tems evolve successfully by creating structures which increase their capacity to extract energy from the environment and to override fluctuations in the environment. Viewed from this perspective, it might be expected that, while entropy maximizing landslides should be strongly influenced by their environmental controls, entropy minimizing "chronic" landslides should achieve a relatively large degree of independence. In sum, self-expanding "chronic" landslides may only be identifiable through an evaluation of their own, internal, energy-generating, structures. In this case, the key structure seems to be the back wall created by a rotational slump, a feature which may be steeper and less stable than the hillside it replaces.

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NEW INSECT GROWTH REGULATORY COMPOUND FOR THE CONTROL OF INDIAN RICE MOTH *CORCYRA CEPHALONICA* (LEPIDOPTERA: GALLERILIDAE)

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In our search for plant extracts and natural products for insecticidal properties, we have found petroleum ether extracts of the aquatic weed *Eichhornia crassipes* (Mart) Solmns as a source of potential juvenile hormone mimic, against certain insect pests like *Dysdercus cingulatus* and *Triboleum castaneum*[1]. These studies were further extended to assess the growth and reproductive inhibitory activity against freshly moulted fifth instar larvae of rice moth *Corcyra cephalonica*, a serious pest on stored products. Three active fractions from the crude extract were isolated chemically on TLC and these fractions were assayed against the larvae of rice moth.

C. cephalonica culture was maintained on pearl millets in the laboratory insectary at 27° ± 2°C and 50% RH. Different fractions of the extracted materials were assayed against freshly moulted fifth instar larvae. One μl acetonic solutions of different concentrations of the three fractions were topically applied to the larvae using an Agla micrometer syringe. The same volume of solvent was applied to the larvae of similar age as controls. Treated as well as control larvae were provided with pearl millets as feed and kept under observation for pupation and adult emergence, in glass bottles with mesh lids.

Of the three fractions assayed for toxicity and growth inhibitory activity against *C. cephalonica* the component from the III fraction was found to interfere with the morphogenesis of the treated insects. Immediate mortality of the larvae was not observed after treatment. Symptoms of poisoning manifested only during pupation. At 1 μg and 0.75 μg doses, most of the larvae became black, exuded their body fluids and ultimately died without pupation resembling the symptoms typical of chitin inhibitors[2,3]. At all doses tested metamorphic abnormalities like formation of larval-pupal intermediates, abnormal pupae, etc. were observed. At 0.5 μg and 0.25 μg doses prolongation of larval period was observed. Crude extract of water hyacinth produced similar activity against red flour beetle[1]. Prolongation of larval period may be due to the inhibition of moulting process caused by an increased titre of JH in the insect body. The adults emerging from such pupae always showed abnormal wing pattern. Such adults failed to reproduce and died 2–3 days after emergence. When dissected in insect ringer solution abnormal size and shape of Vas deferens and accessory glands was noticed in case of males. Likewise, female insects showed under-developed ovaries with reduced number of oocytes. In our earlier studies we have reported similar reproductive abnormalities against *Dysdercus cingulatus* with JH analogue and chitin inhibitor[4,5].

The per cent inhibition at each dose was calculated based on the scoring system of morphological deformities[6]. The per cent inhibition thus obtained at each dose was subjected to probit/log concentration transformation so as to draw probit regression line. From the regression line 50% inhibition dose

Table 1 *Statistical data on the effect of water hyacinth extract against the fifth instar larvae of C. cephalonica*

Dose (μg)/per cent inhibition*	Regression equation	χ^2 (μg)	$ID_{50} \pm S.E.$ (μg)	Fiducial limits (μg)
1.50/90 1.00/70 0.75/55; 0.50/38; 0.25/25	$1.16 \times 3.51X$	3.51	0.644 ± 0.09	0.825 0.463

* Inhibitory activity was rated as: Score 0: formation of normal insect that survived (perfect adult); Score 1: Adult with deformed wings that died 2–3 days after emergence; Score 2: Abnormal pupae; Score 3: Larval-pupal mosaics; Score 4: Death of the larvae in pre-ecdysial stages with blackened cuticle.

was calculated which was found to be 0.644 $\mu g \pm 0.09$ (table 1).

Preliminary chemical analysis reveals that the extract contains sterols which may be considered to be the main cause of these moulting abnormalities. From the present study, it can be concluded that the extract has the potentiality to disrupt the growth and reproduction of *C. cephalonica*. Studies are in progress to identify the chemistry of the active principle.

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FORMATION OF APOTHECIA BY SCLEROTIA OF *SCLEROTINIA TRIFOLIORUM* ERIKSS — A NEW RECORD IN INDIA

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STEM-ROT of Berseem (*Trifolium alexandrinum* L.) caused by *Sclerotinia trifoliorum* is one of the most serious diseases of this forage legume in Punjab. The disease was extensively studied in Europe, Northern USA and Canada on perennial clovers, alfalfa and other legumes[1]. Recently the disease was reported on Berseem[4] but no information is available on the formation of apothecia by sclerotia of *S. trifoliorum* from India. Sclerotia germinate in the field either myceliogenically or carpogenically and cause infection but the secondary spread of the disease is through mycelium[3,5].

The main objective of this study was to determine the time and depth at which the sclerotia of *S. trifoliorum* germinate to form apothecia.

Sclerotia of *S. trifoliorum* were collected from the naturally infected fields of Berseem in June 1986, air-dried and stored at 25–40°C. Sclerotia were also obtained from the culture of *S. trifoliorum* grown for one month on potato dextrose agar and stored.

Earthen pots were filled with sterilized sandy loam soil. The sclerotia collected from field as well as from culture were buried at different depths of soil (0, 0.5, 1, 2, 3, 4 and 5 cm). Ten sclerotia were added to each pot in three replicates during the last week of October and Berseem variety BL-1 was sown in these pots. The seedlings were established by sprinkler irrigation. The pots were examined weekly for the production of apothecia. Only open,

Figure 1. Apothecia developed from sclerotia buried 1 cm deep in the soil.