was applied with slight modification for C-banding.

Meylan[2] described a diploid number of 42 in a single male specimen of *S. etruscus*, collected from *Pyrenees orientale* (S. France) but he expressed that the grouping of the autosome pairs and the identification of the sex chromosomes were arbitrary. The chromosome complement of the pygmy shrew was confirmed to be 42 in all the tissues of both the sexes. The karyotype comprised of 18 metacentric, 6 submetacentric, 10 sub-acrocentric and 6 acrocentric chromosomes. The fundamental number (FN) is 74 (figure 1). The *X* chromosome is submetacentric (7%) and the identification of the *Y* chromosome is unequivocal as it is the smallest acrocentric (2%). The morphometric data are presented in figure 2.

The C-banding (figure 3) shows that the centromeric bands are distinct in all autosomes except in a few smaller ones. The *X* chromosome is confirmed to be submetacentric and the entire short arm is C-positive. The largeness of the *X* chromosome (7%) may be due to the addition of constitutive heterochromatin. This confirms that the geneti-





Figures 1–2. 1. Male karyotype of *Suncus etruscus* with $2n = 42$. **2.** Idiogram of the karyotype.

Figures 3–5. 3. C-banded metaphase of the female. Most of the autosomes and the short arm of the X chromosomes are C-positive. **4.** Diplotene with 21 bivalents. The X and Y chromosomes have a distinct chiasma. **4a.** Magnified sex chromosomes to show the chiasma. **5.** Cell at diakinesis with the terminalized chiasma between X and Y chromosomes showing end-to-end association.

cally active DNA of the chromosome conforms to 'the original type' of the eutherian mammals.

The meiotic events are similar to the house shrew, *Suncus murinus*[5]. The sex vesicle resolves into a positively heteropycnotic bivalent in pachytene and becomes prominent in the later stages. In diplotene, the *X* and *Y* chromosomes show a distinct chiasma. The chiasma formation appears to be between the long arm of the *X* and *Y* chromosome (figures 4 and 4a). In diakinesis, the sex bivalent exhibits end-to-end association with the terminalization of chiasma (figure 5). Clear chiasma between the *X* and *Y* chromosomes is a rare feature among eutherian mammals, suggesting the presence of homologous segments between them[5–7]. Occurrence of a distinct chiasma in *S. etruscus* adds one more instance to the list in mammals.

The present karyotype seems to be an usual karyotype of *S. etruscus* as it is consistent in number and structure in all the individuals studied. The *X* chromosome larger than 'the original type' and a clear chiasma between the sex chromosomes in both the species of *Suncus* appear to be implicated in the karyotype evolution of this genus.

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1. Ellerman, J. and Morrison-Scott, T. C. S., *Checklist of Palaerctic and Indian mammals*, II edn, British Museum (Natural History), London, 1966, p. 8.
2. Meylan, A., *Bull. Soc. Vaud. Sci. Nat.*, 1968, **70,** 84.
3. Satya-Prakash, K. L., Ph.D. thesis, University of Mysore, Mysore, India, 1976.
4. Sumner, A. T., *Exp. Cell Res.*, 1972, **75,** 304.
5. Satya-Prakash, K. L. and Aswathanarayana, N. V., *J. Heredity*, 1984, **75,** 149.
6. Lavappa, K. S., *Lab. Anim. Sci.*, 1974, **24,** 817.
7. Solari, A. J., *Int. Rev. Cytol.*, 1974, **38,** 273.

JUVENOMIMETIC EFFECTS OF SOLASODINE ON *CHILO PARTELLUS*

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THE responses of insects to various juvenile hormone analogues derived from plants have been studied previously by different workers[1–4]. In this communication we report the juvenomimetic effects of solasodine[5,6] extracted from the green fruits of *Solanum aviculare* on the jowar stem borer *Chilo partellus* Swinhoe (Lepidoptera: Pyralidae).

The jowar stem borer *Chilo partellus* was reared on artificial diet[7] at a temperature of 27 ± 1°C and RH 65 ± 5%. Freshly ecdysed fifth instar larvae were treated topically on the abdominal region with 5 μls of different concentrations of solasodine (0.25–1 μg/μl) in acetone. Thirty larvae were treated (1.25, 2.5 and 5 μg/larva) each time and the experiments were replicated five times. Controls were treated with an equivalent volume of carrier solvent acetone. After total absorption of solasodine the larvae were transferred into the artificial diet and were observed daily to note the changes.

The duration of the last larval instar in controls usually varied between 11 and 13 days which, however, extended during the diapause state of the borer larvae[8]. Application of solasodine caused morphogenetic aberrations which were expressed in the next moulted forms.

At 5 μg/larva dosage the larval life prolonged by 5–7 days to that of control. Eighty-two per cent of the larval-pupal intermediates showed more larval characters, their length was reduced, the body was shrunken, the abdominal legs were absent but prolegs were present with their tips chitinized. Such forms were inactive and could not spin their cocoons and soon died. While at 2.5 μg/larva 86% of the larvae moulted after 15–16 days of treatment into larval-pupal intermediates with more pupal characters showing head, thorax larval and abdomen pupal and these intermediate forms died after 2–3 days. At lower concentrations of 1.25 μg/larva the larvae moulted into normal pupae and externally normal adults eclosed from these pupae.

The resultant externally normal female adults were dissected in insect Ringer solution. The ovariole length differed between the members of the same ovary or of both the ovaries. The number of