

TABLE 2

Chromosomal valency involving six homologues at diakinesis in a hexasomic plant

Total number of PMCs scored	VI	IV+II	2II+2I	III+II +I	3II	III+III	V+I	III +	II +	IV +
380	93	63	54	46	43	27	18	3I	4I	2I

individuals<sup>1</sup> with reduced pollen and ovule viability. A tetra-trisomic ( $2n+2+1$ ) plant of *Pennisetum americanum* (L.) K. Schum was isolated with  $2n=17$  ( $2n+3$ ) chromosomes from among the progeny of open pollinated triploids<sup>9</sup>. The three extra chromosomes in the majority of PMCs were reported to give quadrivalent and trivalent configuration proving its tetra-trisomic nature. Because of the three extra chromosomes in the complement, this plant showed highly reduced vigour and fertility. However, all the different chromosomal variants in *Coix* both on the minus side as also on the plus side of diploids isolated in the present study were quite healthy except the pentasomic and the hexasomic. Pentasomic and hexasomic plants were stunted, had mutilated male racemes and showed no seed setting. Pentasomic plant showed about 18% stainable pollen, although the property to stain might not be an indication of viability. Hexasomic plant showed nearly all crumpled and unstained pollen.

Although the origin of the polysomics in *C. gigantea* would be a matter of guess, cytological studies carried out in this laboratory led to the inference that they arose through fusion of gametes produced by the trisomics. The meiotic analysis of trisomics ( $2n=21$ ) showed quite a few 9-12 and 10-11 anaphase-I and metaphase-II distribution of chromosomes due either to non-disjunction of the trivalent or its segregation as II-I. Chance mating of gametes both with 12 chromosomes would produce hexasomic plant ( $2n=24$ ) and fusion of gametes with 12 and 11 chromosomes would result in a pentasomic ( $2n=23$ ). The tetrasomic plant ( $2n=22$ ) could also be the potential source of aneuploid superhaploid gametes but compared to trisomics, tetrasomics are rare in the present population. *Coix*, although basically an open pollinated plant, shows some amount of selfing on account of the number of inflorescences bearing male and female flowers at various stages of development on the same plant and at the same time. In all probability, therefore, both the selfed and crossed progeny in the trisomes produced these higher polysomics.

We thank Prof. R. M. Pai, for facilities and interest.

One of us (SSB) thanks the U. G. C. New Delhi for a fellowship.

30 October 1982; Revised 29 January 1983

1. Khush, G. S., *Cytogenetics of Aneuploids*, Academic Press New York, 1973.
2. Hamerton, J. L., *Handbook of molecular cytology* (ed.) A. Lima-de-Faria; North-Holland, Oxford, 1969
3. Conger, A. D. and Fairchild, L. M., *Stain. Techn.*, 1953, 28, 281.
4. Darlington, C. D. and Janaki Ammal, E. K., *Chromosome Atlas of Cultivated Plants*. Allen and Unwin, London, 1945.
5. Nirodi, N. *Ann. Misso. Bot. Gard.*, 1955, 42, 103.
6. Bor, N. L., *Grasses of Burma, Ceylon, India and Pakistan*. Pergamon Press, Press, New York, 1960.
7. Venkateswarlu, J. and Chaganti, R. S. K., *Job's Tears*, ICAR Techn. Bull No. 44 New Delhi, 1973.
8. Venkateswarlu, J., Chaganti, R. S. K. and Rao, P N., *Bot. Mus. Leaflets*, 1976, 24: 205.
9. Sai Kumar, R., Singh, U. P., Singh, R. B. and Singh, R. M. *Curr. Sci.* 1982, 51: 376.

#### DIURNAL RHYTHMICITY IN TOTAL PROTEIN AND COPPER CONTENTS OF THE BLOOD OF THE FRESHWATER FIELD CRAB, *OZIOTELPHUSA SENEX SENEX* (FABRICIUS)

P. SREENIVASULU CHETTY, V. KALA RANI, D. CHANDRA SEKARA REDDY AND B. PADMANABHA NAIDU

Department of Zoology, Sri Venkateswara University, Tirupati 517 502, India.

CONSIDERABLE work has been done on the activity rhythms in arthropods, including crustaceans<sup>1</sup>. Bar-

ring a few studies<sup>2</sup>, not much is known of rhythmicity of metabolic parameters—especially blood constituents—of freshwater field crabs. Laboratory observations revealed that crabs are more active in the morning (immediately after sunrise) and during midnight. Hence there might be corresponding variations in the various physiological processes of these organisms. Since very little is known about the rhythmicity of various constituents of the blood, a transporting medium, an attempt has been made to study the levels of copper, an important constituent of the respiratory pigment, haemocyanin, and total protein, in the blood and hepatopancreas of the freshwater field crab, *Oziotelphusa senex senex* as a function of time of the solar day.

Crabs, collected from paddy fields, were brought to the laboratory and kept in large glass troughs containing tap water and were fed *ad libitum* on frog muscles. After a brief and adaptive sojourn, male animals of the intermoult stage weighing 30–35 g were selected for the experiment. Blood was collected using a hypodermic syringe and hepatopancreas was isolated immediately at regular intervals of 4 hr to cover 24 hr period. Blood and hepatopancreatic copper and the protein contents were estimated<sup>3,4</sup>. The experiment was repeated for 3 consecutive days to see whether the pattern remained the same. Significance of the data was assessed through student's 't' test<sup>5</sup>.

Results presented in figures 1 and 2 clearly indicate

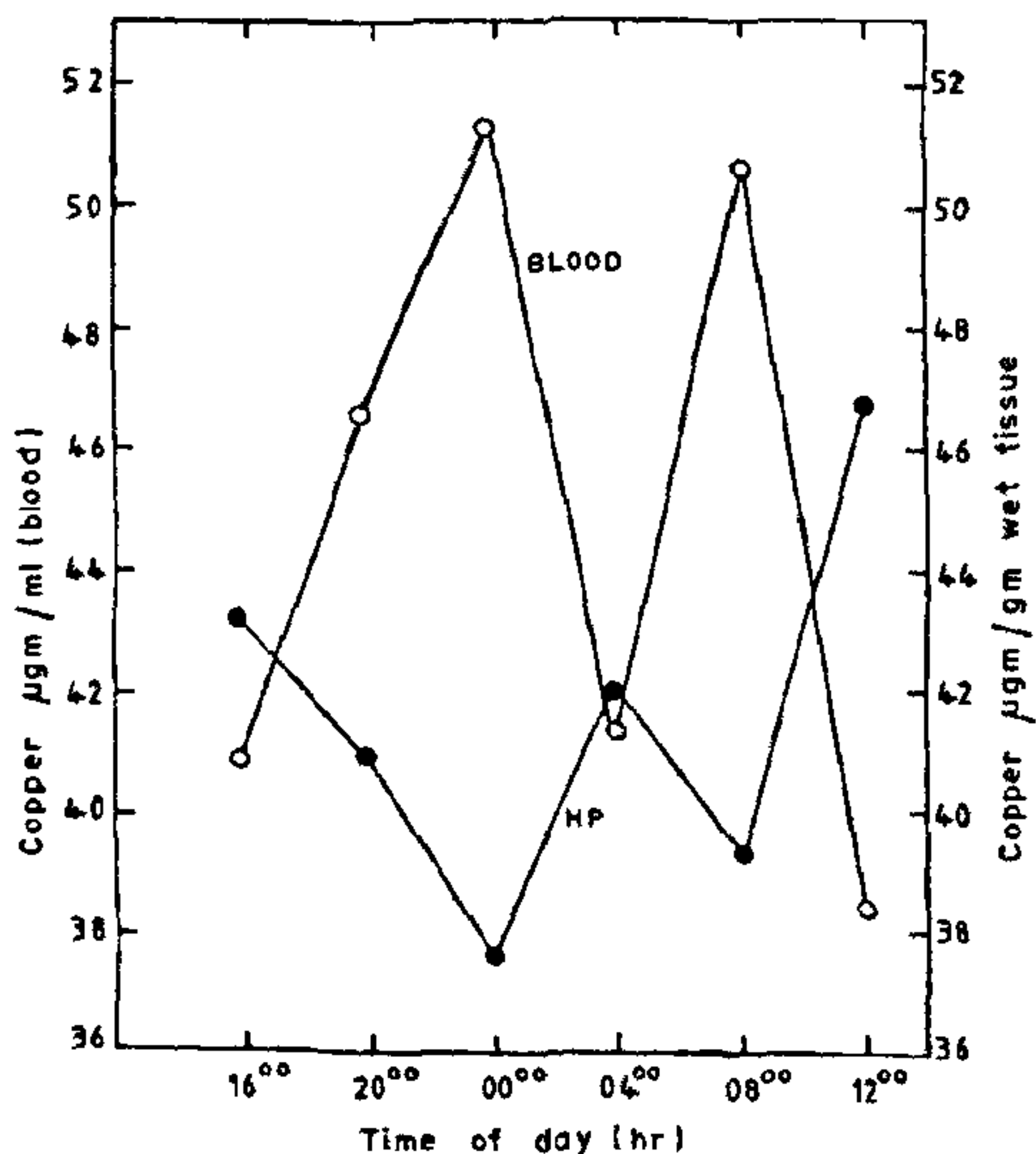


Figure 1. Rhythmic variations in blood and hepatopancreatic copper in *O. senex senex*.

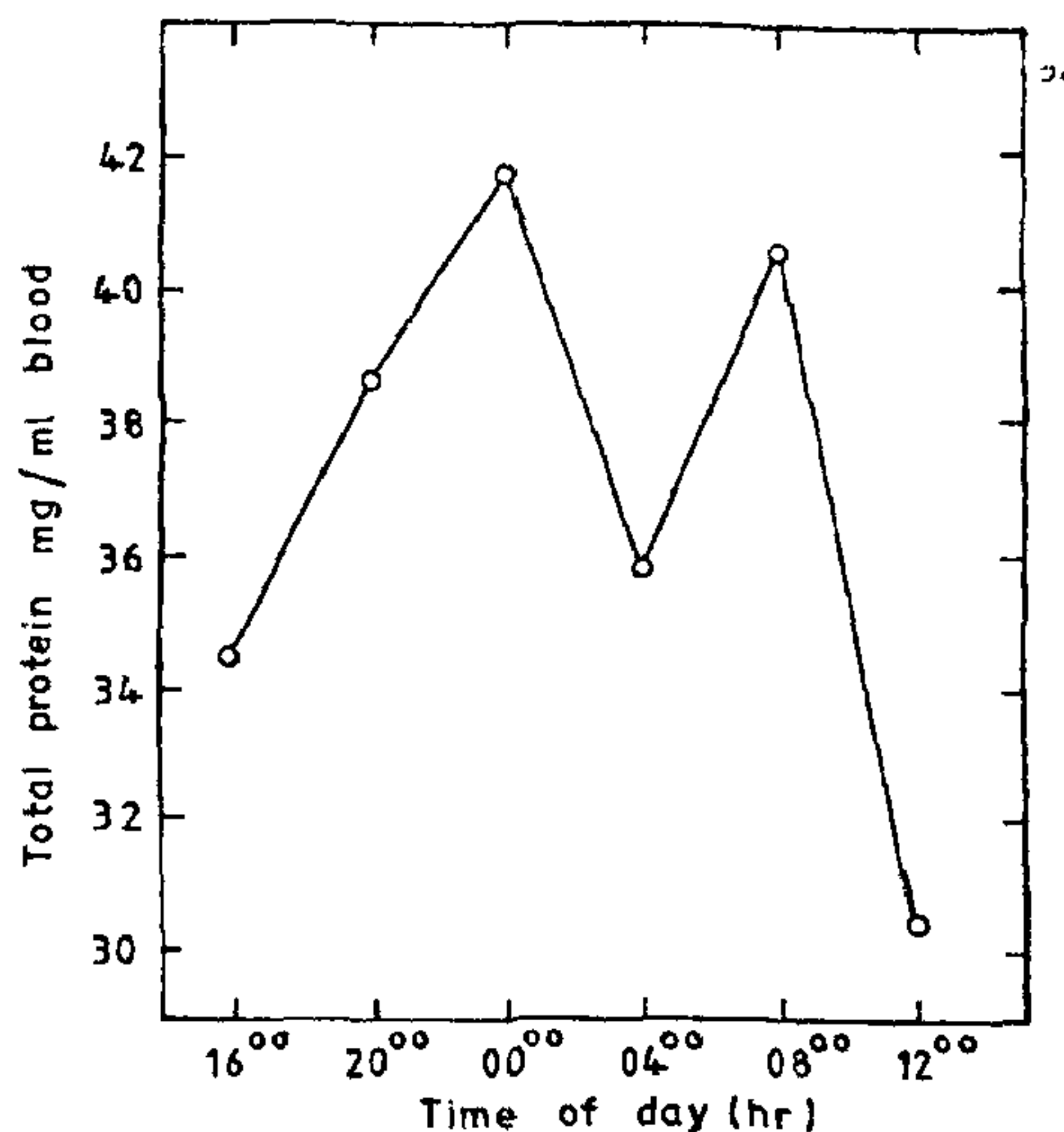


Figure 2. Rhythmic variations in the total protein content in *O. senex senex*.

that copper and total protein levels varied rhythmically during the course of a 24 hr day. While blood copper level was maximal at 0 hr and 0800 hr and minimal at 1600 and 1200 hr, and converse is the case with hepatopancreatic copper level (figure 1). Blood proteins also exhibited a similar trend as that of blood copper (figure 2) indicating the presence of a diel rhythm. Daily variations have been observed in copper and protein levels of the marine crab, *Sylla serrata*<sup>6</sup>. The difference between maximal and minimal levels of copper and total protein was significant ( $P < 0.001$ ).

The present study shows that whenever the animals are active, blood protein and copper levels are high and *vice versa*. The pattern of variation in the levels of blood copper and total protein indicate the pattern of variation in the haemocyanin concentration, since these two are the important constituents of the haemocyanin, and thereby in the oxygen carrying capacity of the respiratory pigment. The crabs are more active in the morning and midnight indicating a greater energy demand. As such aerobic oxidations are at a higher level at peak activity periods implying that the cellular oxygen requirement is also high. It was found that the daily variations in the oxygen consumption and succinate dehydrogenase activity<sup>7</sup> of *O. senex senex* corroborate with the observed variations in the physical activity.

The hepatopancreatic copper content was low at peak activity periods and high at other periods indi-

ting transmobilization of copper between blood and hepatopancreas. The results show that variations in the blood copper and protein levels have a direct bearing on the oxygenation properties of the blood and thereby on the overall metabolic rate of the animal.

PSC and VKR acknowledge financial support from UGC New Delhi.

1 October 1982; Revised 2 December 1982.

1. Sollberger, A. In *Biological rhythm research* (Elsevier, Amsterdam-London-New York), 1965.

2. Chandra Sekara Reddy, D., Raghupathi, M., Purushotham, K. R. and padmanabha Naidu, B., *Indian J. Exp. Biol.*, 1981, **19**, 403.

3. Barnes, H. and Rothchild, L., *J. Exp. Biol.*, 1950, **27**, 123.

4. Lowry, O. H., Rosebrough, R. J., Farr, A. L. and Randall, R. J., *J. Biol. Chem.*, 1951, **193**, 265.

5. Goodmann, R., in *Teach yourself statistics* 1974, p. 151.

6. Arumugam, M., M. Phil. Dissertation, Madras University, 1978.

7. Surendranatha Reddy, K. V., M. Phil. Dissertation, S. V. University, Tirupati, 1978.

---



---

## ANNOUNCEMENTS

---



---

### WORKSHOP ON ULTRASTRUCTURE OF NUCLEUS AND CHROMOSOMES

It is proposed to hold a Workshop on Ultrastructure of Nucleus and Chromosomes from October 3 to 8, 1983 at Centre for Cellular and Molecular Biology, Regional Research Laboratory, Hyderabad. The Workshop would be technique-oriented; however, some lectures will be given on recent advances in structure of nuclear membrane, chromosomes and nucleolus. Practical/demonstrations would be given on isolation of nucleus, chromosomes and nucleus and preparatory techniques for such structures for

scanning, transmission, backscattered imaging and x-ray analysis models in electron microscopy.

The Workshop being technique-oriented, only eight candidates will be selected. Applicants are requested to send along with their brief resume, reasons for the necessity and usefulness of this training in their research work in ten to fifteen lines. Kindly send your applications before 31st July 1983 to Dr. P. D. Gupta, Centre for Cellular and Molecular Biology, Hyderabad 500 007

---

### SEMINAR ON RICE BRAN OIL: STATUS AND PROSPECTS

The Oil Technologists' Association of India, Southern Zone, is organizing a seminar on "Rice bran oil: Status and prospects" on Saturday, August 13, 1983 at Regional Research Laboratory, Hyderabad 500 007. The programme includes invited lectures and panel discussion on topics of relevance.

It is planned to bring out a Souvenir. The last date

for submitting the advertisement order is June 30, 1983. Those interested in attending the seminar are requested to register their names before July 15, 1983. For details please contact: Dr. M. M. Paulouse, Convener, Seminar on Rice bran oil: Status and Prospects, Regional Research Laboratory, Hyderabad 500 007.