their roosting sites. Surgical procedures for the recovery of adrenal gland were described earlier[5]. Tissues were fixed in 10% chilled neutral formalin (4°C) for 6–8 h. Frozen sections (10 μm) were processed for alkaline phosphatase according to the Gomori method described by Pearse[10], and for 5′ nucelotidase according to Wachstein and Meisel[11].

The adrenal gland of *P. g. giganteus* exhibits a characteristic tripartite cortex and well-developed medulla. Positive activity of enzymes alkaline phosphatase and 5′nucleotidase was observed in the cortex and medulla but with varying intensities.

The activity of alkaline phosphatase was intense in the zona glomerulosa (figure 1:ZG) and zona fasciculata (figure 2:ZF). Reticularis (figure 3:ZR) showed moderate activity of this enzyme whereas medullary cells (figure 3:MED) arranged in a cord-like fashion (C) exhibited slight activity. Intense activity of 5′ nucleotidase was manifested by zona glomerulosa (figure 4:ZG) and zona fasciculata (figure 5:ZF). Reticularis (figure 6:ZR) displayed high activity and cells of medulla exhibited moderate activity.

The present study highlights the pattern and distribution of alkaline phosphatase and 5′nucleotidase in the adrenal gland of *P. g. giganteus*. The differences in alkaline phosphatase profiles in the cortex and medulla may be related to the differential rate of substrate hydrolysis and transfer of metabolites across the cell membranes. High activity in the cortical region may be linked to considerable demands of the metabolites to mobilize and transfer large amounts of energy-rich precursors. The low concentrations of this enzyme may be due to lesser demands and transfer of metabolites. Positive alkaline phosphatase activity is linked with the secretion of adrenaline[12,13]. Elftman[14] and Nicander[15] reported in mammals a higher concentration of alkaline phosphatase in the adrenal cortex of males. This agrees with our findings in *P. g. giganteus*.

The higher concentrations of 5′nucleotidase in the cortical cells may be due to their relatively high metabolic functions. The differential activity of this enzyme in the cortex and medulla may be related to the role in maintaining the levels of nucleic acids in these regions. Our observations differ with those of Barka and Anderson[16], who reported 5′ nucleotidase to occur mainly in the adrenal medulla of rat.

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1. Bhima Rao, B. S. and Devraj Sarkar, H. B., *Curr. Sci.*, 1975, **44**, 809.
2. Saidapur, S. K. and Nadkarni, V. B., *Endokrinologie*, 1976, **67**, 244.
3. Sapkal, V. M., *Curr. Sci.*, 1978, **47**, 140.
4. Karim, K. B., Gopalakrishna, A. and Gadhoke, H., *Curr. Sci.*, 1979, **48**, 607.
5. David, S. K. and Lall, S. B., *Curr. Sci.*, 1981, **50**, 527.
6. Rudd, R., Unpublished work cited by A. Gorbman and H. A. Bern, In: *A text book of comparative endocrinology*, John Wiley, New York, 1962.
7. Lowry, M. L., Bhardwaj, J. C. and Lall, S. B., *Curr. Sci.*, 1980, **49**, 730.
8. David, S. K. and Lall, S. B., *Pak. J. Sci. Ind. Res.*, 1983, **26**, 318.
9. Lowry, M. L. and Lall, S. B., *Myotis*, 1986, **24**, 105.
10. Pearse, A. G. E., *Histochemistry: theoretical and applied.*, J. A. Churchill, London, 1968, Vol. 1.
11. Wachstein, M. and Meisel, E., *J. Histochem. Cytochem.*, 1956, **4**, 424.
12. Allen, J. M., *J. Histochem. Cytochem.*, 1956, **4**, 341.
13. Miraglia, T., *J. Histochem. Cytochem.*, 1965, **13**, 595.
14. Elftman, H., *Endocrinology*, 1947, **41**, 85.
15. Nicander, L., *Acta Anat.*, 1952, **14**, 1.
16. Barka, T. and Anderson, P. J., *Histochemistry*, Harper and Row, New York, 1963.

BIOLOGICAL CONTROL OF WHITE GRUB USING *VERTICILLIUM LECANII* (ZIMMERM) VIEGAS

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BIOINSECTICIDE is being increasingly used to control major insect pests of crop plants. Its use is inevitable especially when there is no traditional and economical method for controlling crop pests. Micro-organisms are useful for biological control of insect pests[1–4]. The present study attempts to examine the possible use of an entomophagous fungus in controlling the white grub (*Holotrichia consanguinea* Blanch.), a polyphagous pest, which attacks most kharif crops causing 10–100%

damage[5]. Despite several attempts to combat its menacing effects, this grub has not been found susceptible even to higher dosages of the commonly used soil insecticides[5]. There is therefore an immediate need for biological control of this pest.

From our fungal cultures isolated from saline soils (ECe 14.0 mmhos/cm) a fungus was identified by CMI, Surrey, Kew, UK as an entomophagous form of *Verticillium lecanii* (Zimmerm.) Viegas. The fungus culture was maintained on PDA slants and the seven-day-old culture was used throughout the experiment, which consisted of four treatments. For each treatment, 100 mg of fungal mass was macerated in 50 ml sterilized distilled water (SDW) giving two thorough washings each of 25 ml, thus making the total volume of fungal suspension (FS) to 100 ml. The roots of 20-day-old pearl millet plants were used as food material for white grubs in pots (diameter 37.5 cm, depth 10 cm) for all experimental work. Five second instar grubs were released in each replication. The first and second sets consisted of six and seven replications respectively. In the first treatment grubs were treated with FS for 5 min and released in pots; in the second treatment the root system of food material was dipped in FS for 15 min and in the third treatment the soil weighing 4 kg was treated with 100 ml FS. Control pots received SDW. The insecticidal effects of fungus were observed 10 days after the treatments.

The mean mortality of white grub was significantly superior over the control at 1% level of significance in all the three treatments (table 1). Interestingly, the fungus was more insecticidal to white grub through soil treatment, the mortality being 53% and 48% in the first and second sets respectively. The second set confirms the results of the first set.

Table 1 *Efficacy of Verticillium lecanii (V1) for the control of white grub*

Treatments	Mean per cent mortality	
	I set 21.9.86 to 1.10.86	II set 7.10.86 to 17.10.86
Grub + V1	26.61 (30.79)	17.14 (20.79)
Food + V1	33.33 (35.01)	28.57 (32.00)
Soil + V1	53.33 (46.92)	48.57 (45.82)
Control	00.00 (00.00)	00.00 (00.00)
C.D. at 1%	10.83	15.58

Figures in parentheses are angular transformed values.

V. lecanii is an established entomophagous fungus against several insect pests[2,6]. These results with white grub and *V. lecanii* are highly encouraging. It could be one of the several successful attempts for biological control of insect pests. It is hoped the present results would help encourage further experiments with white grub and *V. lecanii*.

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1. Battu, G. S., *Indian J. Entomol.*, 1978, **38**, 225.
2. Thoms, E. M. and Watson, T. F., *J. Invertebr. Pathol.*, 1986, **47**, 178.
3. Dabi, R. K., Mehrotra, P. and Shinde, V. K. R., *J. Entomol. Res.*, 1980, **4**, 231.
4. Ranganathaiah, K. G., Veeresh, G. K. and Govindu, H. C., *Curr. Sci.*, 1973, **42**, 432.
5. Anonymous, Final Research Report on Integrated Control of white grub, University of Udaipur, Campus Jobner, 1981, pp. 219.
6. St. Leger, R. J., Cooper, R. M. and Charnley, A. K., *J. Invertebr. Pathol.*, 1986, **47**, 167.

SCYPHOSPORA PHYLLOSTACHYDIS KANTSCHAVELI, A NEW GENERIC RECORD FOR INDIA

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DURING a collection trip to Kerala an interesting Coelomycetous fungus was collected on bamboo. This was identified as *Scyphospora phyllostachydis* Kantschaveli[1]. The genus *Scyphosphora* Kantschaveli is monotypic[2]. The fungus is briefly described in the present paper.

Conidiomata stromatic, linearly arranged, black, sub-epidermal, unilocular, flattened, 800–950 × 200–250 μm, glabrous, dehiscing irregularly (figure 2); wall tissue made up of pale brown, textura angularis in the outer layers, becoming hyaline in the inner layers. Conidiogenous cells arising from the inner most layers of the cells lining the bottom of the cavity, holoblastic, ampulliform to cylindrical, pale brown, smooth to slightly verrucose near the tips, 10–20 × 5–6 μm. Conidia amerosporous, brown, thick-walled, spherical to nearly triangular, with a longitudinal hyaline band on the flat surface, 25.5–37.5 μm in diam., often with an appendage at the base measuring 25–30 μm long and 3–5 μm wide (figure 1).